LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
School of Industrial Engineering and Management
Department of Industrial Management

Supplier Segmentation for Nordic Petrochemical Industry

Examiner: Professor Janne Huiskonen
Associate Professor Petri Niemi
Supervisor: Antti Ilves, Nikita Andreev and Koen Tiels

Porvoo 12.8.2013

Annika Huomo

ABSTRACT

Author: Annika Huomo

Title: Supplier Segmentation for Nordic Petrochemical Industry

Year: 2013 **Place:** Porvoo

Master's Thesis. Lappeenranta University of Technology, Industrial Management.
126 pages, 14 figures, 25 tables and 2 appendices
Examiner(s): Professor Janne Huiskonen and Associate Professor Petri Niemi

Keywords: Segmentation, Supplier management, Supplier evaluation

Objective of this thesis was to map possibilities for systematic supplier management in field of chemical process industry. Through this study it was aimed to develop a tool for supplier management that could be integrated with operations in business unit. With developed tool suppliers should be able to be segmented based on their willingness and capability, and segmentation could be applied in purchasing decisions.

In this thesis there was made a survey of methods that are recognized in literature to manage and allocate suppliers. This thesis recognizes segmentation as a method to group and select suppliers in procurement. Based on literature, a proposal for segmentation framework and evaluation criteria factors will be constituted.

Based on theoretical proposal, in an expertise workshop a final segmentation framework was constituted, which covers segments with descriptions and evaluation part. Evaluation part includes an evaluation framework which helps to score suppliers with selected factors and leads to total grades in willingness and capability. These total grades will be the coordinates and they determine the segment where the supplier under evaluation belongs. In this thesis segments definitions, objectives, and road maps will be described.

TIIVISTELMÄ

Tekijä: Annika Huomo

Työn nimi: Toimittajien segmentointi petrokemianalalla pohjoismaissa

Vuosi: 2013 **Paikka:** Porvoo

Diplomityö. Lappeenrannan teknillinen yliopisto, tuotantotalous.

126 sivua, 14 kuvaa, 25 taulukkoa ja 2 liitettä

Tarkastaja(t): professori Janne Huiskonen ja Tutkijaopettaja Petri Niemi

Hakusanat: Segmentointi, Toimittajan hallinta, Toimittaja arviointi

Tämän diplomityön tavoitteena oli kartoittaa mahdollisuuksia toimittajien systemaattiseen hallintaan kemian prosessiteollisuuden alalla. Selvityksen perusteella pyrittiin kehittämään toimittajien hallintaan työkalu, joka voitaisiin integroida liiketoimintayksikön operatiivisiin toimintoihin. Työkalun avulla toimittajat tulisi pystyä kykyjen ja halukkuuden perusteella segmentoimaan ryhmiin, joita pystyttäisiin hyödyntämään hankintoja kohdennettaessa.

Työssä kartoitettiin teorian tunnistamia toimittajien hallinnan elementtejä hankintaprosessissa sekä sitä, miten toimittajia on tavattu allokoida. Työ käsittelee segmentointia tapana ryhmitellä ja valita toimittajia hankintaprosessien yhteydessä. Kirjallisuuden esittämien asioiden perusteella muodostetaan ehdotelma segmentointimallista ja kysymyspatteristosta, jonka avulla segmentointiin liittyvä arviointi voidaan toteuttaa.

Teoreettisen ehdotelman pohjalta, asiantuntija-workshopissa muodostettiin lopullinen segmentointityökalu, joka käsittää segmenttikuvaukset ja arviointiosan. Arviointiosa sisältää kehyksen, jonka avulla pisteytetään toimittajat valituissa asioissa, jotka johtavat toimittajan halukkuuden ja kyvykkyyden kokonaisarvosanoihin. Nämä kokonaisarvosanat ovat koordinaatit, jotka määräävät toimittajan sijainnin segmentointimallissa ja kertovat, mihin segmenttiin tämä kuuluu. Työssä myös kuvataan jokaisen segmentin määritelmä, tavoitteet sekä toimenpiteet.

ACKNOWLEDGMENTS

This Master's thesis was done as an assignment of Borealis Polymers Oy's Feedstock & Energy in Porvoo, Kilpilahti during 2013. First of all I wish my very best gratitude to my supervisors Antti Ilves, Nikita Andreev and Koen Tiels for your supporting guidance. Theirs and other Borealis organisation people's inspiring attitude throughout the process was most valuable and deserved to be mentioned.

I also would like to express my gratitude to Professor Janne Huiskonen and Associate Professor Petri Niemi for their guidance, flexibility and valuable time during this thesis.

Finally my deepest appreciation I owe to my family for their interest and encouraging through my studies. Thanks for my friends who had made my studying time unforgettable and counterbalancing my studies. Especially gratitude I want to express to my dear proofreader, who made this thesis comprehensible.

Thank you, all

Porvoo 12.8.2013

Annika Huomo

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABREVIATIONS

ADNOC	Abu Dhabi National Oil Company
Border	Vainikkala – Buslowskaya border station between Finland and Russia.
CPFR	Collaborative Planning, Forecasting, and Replenishment
CXL	Material planning and follow-up system used by Borealis
DAP	Delivered at place. Seller bears costs, risks and responsibility for goods until made available to buyer at named place of destination.
Feed	General name for representing all LPG:s and Naphtha feed materials, the goods that supplier are delivering, and goods that sourcing process this thesis aims to evaluate
HE	value Hold Even value, which is chemical definition for value that certain Feed creates.
HSE	Health, Safety, and Environment
IPIC	International Petroleum Investment Company of Abu Dhabi
LPG	Liquefied Petroleum Gases
OMV	Österreichischen Mineralölverwaltung Aktiengesellschaft Austrian Oil Administration AG
OTIF	On-Time In Full
PP	Polypropylene
PE	Polyetylene
RTC	Rail Tank Car
SCM	Supply Chain Management
SRM	Supplier Relationship Management
Trader	Borealis' trader, who purchases feedstock from Russian markets to Porvoo
VMI	Vendor Managed Inventory
VR	Valtion Rautatiet (VR Oy), Finnish Railways

1 INTRODUCTION

For the last two decades companies have been increasing their focus on supply chain issues and the concept of Supply Chain Management has been established. Consequently supply chain management with purchasing performance has been recognized as an important determinant of company's competitiveness (Dyer, et al., 1998). The concept of Supplier Relationship Management (SRM) has followed and supplier evaluation processes is receiving continuously more attention in literature.

1.1 Purpose of the Study

The purpose of this study is to rationalize the supplier base and create a model and base for instructing Borealis sourcing process. Borealis is buying its Feeds for steam cracker from various sources. Currently all sources are considered generally with equal priority. Also the supplier pool is relevantly unorganized, and mostly the information about suppliers is in intangible and in form of knowhow of persons who are involved in this supply chain process.

The purchasing has traditionally been highly transactional, and that's why the relationships with suppliers have stayed relevantly distant. Also in this industry the purchasing of Feeds has traditionally been so called "one man's responsibility" and it has generally based on knowhow, connections and experience, and thus there has not been need to spread the information. As a consequence from this, the suppliers have not been regularly evaluated, and there is no available statistic data about their performance, which could be used as a supportive tool in buying decisions.

The need for rationalizing the purchase has been recognized in order to stabilize the quality and increase the overall efficiency in sourcing of Feeds. One way for ensuring the required quality level is the minimizing of the risk of contamination while delivery. This could be done by using only the same RTCs in every

delivery. Generally, using the same RTC could be possible, if there would be clear regularity in deliveries. Currently the transactional deliveries would not enable this. When increasing the efficiency, it is wanted to consider how competitive the current purchasing of Feeds is and also if the purchasing process could be improved somehow. As an inconsequence of these issues there arises a need to map possibilities to rationalize the purchasing procedure within the limits of the elements in this industry.

As discussed above, this delivery process considers products that are as substitutes, which is why the supplier evaluation must be merely based on evaluating supplier itself. Building up relationship management strategy, should character of supplier been considered in order to apply same strategy on alike suppliers. Purpose of this study is to build up model that would allow evaluating and comparing of suppliers based on issues that Borealis considers to have an impact on supplier's potential for being a good supplier for Borealis.

1.2 Scope and Goals of the Master's Thesis

The scope of this Master's thesis covers the whole purchasing process of Feeds from supplier selection, bidding procedure to the actual delivery, and invoicing. The main focus is on Porvoo ethylene cracker's feedstock where Feeds, mainly naphtha and LPG, are purchased from Russian and Western markets and delivered to Porvoo. Feeds from Russia and former Soviet Union countries are mainly purchased as DAP and delivered from refineries by rail tank cars to Finnish-Russian border station. Besides RTC's, some volumes are also supplied locally, and because of the location by the sea there is also a possibility for suppliers to deliver by vessels.

The main scope of this thesis will be in Feeds that are mainly sourced from Russian sources and delivered to Borealis factory site in Porvoo Kilpilahti with rail tank cars (RTC). The framework developed in this paper will base on examples from rail logistics, but for further and wider use it should also be

applicable for other types of logistics deliveries as well. The logistical process contains loading and dispatching of RTCs, getting them to border, delivering it from border to Porvoo, unloading, and discharging it to be delivered back to Russia. Besides physical process, the logistical delivery process involves lots of documents for arranging delivery, product and demurrages invoices, customs clearances and reports, not to mention actions before the delivery. All these issues and how they are dealt, will be considered as relevant elements of supplier's performance and should have impact on purchasing decision.

The delivery process from border between Finland and Russia to Porvoo is executed by VR Transpoint, which is in the study commonly called as VR. Their actions and impact to delivery process has in this Master's thesis been left out of the scope, because it can be assumed, that VR's impact on delivery is equal within each supplier's case. Also because the purchasing is done as DAP, the delivery process that Borealis is able to track, starts from Vainikkala border station. Thus in most, cases if there is discussion about delivery times, the delivery is considered to be from suppliers dispatching and loading station to the Vainikkala border station, which is in this thesis discussed with word "border" or "border station". How delivery times are calculated for special cases will be explained in latter chapters more specifically.

1.2.1 Definitions

In this thesis the Porvoo cracker will be a case example and way to reflect sourcing processes' operational sides and also because adequate knowledge is available at the plant. The Porvoo ethylene cracker is integrated with Refinery located in the same Kilpilahti area and around 35-50% of the needed feedstock is supplied locally from there. The rest feedstock is sourced from third parties, who are in this paper discussed as Suppliers. The overall sourcing area includes Western and Russian markets including former Soviet Union countries, but suppliers discussed in this study, are mainly considered to locate in Russia and delivering by rail. The main sourced components that are imported is made by rail

from Russia are naphtha and liquefied petroleum gases (LPG). LPG category contains different type groups of Feeds, which are propane, n-butane, and butane mix and gas condensate. All of these feed materials will be in this study discussed with Feed. Even the type of Feed, a commodity, has an impact on operational issues, which will also be evaluated in this paper. They are still considered nearly substitutes and discussed with same definition. At some evaluations, which are considered as Commodity specific, the differences are brought out by separating Feeds to Feed1, Feed2, Feed3, etc.

The process, which will be discussed in this thesis, covers overall sourcing process, which starts from requirement calculation done by optimization, and in which trader gets instructions, which quality type should be bought at which price. The cracker in Porvoo is very flexible for feedstock, which allows wider range of possible supplies and different qualities of Feeds used in production. Technical limitations for process are determined by production department and optimization calculates the economical requirements for process. Optimization calculates so called reference values for each quality type of Feed, which defines what the purchasing price should be, so that a certain Feed would be cost effective to buy. Technical limitations for process are mainly outcomes from constructions in the plant or qualitative requirements.

The actual purchasing is done by a trader of Borealis feedstock, who is responsible for finding counterparties, maintaining connections and closing the contracts with suppliers. Purchasing decision and allocating volumes for certain feed types depends from instructions from optimization, technical requirements, and seasonal issues and from other supplier related variables. This thesis focuses mainly to consider these “supplier related variables”, which covers suppliers’ all actions and properties that are comparable with others. For example, quality of Feed is a property of how relevantly good are the goods that certain supplier delivers considered to be. And it can be compared that supplier A’s Feed is better than supplier B’s. Supplies abilities to carry out actions like “delivery” can also be

compared, and comparison could base on how long it would take to arrange their RTCs to Porvoo, including the delivery time, loadings and other arrangements.

For this industry, it is also common that suppliers vary annually. Some of suppliers are trading companies, some are big players who own their refineries and RTCs and some others are something between these. In this thesis the solution is developed generally for all suppliers. In some points when it is considered crucial, it is explained the extending for special cases, like suppliers with certain organization structure. In introducing solution, the speculations, if the supplier will grow or decrease, are not considered. The extent of dealing with suppliers is from the first contact between representatives of Borealis and supplier until when supplier does not exist anymore. Even though there would not have been for a while any interaction with supplier, all experiences about supplier are considered relevant for this study. For example the overall impression about supplier is something that has likely developed over years and could provide important perspective on comparing suppliers.

1.2.2 Research Questions

In this Master's thesis the aim is to develop a conceptual framework for Supplier Management. This thesis is designed for Feedstock and Energy, but elements of this thesis could also be applied in other business units. The focus of this thesis is in creation of evaluation model that could be applicable with sourcing to other corresponding locations.

The main focus in this thesis will be in suppliers who provide Feeds that can be delivered by rail to Porvoo. In this thesis there will be discussion about supplier management and purchasing in general, and what the main requirements for efficient purchasing are, and how suppliers should be managed in certain situations. Whether all suppliers should be managed equally or not and how the buying's should be allocated to them will also be put under consideration.

This paper should also provide a road map for SRM that would take resource requirements under considerations.

Deriving from the goals and definitions introduced above, the research questions in this thesis are:

RQ1. Where should Supplier Management strategy base on?
RQ2. How could suppliers be allocated?
RQ3. How could Borealis Feed suppliers be evaluated and what are the mattering factors in suppliers operations that reflect to Borealis?
RQ4. How could different types of Borealis Feed suppliers be managed?

1.2.3 Objectives

The objective of this thesis is to create a supporting tool for Borealis Feedstock Supplier Management. This thesis should define what the most mattering characters of suppliers for Borealis are, and how it could be ensured that purchases would be allocated to supplier who manages with these issues. For enabling it, this thesis should find out what are most mattering operations where supplier's actions have the highest impact on Borealis satisfaction to them. As these actions are known and can be resulted in to own factors, this thesis will define an evaluation framework that will round-up all these factors in order to grade suppliers. With factors will be meant issues that each supplier will perform based on its features and every supplier executes each factor differently. This is the main expectation, the developing of the evaluation framework will base on. The main requirements and objectives for the evaluation framework are that it will be simple to use, the evaluation will be repeatable and that it will require only information that is easy to get.

Besides the evaluation part an objective for this thesis is also to determine general instructions for supplier management. In future there should be instructions how relationship with certain type of suppliers should be managed, what would be the

objectives for relationship, what would be the resource requirements and what would be the practical steps, which should be followed in relationship maintaining perspective. In road mapping should be considered, that aspects of Health, Safety, and Environment (HSE) and quality would be covered without leaving aside issues related to relationship history.

1.3 How the Study Was Made

Information gathering for this thesis was done by interviews and going through documents related to purchasing-delivery process. In order to get sufficient and wider perspective for this certain business process, many informal discussions with persons involved in this logistical process were done. Also benchmarking was considered in order to find out existing trends of supplier management in this field of industry, but because of the uniqueness of this industry and process type, it was not possible. Theoretical research was applied in relation to limits of this business environment and requirements and limitations of the organization. Based on these guidelines, a first proposal was presented for specialist committee in a workshop.

In the workshop, the first proposal was modified and boundaries for final form of segmentation were defined. People involved in the whole supply process were at present in the workshop, and thus it was ensured that wider perspective was to be considered in evaluating suppliers.

When the evaluation–segmentation framework was formed, persons working in purchasing and delivery processes and in supporting operations were involved in evaluation. They had the highest knowledge considering suppliers action with their responsibility operations.

1.4 Outline of the Thesis

This master's thesis consists of ten chapters. After introduction where is defined the fundamental problem why this thesis is actually done, and it is determined limitations and scope of this thesis, come company presentation. In this chapter basic information about Borealis is presented and the process on this study focuses is presented widely. In this business process presentation it has been focused on bringing out issues processes where the problem and reason for this thesis lies and outlining what would be the requirements for the solution. Below in figure 1 is presented visualization of the outline of this thesis.

After outlining and problem setting, it will follow two theoretical chapters. Both focuses on outlining the corresponding problems introduced in literature and mapping out what kind of solution literature would provide, that could be applied in this case. Based on literature review will be chosen model for solution that will be redeveloped. Solution proposal will base on theoretical review and proposal will be collection of evaluation elements from various literature sources. Proposal divides on two parts, a proposal for segmentation model in chapters 3.3.1 and 3.3.2, and evaluation table introduced with chapter 4.

In chapter 5 will be introduced how the final model is defined based on these proposals. In chapter will be first introduced the final form of segmentation framework and then described all the evaluated factors, the procedures and how the grading is done. In the end of this chapter will be introduced the actual segmentation and the definitions, objectives and road mappings of each segment. The actual implementation is described more specific step by step in chapter 7 and in chapter 8 the whole study will be concluded.

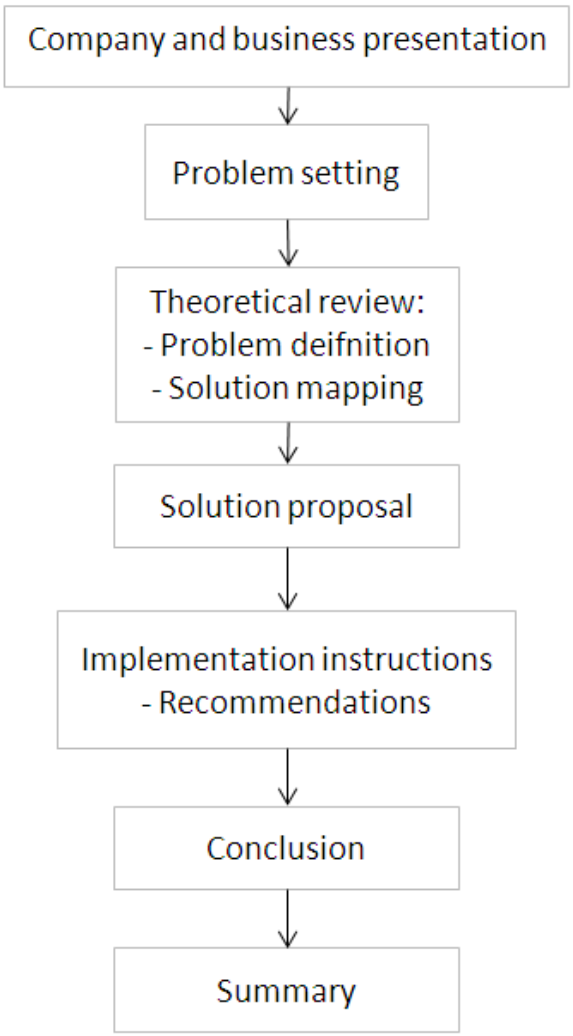

Figure 1 Outline of this thesis

2 BOREALIS AND INDUSTRY PRESENTATION

Borealis was formed in 1994, with merging of the Statoil's and the Neste's plastic productions and currently Borealis is owned by the International Petroleum Investment Company (IPIC) of Abu Dhabi (64%) and by OMV (36%) which is the leading energy group in the Europe. With sales of EUR 7.1 billion in 2011, customers in over 120 countries and worldwide 5.300 employees Borealis is nowadays one of the largest polyolefin producers in Europe and worldwide also a leading provider of chemicals and plastic solution. Headquarter of Borealis' is located in Vienna, Austria, and facilities like production, innovation centers and customer service centers are located across Europe and America. Through a joint venture between Borealis and the Abu Dhabi National Oil Company (ADNOC), Borouge production sites are spread out to Middle East, Asia Pacific, Indian subcontinent and Africa. Borouge was established in 1998 and its headquarters are in Abu Dhabi in the United Arab Emirates and in Singapore and it employs approximately 1,700 people and has customers in more than 50 countries. From figure 2 can be seen polyolefin producers' capacities based on percentage ownerships of effective sales of output. As can be seen from figure 2, globally Borealis is eighth biggest but with only Western European producers, Borealis would be second. (Borealis 1, 2012) (Borealis 2 , 2010)

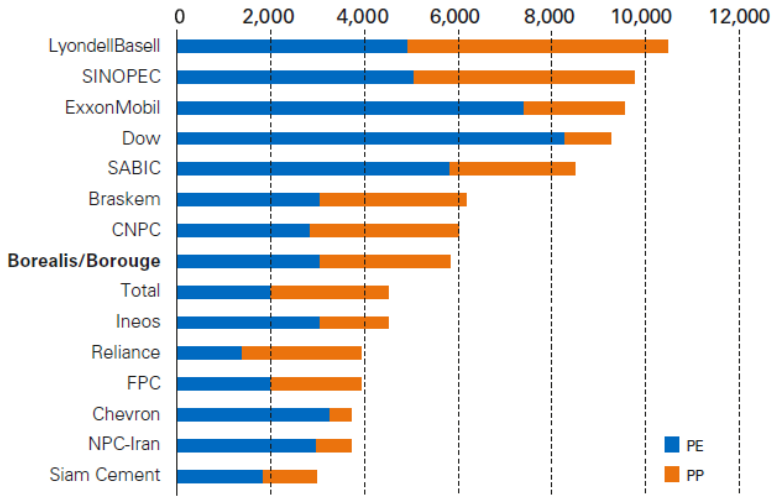

Figure 2 Global polyolefins producers 2011 (Borealis 1, 2012)

2.1 Mission and Strategy

Borealis' strategy is to grow business in infrastructure, automotive and advanced packaging while expanding the Abu Dhabi complex to supply growth in Middle East and Asia. Borealis will also try to strengthen their European base by ensuring cost competitiveness from customers to Feedstocks and developing its Base Chemicals business. Other strategically important things are pursuing operational excellence, considering safety at all times and achieving a step change in innovation. Additionally, Borealis strategy states exceeding in serving customers with a focus on quality and in reliable execution while building a cross-cultural organizational capability. (Borealis 1, 2012) Borealis' mission is to be the leading provider of chemical and innovative plastics solutions that create value for society. (Borealis 1, 2012)

2.2 Values

Borealis values constitute of four ideologies: responsible, respect, exceed and nimblicity™. Responsible states for health, safety, and environmental issues while being a good neighbor wherever Borealis operates. Also doing business according to high ethical standards is a part of Borealis responsible values. Respect represents goals of being "One Company" – building on diversity with involving people and communicating straightforward. Exceed is a promise of doing what is promised and allow success to Borealis customers and owners. Fourth value, nimplicity™ states for Borealis targets of being fit, fast, and flexible, while creating and capturing opportunities and seeking smart and simple solutions. (Borealis 1, 2012)

2.3 Products

Borealis operates in two business group, Polyolefins and Base Chemicals, and provides products from simple everyday products to step-changing technological advancements. Products of Polyolefins business group consist of applications of

polypropylene (PP) and polyethylene (PE), applications of which are various in field of infrastructure, automotive and advanced packaging. The other business group Base Chemicals divides on three sections of business, Feedstock and Olefins, Phenol and Aromatics, and Fertilizers and Melamine. Basic Feeds Borealis sources such as naphtha, butane, propane and ethane are sourced from oil and gas industry and converted through olefin units to ethylene and propylene, and other side products. Borealis steam crackers, olefin units, locate in Finland and in Sweden and Borouge in Abu Dhabi operates one. Phenol and Aromatics section products; acetone, phenol, benzene and cumene are produced in Finland and sold in northern Europe mainly to the adhesive, fiber, epoxy resin and polycarbonate industries. Melamine and fertilizers are produced in Austria and in France and additionally also in Germany. Currently Borealis is a leading provider of melamine in Europe. (Borealis 1, 2012)

2.4 Operations of Feedstock and Olefins

Under Borealis Feedstock and Olefins operate steam crackers, which are located in Finland, Porvoo and in Sweden, Stenungsund. In Finland Borealis has a fully integrated petrochemical complex of five plants; steam cracker, and phenol and aromatics plant, and three plants that produce different qualities of plastics. In this Master's thesis the focus is on Porvoo cracker's sourcing process. Feedstock for Porvoo plant is mainly sourced through independent suppliers from Eastern markets, which includes Russian and former Soviet Union countries. A part of required feedstock is also received from refinery next to Porvoo cracker which Porvoo cracker is integrated with. The cracker in Porvoo is flexible and it can use both liquid and gas Feed. From figure 3 can be seen an overview from Porvoo steam cracker purchases and what is the distribution for using certain type of Feeds.

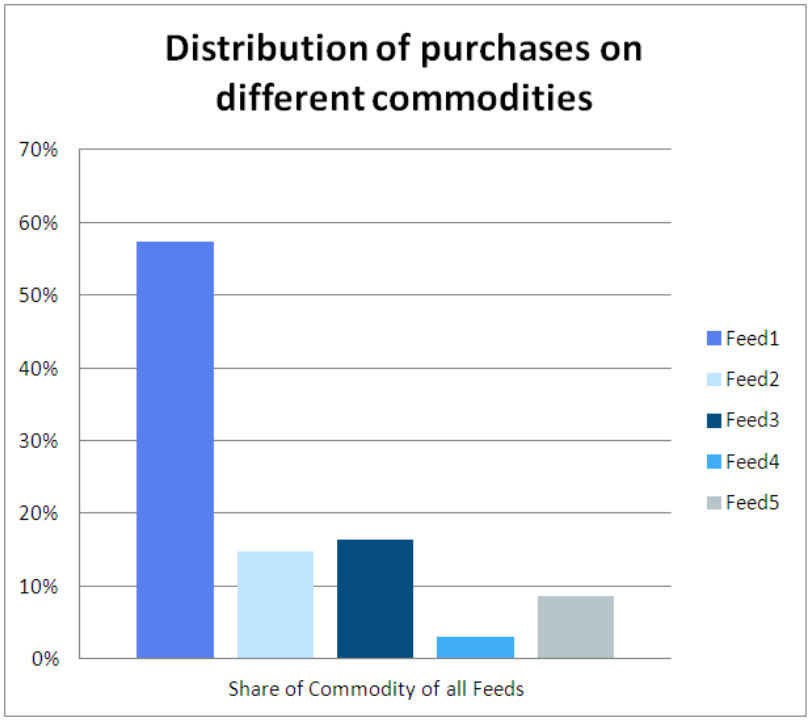

Figure 3 The distribution of purchased Feeds

Feedstock sourcing process for steam cracker is done mainly with spot volumes from existing supplier base. Supplier base consists of "accepted" suppliers, which businesses and contracting fits to Borealis business ethics and agreements, and between them Feedstock trader allocates volumes in order to reach the needed quantity. That how trader allocates the volumes is traditionally up to optimizations requirement calculations and traders own outlook. Trader's outlook generally considers the conformity of the product to Borealis purchasing specifications and agreement on price, while the conformity of proposed deal with Borealis ethical policy and acceptance of the supplier's commercial terms is in order. (N. Andreev, personal communiqué 15.5.2013)

2.5 Process and Problem Description

Here will be introduced a short description of the sourcing process to Porvoo steam cracker. In process description below, the sourcing process has been itemized on different steps which can be recognized from purchasing procedure.

This thesis recognizes the process with these steps and focuses on solving the problem which can be positioned on the early stage of the process.

Below in figure 4 is introduced a process description where in the 1st level there are two boxes where the process is considered to start. The other is "Optimization" that includes operations where are defined the need and instructions for what, how much, and with which terms should Feeds be bought. The other first level box is the "Supplier pool" that includes available information of all possible suppliers. In definition of "possible suppliers" are included only suppliers who are in the list of "agreed", so that their commercial and ethical terms are in line with Borealis's. From these suppliers should be chosen the ones from who certain volume will be bought. These two first level boxes create the base line and limitations for sourcing no other instructions for allocating volumes are considered to exist currently.

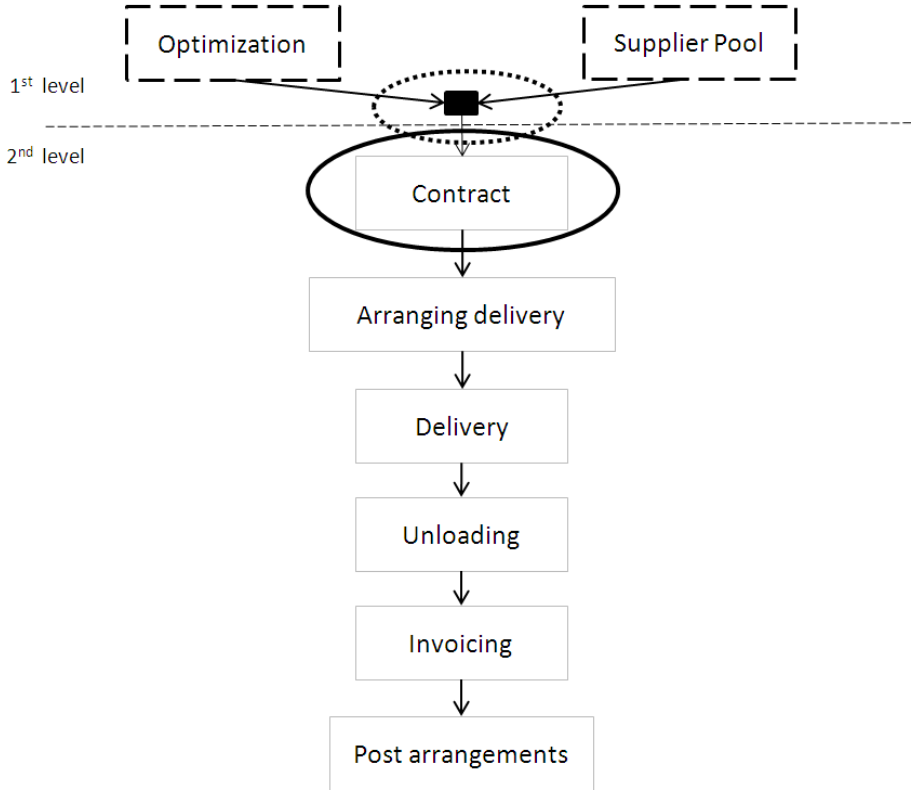

Figure 4 The process description of sourcing Feeds to Porvoo

The small circled which also locate over the 1st level line box represents combining optimization instructions and available suppliers. The actions and decision of trader take place in here. In future this box could be more automated and clear instructions would define who would be the supplier when optimization would give certain type of orders. Because in this box is considered to happen the decision of which supplier would be used, it will also define the terms of references for following actions which will take place in later steps. These steps are illustrated with boxes with unbroken perimeter.

First step in 2nd level is deciding to use certain supplier is to write the contract. In contract will be defined the price, amount and other terms of delivery. Generally volumes are bought in spots and each spot requires its own contract. Surely in contracting can be used readymade templates but, anyhow terms needs to be defined independently with each contract. Usually the spots will cover a volume that is delivered during that month and one contract might cover for example approximately 5 % of Borealis monthly requirement. Due this it can be considered that the contracts are not very longstanding and the procedures of contracting are rather time consuming in the long run. This is the first step where prioritizing and deeper collaboration with some suppliers might ease procedures. Already with some suppliers the main contracts are done yearly and in these cases the price is dictated by formula pricing and the volumes are confirmed monthly. Even this kind of collaboration with a part of suppliers would ease and accelerate the sourcing process, but before applying any kind of strategy it should be defined who these suppliers would be and how they would be selected.

The second box in 2nd level after contracting is arranging the delivery. This definition includes all the actions that are required to get the RTCs to Porvoo. These actions involve mostly operational actions and communication between Borealis and suppliers' operative persons. That, how all these arrangements go with every supplier, defines the stress of this stage. Naturally some suppliers involve more attention than others, and it has not been evaluated if there is any link between this and the supplier's commercial efficiently. Even though this step

has not traditionally been considered to have any commercial value, this step also involves many official arrangements and if those are performed badly it impacts directly on delivery. Also because the volumes are bought as DAP, what happens in delivery before the border has not been considered to have further significance.

Third box represents the actual Delivery, and includes operations like scheduling and dispatching of RTCs. Suppliers are required to provide scheduling information of all their deliveries, but the timing and form varies. Currently the information of some suppliers is more useful than others and because of the lacking comparability, scheduling does not provide all the benefits it could. Also the dispatching information is more like announcing and not something that can be significantly impacted. The risk in current delivery process is that timing of deliveries can't be designed according to Porvoo unloading capacity but suppliers own schedules, which may in the worst case cause an overflow with RTCs in Porvoo unloading yard.

From delivery follows logically the fourth box of unloading, which is the process while RTCs are unloaded. In case there is something wrong with RTCs, it will be recognized during the unloading process, and when the RTC is empty it will be discharged. This whole process should take maximum three days, so that no penalty invoices, demurrages would be caused. The time is sufficient as long as the amount of RTCs in Porvoo rail yard stays in control, but if too many or big batches will arrive simultaneously, delays can be expected. The quality controlling is also done while unloading by taking samples from RTCs, which are later inspected in laboratory. These samples are usually taken randomly if there is no further reason for testing some specific batches.

When the delivery is done and the RTCs have returned to their suppliers, the border cross information where the weight of RTCs can be seen, and on which the invoicing is based, is provided to suppliers twice in a month. VR provides Borealis the border cross information and Borealis forwards it to suppliers. Also the customs clearance is based on the border crossing information and must be

done monthly. Beside these invoices considering Feeds suppliers might also provide some demurrages which are penalty invoices from too long idle time in Porvoo. That, how well suppliers provide their invoices, the timing, validity, and form affects on how time consuming the invoicing of a certain supplier is. For example, if there always are some mistakes with some suppliers' invoices and these corrections always come afterwards, it may besides the extra work also cause economical mistakes.

Post arrangements in box six represents all actions that may take place after the actual delivery. For example the evaluation of quality occurs while unloading and the results are actually available only after the Feeds are already loaded. Thus, if a problem with quality is recognized, it must be claimed afterwards. Also after the contracting time is ended it can be seen if the whole quantity that was agreed in the contract was delivered, or if a part was left out. Also the time frame provided with the demurrage invoices might be extremely long and usually those are discussed in order to find an agreement that both parties accept. Overall after the actual contracting time has ended there might come out all kind of side issues, which need to be taken care of. Thus, despite that the purchasing of Feeds is mainly transactional and short-term it might have long-term impacts and requirements on Borealis side.

Overall from the process can be recognised many steps where supplier's actions may either ease or complicate the efficient dealing of the whole sourcing process. Based on figure 4, it can be considered that the 1st level two boxes X and Y represent actions and issues that exist and will stay so, and boxes in the 2nd level represents processes that include actions which together define if the whole process is efficient or not. The efficiency of each process depends on how well the supplier performs the actions that certain process includes.

The main problem that can be recognized here is the considerably limited possibilities to impact on supplier's actions in transactional business relationships. From this observation, it can roughly be concluded that if there is no way to

improve supplier's actions, business should probably be chosen to be done with the ones that already perform their actions well. This means that a system that chooses the right supplier from the supplier pool according to optimization requirements should be developed and implemented in box X.

3 SUPPLIER MANAGEMENT IN LITERATURE

The definition of supply chain links together all parties involved, directly or indirectly on fulfilling the end customer requests. Overall supply chain includes not only the manufacturer and suppliers, but also transporters, warehouses, retailers and even customers themselves. The term of supply chain conjures up images of product or supply moving from suppliers to manufacturers to distributors to retailers to customers along a chain. This tangible and physical movement is certainly part of supply chain, but also is important to visualize flows of information, funds and products along both directions. In reality, one stage in a supply chain may either receive supplies from several suppliers or an individual supplier may supply several actors in the next level of the chain. Thus, many supply chains can actually be considered as supply networks rather than chains. Generally any discussion of supply chain should begin with defining the stages of SC where the companies operate, which will be under consideration in this case. Especially if the discussion is about supply chain management issues, it should be identified which stage of supply chain is currently under consideration. Overall effective supply chain management involves the management of supply chain assets and products, information, and fund flows to maximize total supply chain surplus. (Chopra & Meindl, 2010, pp. 21-23)

Most discussion about supply chain management policy outlines that there is not only one way to manage company's sourcing but designing sourcing possibilities should be considered with features of, purchased goods, final products and suppliers. Dominant industry with its characteristics also defines limits for supply. Possible suppliers do commonly differ besides their product quality, also with their operational issues. Because each supply chain is different, to obtain the most efficient supply base in all situations, each supplier should be managed differently but effectively. The efficient management requires recognizing various aspects within suppliers. For example the relation of one supplier's transaction costs and share of purchased volume compared to the total volume and average transaction

costs allows estimation of the overall price of certain relationship (Kraljic, 1983). (Wagner & Johnson, 2004)

In order to optimize purchasing effectiveness, suppliers should strategically be segmented into strategic partners and durable arm's-length suppliers in order to allocate different levels of resources to each group. With resource-based view, the resources are scarce commodity in any company, and most should be allocated to suppliers who fall into the strategic partner category. Strategic partners are typically those suppliers who provide inputs with high value and do play an important role in differentiating the buyer's final product or otherwise creating more value than others. With these suppliers the buyer should maintain higher levels of communication and make relation-specific investments and put effort on maintaining both parties' capabilities in the future. (Dyer, et al., 1998)

3.1 Purchasing

Purchasing is a function that traditionally encompasses all processes of buying. Purchasing involves determining the need, selecting supplier, allowing a proper price specifying terms and conditions, issuing the contract or order and doing follow up in order to ensure a proper delivery (Van Weele, 2005, p. 12). All wider scale purchasing is discussed as procurement, which is a more established policy through which companies acquire materials, components, services, products, and other resources from suppliers to execute their own operations. In efficient procurement the goal is to enable orders to be placed and delivered with the lowest possible total cost and according to the schedule. The concept of sourcing covers the entire set of business processes required to purchase goods. With planning of sourcing and analyzing the spending across various suppliers and categories of goods the goal is to identify possible opportunities to decrease the total costs. (Chopra & Meindl, 2010, p. 410)

Often in markets there are more possible suppliers than buying company requires, especially with lower differentiation items. In supply chain theory it has been

stated that the amount of suppliers should be minimized, nevertheless to not end up purchasing from only one supplier. Traditional view with arm's length model for supplier management relies on minimizing the dependence on suppliers and maximizing the bargaining power. The key of this kind of approach is to avoid any commitment which allows the freedom to always be after the lowest purchasing price. (Dyer, et al., 1998)

Nevertheless as a consequence of globalization of markets, the diversification of customers' need and complexity of supply chain, the efficiency of supply chain management has increased its importance within company's competitiveness. Thus properly managed supply chain cannot only diminish risk and uncertainty, but it can also optimize the inventory levels and process cycles. With "properly managed" should be understood that there are more possible ways to reach the optimized supply chain management. As Park et al. (2010) suggest, approach to purchasing can commonly be classified into two types; Competitive- and cooperative approach and that the best way to apply these opposite methods for supply chain management should be applied with "fit-for purpose" method. (Park, et al., 2010)

3.2 Supplier Management

To be able to build an efficient policy for managing suppliers, it should first be ensured that all possible suppliers are recognized and the final and actual supplier base is the best possible. In recognizing state, supplier pool should be created and through registration and evaluation arranged to supplier portfolio (Park, et al., 2010). The concept of supplier portfolios and portfolio management is commonly linked to the idea of supplier management which is constantly increasing with importance. To ensure continuous supply, the supplier base should be as wide as possible, but still not all suppliers would need to be recognized with equal importance. Allocation of buyers' resources and orders among suppliers as efficiently as possible is still the main idea in competitive purchasing. Anyhow despite the cost leadership thinking, sustaining the supply availability of whole

supplier portfolio, from time to time all suppliers should be acknowledged with orders. Besides the group of suppliers with most and regular volumes, some volumes should also be allocated to suppliers with potential, in order to maintain connection and supply availability with these suppliers. However, with respect to efficiency, each supplier relationship should be invested with a line to the benefits of the relationship. (Wagner & Johnson, 2004)

Efficient strategy for managing supplier base should consider, besides the characteristics of purchased goods, also the requirements that delivery process puts on the relationship between buyer and supplier and how fluctuating the industry is as itself. How likely and what range of impact external issues would have on current supplier base needs to be paid attention to. Managing suppliers is multiform process where it is crucial to be aware of, besides buyers' own requirements, supplier characteristics. Not all suppliers can be managed equally. Strategies for managing should be developed for suppliers instead of trying to fit all of them for readymade group with set management policy. Anyhow, with wide supplier base it is more efficient to only have some policies for segments of certain type of suppliers and only selecting the group of suppliers that certain segment mostly represents. Especially if typical for that industry is that outward circumstances defines suppliers' actions. For selecting suppliers there exists a wide range of models considering supplier selection from different perspectives and with wide range of characteristics. Despite that selection model, the perspectives in selection usually depends more on the decision environment, personal views and knowledge sharing outcomes, and evaluations to provide sustainable results depend on the awareness of the evaluator. Overall efficient management requires awareness of what is managed. (Ordoobadi & Wang, 2011) (Caniëls & Gelderman, 2007)

As a summary of Supplier Management chapter, supplier selection and segmentation are closely related. First companies select suppliers, then segment them, adopt a strategy to cope with each segment and finally they may decide if to adapt this strategy over time as the relationship evolves. For example, in Borealis

case all LPG suppliers would be collected and selected to supplier pool, then ones with biggiest volumes would be segmented in to one group and ones with lowest volumes together, and rest to its own group. For these segments would be adopt management strategies so that with biggiest suppliers the interaction and dealing would be closest, with second biggiest ones more commercial based and less deep, and with the smallest types of suppliers management would only base on maintaining the relationship. This management would envole evaluation overtime. If relationship with some relevantly small player the has developep so that this certain supplier could be considered more important than others in that segments, this supplier should possibly be threated with other management strategy. Below is classified issues on relationhsip management and on supplier selection.

3.2.1 Supplier Allocation

One fundamental activity to improve company's outcome through sourcing efficiency is to enhance and maintain its position in the marketplace with prioritizing the use of the most suitable suppliers. Most suitable sources do usually have alikeness's and together those might define the ideal supplier for certain buyer. Allocation and ranking of suppliers with similar characters is also recognized as supplier segmentation, which, compared to supplier selection literature is well developed and well researched, is still in its infancy (Rezaei & Ortt, 2012, p. 4598). Allocating and segmenting suppliers could be seen as corresponding activity for market targeting and positioning, and as customer segmentation. Generally supplier segmentation could base on various generic criteria as the type of logistic flow, characteristic of the items, type of relationship, and type of supplier. Criteria should also been considered as industry and business environment specific with relevant time frame. More important and what must be clear before criteria selection is how suppliers are wanted to be allocated and how many groups should the suppliers form. (Svensson, 2004, pp. 12-14)

All; grouping, allocating, and segmentation could be seen as supplier selection related processes and are important sub processes in the total supplier relationship

management. In this paper, segments are considered as components of the supplier segmentation framework under development, and segmentation is considered as dividing different suppliers to different segments. According to Rezaei and Ortt (2012) existing segmentation methods can be classified to three groups; process, portfolio, and involvement methods. Fundamental problem in most situations in segmenting and selecting is the consideration of the time frame. The view of one point in time refers on purchasing and in supplier segmentation is only relevant for individual transaction cases. Thus for creating preface for longer term segmentation must be invented a solution to avoid the time frame problem. (Rezaei & Ortt, 2012)

Many articles approach supplier segmentation by comparing the characteristics of purchased goods. A pioneer of supplier comparisons, Peter Kraljic, presented his research with portfolio approach to purchasing, underlining the importance of purchasing in respect to the complexity of the supply market. His segmentation framework did dispense to segments defined by characteristics of purchased goods, and especially with variables of profit impact and supply risk. Despite early publishing date his research is still the basis of modern supplier evaluation. In case of Borealis and purchasing of Feeds the discuss is about suppliers delivering roughly the same kind of goods and thus the evaluation must focus more on supplier-buyer relationship and supplier characters than the comparing the characters of goods. With Feeds purchase process it can be assumed that all suppliers are delivering substitutes, and comparing the characters of goods is highly limited. Despite the differences in baseline, Kraljics's article provides important perspective on supplier characteristic and will be utilized as supportive material defining the evaluation method presented in this paper. (Kraljic, 1983)

Overall it can be considered that segmentation is a part of involvement approach, in which variables used for segmentation focus on strength of the relationship between supplier and buyer, whereas with portfolio approach the characteristics of supplied goods are in focus. Process-approached segmentation is about the processes of finding segmentation variables without widely specifying them.

Generally many segmentations base on combination of involvement and portfolio methods. Selection of segmentation method and specifying it is strongly dependent on industry, buyer's requirements, and the existing supplier base. The structure of segmentation is the most explicit outcome of to how many segments suppliers are wanted to be grouped and is generally rather clear but also relatively easy to modify afterwards. Instead the complexity of variables dimensions is recognized as obstacle, which often must be solved iteratively. Efficient evaluation requires minimized amount of variable criteria factors, but the complexity of dimensions should not be reduced at expense of important variables which are important in actualizing dimensions. (Rezaei & Ortt, 2012)

3.2.2 Supplier Relationship Management

The supplier-buyer relationships in supply chain management (SCM) context have lately been investigated widely in literature. The main objective of most of the cases is to evaluate suppliers based on certain criteria and using a variety of multi-attribute decision making techniques that are designed to rank suppliers with aim to select the best. (Rezaei & Ortt, 2012, p. 4593)

The performance of certain buyer-supplier relationship is not only related to the type of the group where the supplier is allocated, but also to the suitability of the applied strategy. Each relationship, regardless of the integration, should be able to be managed with equal efficiency as long as the key issues of each relationship are recognized. The efficiency should be considered as a relation of inputs and outputs of that certain relation, where inputs are costs of resources involved in maintaining the relationship and outputs as the economical benefits enabled by this relationship. The instructions of how the relationship should be taken care of should ensure that the allocation of resources also considers the profit impact and that the objectives for relationship are realistic. The policy and approach for management of each relationship needs to be most suitable, which might be difficult in case when the SRM policy is common for group of suppliers. Depending how suppliers have been grouped together they can be expected to

have similar characteristics or vary from each other. This should be considered while choosing and making the evaluation platform and defining the criteria factors. Despite the evaluation preparations building up SRM strategies for groups should be taken into account that these groups may include several suppliers, which, despite their alikeness, might still differ in several crucial ways. (Bensaou, 1999)

In real case each supplier-buyer relationship is different and varies with operational issues like information exchange, operational linkages, legal bonds, cooperative norms, and buyer/seller adaptations, and should thus be managed differently. As stated earlier, with large platform of suppliers in constantly varying markets in the long term it is not efficient to develop an own strategy for each supplier in every situation. More relevant it is to have draft management strategy for certain case situation supplier, and apply it with suppliers who in that case do meet the definition. Defining each supplier's role and type in buyer's supplier portfolio allows the possibility to allocate resources and volumes to suppliers accordingly to these factors and not only based on the profit impact. (Wagner & Johnson, 2004)

Anyhow, supplier relationship management is a long-term project and defined strategy instructions should be able to stand on despite of smaller occasional changes. To obtain long-term objectives it is relevant to not only consider current cost base but also to ensure prospects in case of changes in supplier pool. Especially, that how the groups of currently most important - and most potential suppliers is formed and then managed is crucial in order to gain the most benefits. Overall the relationship management strategy should define what kind of and how deep a relationship should be and how it would be obtained in terms of inputs and outputs of a certain relationship. Also how the relationships with not currently relevant suppliers should be managed with policy in line with the overall SRM strategy. (Moller, et al., 2003)

3.3 Segmentation

The segmentation framework, that will be used to segment Borealis Feeds suppliers, will base on combination of evaluation frameworks by Rezaei and Ortt, Olsen and Ellram and Park et al. The introduced frameworks for Borealis application will be a modified version of Rezaei's framework complemented with elements from various articles from the field of supply chain management, and applied with characteristics of the prevalent industry. In an expertise workshop with people involved in the actual supply chain process, the final segmentation framework for Borealis use will be defined.

The segmentation model of Rezaei and Ortt is chosen because of its best applicability for business environment where this sourcing process locates. Their segmentation model is originally made for food industry such as sourcing of broilers, which in this case represents goods with middling low degree of processing. Despite that sourcing broilers can be seen as an industry of parceled goods, there could be recognized certain similarities with chemical process industry, as big amount of suppliers for substitute products, no wide requirements for common development and short term contracting. Most other segmentation models are made for automotive or high electronic industries, which both are about more or less high technological components, which puts a lot of requirements to supplier and the delivery process. Unlike in those researches, this model does not target on screening out suppliers or indirectly creating close collaboration systems like VMI (Vendor Managed Inventory) or CPFR (Collaborative Planning and Forecasting Relationship). Overall, despite of all differences between food and chemical process industry the model of Rezaei and Ortt's model provides, with additional evaluation factors from other researches, a good base for creating Borealis specific segmentation model exists. Below in figure 5 is presented the original segmentation model introduced by Rezaei and Ortt, where this defining of Borealis segmentation model bases on.

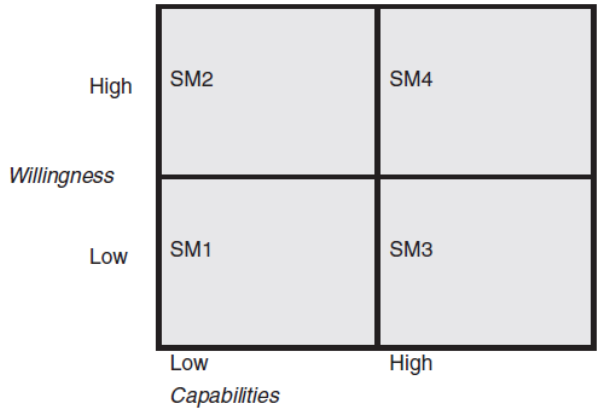

Figure 5 Supplier segmentation based on supplier's potential (Rezaei & Ortt, 2012)

In this case the Segmentation will be based on supplier's potential, and the product characters will be determined with differences in quality. Rezaei and Ortt define the concept of "suppliers potential" as buyer's perception of supplier's willingness and capabilities to engage and maintain partnership and to achieve mutual objectives. The original segmentation models of Rezaei and Ortt in figure 5, can be seen how "potential" is considered to grow while going further from left down corner. Their approach recognizes three kinds of supplier selection criteria: "element of exchange"-related, supplier-related and relationship-related criterion, which divides to these two categories of potential: capability and willingness. A relationship-related criterion includes criteria factors that are related to partners' "willingness" to start and maintain their relationship. Factors like relationship closeness and openness may indicate the extent to which partners would be able to build successful relationship. Supplier related criteria and "element of exchange"-related criteria are linked and aim to define supplier's capability issues. Capability factors, for example "quality" indicates supplier's ability to offer items purchased with desired quality level. (Rezaei & Ortt, 2012)

To complement the framework of Rezaei and Ortt, the categories of willingness and capability will be complemented with factors, which Olson and Ellram have presented in review of analyzing supplier relationship. Their approach to segmentation divides framework to two axis of supplier strength and supplier attractiveness. Supplier strength aims to add evaluated criteria factors to supplier

willingness category and a factor of supplier attractiveness increases the amount of criteria factors in capability category. The relative supplier attractiveness describes factors that will make buyer to choose a certain supplier and strength of relationship will underline the factors that create bonds between buyer and supplier. The elements from articles of Olsen and Ellram and Rezaei and Ortt do also define a base range for possible evaluation criteria factors which are introduced in next chapter. (Olsen & Ellram, 1997)

The actual segmentation will be performed with three main steps as Olsen and Ellram suggests and the purpose of the framework is to reflect the overall situation of how all suppliers will arrange in segment chart as commensurate to each other's. The steps to segmentation process are as follows:

1) Analysis of Purchasing priorities
    - Choosing the criteria and road map for supplier evaluation
    - Deciding about possible weighting of same criteria over others
    - Defining how many segments Borealis should have for their Feeds suppliers
    - Defining the roles, objectives and road maps of each segment
2) Analyzing the supplier relationship
    - Evaluation of suppliers within each criteria
    - Counting the total grades and location in framework to each supplier
3) Implementation of Segmentation road map
    - Setting suppliers to defined segments
    - Applying segment instructions to each supplier
4) Evaluation
    - Is the amount of segments correct
    - How well segment instructions suits to certain suppliers

    (Olsen & Ellram, 1997)

In first step, it will be analyzed the main objectives for Borealis in Feeds purchasing process. Not all willingness and capability factors that will be presented by Rezaei and Ortt or other researchers are relevant in every industry, so for each case only the most relevant criteria should be selected as variables to be evaluated. Selection of evaluation criteria should be done with expertise knowledge and commonly it is done by decision making team panel that constitutes of experts. That how each criteria could be evaluated and who would do it should also be determined within first step. (Rezaei & Ortt, 2012)

The amount of segments also depends on characteristics of industry, and about situation and objectives of the whole segmentation process. Determination of the right amount of segments should be considered with team of experts, and modified afterwards on demand. It should be analyzed with scenarios how well the segmentation would work and if suppliers with differing capabilities would fall in to a same segment, and how would that affect to segment's roles, road mapping, and objectives. If it seems that two different types of suppliers would end up to the same segment and would be complicated to be managed with one common management strategy, something in segmentation should be reconsidered. In this case something either with segmentation, evaluation, dimensions, or the amount of segments should be changed. On the other hand, if the management policies of different segments are too similar, perhaps the number of segments should be reduced. The boundary values for segments should be defined while deciding the amount of segments. Boundary values can naturally be modified afterwards and iteratively setting of these values would allow segmentation to suit this especial case. In first step should also be defined what will be the scale of segmentation model, what is the minimum and what maximum value and how the total numerical value that defines location in segmentation chart is defined. In this thesis these numerical values are as follows. (Rezaei & Ortt, 2012)

- The scale of the axis in framework will be from 1 to 5 (1 minimum value and 5 maximum)

- Grading of each factor will be from 1 to 5 (1 lowest performing and 5 best)
- Value of capability will be average of supplier's capability factors
- Value of willingness will be average of supplier's willingness factors

In second step suppliers will be evaluated and calculated the dimensions in segmentation chart. With this step it will actualize how well suppliers will spread within segments, and if some parameters should be modified. Execution on segment instructions will take place on third step, and the differences of treatments between segments will be seen. The third step might take longer and with evaluation that will be repeated after agreed time frame it can be seen if it's relevant to do the evaluation so often and if some parameter should be changed. The fourth step is obligatory and could be a part of step three, because it is about evaluation the overall success of the segmentation and if the amount of segments was good, or if some suppliers are considered to be misjudged and they seem to be in an incorrect segment. (Olsen & Ellram, 1997)

Below two proposals for segmentation framework are introduced, which both base on the model of Rezaei and Ortt discussed above, but which other have some elements also from segmentation model of Park et al. Both of these proposals aim to demonstrate some elements that should be considered defining the suitable amount of segments with so called efficient shape, for this particular case. These segments are going to be a proposal for the workshop where the final form of segmentation model will be defined. Also the names of segments are proposal and the final names should be defined in the workshop. The final names for segments should be determined to fully describe what the main objective of that segment would be and what kind of suppliers should end up in it.

Before defining names or the criteria factors to be evaluated, it is important to know and to be aware of what is going to be the final form of segmentation model and what the issues are that are wanted to be paid attention to in segmentation.

Choosing criteria factors it is relevant to consider what would its impact in segmentation be and what kind of suppliers it would arrange and where. The criteria factors are also going to be defined iteratively with the segmentation framework in the workshop. Because these are only tentative proposals, in the workshop the final boundaries for segments should also be defined and they don't have to be either of the proposal models. Anyhow in this process there should first be a vision of segmentation framework before selecting the criteria factors. The proposals for segmentation model can be seen below and in chapter 4 all theoretical criteria factors form Rezaei and Ortt's model, which have introduced as reference criteria factors for evaluation in the workshop, will be introduced.

3.3.1 Three Segment Model

The first suggestion for the amount of segments is three, where the final form of segmentation framework will be a two-axis model with three possible segments. According to Park et al., there would be three segments, which would be divided as follows:

1) Strategic relationship segment
2) Collaborative segment
3) Transactional segment.

This proposal aims to demonstrate that suppliers would be managed more based on their "importance" and not only on their characteristics. The model is presented in figure 6.

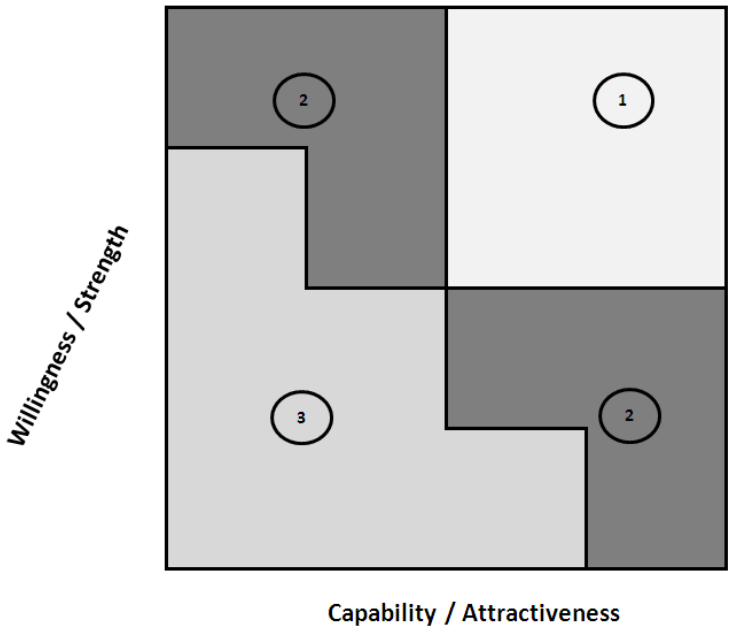

Figure 6 Three segment model

In the model of segmentation framework, the strategic segment is marked with number one and as it can be seen, it covers a quarter of the whole model. Suppliers in this sector are considered as strategic and with then the dealing should be more integrated than with suppliers from other segments. This segment and its boundary values are the same as in the proposal of four-segment model.

The collaborative segment, which is marked with number two, covers the both extremities of segmentation table. The other extremity represents high capability and low willingness and the other corner is about high willingness and low capability. This may cause that extremely different suppliers may end up to the same segment, to be managed with equal strategy. Nonetheless, the suppliers in this segment generally have their competences specialized either on willingness or capability related issues, which likely makes it more clear to recognize their benefits. Also as it is seen from Figure 6 if supplier makes improvement with sector that currently is weaker they might reach to segment of strategic suppliers. Depending on how strict the guidelines for management of segments are, could also so varying type of suppliers most likely be managed efficiently.

The third segment in this model is the segment of transactional suppliers. The definition of this segment is that these suppliers will also be a part of the whole supplier pool but from these suppliers volumes are purchased only occasionally and mainly to maintain the relationship, and to sustain them as possible supplier. The main difference for the second proposal's four segments model is that with this segment the boundaries will allow higher willingness and capabilities than the other model does. With this model, suppliers that has relevantly high willingness but low capability and relevantly high capability but low willingness are also considered in this segment, despite that for strategic segment would actually be required a lower level of willingness or capability, as far as the other side of potential would be over average.

According to the figure 6 suppliers with success at least in either willingness or capability would end up to collaborative (2) segment. Still the suppliers which would have nearly average success with both sectors would end up on transactional segment and between strategic and transactional segments would not in this model be any cross segment. This would probably cause a managerial problem because if only transactional business with commercial meetings have been applied with the supplier, some obstacles may occur in the steps towards deeper interaction.

3.3.2 Four Segment Model

If Borealis Feed's suppliers would be segmented to four categories as presented by Rezaei and Ortt, the segmentation would still be performed with a two-axis model. The main difference between this segmentation framework and model with three segments is that in this model both the high capability – low willingness and high willingness – low capability areas belong to their own segments. This kind of division makes it possible for the management policies to better take the suppliers' abilities into account. In four segments model the segments would be:

1 Strategic supplier segment

2 Potential supplier segment
3 Volume supplier segment
4 Transactional supplier segment.

In this segmentation strategy so called extremity suppliers, the ones with high willingness and low capability and the opposite, would have different strategies to be managed with. This would allow more efficient allocating of resources to be applied in supplier management of certain suppliers (Rezaei & Ortt, 2012). Also it would be likely that the suppliers in segment 3 and 2 are really different and thus the relationship management strategies would have quite different requirements. For example if the volumes delivered from supplier X with high willingness are small because of their small production, there is likely to be no reason for further implementation for big volume allowing data sharing. But in case if supplier Z is currently providing small quantities but could potentially deliver much more, with "supplier development" and improving the relationship with this supplier, the relationship would be extremely potential. With this example it should be demonstrated that suppliers X and Z should not be managed equally and thus should not be in the same segment, which also is an argument for the relevance of having four segments. Anyhow, with this speculation it should also be kept in mind that the choice of which criteria factors to constitute the segmentation has its impact on what issues would a certain segment actually embody.

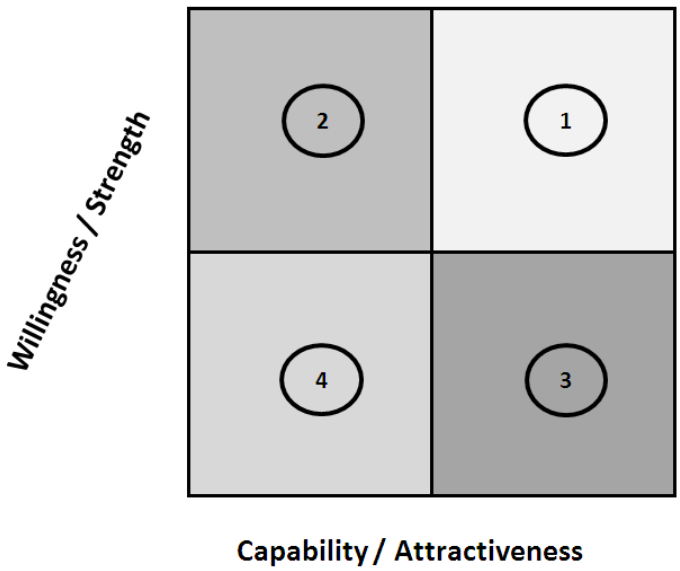

Figure 7 Four segment model

As it can be seen from figure 7, the boundaries of this segment framework form a model with four boxes. As it can be seen, to the segment of Transactional (4) suppliers would in this model end up suppliers with nearly average potential with capabilities and willingness issues. Mean while in Potential (2) segment would be suppliers with much lower capabilities and in Volume (3) segment would include suppliers until zero willingness. Also between Transactional (4) and Strategic (1) segment there wouldn't necessarily be any steps if the supplier would have a nearly average performance in both willingness and capability sector. In final segmentation model it could be good if there was a cross segment between the Transactional and Strategic segment. That cross–step would tone the change with management, in case the suppliers developed from segment to another, and also the potentiality of suppliers who would end up in this so called "average corner" border could be utilized.

4 SEGMENTATION FRAMEWORK

Supplier segmentation has been in this paper discussed as evaluation process, despite that actually segmentation is more about comparing suppliers based on results of evaluation in order to group suppliers with similar results (Rezaei & Ortt, 2012). In this chapter it will be presented the method for evaluation, which will lead to segmentation and, the criteria factors, with theoretical base, used in evaluation. Overall this chapter should define the proposal for segmentation framework's evaluation part.

Below will be introduced the theoretical background for the evaluation process which leads to results that will be used for segmentation. In practice the evaluation will be done for each factor independently and the evaluator will be the person who has the best knowledge of that certain issues. Evaluations will base on collected data or intangible know how. Evaluation will be grading suppliers numerically every supplier with that certain factor, and all grades will be collected to one file with the calculation will be done.

The criteria factors that will be evaluated will be constituted from group of variables that are represented in segmentation related literature. Originally segmentation table of Rezaei and Ortt, with some factors cutted out, is introduced in table 1, and each criteria is discussed widerly. With each criteria factor, will be short description of the theoretical function, what it respects in Borealis case and roughly how it could be evaluated. This table with eleven willingness and capability factors is only a proposal where with decision making team will be constituted the actual segmentation framework for Borealis.

4.1 Evaluation Process

Every successful evaluation process requires evaluators to fully understand what is evaluated and to have an idea of what would be the outcome. As every supply chain is different requires every supply process its own evaluation strategy, which

is able to recognize the head points in this certain supply process. Defining the most suitable evaluation strategy, it is crucial to consider the factors that are relevant for certain process and to select the ones with highest total cost impact and regarding buyer's values. The definition of the frame of total cost impact varies but generally it is defined as the summary of all components related to the final cost of purchase. These components might commonly be the prices of purchased items, delivery costs, transactional cost and possible additional costs that may emerge afterwards. The idea of total cost could be stretched to comprise also the input of resources for certain supplier, but depends of industry and supply process if those available information. (Chopra & Meindl, 2010, pp. 420-22)

In this case supplier evaluation bases on supplier's potential and evaluated variables are divided in two dimensions of "capability" and "willingness" according to Rezaei's segmentation model. Supplier evaluation requires a buyer to choose a "suitable amount" of qualitative and quantitative criteria factors that will be arranged to these two dimensions and used to evaluate the suppliers in order score them for further arranging them on segmentation chart. "Suitable" is an amount that decision making team defines to be sufficient for segmenting suppliers. Rezaei and Ortt presented a table of segmentation criteria variables, and from this table have been chosen and modified the most relevant factors, for this case, in order to provide for decision making team a wide range of factors where to define the group of most relevant for evaluating Borealis Feeds suppliers. Modifying the original evaluation variable table was done by first cutting out the most irrelevant factors considering the field of this industry, combining some factors which in this case were too alike to consider as independent factor, and supplementing table with relevant sub factors from other research. Factor variables from other research have been applied as part of the Capability or Willingness according to how well they reflects' the definition of these dimensions. The definition of capability is according to Rezaei and Ortt;

> *"Supplier's capabilities are complex bundles of skills and accumulated knowledge, exercised through organizational processes that enable firms*

> *to co-ordinate activities and make use of their assets in different business functions that are important for a buyer"*

And for "suppliers willingness";

> *"Suppliers willingness is confidence, commitment and motivation to engage in a (long-term) relationship with a buyer"* (Rezaei & Ortt, 2012)

It is somewhat typical that researches considers evaluation factors with two dimensions and allows thus evaluation form two aspects. Generally the grouping of evaluated factors bases on so called "soft" and "hard" issues in suppliers performing. For example Sarkis and Talluri divide supplier evaluation factors in two categories; "Strategic performance metrics and components", and "Organizational Factors". Strategic performance metrics cluster focuses on four major metrics cost, quality, time and flexibility. These metrics are comprised of operational measures that organizations use to manage their processes. Each of these major strategic performance metrics can be further evaluated through their components or sub factors. The group of Organizational factors contains three sets of factors: culture, technology and relationship. These elements focus less on the competitive factors associated with operational measures and more on the capabilities and characteristics of the organizations that will form the partnership. Within each of these metrics, there are tangible and intangible factors that may be used in evaluation. Selection of which components to use, will be dependent on decision maker and the organization completing the model. (Sarkis & Talluri, 2002)

When the criteria variables represents issues like costs, quality and communication, it should be considered how each of these could be evaluated in case of segmenting Borealis Feeds suppliers. When metrics used in evaluation are both tangible and intangible factors, and some of them can be evaluated with numerical data and some not, it is required to implement an additional system that allows comparable information from all these factors. Some of evaluated factors

do not have any statistic data, and evaluation must base on experimental knowledge, and some that has data needs first to be manipulated before it could possible to use, which also complicates evaluation. Generally the problem of knowledge based evaluation in repeated evaluations is the ensuring evaluations comparability (Ordoobadi & Wang, 2011). Thus the instructions and weighting of evaluation procedure's needs to be clear and to ensure that each cyclically implemented evaluation will be in line. With factors which evaluations will base on empirical data, the instructions should also define clearly the calculations methods and limitations for used data.

The objective of segmentation is to allocate suppliers to each segment and thus the evaluation must bring out sufficient difference between suppliers. This should be considered already in designing the evaluation method for segmentation in order to choose the correct criteria factors which the evaluation would base on. The wanted form of the final segmentation framework also defines possible need for possible weighting of certain factors.

Below are presented criteria variables by Rezaei and Ortt, complemented with sub factors from other research. First in table 1 is represented all evaluation criteria factors, willingness and capability, based theoretical research and below it in table 2 is introduced sub factors also collected form theoretical reviews to complement the issues behind the factor evaluated. In next two chapters will be introduced both, willingness and capability factors, and each criteria will be described with following aspects;

1 What is the theoretical perspective to certain factor?
2 What are the issues that certain criteria reflect in case of Borealis?
3 Rough defining how certain criteria could be evaluated in case of Borealis?
4 What are the benefits that knowing suppliers performance in this area, could provide?

Table 1 Theoretical criterion variables

Capability	Willingness
Cost and prizing	Commitment to quality
Technology development and adaption	Relationship type and -closeness
Delivery	Communication
Quality	Bidding procedure
Process capability and Capacity of production	Reciprocal arrangements
Geographic location	Prior experience
Management and organisation	Attitude
Communication systems	Information sharing and co operational development
Position in markets	Openness
Reputation	Dependency
Environmental health and safety	Long term relationship

In table 1 it is introduced sub factors which could be understood as issues where the actual evaluation criteria factors constitute of. These factors covers all issues under the main factors of certain subject in supplier – buyer relationship, and the evaluated issues are only some actions selected under that definition. These sub factors are more operation related issues and are collected from previous research, where it have used for evaluating suppliers performance. These sub factors are more business specific, and must be defined case specifically to every segmentation process. The proposal for this thesis sub factors is below in table 2 and these will be issues that where suppliers evaluations would provide the overall grade for this thesis.

Table 2 The theoretical sub factors of criteria variables

Capability sub factors	***Willingness sub factors***
Competitiveness of pricing	Stability with operations
Adaption, ability to cope with changes in technology	Cooperativeness, Social distance, Cultural distance
Scheduling, Perfect order fulfillment, Service	Frequent, Open and Downright communication
Technical quality, Quality of goods.	Price combining
Delivery frequency and overall Flexibility	Mutuality
Delivery time, Geographic distance and Time distance	Feeling of trust, Impression
Operation orderliness	Outlook for the future,
Type of contracting, supplier's order entry and invoicing system	Investment willingness, Co operative technical development,
Supplier's financial stability	Open to site evaluation and constancy
Ability to cope with changes in the environment	Buyer's importance to supplier
Supplier's safety record	Commitment

4.2 Capability Factor Variables

Capability is group of factors that correlates supplier's resources, and strives for defining "what suppliers could do", in order to obtain a certain level of performance. Capability factors won't take stand on whether the relationship, on its current stage would enable it, but would supplier has potential to do so. All Capability factors introduced in this chapter will base on list of capability variables presented by Rezaei and Ortt.

The total grade for suppliers' capability, that will define certain supplier's location in orientation of capability-axis, is the average of all evaluated capability factors grades. Factors presented in table 1 represent issues that relates on delivery process and that how good supplier is with these actions, would it be considered as more potential supplier for Borealis. Sub factors in table 2 were more the actual operations and evaluation methods described below will lie on how well these actions are executed. Some criteria variables have more sub factors, and with

these the total grade of certain criteria variables will be average of all these sub factors grades. These sub factors are more real operations related and can be evaluated in case of Borealis. Below will be explained each of these factors, what are the theoretical aspects, what do these variables over all represent in Borealis case, and roughly defining how these sub factors could be evaluated. Depending on case, the amount and evaluation of criteria factors will vary, and statistic data would be available.

In this chapter the aim is only to define and introduce the possible criteria variables in order to provide good perspective on, what could be evaluated, and which kind of information it would provide for segmentation. In actual evaluation this many factors would not be relevant to evaluate a simultaneously especially when some of them touch on each other's this much. This introducing of all these criteria variable is more less and preface for workshop where with decision making team will be defined the final evaluation framework for segmentation.

4.2.1 Cost and Pricing

Pricing terms are commonly the first step for evaluating and comparing suppliers, as consequence of the direct cost impact. Too often does the quoted price do also have too high impact on purchasing decision even it doesn't always reflect the whole final cost. Instead of only comparing quoted price of volumes, economical aspects should be considered through pricing terms of the whole purchase process. Concept of pricing terms should include definition of formation of the total price by assorting discounts, demurrages and other administrative cost beside only the quoted price for certain volume. (Chopra & Meindl, 2010, pp.420-21)

Evaluating the cost of certain supplier beside the simple price comparison should be considered what other costs certain supplier causes. Beside the price of volume should it be considered the actual value of certain Feed, and how it impacts on distribution of final outcome products. Also what are the logistical costs should be included on price calculation and if unloading procedure creates with some Feed

types some additional cost should those be considered in evaluation. Additional costs that delivering of goods might cause, should be linked in evaluation to suppliers delivery arrangement. If there is no direct link between price and additional cost, for example why certain volume that would have certain quoted price and will cause for example demurrages, should additional costs evaluated with delivery terms.

Evaluating suppliers cost and pricing will be comparing supplier's Hold even values with logistical and unloading costs for Feeds. Hold even value is calculated by optimization and it indicates costs and benefits of certain type Feed compared to basic reference Feed. Logistical costs are the cost that will cause from delivering certain Feeds from Finnish border to Porvoo. Also unloading impacts on the total cost of certain Feed, and for example feeds which are unloaded through Borealis own capacity has lower unloading costs than Feeds that are unloaded through Refinery's next to Borealis unloading facilities. In evaluation pricing should be represented with discussion of the development of quoted prices with each quality group of Feeds.

- What is the value of suppliers Feeds compared with the same type of feeds?
- How great is the benefit of certain type of Feed, after logistical and unloading costs?

4.2.2 Technology Development and Adaption

Technological development and adaption represents suppliers ability to develop it itself and adapt trends in order to sustain it competences and stay as potential supplier. Developing collaborative relationship is a process that requires not only resources and current relationship to be already in sufficient states but also both having future potential so that benefits reach in the long run would be gained. Deeper the collaboration is more specifications both parties do usually adapt on their manufacturing, services and on their administrative procedures, in order to make it more suitable for the other party. Anyhow with only cooperative

relationship mostly the adaption's made to daily operation are outcomes from contractual agreements and or informal adaptations which are agreements upon to cope with a problem that arises or at the request of the other. Generally supplier's capability to adapt technological improvements and impact on characteristics of their product indicates how well they know their own production and are aware of general development of the industry. Besides higher technical adaptations, improvements considering packing and delivery possibilities are also positive actions from side of supplier. Especially with specified products, buyers involvement in manufacturing and in product development is generally high otherwise like with bulk products which acquisition (Van Weele, 2005, pp. 36-38). (Chopra & Meindl, 2010, pp. 502-5,411-12) (Jonsson & Zineldin, 2003)

In this case, scoring Feeds suppliers based on their capabilities to adapt new technologies and to cope with changes, it should be remembered that currently the involvement of Borealis in suppliers manufacturing processes are nearly non-existent. Broadly Borealis buys volumes of Feeds that fits with the open spec definition. The spec defines the quality that Feeds must be so that is suits for production and the transaction will actualize. Beside the overall quality and composition of Feeds there might be differences for example in the density of the goods purchased and it comes out while unloading. Example of potential actions with this factor variable would be if some suppliers who have capabilities to impact on their production and have technological abilities could speculatively impact on their manufacturing process so that their product would become more Borealis suitable. As supplier's technological development and adaption capabilities could be illustrated with capability to impact on product quality and better packaging, and adapting new ideas. In case of Borealis, packaging reflects the condition of RTCs used in delivery process, and which size and condition has high impact on total performance in delivery. Evaluation of RTCs condition can be divided in external and internal, where internal condition reflects how well stage unloading equipments are and is the RTC clean from impurities so that the risk of contamination is minimized. That how a well supplier adapts new habits with production or does effort for solving the RTC problems reflects their

resources and capabilities with this factor variable. Following issues could be considered in estimating suppliers potential;

- Would supplier be capable to do technological improvements for their product so that it would suit better for Borealis?
- Have supplier increased the amount of bigger RTC's and what is the share of bigger RTCs?
- Is supplier capable to use same RTCs in delivery?

4.2.3 Delivery

In literature delivery process is recognized as all actions from supplier selection until received delivery. Generally type and attributes of delivery depends totally on the terms of delivery contracted with supplier. Contracting delivery process does usually include issues like; Prices and terms of delivery, Terms of payment, penalty clauses and warranty conditions, and other arrangements like role of third parties and terms of delivery, in own categories. Prices and terms represent delivery type (DAF or DAP) and how the price constitutes, fixed or formula, and time frame of the contract and deliveries. Terms of payment defines the instructions when and how the payment should be done. Penalty clauses and warranty conditions will define what the possible penalties are and where is the responsibility of supplier. The section of "other arrangements" represents other subjects that could be addressed in contract or hold as obligatory recommendation. (Van Weele, 2005, pp. 54-57)

In case of Borealis, evaluation of Delivery concentrates on actions like scheduling, size of wagons and perfect order fulfillment. Scheduling is timing and allocating bought volumes during in contract agreed time-period. Better scheduling would allow more efficient use of unloading capacity and decreasing the possibility of demurrages. In this case scheduling is done by Borealis and bases on loading and dispatch information provided by supplier and later become more accurate with border crossing information provided by VR. The forms, time frame and quality of information provided by suppliers differ a lot and that

afterwards occurring changes are common. Also the delivery time may vary from one day to two weeks, which puts its own limits on scheduling volumes. Based on scheduling, unloading plans will became more accurate and more precise unloading plans are updated to CXL system. Over all the objective of scheduling is to ensure that Porvoo rail yard does not run out of RTCs and attempt to allocate volumes to optimize unloading capacity to avoiding demurrages. As long as the provided scheduling data is as unreliable as now the benefits of scheduling won't be reached.

Size of wagons reflects how many tons one RTC will cover. Discussion about small and big expects there to be two size of RTCs. Size of wagons influences to utilization of unloading capacity, so that bigger RTCs higher unloading volumes per day. The amount of bigger RTC is slowly increasing but still the amount of smaller ones is remarkable. Suppliers who own their production and wagons obviously have a higher impact on size of their wagons, but others power to influence on this issue is quite low. The size of wagons will also vary a bit between quality groups of purchased Feeds. With evaluating could be recognized which suppliers are providing more these bigger RTCs than others, and thus has more positive effect on total cost of their goods. Knowing who is providing bigger RTC would be possible to utilize in situation as decision supporting information for prioritizing some suppliers over others.

The final attribute of Delivery variable, in this paper is perfect order fulfillment which recognized as combination of attributes "on-time delivery" and "complete amount". On-time delivery presents suppliers capability to deliver agreed quantity within the agreed time frame and complete amount measures how big share of agreed volume will totally be delivered. Overall the evaluation of Delivery considers following issues;

- Size of wagons – What is the share of bigger RTCs used in suppliers deliveries?
- POF – How big share of supplier's volume does arrive in agreed time frame and how big share of volume will overall arrive?

- Scheduling – How on time and correct information supplier is able to provide of loading and dispatching schedules

4.2.4 Quality

Quality is one fundamental construct for defining the state of goods or items, and still has only an open definition, as quality aims on measuring if item or matter is as it is expected to be. Measuring quality depends on what actually is measured, and what are the characteristics that will define quality to be on in- or appropriate level. Approaches for defining quality are various and appropriate level depends on evaluator. Generally quality is something that only makes sense when it fulfils buyer's requirements. The "goodness and badness" of quality is always definable issue, and depend on the situation. This is why sometimes it is more relevant to consider the optimum quality instead of highest quality. Anyhow quality is wider matter and it could be considered within tangible and intangible issues. In this the case quality is understood as agreed condition within goods and package. (Garvin, 1984) (Lyssons & Farrington, 2006)

Buying Feeds, the Quality of goods it is defined with spec's that suppliers are committed to obey. The manufacturing process bases on great quantity's and is not too sensitive for small quality changes which allows using of wider range of Feeds components. Different quality group of Feeds are feed to process nearly as they were equal, and this is why in this paper is discussed about different Feeds quality suppliers as comparable. Anyhow this won't allow impurities within Feedss and for some impurity components the process or unloading systems are more sensitive than for other. The quality control is done while unloading and the results are available only when the supplied material is already unloaded to Borealis tanks. Always in case of new supplier or long time since last purchased volume first need to be taken trial heat so that the product will be tested and verified that the quality is suitable. The evaluation of quality issues should consider following points;

- Relatively, how good is supplier's quality for processes outcomes?

- What is the occurrence of impurities with supplier's Feeds?

4.2.5 Process Capability and Capacity of Production

Generally managing company's supply is controlling and optimizing their costs of "Production capacity" and "Inventory". Fundamental approach on this issue is considerations on building sufficient supply chain. Marshal Fisher presented in 1997 article with discussion of whether supply chain should be efficient or responsive and end up on dividing products on innovative and functional. Anyhow he also stated that the how customers considers it, should not be underestimated, and the solution should more like be combination of suppliers expectations and cost-effective. Anyhow within every situation larger amount of excess capacity allows higher flexibility, but however it also costs. Other possibility to ensure supply flexibility is to keep production cycle time proportionally higher inventories with open transportation capacity. Naturally issues like product type, its self life, and product variety impacts on possibilities with warehousing and production and thus capacity factors should be considered industry specific. (Chopra & Meindl, 2010, p. 64) (Fisher, 1997)

In field of chemical industry where production is based on major quantities and capacity utilization is near on 100% the flexibility of production site is commonly quite low. Feeds production for Chemical industry could be seen as primary production where some seasonality occurs and as consequence of high volumes the warehousing possibilities are generally quite limited. Because of lack of possibilities to impact on process demand planning should play a higher role in ensuring supply flexibility. (Lasschuit & Thjissen, 2004)

Because the whole supplier base consists of varying range of suppliers, while some are bigger and might own their production site and some are smaller and are practically only trading companies. Besides differences within suppliers' resources, the size does traditionally also reflect on suppliers overall authority on stakeholders and together this outcomes as differences within suppliers'

capabilities. With overall authority is meant suppliers capabilities to impact on volume they sell, time of dispatch and flexibility of delivery. Directly can't be said that suppliers with better resources would lead on more flexible and capable supply, but they might have a better potential to do so.

In Borealis case, production- and process capability represents supplier's ability to provide wider quantities of goods and their flexibility to increase or decrease total volume and individual batches, from of Borealis needs. Also how efficiently and flexibly supplier is able to process the whole purchasing-delivery procedure impacts on grade with this variable. The evaluated procedure starts from purchasing contract and will end on paid invoice by Borealis. In this evaluation attributes of process capability are "delivery frequency" and "flexibility". The evaluation does not take stand on if production facilities are suppliers own or is supplier dealing as broker. For this industry it is typical that because of lack from sufficient warehousing capacity, the RTCs which are used for delivering goods are also used as extra inventory. This is one reason why sometimes suppliers are keen to deliver bigger quantities at once and with lower unit price. In case when these RTCs are already loaded the volume will likely be delivered all in once batch, and afterwards changes to the volume or impacting on delivery time are not possible. On the other hand some suppliers that own their production and have sufficiently warehousing capacity are able to provide their loading schedules in advance and possibly delay some of their planned dispatches.

Delivery frequency is issue that is in this case recognized to represent, how often supplier will deliver and what are the size range of batches in which they are providing their volumes. If supplier is providing whole volume at once it will likely cause overflow with RTCs. When more than one supplier are supplying simultaneously it would be reliable if all suppliers would provide their supplies in stable flow with smaller batches. In case if all deliveries could be scheduled by Borealis, receiving supplies as first one suppliers whole volume in suitable batches and then batches from second supplier and so on. "Delivery frequency" comes in practice with factors of size of batches which evaluation would base on

experienced knowledge of persons, for example trader and site logistic coordinator who are dealing with it. In evaluation should be considered following issues;

- Are the batches optimized? (8 propane wagons can be unloaded a while, so batch of 16 or 8 arriving at the same time is good. And that if RTCs arrives from far or close impacts on what is optimize size for delivery)
- Does volume arrive "one RTC at a time "?
- Is supplier capable of delivering bigger volumes than its delivering now?
- How relevantly big are the volumes supplier has been providing?

Flexibility is in this part understood as Borealis ability to impact on delivery schedule. Flexibility represents also suppliers' ability to cope with changes, as for example delaying or advancing deliveries. In this section it is assumed that supplier is willing to do so, if they only can. Evaluation of flexibility will also base on knowledge because there is not relevant statistic data about how capable suppliers would be. In evaluation should be considered following issues;

- How much time supplier requires to cope with changes – "Are they able to delay at short notice"?
- Is supplier able to consider Borealis' opinion about delivery dates?
- Are size of batches settled together, can Borealis impact on dates timing?

4.2.6 Geographic Location

Location of facilities is a large part in designing supply chain. Basic trade-off is considering whether to centralize or de-centralizing inventories and where the facilities will locate. Factors that will affect on company's decision to locate facilities on certain area could be quality of workers, labor cost, availability of infrastructure, location of that firms other facilities and cost of facilities'. Characteristics of industry do also play a part in defining the possible locations for supplier's facilities. Especially industry's that are in early stage of quality grade the facilities are often located based on natural resources or other infrastructural particularity. (Chopra & Meindl, 2010, pp. 62-65).

Geographic location is a factor that determines delivery times and defines the limits for flexibility and thus should not be underestimated. To Porvoo As most suppliers to be delivering their Feeds from Russia and their delivery times from loading station to Finnish border do vary from one day till two weeks. Because of this variation it is not insignificant who is delivering. Certainly higher delivery time is impacting negatively on suppliers' flexibility and with longer distance also the uncertainty with planned delivery time increases. The evaluation of "Geographic location" factor would base on suppliers geographical- and timely distance. Because the purchase is done as DAP and overall the delivery process has no high transparency this evaluation won't consider lead time, but focuses on only the delivery time which suppliers refinery's geographical location represents and more days it will take from RTCs to come to Border, earlier those needs to be loaded. Longer delivery time has negative impact on supplier's possible flexibility because earlier the RTCs needs to be loaded less will be the time that deliveries can be delayed or brought forward. Evaluation of Geographic location would compare suppliers' delivery times and grade suppliers based on how relevantly long or short the delivery time is in relation to others.

- Where does suppliers' refinery locate from where suppliers RTCs dispatched, how long does the delivery take?
- Where does suppliers contact persons office locate, may time difference consider any problems?

4.2.7 Management and Organization

Orderliness in suppliers operations is commonly underestimated factor. The way how supplier is managing their internal communication systems will have a high impact on their overall performance and how they will deal with external issues. Amount and level of personal contacts and how their roles are defined impacts on how the communication with them works. (Olsen & Ellram, 1997)

Some suppliers do cause more work than others, which may be outgrowth from various issues, but in case of lack of professionalism the risk of confusions increases. For example if the roles in suppliers organization are not clear, more persons from supplier may contact about the same issues, confirming information from Borealis could be ignored and issues that are discussed and agreed will be forgotten if the responsibilities are not clear. Evaluation of supplier's organization and management would consider issues like;

- Is it always clear who is a contact person in certain issues?
- Will agreed issues actualize as discussed or doe some issues just be forgotten?

4.2.8 Communication Systems

Importance of information sharing is increasing constantly. In order to obtain lower inventories with many industries rationalizing supplier base is seen as a part of creating collaboration is developing communication and information sharing system. Integrated system would provide transparency and enable real-time order placing. Efficient information sharing requires resources and capabilities to build up a system, while willingness is moreover needed. (Park, et al., 2010)

In the downstream oil and chemical industry, planning and scheduling are highly resource-intensive and more complex than scheduling generally in order to enable rolling processes. Supportive tools should be provided within a suitable frameworks, including mechanisms which would allow consistent economical and operational guidance, account of real-time information on actual operations and market economics. With global and strategic level, planning for a manufacturing plants network, decisions and scheduling should be considered, feedstock procurement and distribution, suppliers production capacities, transport and general demand allocation. Possibly in case increased regularity with deliveries and converging information sharing system would be possible between individual buyer and supplier providing a portal where both parts could update required data

considering supply process, which would otherwise been send by email. (Lasschuit & Thjissen, 2004)

Anyhow, always before wider integration, the level of systems of communication between supplier and buyer has been at least on tolerable. With systems of communication it is in this section understood file format of documents, contents of documents, calculations of deficits- and demurrage requests, invoicing, and other documents in operational communication. Evaluation of this factor is mainly about evaluating supplier's document handling and that documents are provided in understandable and useful form and file format. The amount of documents that supply process requires is considerable and most needs to be re-edited and forwarded to third parties. Thus it is crucial that content's information is correct and documents arrives on-time to the contact person in Borealis. Because need for editing it is vital that documents are in form that does not require re-typing. As summarized the evaluation of communication systems factor will consider following issues;

- Does supplier provide all required documents on time?
- What is the format of these documents?
- Is the language understandable?
- Are all received documents valid, does there usually come lot of changes, are there mistakes and how alike is to get corrections without asking?

4.2.9 Position in Markets

The growing role of suppliers for buying company's businesses increases the need for objective assessment of supplier performance. There might be cases when buyer wants to determine whether a supplier is sufficiently equipped to live up to fulfill buyers' longer-term requirements and needs. With long run it is necessary that supplier can guarantee sustained continuity of supply, and evaluation of supplier's strong and weak points could provide buyer a reliable picture of supplier's abilities to do so. Besides evaluation, systematic gathering of supplier performance related data will possibly enable the buyer to negotiate strict

agreements about improving reject rates, reducing total lead time and contributing to cost reduction. The importance of evaluating suppliers financial state varies depending on type of sourcing, type of relationship that buying process requires and industry. Importance of purchasing as a function increases especially if rises in materials prices cannot be automatically passed on to the customer. (Van Weele, 2005, pp. 270-278)

Together position and financial situation defines what supplier's role in the markets is, and what might be the possible opportunities and risks of doing business with them. Especially within global supply chain there tends to be more possible risk factors and being aware of those might allow to be prepared for them. Minimizing the risk, initially buyer should be aware of the local markets where it is purchasing and what the general rules for behaving are. Analyzing of suppliers reciprocal relations gives a picture that, which suppliers has the authority in the markets, who might be the gate keeper, and who is the smaller player. (Chopra & Meindl, 2010, pp. 163-165)

Deeper is the cooperation with supplier, more vital is to be aware of their cost structure and financial stability. In most European countries, financial stability assessment of suppliers is carried out based on annual financial reports which usually can be obtained from supplier, because legislation. In most European countries companies are required to file a summary of their financial reports. The results of financial analysis do give a good impression of the quality of supplier's management, and allow buyer to build up strategy for further evaluation about supplier. (Van Weele, 2005, pp. 280-282)

Suppliers' overall position and their role in the markets depend on many issues, and might constantly vary. Position and the role are also ways to describe and group possible risks that sourcing with certain type supplier would include or create. Supplier's current role and position in the markets do often also reflect the possible trends and future situations. Especially in this case are the power balances of suppliers, because more connected and bigger player supplier is more

alike is that the situation will be so also in future. The financial stability is also in this case, as it is generally, an issue that does reflect on how potential supplier would be in the long run. Despite that supplies are purchased with DAP and payment is done only of received quantities, which makes suppliers financial state less crucial for Borealis, but if longer-term and deeper cooperation's are considered it is not relevant to use resources for something that might collapse. Borealis do have a list of possible and approved suppliers than could be considered, and who the possible supplier base consists of.

Evaluation and grading of supplier's position in markets and financial situation will in this evaluation reflect more about probability that certain supplier will be a possible partner for Borealis within many years. Evaluating supplier's stability will take also on account their authority and how well connected player certain supplier is. Because of the characteristics of this industry the connections and organization will play a bigger part in supplier's success than maybe in other lines of business. Evaluation of this variable factor would base on evaluators experience especially because of the importance of intangible issues which usually are not recorded. Defining positions and roles requires long experience and lot of knowledge from markets. Following issues could be considered in evaluating this factor;

- Is supplier old and traditional player, in the markets?
- How stable have supplier's operations been, have they continuously been equally capable to deliver Feed's? (regardless of Borealis intense to purchase from them, but would supplier have been capable)

4.2.10 Reputation

The impact of reputation is one of most remarkable motive in decisions to choose a certain supplier over others. There also exists empirical evidence that the link between supplier reputation and buyer satisfaction. In many situations buyer infers suppliers' trustworthiness and expected satisfaction through the actions and words of other people and organizations. The bases for reputations power does

come on experience which have created the suppositions, that certain supplier is capable to fulfill expectations (Lyssons & Farrington, 2006, pp.266-67). Within many industries reputation can in worst case damage organizations image and customer relationship or give a boost in the market. Reputation can be crucial if it blinds too much, but simultaneously it is one of the most powerful elements for creating and retaining customers. (Jonsson & Zineldin, 2003)

Despite of that, "reputation" is good reference while collecting supplier base, but creating any relationship that aims to lead on actual purchase should good rumors be confirmed. After financial approve suppliers are commonly tested with trial heat. Depending on how well the delivery process actualizes, product will meet the targets and what is the overall impression, will the supplier be utilized afterwards. Reputation is intangible factor and evaluation can only base on impression of people involved. Following issue could be considered grading suppliers;

- What is the first conception about supplier?
- Are impressions about supplier in line?
- Do empirical findings about supplier support the existing reputation?
- How well has suppliers performed before, if previous transactions.

4.2.11 Safety, Health and Environment

Issues related to sustainability and environment has grown their relevance and must nowadays be accounted when designing supply chain. In some instances the grooving amount of regulation has been driving changes while others change has been driven by the perception of environmental issue as a risk factor. While company's environmental impact is examined and environmental stress is tried to minimize the suppliers role has also been recognized within this puzzle. The actions due recognizing environmental and safety's aspect has reached from optimizing deliveries by prioritizing closer locations to packaging and the production of final goods. (Chopra & Meindl, 2010, pp. 51-52)

HSE issues are increasingly important part of production and as it is stated in Borealis instructions for that “if it can’t be done safely it won’t be done at all”. Because the purchase from Feeds supplier is transactional and suppliers own actions can’t be too widely evaluated, Borealis can only grade suppliers HSE capability based on issues that will reflect on operations in Borealis facilities. Issues like condition of RTCs, so that unloading process won’t cause danger to operators, and that condition of RTCs will allow unloading to occur encumbered environment, are issue that supplier should be committed to ensure. In future each supplier should have their own safety record, which would contain summary of all safety bias and description written based on audit in suppliers refinery. But in lack of existing supplier-specific safety records, grading supplier’s safety issues will base on expertise knowledge and possible records. The evaluation within this factor would be comparable with other suppliers, and if some supplier would actually perform extremely badly with this factor variable, should that supplier no longer be considered as potential supplier. Anyhow the evaluation of HSE variable should consider following issues;

- How often, compared to total delivered amount, supplier has broken RTCs?
- Have there been any serious problems with their RTCs?

4.3 Willingness Factor Variables

Willingness is group of factors that correlates supplier’s eagerness to do business with Borealis, and strives for defining “what suppliers are willing to do” if benefits of Borealis requires so. Willingness factors won’t take too much stand on whether suppliers would actually have abilities to do so. Most of the willingness factors are closely related to communicational issues and on defining the extent of the current relationship. With these criteria variables the objective is to bring out supplier’s potential for willingness. Also these willingness criteria variables will base on factors introduced in research by Rezaei and Ortt.

The total grade for supplier's willingness that will define certain supplier's location in orientation of willingness-axis is the average of all evaluated willingness factor variables grades. Some factors presented in table 1 and described below, will constitute of sub factors and in this case the grade for certain factor will be the average of sub factors grades. Sub factors in table 2 are more actual operations related and evaluation will be about these actions. Each sub factor is operational issue that could be evaluated in case of Borealis in order to define supplier's potentiality.

In this chapter willingness variables will be introduced with theoretical base and only roughly defined how those could be evaluated in actual. Neither not all of the willingness factors would be relevant to use in the actual segmentation, but in workshop should be constituted an evaluation framework based on the perspective that this chapter aims to provide.

4.3.1 Commitment to Quality

Supplier's commitment to quality outcomes usually with efficient quality control systems combined with open communication between supplier and buyer. Supplier's commitment to quality also reflects supplier's willingness to do its own quality controls and thus ensure buyer a constant and stable quality supply flow. Supplier who is capable to ensure its supplies stability is vital in quality sensitive production. (Park, et al., 2010)

Borealis does quality controls casually, together with unloading process, but the results will be received with a time-lag so that the trial heat will then be already in Borealis tank. Thus it would be crucial that supplier would independently be aware of their quality and inform Borealis about possible deflections. It can be assumed that every refinery will have capacity constantly to evaluate their quality, and that the information about even smaller changes that have happened in supplier's refinery would be appreciated information. Evaluation how well the

supplier is aware of their quality and does inform about it will be done should consider following questions;

- How well supplier does report about their quality changes?
- How stable is the quality of supplier's certain Feed?

4.3.2 Relationship Type and Closeness

The type of relationship between supplier and buyer depends on various issues including among other things their history, existing trust, characteristics of the industry and dominant overall economical situation in markets. Building up any stage of relationship, the willingness of each side is crucial and initial level of their mutual trust will define the first limits for possible cooperation. Relationship that bases on trust between two stages of a supply chain includes dependability and trust on future. The joint, striving towards mutual goals and benefits is also defined as cooperation. Cooperation and trust within the supply chain is way to improve performance by creating base for better matching of supply and demand as result from better information sharing and elimination of duplicated effort, and achieving political and economical benefits. In general positive relationship builds from trust, exists between cooperation, satisfaction and benefits, but stabilizing of real it requires more (Jonsson & Zineldin, 2003). (Chopra & Meindl, 2010, p. 496)

Besides cooperation, relationship builds up on bonds. Bonds reflect and engender commitment in business; bonds can arise between any interacting parties while they learn to deal with each other. Bonds can be technical, social, timing, planning, knowledge and legal or economical. Especially social and knowledge bonds which represent perceptual factors are usually for firm difficult to manage and measure. The impacts of these bonds are commonly generating trust and commitment in developing stage, and afterwards create exit barriers. A committed relationship can be dependent on perceived or contextual bonds that functions as exit barriers. Exit barriers are bonds that prevents customer for changing supplier. Anyhow the importance of contextual barriers may decrease if their use will

generate dissatisfaction. Still bonds can prevent buyer from ending relationship despite of low satisfaction with relationship. (Jonsson & Zineldin, 2003)

Behind each step in building cooperative relationship and defining bonds there is always cultural and social issues. Cross-cultural sourcing requires understanding of meaning and requirements of cultural and social distances, at least by the other one of partners. Cultural distance describes the extent to which the norms and values of the two companies differ because of their separate national characteristics. And the social distance describes the extent to which both the individuals and the organizations in a relationship are unfamiliar with each other's way of working. (Olsen & Ellram, 1997)

Because Borealis is international company and actions do occur over more than couple borders, their sourcing can be converse to be cross-cultural. The business culture within suppliers varies a lot from traditional common European judgement of purchasing process, despite that lately some convergence with traditional European manners can be noticeable. Despite that it is important that Borealis representatives are aware of cultural differences should supplier also be aware, understand and pay respect to Borealis sourcing policy.

That how close the relationship is, usually reflects from cooperativeness and more closely the relationship already is higher is the readiness to develop it closer to strategic relationship. Usually closer the relationship is more openness is observable between supplier and buyer, and audits like site evaluation are possible. Evaluation of relationship type and closeness should consider issues like;

- How close is current relationship with supplier?
- Does relationship allow visiting in supplier's refinery?
- How well suppliers habits are understood, does it come lot of surprises?

4.3.3 Communication

Communication is interaction and essential with any relationship between supplier and buyer who are in contact with each other, and aims to create relationship even for transactional business. Through individuals, communication links companies together. The structure of information systems and the functionality of the information technology are necessary for the success of any supply chain collaboration. Measuring the communication could be done with evaluating the frequency, duration and content of the contact between partners involved. (Jonsson & Zineldin, 2003)

The role and style of communication varies depending on the type of dominant relationship. In partnership the frequency of communication is higher and flows are more bidirectional than in transactional relationship. Determining the degree to which the parties understand each other's goals and coordinate their efforts achieving those, significantly results from the quality and frequency of information. More intensive communication is more likely to lead better informed partners, which increases the confidentiality of the relationship and makes both parties willing to build and keep the relationship alive. (Jonsson & Zineldin, 2003) As communication is prerequisite for building high trust relationship and mutual respect between two parties, and despite the closeness and frequency, it needs to be honest and constant. Even periodic lapses in communication may encourage either party to dissociate themselves from the responsibility for the objectives of the partnership and follow their own agendas instead. (Jonsson & Zineldin, 2003)

Communication is usually taken as granted and only recognized when it does not function as it should. In case when it is about processes which can't be planned in advance too precisely, the need for responsive communication and ability to make quick decisions and react is even higher. Quick reactions by both sides are in some moments vital in Borealis Feeds sourcing. When sourcing is cross-cultural the role of communication even emphasizes. Besides cultural factors language barriers may cause misunderstanding and complicate communication.

Communication should not only be limited on operational issues and ensuring that minimum required information will be provided. More open the communication between supplier and buyer is more alike is that unwanted situations could be avoided through transparency. Anyhow, one of nowadays problem is the excess amount information that needlessly takes resources and causes extra work, is issue that supplier should be able to minimize. Open communication with well managed organization enables efficiency in communication factor. For example right amount of people with clear duties could help elimination the risks of duplicated work but bigger amount of people involved could also ensure that someone is always able to be reached and that contacting supplier is made easy. Evaluation of communication should consider following issues;

- How are spoken and written skills in English?
- In case of urgent matter, is it possible to get supplier answer quickly?
- Does supplier require some special treatment, extra additional information?
- What is the time spent on serving certain supplier compared to others?
- Is all information received from certain supplier correct, or should some information be taken with reserve?

4.3.4 Bidding Procedure

Pricing is significant attribute through which a firm executes its competitive strategy. From perspective of supplier, pricing is way to match supply and demand and thus formation of the final price might be iterative. Despite that customers are expecting low prices they might accept higher if they are in need and with lower prices they might also be comfortable with lower level of flexibility. Thus sometimes for supplier it is more profitable to let the price build up with bidding process, instead of using so called “pricing menu”, and see what is the price customer would be willing to pay. Anyhow it might also have affect on negatively and customer will prefer supplier with simple methods. It is always buyer’s task to unveil supplier’s cost structure and pricing methods, and if it

cannot be done directly, there are indirect ways to perform financial evaluation for supplier (Van Weele, 2005, p. 270). (Chopra & Meindl, 2010, pp. 74-76)

Some of Borealis suppliers do use fixed pricing system but with most suppliers price for certain volume is defined separately for each contract. Usually the timeframe to purchase volumes is short and to ensure the required volumes the bidding process can't take too long. Thus sometimes if bidding process is complicated there are no time to wait for the lowest offer and the "second best" offer needs to accepted. Evaluation of the compliance of bidding process could base on traders view considered with following issues;

- How simple, usually, is to find out the final price for certain volume?
- How often it needs to accepted a higher price from other supplier, because this suppliers bidding process takes too long?

4.3.5 Reciprocal Arrangements

Reciprocal arrangements represent's operations where buyer and supplier are willing to do favors to each other's without extra costs. Situation when supplier could agree to reduce deliveries from contractually agreed level for a short time in order of Buyer Company. Likewise the buyer company could arrange its supply base to compensate and cope with difficulties at its suppliers. Adaption or willingness to customize and fit provides evidence that a supplier is beside trustworthy, also willing to cooperate for the common benefit. Reciprocal also reflects that supplier cares about the relationship and is besides its capability, willing to be flexible if relationship requires it. (Jonsson & Zineldin, 2003)

Borealis suppliers do deliver their goods in batches that will arrive to Porvoo as supplier has planned. When there are more suppliers delivering simultaneously the possibility that RTC might arrive with too big groups and limited unloading capacity will cause too long idle time for RTCs in rail yard. Some suppliers are, besides their capability, more willingness to delay or hurry some of their deliveries. Likewise when too long idle time causes demurrages to Borealis, that

how well those can be negotiated to smaller, will reflect supplier's willingness to reciprocal. Evaluation and grading of this factor will base on experience and does not take on account supplier's capability, but should consider following issues;

- How well demurrages can be negotiated?
- How well does supplier delay or advance its deliveries from Borealis request?
- How flexible are terms of payment?
- Overall does relationship mutually allow favors?

4.3.6 Prior Experience

Impact of prior experiences matters with everything and so it does with suppliers. Same phenomena as with creating brands, the importance of first impression, is remarkable and also in purchasing unconsciously association may define more than it should. Despite that situations in markets changes, organizations develops, technological improvements come up and authority rates will change, companies strategies do usually stand. Strategies define the ways companies will react on their environment which includes their customers, competitors and other counterparties. If there is a strategically mismatch between supplier and customer it is not likely that situation could change with short term, and if neither part sees no reason for change in their operations easiest would be if both would find a new counterparty. (Kamesky, 2010, pp. 18-20)

Borealis has a long history with some of the suppliers and some supplier do stem from bigger supplier that Borealis have previously associated with. Overall the possible supplier pool and the established base have been composed during many years. That, which one of the suppliers are used, depends on many issues. Seasonality of the Feeds, their quality and their necessity, supplier's ability to deliver and connections of Borealis current trader are some reasons which defines that which suppliers have delivered and when. In evaluating of factor of prior experience, it should be considered the overall satisfaction to certain supplier. If supplier is currently still delivering, issues Borealis has appreciated in their

actions and disagreements, especially in case if supplier is not supplying anymore, should be considered and comparative analyze made. Evaluation of prior experience could consider following issues;

- What is the volume supplier has delivered during last year?
- Overall grade how satisfied Borealis have been on them?
- Have there been any problems with certain supplier? – If, then what kind of?

4.3.7 Attitude

In supply risk management have been widely recognized and discussed risk rising from improper supplier. Especially in supplier development, building strategic alliances or supplier's early involvement, supplier's bad attitude may difficult implementation or prevents it. Anyhow, likewise supplier who is extremely committed and attitude towards buyer and their future interactions is highly positive could also ensure common competence. (Micheli, 2008)

For Borealis the variable factor of attitude would mostly represent supplier's outlook for future and towards Borealis. That how supplier is prepared to react on external needs for change, and how they will cope with those determines how potential supplier would be for Borealis in the long run. Supplier's openness for evaluation and eagerness to do businesses with Borealis will define how good supplier's attitude is considered to be. Evaluation of attitude should consider following issues;

- Is borealis customer in favor?
- How is suppliers attitude for future, are they regenerating company or stuck with past?
- What is suppliers attitude against improvement suggestions coming from outside?

4.3.8 Information Sharing and Co-operational Development

Technical cooperation is important within every field of industries. The importance of supplier's capability to technical development increases while the degree of upgrading in goes higher. Despite of supplier's capabilities, their readiness to take improvements in to operation and moreover their urge to propose for those is in some cases more valuable than only their ability. Adaptations are also one way to guarantee that it can be trusted to respond buyer's needs. Highly committed and willing supplier may invest in relationship with special equipment or adaptations for their production process in order to meet buyer's requirements. In high commitment and trust relationship, supplier's willingness to customize or make adaptations for customer leads to a higher perception. (Jonsson & Zineldin, 2003)

Traditionally supplier's interest to customizing, have not been considered as too relevant criteria. The purchased goods are selected based on quality speck, and suppliers are selected based on how well their product suits to Borealis as it current form. With quality inspections the suitability of suppliers Feeds are tested from test batches and in case of mismatch, no further actions are usually considered. Anyhow in some cases new Feeds would be nearly in speck, and supplier is willing (also capable) to make need changes to the consistency so that it would became Borealis suitable. This is not common but certainly considered as positive attribute in evaluation. Also how open supplier is about their coming changes, technological or operational, and if they are ready to make investment for common benefit of relationship it will impact on scoring their potential. Following issues could be considered while evaluating them;

- Have supplier modified their product, to more Borealis suitable?
- Does supplier inform Borealis about their improvements?
- Understanding how willing the supplier would be to perform improvements and invest on this relationship?

4.3.9 Follow-Through and Openness

Openness is character within relationship that eases creating trust and maintaining it. The stage of integration in supplier buyer relationship is generally an outcome from how well parties are aware of each other's, and are able to get the information they need. Sourcing strategies should reflect the supplier profile and if supplier profile can't be constituted well, it is not reliable. As stated in literature, effective supplier evaluation and selection should be considered to be one of the critical issues in supplier management. Often it involves the simultaneous consideration of several important supplier performance attributes that includes many factors which can only be known through openness in relationship. More clear and constant supplier's action and performing is, more reliable the built supplier profile can be considered. (Oberoi & Khamba, 2005)

Consistency and follow-through of suppliers aims on defining how stable will their performance be and is it possible to inspect by Borealis. Supplier's openness for evaluation and letting Borealis to explore their processes, helps to build trustworthy image. Openness for site evaluations and providing additional information of upcoming issues in with their delivery is way to build trustworthy image, and allow Borealis to profiler them correctly. In evaluation of this factor should be considered following issues;

- How constant is suppliers performing, how much there occur peaks and falls with their operations from Borealis perspective?
- How willing is the supplier for audits?
- How open overall is the associating with supplier?

4.3.10 Dependency

Between buyers and suppliers can be recognized three generic categories of dependencies which create a dynamic business environment on micro-level. Time-dependency which relevancy is motivated by increased importance of timing in today's' business environments, and which on one-hand, divides into time compression and order response, and on the other hand o agility and ability

to change direction of the supply flow. Functional-dependency refers to where companies' business activities are specialized and how they complement each other in channels or networks. Third category is relationship dependency which refers how business activities are dependent on the interaction process between companies in marketing channels. (Svensson, 2004)

Generally dependency indicates situations where buyer may depend on their major supplier on issues like product warranty, service, response to emergency orders and overall timing. The significance and scope of interaction process and dependency between partners depends of the atmosphere of certain environment in which they operate. The characteristic of the partners involved influences the atmosphere and can be described in terms of power-dependency. Dependency theory predicts that the power of one firm in two-firm relationship is based on others dependency, where dependent firm needs to maintain the relationship to achieve desired goals and satisfaction. (Jonsson & Zineldin, 2003)

Within relationships as in every social structural, balance of power is always involved and has impact on defining dependency between supplier and buyer. Usually all operational changes in relationship are based on suggestions by higher authority. The amount of perceived power put between sourcing partners is a function of authority and dependency. The bases of power can also been classified as coercive and non-coercive power, where coercive power represent a power struggle driven by force, and non-coercive power bases of power that increases value of the relationship through team support and common interests as well as promoting collective goals. The application of non-coercive power usually bases on increasing the level of effective cooperation and in turn the level of perceived satisfaction, while decreasing the possibility of conflicts. Simple way to define the power relations is to consider is there more suppliers of buyers in the market, is the issue over – or under supply. (Jonsson & Zineldin, 2003)

Dependency as most evaluated factors is industry related issue, and due higher degree of upgrading supplier's importance in its customers success will increase.

Goods that Borealis purchases do not include too much specified technological details which might put some supplier over others, which allows purchasing to be relevantly transactional. Thus the dependency in relationship between Borealis and its suppliers is relatively not too high. Anyhow the evaluation of dependency factor aims to bring out that how important customer Borealis is to certain customer, and if some supplier is actually dependent of volumes that Borealis purchase. Generally dependency is also one outcome of who has the bargaining power in relationship. Evaluation of the dependency factor should consider following issues;

- How important customer Borealis is for supplier?
- What is Borealis bargaining power?

4.3.11 Long-Term Relationship

The concept of long term relationship as criteria factor for supplier evaluation can be enclosed with commitment. Commitment is a result of the development of collaborative relationship between two companies. Trust is a necessary condition for commitment but commitment also has a more distinct priority dimension. With daily purchase situations it is enough to ensure partners trustworthy but with long term relationship partner's commitment has a vital role. For successful relationship it is imperative to communicate and cooperate in atmosphere of trust with interdependence, frank debate, and mutual positive expectations so that mutual benefits and satisfaction would be achieved. As commitment can only be built on actions such communication, adaption, bonds, degree of cooperation, length of the relationship and quality, can commitment generate with time and not only by contracting. (Jonsson & Zineldin, 2003)

Competition in markets requires that firms continually seek out products, processes and technologies that add value to offerings of their own. One way to ensure company's competitiveness is to look for alternative suppliers or develop its current. Benefits gained from relationship will usually define what both sides are ready to do, for maintaining and improve their relationship. Supplier

development activities are a wide range, from feed backing about performance to engineering support, if parties see the development as most relevant function. Generally it is stated that longer the cooperation lasts the greater are the benefits and rewards for the buyer while supplier is having loyal a customer. In low trust and commitment relationships the positive relationship benefits are even more important for achieving high satisfaction, as maintaining any relationship. (Jonsson & Zineldin, 2003) (Krause & Ellram, 1997)

With most of its suppliers Borealis has a long history, and the proximity of relationship can be recognized with cyclical nature. As the relationships vary also the contracts with different supplier are different. Some of the relationships can be recognized to be more committed with longer term contracts and some suppliers are highly transactional with short-term contract. With some suppliers the communication can be constant and with some suppliers much more frequent. In case when there are no requirements for supplied goods to be highly buyer specific, evaluation should concentrate more on willingness based motives. Thus in longer term relationships is that what both sides want from the relationship, and is developing relationship to be more integrated or keeping it transactional more relevant;

- Do Borealis and supplier have a long common history, how close?
- Is there common goals or objective that has been defined together with Borealis and supplier?
- Has there Borealis provide support in order to develop suppliers Feeds to suit better with Borealis requirements?

5 FINALIZING THE EVALUATION

Determining of frames for final evaluation were done with workshop were participated peoples form different operations but who somehow were involved in the supply chain process of sourcing Feeds to Porvoo cracker. Based on discussion and case solving in workshop were defined how the segmentation model would be. Based on the proposal presented in two last chapter were defined the Segmentation framework with segments and boundaries, and Evaluation criteria framework. The criteria framework will include all factors that will be evaluated in order to grade suppliers for segmenting them.

Based on expertise workshop, theoretical criteria framework for segmentation presented in Chapter 3.3 was modified to suit better for Borealis requirements. In workshop, criteria framework was wrapped up to lesser factors, and some of these factors were updated to versions that will include criteria combinations and some factors are considered from different perspective as in theoretical framework. In workshop were discussed what are the practicalities that best represent supplier's abilities within certain factor and how those operations could be evaluated. Because the characters of these factors varies from intangible to tangible, also that where the evaluation bases varies from compiled statistical data till impression and experience of persons who have been involved with suppliers in certain issues. Thus for each factor the evaluation methods have been considered singly and the decision if evaluation is done with calculations or "question framework" depends on the amount and quality of existing data, or lack of it.

The updated framework for segmentation was defined in workshop to better reflect the reciprocal order and relations of possible suppliers. Also the names, boundary values and amount of segments were modified to better describe and reflect the roles of suppliers in certain segment. Segments and their objectives are wider discussed in chapter 6.2, but below it is presented roughly the shape of defined segmentation framework. The main difference between previous segmentation and updated versions was that in new version willingness includes

the volume supplier is at present delivering and that segment of potential is now considered as suppliers with higher capabilities instead of higher willingness. As in can be seen from figure 8 below the required scoring to Strategic segment is 4 with both capability and willingness factors.

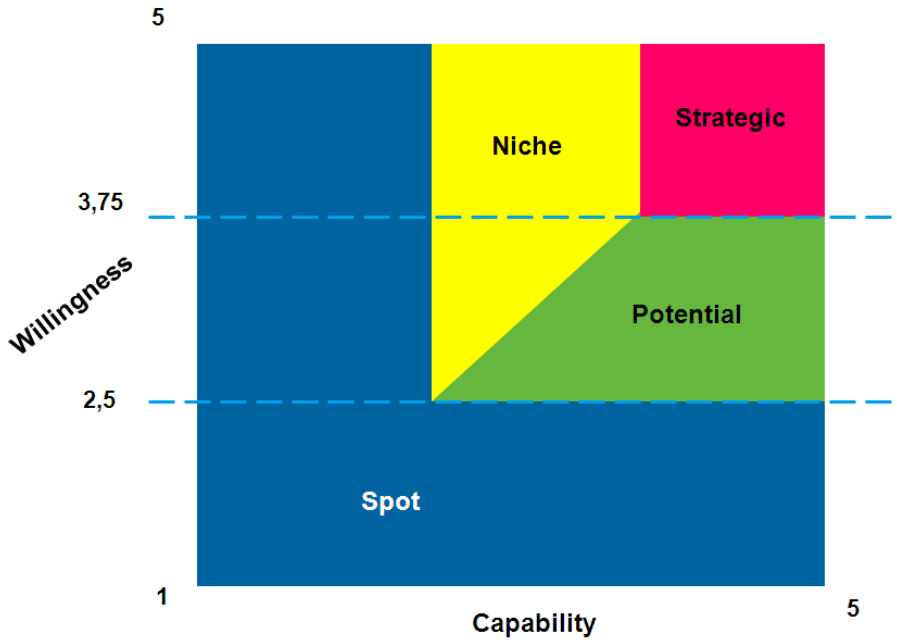

Figure 8 The supplier segmentation framework

The names of segments aim to reflect the objectives of certain segment, and can be modified afterwards if the requirements and purposes changes. Below is with table 3 represented all the names of segments. The order from segment first to fourth segment is in relation to how deep the relationship is considered to be.

Table 3 The definition table for the supplier segmentation framework

Segment 1.	Strategic
Segment 2.	Potential
Segment 3.	Niche
Segment 4.	Spot

In following chapters it will be introduced the evaluation for suppliers and how suppliers will be segmented in to these segments presented in table 3. After presenting the evaluation factors will be a short example how the evaluation would be done, grading and locating supplier to the segmentation chart. Also all segments will be introduced, what are their definition, objectives and road mapping. In chapter 7 will be description of implementation by step by step.

5.1 Evaluation Criteria Table

In workshop, framework of Criteria factors, were modified and boiled down to form that better bring out the mattering issues in selecting potential suppliers for delivering Feeds to Borealis Cracker. Division into two groups, capability and willingness, as presented in chapter X, were kept and mostly factors stayed in their original divisions. In final framework it will be six factors in both divisions and weighting of factors importance varies from 10% till 30%. Evaluation of some factors will base on empirical data and with some factors evaluation will be done based on experienced knowledge applied with query table.

Only bigger changes that was made to the framework was that the factor presenting economical issues like price was moved from capability sector to be part of willingness issues, because of change in its aspect. Instead of “price of goods” now it is considered “value” which in evaluation considers more widely what the cost of certain type of Feed is.

All criteria factors presented above in chapter 4 were used in workshop as a proposal of what kind of issues should be evaluated and what certain factors would reflect in Borealis actions. With each of these criteria factors were introduced the description of ways to evaluate these issues and what would be the possible benefit what knowing of supplier potential within it would create. In workshop these factors were discussed through and were considered if there would be resources and possibilities to evaluate them, what would be the impact of results for segmenting and would it be too close to other factor. Based on example case suppliers, in workshop were considered if some of the factor variables could be put together and if some would not provide any valuable information. Determining the segmentation framework was considered what kind of suppliers with certain characteristic should locate in which segments and that was considered in choosing capability and willingness factors. Because most of the factors of final evaluation are named differently and are combinations, it can't be done specific link, why certain factor presented with theoretical background in chapter 4 is chosen for further evaluation and some are not. Overall the link between actual chosen factors and ones in chapter 4 is that, the factors in chap 4 were the fundamental proposal in order to enable base for open discussion, where no important section would be left out.

Table 4 The defined criterion factors for evaluation and segmentation

Willingness	Capability
Value (30%)	Agility (25 %)
Current volume (30%)	Communication system (10%)
Communication (10%)	Volume Capacity (10%)
Attitude (10%)	Geographic location (10%)
Dependency (10%)	OTIF (20%)
Joint development (10%)	HSE (25%)

Below in chapters 5.1.1 and 5.1.2 will be introduced groups of Capability and Willingness and evaluation of all their factors. All factors will be listed in their group and introduced how to evaluate those, some with examples. The results of final evaluation will be introduced shortly in chapter 7 where will also be introduced a short case example of each segments. Anyhow the segments, their targets and objectives, which were defined in workshop, are presented in chapter 5.2, Road mapping for segmentation.

5.2 Capability Factors for Evaluation Framework

Capability factors reflect on evaluating supplier's resources and existing, mainly, tangible issues. Capability issues do not take on account "why" performing of within factor is on certain level, or if performance has anything to do with willingness. In workshop discussion about capability summarized that capability should represent issues that with well managed higher resources could be created great benefits so that some tolerance with willingness factors would allowed. In final grading before segmentation some capability factors are considered to have a higher impact on supplier's potentiality which will be taken on account in segmentation by weighting some factors over others. In table 5 it is shown after

the factor what would be the weighting of that factor in final grading. The weighting does not impact on the evaluations of these factors and thus the weighting actions won't be described in same chapters where the evaluation of each factor is described.

In table 5 below is represented capability factors, short definitions, what they represent and what their weighting value (presented in parenthesis) is in final scoring. Following chapters will go through all capability factors within suppliers will be graded. Each chapter will include an introduction to what are the main impacts of actions behind the factors, and short description how those would be evaluated and grated. Some factors will base on statistic data and has grading scale which defines the boundary values and grade is constituted based on calculations, and some factors grading will base on inspection. The factors for there do not exist relevant numerical data evaluation must base more on experiences and estimations and also these factors are grated from one to five. Evaluations that bases on so called common sense are generally less reliable especially with repeated evaluations. In these so called feeling based evaluations would be good to consider one supplier as "average player" and proportion others grading there.

Table 5 Evaluated capability criteria factors

Capability	capability definition
Agility (25 %)	How many days does it take from suppliers to increase or decrease their deliveries
Communication systems (10%)	Supplier's document handling and - correctness
Volume Capacity (10%)	How big volumes supplier could provided and supplier's production capacity
Geographic location (10%)	Where does supplier's refinery locate, what is their delivery time
OTIF (20%)	Supplier's accuracy with timing and volume
HSE and Quality (25%)	Supplier's stability with FM quality and conditions of RTC

In creating the evaluation models for these factors it is generally considered a basic case where one independent supplier is delivering from one location only one quality type of Feed. Because in reality there are various exceptions form this ideal situation within each factor it has been tried to make guidelines to deal with most likely deviation. These exceptions may equally come out with factors that would have statistic data or the ones that will base on estimations and knowledge.

5.2.1 Agility

Agility measures supplier’s flexibility and ability to cope with change. Agility is a factor that depends mainly on supplier’s production and warehousing capacities, but also on delivery time from loading station sets its limits on supplier’s agility and possibilities to deliver flexibly to Porvoo. Overall agility indicates supplier’s flexibility and capability to postpone deliveries or hurry them up. Evaluated factor agility is chosen to be, because Borealis considers flexibility been as important capability with supplier that would be considered strategic.

Evaluation of Agility factor will base on suppliers capability to stop or fast its shipping. The minimum volume how much supplier is capable to flex is not determined, and it should be considered case specifically. The grading of this factor will base on evaluating how many days suppliers needs for flexing. The grading is done for delaying and for speeding up the deliveries, and the total grade will be the average. The figure 9 aims to demonstrate the time frame and decreasing or increasing the volume that will be delivered. It is likely that supplier would be equally good or bad with both of these actions, but in case if there occurs high variations it should be considered. Slowing down and delaying, indicates case where Borealis faces a situation that there is overflow with RTCs in the Porvoo rail yard and those can't be unloaded within agreed time. If Borealis contacts on supplier X to delay their RTCs dispatch. That how many days in advance supplier needs to know about need for delaying determines the grade, because calculating the required time will be delivery time + time that supplier needs for reacting request.

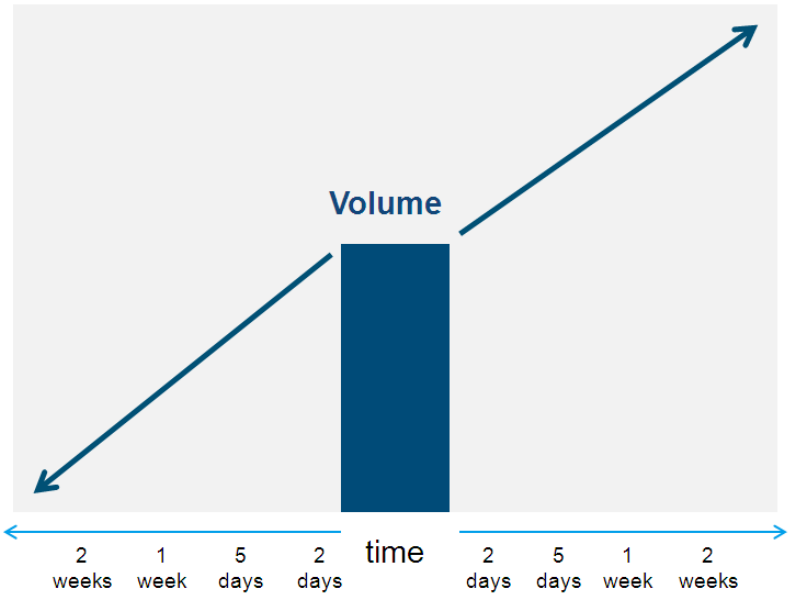

Figure 9 Suppliers agility to increase or decrease their volume

Evaluation of agility factor will base on experience and impression, for estimating how many days supplier needs to increase or decrease the volume they are delivering. The contracts for certain volumes are usually done per month, and for

this factor it is evaluated if supplier can change the amount agreed in that contract. The scoring of supplier's agility will go according to the table 6 below, where it is described the amount of days needs for arranging the change. If supplier can't flex with deliveries the grade is one (1), and if they can do it within max two days they will get grade five (5). In scoring, with "days", it is counted on how long does it take from that extra volume to get from suppliers loading station to Border. This definition of "days" includes beside the time that goes for re-scheduling supplier's delivery also the time that goes from suppliers dispatching station to the border. If suppliers delivery will take in total 4 days from loading station to Border and they would be really flexible and fast making rescheduling for extra deliveries they would have possibility for grade 4. For postponing their deliveries would be considered the same time, because in need for delaying, supplier needs to be informed at least four days before the RTCs would be in the border. In case if supplier is not as flexible with postponing as it is with increasing the volumes, the grade could be even lesser.

Table 6 The grading scale of agility

Grade	Scale
5	Less than 2 days
4	Less than 5 days
3	Less than 1 week
2	Less than 2 weeks
1	Longer than 2 weeks or cant do it

This factor might touch on a little bit of the willingness for reciprocal arrangements, but in this factor the focus is mainly on supplier's actual ability. Also the delivery time that is an outcome of supplier's geographical location will sets its limit on how flexible supplier even can be. With this factor suppliers who locate most far will not be able to get grade 5, despite they would perform well in many other sector. However not all suppliers despite their short delivery time are always so flexible which will be the considered issue with this factor.

5.2.2 Communication System

Criteria - communication system is a factor that represents supplier's tools, systems and abilities to communicate and share information with Borealis. This factor covers all issues related on document handling, what is the format, how correct are provided documents with language and content, and what their timing is. Especially when the amount of required documents is high, as in this delivery process, it is vital that each supplier takes care that their documents are correct and are sent on-time. The problems that poor performance within this factor could cause are besides wasted work a risk of custom clearance problems and extra costs.

Evaluation of communication systems, bases on experience and impression of persons who handle the documents which are required on purchase and delivery process. Documents are mainly; invoices, loading schedules, instructions and contracts, of purchased volumes and RTC delivery. Evaluation will be done with considering of following issues that will help evaluators to concentrate on same issues and allow repeating the evaluation. In appendix 1 it is presented a supportive table for evaluation with excel sheet.

Timing

- Does this supplier provide all their documents on-time, does some arrive too early
- Does some type (invoices, instructions…) of documents always arrive late/too early

Language

- What is the language with supplier provides their documents
- Are there spelling mistakes which could cause problems

Format and file type

- What is the format of certain document? (Is it common type, is it possible to open)

- Is it possible to copy the information to another document or is required to re-type. (for example RTC numbers from scanned PDF are not possible to copy to excel)
- What is the “way” that certain information is received, fax, email with attach or written in to email, or traditional mail
- Is information arranged so that it is easy to embody it and find the important part, and does the orientation and formation allow copying the required part

Validity

- How correct are the documents that supplier provides
- Afterwards arriving corrections causes extra work when mistakes are noticed, and risk when they are not. How crucial mistakes does occur with suppliers documents.

The grading scale for evaluating the factor of Communication systems is shown in appendixes and it describes mainly example situation and considers points which are also presented above. From table it can be seen how certain situations considered to be graded, with issues that are evaluated in this factor. In evaluation it is considered the closest possible definition from appendix 1 for current situation. Grading scale is from one to five and bases on evaluator’s impression what is the closest definition for supplier’s actions.

Below in table 7 it is represented evaluation of supplier X’s performing within criteria of Communication systems. Evaluation bases on situation definitions presented in appendix 1. In table 7 is presented a situation where suppliers Invoices are nearly always on time and the language is understandable. Despite that is not totally in English, the format is good even sometimes it is hard to embody the total price or due date. The content of documents that supplier provides is nearly always correct and when it is not, supplier provides corrected document before it causes problems. With demurrages supplier provides them quite late possibly with bigger groups and language is not English but content can be understood. The format is PDF which does not allow copying and checking the

correctness requires re-typing RTC numbers, and the content usually includes some mistakes like same RTC twice but those will be corrected quickly when asked. Grading of scheduling issues reflects that plans for loading and dispatching comes nearly on time, are written in Russia. But because required schedule information is mostly dates and volumes which are written with western numbers, the content is understandable. Format of scheduling is with the example supplier a word document where it is possible to copy –paste the values for further use, but not as practically as it would be if the format would have been excel. Luckily the validity of this suppliers schedule is highly correct and their RTCs tend to arrive exactly according to their schedule. Last evaluated issue with this factor is operation with return instructions which are documents that supplier should provide before RTCs cross the border and those will inform VR and border station where to send RTCs when those will return after unloading. This examples supplier does provide their instructions always on-time and without need for corrections, and in word format in nearly good order so that is easy to perceive the content, but the language is Russia and with this kind of text-file it may cause problems and risk of misunderstanding. Overall supplier's performing is good despite that their linguistic problems and that the format of their file is not as good as it should be in every situation.

Table 7 The grading of supplier's document handling

Supplier X					
document type	timing	language	format	validity	**total**
invoices	4	3	4	4	3,75
demurrage	3	3	1	3	2,5
schedule	4	3	3	5	3,75
return instructions	5	2	4	5	4
Communcation systems	4	2,75	3	4,25	**3,5**

5.2.3 Volume Capacity

Volume capacity is factor that indicates defining the actual size of the supplier and how big volumes they hypothetically would be able to provide. For this factor

there should be estimated knowledge how big volumes supplier is overall providing. Capacity with volumes does usually reflect with warehousing capacity and together these resource factors will usually allow better flexibility. One benefit reached through allocating bigger volumes to certain supplier would be regularizing deliveries and possibly and ability to use same RTCs with deliveries. If supplier is able to provide approximately 25% of Borealis monthly need it could be considered possible provider of regular deliveries as long as it will do success within other criteria factors. In reality that how much supplier would be able to provide depends on many issues, from normal export limitations to political restrictions, and the main focus of this evaluation is outlining how big player supplier is compared to others.

Evaluation of supplier's volume capacity bases on comparing suppliers *estimated* capabilities to produce the volume that Borealis would possibly require. The reference value is Borealis average monthly requirement for commodity. And because estimated average sizes and Borealis preference for wide supplier base the grade 5 would be reached if supplier would be able to provide 30 % of Borealis monthly requirement for that certain commodity. Evaluating volumes will be done within each commodity, because the Feeds are not fully substitute. In evaluation, it will be considered suppliers latest capacity estimation. In case if supplier is trading company it will be assumed that the estimated volume that they would able to trade is their maximum volume.

Table 8 The grading scale for volume capacity

Grade	Scale
5	> 30 %
4	> 25 %
3	> 15 %
2	> 11 %
1	< 11%

As shown in table 8 the grading scale is from one (1) to five (5), so that if supplier is producing over 30 % Borealis monthly need supplier reaches to grade five. This evaluation does not take stand on how big share, of the volume supplier produces, actually is delivered to Borealis. The objective of evaluating this factor is to consider if supplier is sufficiently big for deeper collaboration and possibly for more synchronized deliveries. Overall this factor should bring out the size range of supplier, without further considerations. Below in table 9 is shown example how the grade for each supplier is defined with this factor.

Table 9 Calculation of volume capacity

Calculation of supplier's volume capacity	
Borealis monthly requirement for commodity X	50000
Supplier's practical volume	8000
Percentage share	16%
Grade	3

5.2.4 Geographic Location

Geographic location is factor that evaluates suppliers based on their delivery time. Because Borealis purchases all Feeds with delivery terms DAP, the mainly concerned issue with delivery, is how many days it takes from RTCs to arrive from dispatching station to border station. As discussed with factor of Agility, less

days the delivery of RTCs takes, better. Benefits from less delivery time are for example possibility for smaller batches and more frequent deliveries and in some cases better flexibility because later dispatching.

Evaluation of factor of Geographic location is done by comparing suppliers based on their delivery time. The grading scale is presented in table 10 and if supplier can get their RTCs to Finnish-Russian border station in three days they will get grade five. After border it usually does also take from one to three days that RTCs will arrive to Porvoo, but because this does mostly depend only on VR it is not considered in this evaluation. As it can be seen from the grading scale if delivery takes more than 13 days supplier is graded with one. In evaluation should be considered average delivery times which are known and recognized with experienced knowledge.

Table 10 The grading of geographic location

Mean delivery time	grade
Maximum 3 days	5
Maximum 6 days	4
Maximum 10 days	3
Maximum 13 days	3
More than 13 days	1

With suppliers who deliver from more than one location in evaluation it is considered the weighted average of their delivery dates. Weighting bases on how big volumes are delivered from those locations, and naturally the one with bigger quantities has higher impact on average delivery time. Below is shown in table 11 how the calculation of the average delivery time should be linked on volumes delivered.

Table 11 Weighting of deliveries from multiple locations

Supplier X	Location 1	Location 2
Delivery time	10	5
Delivered volume	1000	4000
weight	0,2	0,8
Weighted average delivery time		**8**

5.2.5 On Time in Full

On Time in Full (OTIF) is Supply Chain conceptual framework and it measures if supplier is able to deliver the expected product in right condition with agreed quality and references, so that the quantity is correct and delivery happens so that the time and place it is as it is agreed. Depending on industry the concept and focus areas of OTIF varies, and in case of chemical industry where "products" are mainly gases loaded on RTCs and are measured with tons, the focus is on quality and timing. Sometimes leaving out a part of the agreed volume might happen from common agreement but sometimes supplier can from unknown reason leave part of the volume out, without any information. Especially as the contracts are made, so that payment is done based on what is delivered, for example it might entice to reduce delivered volume of certain contract if next month's contract would have higher price. This kind of issues will effect on suppliers reliability and should be considered while considering closer relationship. That how well supplier stays with schedules and is able to deliver with agreed time frame enables higher reliability on schedules and decreases the need for purchasing so called safety quantities.

Evaluation of OTIF factor will in this case be done by estimating how well supplier manages to deliver agreed quantity and well they do it within agreed time-frame. All Borealis contracted volumes are allocated over certain month and mostly it is agreed that supplier will deliver the whole quantity before end of that agreed month. The evaluation is done by comparing quantity that supplier

manages to delivery during that month, to the whole contracted volume. More tons will be postponed to next month worse score supplier will get with this factor. With this factor is also evaluated how well in all supplier does deliver the agreed quantity. The total grade for OTIF will be the summarized average.

In table 12 it is presented the calculation of OTIF-factor. In this calculation each supplier is considered as supplier –dispatch location combination, in case if supplier is delivering from more than one location. Despite that here it is considered that contracted volume it is required to be fully delivered by the end of month, in some case it is agreed and known that RTC will arrive in next month. Especially with suppliers whose delivery time is longer it is common that together it is agreed a schedule where some RTCs are loaded so late that due the long delivery time those will arrive to Porvoo only before half of the next month. These cases should be considered singly, nevertheless to understating importance of reliable scheduling. In this evaluation if RTCs arrives to border by due date delivery is considered to be on-time.

Table 12 Calculations for evaluating OTIF-factor

Supplier	F-M	bought volume (tons)	delivered volume in month	delivered volume total	delivered share month	On-time grade	delivered share total	Quantity grade	OTIF
Supplier X	Feed 1	3000	2700	2900	0,90	5	0,97	5	5,0
Supplier X	Feed 2	1000	950	1000	0,95	5	1,00	5	
Supplier Y	Feed 3	5000	4100	4300	0,82	4	0,86	4	4,0
Supplier Z	Feed 4	1500	1500	1500	1,00	5	1,00	5	5,0
Supplier Q	Feed 5	2000	1000	2000	0,50	1	1,00	5	3,0
Supplier W	Feed 6	4000	2000	2200	0,50	1	0,55	2	1,5

In table 13 below it is presented the grading system used in scoring OTIF factor. Scale bases on percentage share, of volume that will be delivered on-time, from total volume that it is agreed. If supplier manages to deliver more than 90 % of their total volume supplier will get grade five. In case if only 50 % or less, from agreed quantity ever arrives will grade be one (1).

Table 13 Grading scale for OTIF-factor

Grade	Scale
1	< 0,5 or =5
2	<0,7 and >5
3	>0,7 or =0,7
4	>0,8 or =0,8
5	> 0,9 or =0,9

5.2.6 Quality and Health, Safety, and Environment

Health Safety and Environment (HSE) and Quality are issues that are nowadays considered within every field of industry with importance. In case when supplier is delivering spot quantities the possibilities to evaluate how environmental friendly or how safely they have organized their production process and side operations are very limited. Thus evaluation of suppliers' HSE issues is in this case considered through their impact on buying company's HSE performance. Besides the type of sourcing, the characteristics of industry does effect highly on, how to evaluate HSE and quality issues.

In this thesis evaluation certain supplier's impact to HSE and quality issues must be defined, as attribute of certain operative issues which can be measured. As certain actions can be defined they could be reflected to represent suppliers HSE and quality capabilities. For example, unlike with parceled goods, in process industry evaluation of quality, can't be done with external inspections and "testing before use", and because great volumes not even every ton can be evaluated. In chemical industry one way, and which approach is used in this evaluation, is to consider HSE and quality issues by reflecting those with logistic, unloading issues. Unloading is first and last procedure performed in Borealis where product can be connected to its origin and to certain supplier, nonetheless that the results will be get only afterwards. In this section Quality and HSE issues will be dealt and be evaluated independently, nevertheless that they will lead to one grade for HSE and Quality factor. In evaluation Quality will be considered through the amounts of claims for incorrect quality, in relation the total amount of RTCs received. HSE factor will be evaluated based on the impact of RTCs condition to

unloading process. First will be introduced the evaluation and grading of quality and after that evaluation and grading of HSE, and finally those two will be summarized.

The full quality spec of Feeds is agreed in every contract with supplier. Generally the quality is assumed to be static but, random samples are taken constantly in order to make certain that qualities of Feeds are as it should be. With Feeds from new locations or from new supplier, before full acceptance, a test batch is sent to be tested if the quality is suitable can volumes be bought from this supplier. For Feeds, delivered with RTCs, the only possibility to take samples is while unloading and after unloading, goods will already be in tanks, which are also quality-controlled but, then it is not possible to direct impurities to any certain supplier. Due to great volumes, production is not too sensitive for small impurities and one tested unloading group with small quality deviation does not do too much harm for Cracker's production. Anyhow in contracts there are defined the specs for suitable quality for production, which is purchased, and supplier's compliance with the contract is followed. If problems with quality are recognized, supplier is provided a Claim about it, and reasons for defective are figured out. Depending on the scale of the problem, will be some rectified actions defined.

Evaluation of quality is done based on past 12 month's experience. All quality claims during that time period are calculated and compared with the total amount of the RTCs during same time period. The percentage share of Claims will represent the probability that suppliers next RTC won't be in the spec, which means that the quality is not correct. For example, if a supplier delivers during twelve months 200 RTCs to Porvoo and during the same twelve months RTCs will cause three claims. With the calculations, this evaluation rests on, will be scored that the probability that suppliers randomly chose RTC is not right quality, is 1,5%. Below in table 14 is presented and example how this calculation could be done. This evaluation will base on existing data, because all claims are recorded and every RTC that has visited in Porvoo is possible to track down. The

evaluator of this factor is likely the person who deals with operational issues, and participates on making claims.

Table 14 Calculation of probality for quality deviation

Calculation of probability for problems with supplier's quality	
Amount of delivered RTCs	200
Amount of claims	3
Probability percentage	1,5%
Estimated probability average	2,0%
Grade	4

The grading of the outcomes of this evaluation will be according to the table 15 below. The grading scale bases on the distribution of suppliers general performance with this factor. The grading scale table is same for HSE issues and possible use with both factors because it bases on average results from evaluation. In case if suppliers are managing too likely or if only some suppliers do create considerable variations on general distribution should boundary values in scale be redesigned.

Table 15 Grading scale for quality and HSE factors

Grade	Scale
1	> 2*average or =2*average
2	< 2*average
3	>1,5*average or =1,5*average
4	< average or =0,5*average
5	< 0,5*average

The possibilities in spot business where goods are purchased with DAP to direct HSE issues to any certain supplier are generally considerably low. The matters that would reflect supplier's capabilities in HSE sector and could be evaluated are mainly the condition of RTCs. Condition of RTCs is generally reflected with two issues; leaking valves which can be outwardly recognized and broken unloading pipes, which are usually recognized while unloading. In unloading, RTCs with

faulty unloading pipes can first be recognized from longer unloading time and then with closer examination the actual problem can be recognized. Leaking valves and broken unloading pipes usually comes out with alike signs and are both compiled statistics alike to same file. Every technical deviation is also claimed to supplier and with difference between these and quality claims should be kept in mind.

Evaluation of HSE via condition of RTCs bases on data which is collected to one file and will include all technical problems that have been faced with RTCs. In calculations the amount of problematic RTCs have been compared with total amount of RTCs delivered during past twelve months and the grade will base on average of all suppliers share of problematic RTCs. In table 15 above is shown also the grading scale for Condition of RTCs. Likewise, below in table 16 is presented an example case of calculating and grading HSE factor according to the grading scale.

Table 16 Calculation and grading of HSE factor

time period 12 months			Average of share	0,003533
	amount of			
	problematic RTC	RTC total	share of prob. RTC	Grade
Supplier X	2	200	0,0100	1
Supplier Y	1	600	0,0017	5
Supplier Z	6	1000	0,0060	2
Supplier Q	0	200	0,0000	5
Supplier W	0	150	0,0000	5

5.3 Willingness Factors for Evaluation Framework

Willingness represents issues that are required for exceeding as a supplier. Despite how great capacities supplier would have and no matter how potential it would be based on its capabilities, if it would not be willing to sell or the prices would X, there is no point to consider this supplier as a strategic one. In workshop it was

defined which willingness factors would be most relevant to evaluate and what would be the willingness related elements in suppliers that existence would be valuable to evaluate. Already in defining the segmentation table was considered what kind of elements certain suppliers that were generally considered with higher willingness would have. Based on these speculations were defined what could be the factors that would cover this issues so that could be evaluated which suppliers has these characters and how well they perform with them.

In table 17 below is introduced all these willingness factors that were considered worth of evaluating at the workshop, and in the left part of the table it is presented the explanation of what this factor should estimate. Generally Willingness factors will all focus on defining the current state of relationship, and might require some speculation and estimating. Also some willingness factors were considered to have a higher impact on supplier's potentiality and that will be taken on account in segmentation by weighting some factors over others. The weighting does not impact on the evaluations of the factors itself and thus the weighting actions won't be described in same chapters where the evaluation is described. The weighting is done not before than in the final calculation of the total grades, and will be explained later in this thesis. In table 17 it is shown after the factor what will be the weighting in final calculation.

Table 17 Evaluated willingness criteria factors

Willingness	willingness definition
Value (30%)	What is the total value of supplier's FM
Current volume (30%)	Share of volume purchased from certain Supplier
Communication (10%)	Operational communication with supplier
Attitude (10%)	Supplier's commitment and reciprocally
Dependency (10%)	Buyers importance to supplier
Joint development (10%)	Investments and developments for relationship

Following chapters will go through all willingness factors within suppliers will be graded. Each chapter will include an introduction to what are the main impacts of actions behind the factor, and short description how it would be evaluated and grated. Some factors that will base on statistic data, has grading scale which defines the boundary values and some factors' grading will base on inspection. With factors that do not have existing relevant numerical data, evaluation must base more on experiences and estimations where grading would also be so that 5 would be considered as best and 1 would be given from extremely low performing. In these so called feeling based evaluations would be good to consider one supplier as "average player" and proportion others grading there.

5.3.1 Value

Value of goods, is in this thesis seen as element of supplier's willingness. Better price supplier is willing to offer, more likely Borealis is raring to do business with them with long run. In evaluation, Value should not only be considered through

the quoted price of certain Feed, but with the whole Hold Even value of it. The concept of Hold Even value reflects the overall value that certain Feed creates.

The production of Steam Cracker bases on using multiple types of Feeds simultaneously, and plant cracks those with high temperature to multiple types of products. The comparing of costs of Feeds, while taking on account the value that will be gained through final products complicates the evaluations, especially as the evaluation is done between different Feeds. The share how final products of cracker come out from process depends on besides the cracking severity also from the share of which Feeds are fed in the process. With optimization it is calculated what is the best share to feed process so that the profit is maximized. This optimization also defines for each Feed, what are the guides for purchase, what is the required volume and competitive price estimation. The prices estimation is done in relation to a so called basic reference “FeedX” and it defines how much les the price of certain Feed should be so that it would be efficient to buy. Because of the constant changes in Feeds and products prices the optimization is done weekly and generalizing Feeds typical Hold Even values is hard.

In table 18 it is presented the evaluation of Value factor which calculation will be done with values from optimization and comparing calculated reference values to grading scale presented in table 19. The reference value is calculated as relation of “Benefit” and the cost of the reference FeedX’s. Higher the Benefit value is, smaller the reference value will be and better grade is earned. In calculation in the values of “price with delivery it is included all additional delivery based costs. In table 18 below it is presented the values required for this calculation and the in this table the shown HE value is already included on the value of Benefit. In calculations the value of Benefit is actually the difference of price with delivery, between certain Feed and the reference FeedX plus the HE value of this certain Feed.

Table 18 Calculation of value factor

FeedX with delivery	**894**	Price with delivery	Hold Even	Benefit	Reference value	Grade
Supp1	Feed3	638	-31	226	0,7478	3
Supp2	Feed3	620	-31	243	0,7282	3
Supp3	Feed2	642	45	297	0,6678	4
Supp4	Feed5	685	-1	208	0,7673	2
Supp5	Feed2	644	45	295	0,6702	4
Supp6	Feed3	620	-31	243	0,7282	3
Supp7	Feed2	650	45	289	0,6767	4
Supp8	Feed4	710	-8	176	0,8031	1
Supp9	Feed2	705	45	234	0,7383	3
Supp10	Feed2	655	45	284	0,6823	4
Supp11	Feed3	660	45	279	0,6879	4

In calculations should be used somehow average HE values in reasonable time period and average supplier's average prices with same time frame. In case supplier is delivering more Feed types, should ones with same quality group be summarized and unalike graded separately. Final grade should be weighted average based on how much which type of Feed has been bought. The determined grading scale bases currently on the result values, and if the trend seems to change should grading scale be updated.

Table 19 Grading scale for value factor

Grade	Scale
1	0,85
2	0,8
3	0,75
4	0,7
5	0,65

5.3.2 Current Volume

"Current volume" is a factor that represents, what is the overall volume that supplier is currently delivering, and how important supplier they are considered to be for Borealis within one commodity. If supplier is delivering a great quantity, it can be assumed that the relationship with them is already on significant level and

they have been considered as good and important supplier. Also when the delivered total volume from one supplier is great it can be considered that this supplier has been and is “willing” to supply Borealis, and thus “current volume” is considered as willingness factor. Because Borealis is purchasing different types of Feeds, which are not exactly substitutes, should Feeds be in this evaluation considered with their own commodities.

The evaluation of “current volume” will base on comparing supplier’s shares of delivered Feeds within a commodity. Grading with this factor, will base on comparing suppliers’ based on the percentage share of, how much they are delivering certain Feed compared within its commodity. The evaluation will base on statistic data of delivered quantities from last twelve months, which will be collected to one file, and for each Feed will be calculated its stake from the total volume of that Commodity. The time frame of this evaluation bases on last twelve month because of the seasonality which may occur within Feeds. In case if supplier is delivering from more than one location all their volumes, which are same commodity, have summarized and calculated in evaluation as one Feed.

Grading of this factor is done by comparing the share of Feeds delivered by supplier to grading scale. Commonly for every type of Feed, have been calculated a grading scale where it is stated the boundary values for each grade, which is presented in table 20.

Table 20 Grading scale for current volume

Grade	Scale
5	>50
4	>25
3	>10
2	>5
1	<5

The boundaries for grades are same for every commodity and thus with some Feeds, no supplier reaches to grade five as it can be seen from figure 10. Likewise with some Commodities one supplier might be overwhelming and without consideration the most important supplier for that Feed. These cases when there are only few possible suppliers for certain Feed, reaching higher grades it is more likely than within commodities where there are various suppliers. From figure 11 can be seen that supplier 13 is technically the only supplier for Feed 2 thus they are delivering over 95 % of it. The boundary values are defined so that only few suppliers would reach on grade five and nor that all suppliers would end up on group one. The boundary values of grading scale should be modified if case if current situation will change.

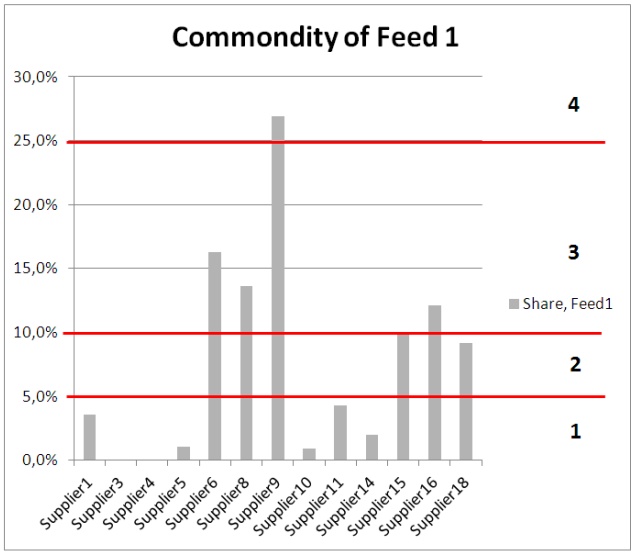

Figure 10 Suppliers shares in delivering of Feed1

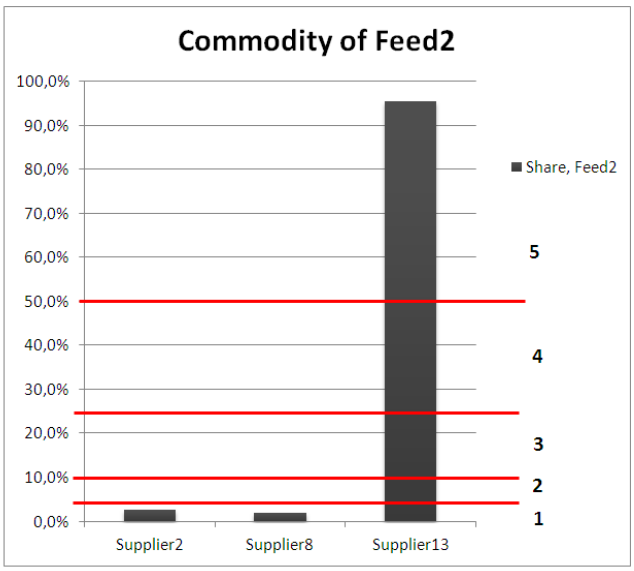

Figure 11 Suppliers shares in delivering of Feed2

5.3.3 Communication

Successful communication between buyer and supplier requires more than just functional system for communicating. The final, operational and crucial communication takes place between individuals and beside the personal issues the overall communication policy of supplier's, impacts on how well the information is shared between sides. In this chapter is discussed about more operational and verbal communication between Borealis and supplier, as the communication through documents was done in capability chapter. "Communication" as a plain factor bases on experience and proportioned understanding of suppliers' actions with verbal and informal written communication. Communication is in this evaluation divided in four sub factors that sights on defining how supplier deals with following issues.

Language skills:

- How are spoken and written skills in English? Is it possible to communicate, so that the issue will be understood by both side, and is risk of misunderstanding how alike.

Openness:

- How freely supplier tells about their overall situation. What is supplier's communication policy is contact person delegated to discuss and negotiate about required widely about issues.

Accessibility:

- In case of urgent matter, is it possible to reach suppliers? Are there enough possible persons to answer the question, and is it possible to reach one of them.

Strain:

- Does supplier require some special treatment, extra additional information? What is the time spent on serving certain supplier compared to others.

The evaluation of communication factors concentrates on issues presented in table 21, and is done by more than one person. For example trader and logistic coordinator will both fill the evaluation table based on their own view and experience and the final grade for supplier will be the average of these two evaluations. In table "Language skills" aims to define how well normal discussion can be done with supplier or will something be always left out because language barriers. "Openness" reflects how well suppliers provides information about coming issues and, how freely they are able to talk about their situations which would help in creating a wider picture. "Accessibility" evaluates how well supplier's contact persons are available and can be reached. That how well organization is organized and managed so that the roles are clear will easy on success with this factor but also that how well supplier wants to be reached affects on this factor. Final subsection with communication is "Strain" which reflects supplier's working and operational culture and should not occur in well managed situation. If the roles are not clear and the operation is not too well designed supplier may need to make more calls, changes to planned issues, and re ask information. In evaluation if supplier does not cause too much extra work will the grade be close number five and if they would require own person to deal with their issues, should the grade be 1. In appendix 2 is presented grading scale for

evaluating communication and which should support allowing evaluation be repeatable

Table 21 Grading of supplier's communication

Supplier X	Communication
Language skills	5
Openness	4
Accessibility	3
Strain	5
Total	**4,3**

5.3.4 Dependency

“Dependency” is a factor that commonly reflects who has the bargaining power in relationship. Also dependency is seen with close relation to size distribution between buyer and supplier, so that the larger one tends to have the power. More than counterparty’s size, in sourcing process the Decency is commonly an outcome of whose production is dependent from the others. In this thesis Dependency is represented by the share that Borealis purchases, of supplier’s whole on sale volume. The volume can be supplier’s whole production or in case of trading company–supplier, the total volume they are trading in certain month.

The industry where purchase – supply process occurs tends to define which are the relevant volumes and shares, purchased or supplied to counterparties. Generally the culmination of dependency is when supplier is supplying buyer’s whole inventory while supplier has also other customers, or when buyer is buying supplier’s whole quantity while having other suppliers. These kinds of situations reflect on high dependency situations and generally in supply chain, a wider supplier and customer base is regarded as indicator of independency. However, even buyer would usually purchase supplier’s whole production, it does not always mean that this supplier would totally be dependent on buyer and that supplier would not have any other opportunity. As summarized, competitive

supplying and purchasing policies can't too well be generalized and instead should be determined case-specific.

Borealis supplier base consists of different size of suppliers with wide range of characteristics. In this thesis their dependency from Borealis is evaluated and grated through the share that Borealis purchases of supplier's on sale volume. Supplies are considered within commodities and if supplier is providing more than one type of Feed, are Borealis purchased shares counted from the volume with certain Commodity. Below in figure 12 it is represented a scale of how suppliers should be grated in order to determine their dependency on Borealis. In table 22 the column of "how big shares Borealis purchases" represents that, how many percentage is the average monthly volume that Borealis buys from supplier, compared to the total volume that suppliers sells out. For example is supplier would produce 8 kilo tones in month and monthly Borealis buys on average 7,1 kilo tones from them, which means supplier would be highly dependent on Borealis and get an grade five. In this evaluation it is considered that more dependent supplier is from Borealis, better. Unlike generally in supply chain literature, supplier's high dependency from buyer is not considered to lead weakening in supplier's performance.

Table 22 Grading scale for dependency factor

Grading scale	
How big share Borealis purchases	grade
More than 80 %	5
More than 60 %	4
More than 40 %	3
More than 20 %	3
Less than 20 %	1

Carrying out the evaluation would require information about what is the total monthly volume that supplier is selling out, and estimation of what is the monthly

volume that Borealis purchases from certain supplier. With this industry it is not like to have clear information about supplier's total volumes and especially if supplier is a trading company, their monthly volumes may differ highly. Also Borealis monthly purchases from certain suppliers do vary. Thus for evaluation it must be done estimations of what is the volume supplier generally supplies to Borealis, and what could be supplier's total production. In order to minimize the seasonal variation the time frame for this evaluation should be one year. The overall grade for supplier's dependency will be the average of the grades of every month as shown in figure 12. Because of the lack of actual statistic data, the person with best knowledge should do the actual evaluation. In order to ensure wider aspect for evaluation persons with supporting knowledge should assist in evaluation. Surely if in case if there would exists statistic data considering even some of the suppliers, could this data be used to support the estimations. Generally this evaluation will base only on experienced knowledge and some available data. Below is shown a table

Supplier X	january	february	march	april	may	june	july	august	september	october	november	december	Dependency
Trader	4	3	5	4	3	4	5	5	5	3	4	5	4,2

Figure 12 Grading dependency factor

5.3.5 Joint Development

"Joint Development" is a factor that represents supplier's willingness to invest on relationship. This thesis understands investment as economical or related to knowhow properties. Some suppliers are more willing to develop themselves in order of buyer's needs and some supplier bases their improvement on their own visions. This factor aims to define if some suppliers are more willing to make improvements to their product or processes than others, in order to make it more "suitable" for Borealis. Extreme situation could be illustrated with example case where, with new supplier X's test batch is recognized that their FeedX would otherwise be suitable to Borealis, if only the level of components B would be

lower. Depending how crucial that component B is, there are generally two possibilities, 1) supplier makes required improvements and becomes a Borealis supplier, or 2) supplier is not able to neither make the investments which the improvement would require or is not willing to develop their product closer to Borealis requirements, and in this case wont further be considered as possible supplier.

Evaluation of "joint development" will be done based on experiences of persons who have been involved with suppliers. Below is presented a table 23 where can be seen the two aspects that should be considered in evaluating supplier. Modification defines how willing supplier would be for making any modifications to their Feed. Modification would cover actions like investments for instrument that would cut out some impurity components or that if supplier would modify their products characteristics. More likely is that supplier would be willing for this kind of actions better grade would pointed to them. Anyhow evaluation of this factor should be considered speculatively, because for this industry the modification of goods is not too typical, and usually not required. Especially suppliers with long-term history it is hard to estimate how willing they would be to modify their Feed, if there never have occurred any need to do so.

The other sub factor, Improvement represents in this case the overall situation how forward looking supplier is and what are their other individual actions to maintain their competitiveness as a supplier for Borealis. Overall improvements are all kinds of actions that makes supplier more potential for Borealis, but improvements can also be actions done from Borealis request. For example, the size of RTC impacts on Borealis overall unloading speed, and more suppliers are using so called bigger RTCs better for the use of Borealis unloading capacity. Borealis have made a request to use these bigger RTCs, and some suppliers have carried it out better than others. That how well suppliers are providing bigger RTCs could be considered as one attribute in evaluating supplier's willingness for improvements. Besides wider investment requiring improvements and modifications the factor of Joint Development considers also smaller issues like

modifications and improvements for current operational actions. That how willing suppliers would be developing joint information sharing system or creating long-term contracts for allowing better forecasting, should also impact on suppliers grading.

Overall, the evaluation of Joint Development factor will concentrate more on supplier's willingness for developments, and their actual capability for implement would be less relevant. Many of this factor's actions have traditionally considered unnecessary and without actual appeared need it is unlikely to find out supplier's real attitude for these issues. Thus the evaluation of this factor will more like only estimate if the relationship with supplier is currently on the level that would allow such investments, timely and physical, from supplier. In case if some refineries are delivering to Borealis via more than one supplier should in evaluation be considered who the actual operative link with each delivery is and how well development issues would work with them. For example if Supplier X and Supplier Y are owned by Supplier Z, and with Supplier Z the relationship is extremely good and with Supplier Y the communication is considered as relatively light but everything goes without wider problems. With Supplier X the communication is good and everything works well and often some representative of Supplier Z is also communicating about supplier X's operational issues. In evaluating these suppliers, should be considered that if the relationship with Supplier Z would earn grade five, and it is likely that this supplier would also participate on Supplier X's operations and apply some their improvements also through them. This would allow Supplier X likely to reach grade four, even as independent it would have only reached on grade three. Likewise Supplier Y who would alone reach on grade 2,5 will with influence of the Supplier Z get a grade 3. Because it is distinguished that Supplier Z does not involve itself that much on Supplier Y's operations as they do with Supplier X, their impact does not help supplier Y to get grade 4. Thus the side impact of parent supplier should be taken on account in grading these so called "sub suppliers".

Instead of only counting averages of different person's opinions about suppliers' potential with these issues, the grading of this factor should base more on general aspect. A group of people who would have some experience of operating with supplier should together consider suppliers substance and together build a picture of how well would they deal with development issues. With this team of expertise the sub factors of Modification and Improvement should be grated as in table 23 below.

Table 23 Grading joint development factor

Supplier X	Joint Development
Modification	3
Improvement	4
Total	**3,5**

5.3.6 Attitude

Attitude is a factor that represents the overall willingness of supplier to do business with buyer. Attitude consists of many sub factors and actions which may either upgrade or weaker supplier's potential within this factor. Commitment, reciprocally and openness are typical issues which attitude builds of and which well managed makes doing business easy with certain supplier. Commitment represents actions that supplier performs in order to fulfill agreements and to maintain the common competitiveness; which overall it is commitment to common goals. Reciprocally comes out through willingness for doing favors to the other part, in order to main time the long-term competitiveness. For example in case if Borealis has problems with unloading equipment, supplier may delay its deliveries until the problem is fixed. In this section won't be taken stand on supplier's capability for doing so. Openness instead is factor that affects on many other factors but can also be seen as outcome of attitude. That how open supplier is about their overall capacity or occasional production problems reflects how

open they are for closer cooperation and how closely they are interested for doing business in future.

Evaluation of Attitude-factor bases on trader's notion of how keen the supplier is for doing business with Borealis. Grading suppliers attitude it should consider how well suppliers are dealing with the operations related to; commitment, reciprocally and openness. That how well supplier is committed on quality, by doing own quality controls and informing Borealis about even, inside spec occurring changes, reflects on good is their attitude with commitment and openness. The willingness on reciprocally actions comes out by how ready supplier is to make exception from what is originally agreed for favor of Borealis, without direct payback. Openness reflects on communicational issues as how freely they do provide all kind of information and if it able to make future plans. Below is shown example table 24 where is grated example situation. This supplier is really committed to reach common targets and fulfills all made agreements. Suppliers reciprocally and openness is also on quite high level thus they provide a lot of information about current situations and coming changes in their refinery. They also are understanding, with delays in RTCs returning from Borealis and do their best for postponing upcoming deliveries. The overall impression about their attitude towards Borealis is quite good ant thus the total grade for this Supplier X is a bit over four.

Table 24 Grading attitude factor

Supplier X	Attitude
Commitment	5
Reciprocally	4
Openness	4
Overall Attitude	4
Total	**4,3**

Evaluation of attitude is divided on sub-factors commitment, reciprocally and openness only to ease evaluation by allowing to acknowledge different aspects and outcomes of evaluation. The total grade for Attitude is the average of all

these sub-factors grades. The row of Overall Attitude is in evaluation table for cases like with new supplier when there does not yet exist enough information and experience to be able to split their attitude on this small sections. Below are listed points, which should be considered in evaluation supplier's potential within these sub-factors.

Commitment;

- How strictly supplier is committed on quality, does supplier inform Borealis about even the smallest changes with their quality, and how stable their action are

Reciprocity;

- Is supplier ready to do favors, for example slowing down loadings or postpone to next month

Openness;

- How open supplier is about their operations? Does supplier inform Borealis enough early about their coming shutdowns and other actions that would have impact on Borealis purchases

Overall Attitude;

- What is the overall impression of Borealis importance for supplier

5.4 Segmentation and Road Mapping

Based on workshop and further discussions, for segments were defined boundary values, instructions and objectives. The preparatory limiting values for segments were defined to be for strategic segment **3,75** with both willingness and capability –axis, and for supplier to be neither in volume or potential segments, **2,5** with willingness and capability axis. That if supplier is going to belong to Potential or Niche segment will depend on the relation of its willingness and capability grades. These limiting values for segments are only preparatory and as the evaluation is implemented it will be seen how suppliers will settle on segmentation framework and if borders should be redefined. In this chapter is shortly introduced how the segmentation of suppliers will be done before introducing the actual segments.

Below is shown table 25 where all suppliers' grades will be collected and counted the total grades for their willingness and capability, which will define supplier's location in segmentation framework. In table will be written down supplier's grades with each factor and table will calculate the total grade for supplier's willingness and capability on columns "total". In calculation of the total grade the formula will count in the weighting values which are earlier defined for each factor. The weighting values are shown also in this table in their own row, and they are counted in on the total values for each supplier.

Table 25 Calculation of the grades for segmentation

	Willingness							Capability						
	Value	Current volume	Communication	Attitude	Dependency	Joint development	TOTAL	Agility	Communication system	Volume Capacity	Geographic location	OTIF	HSE and Quality	TOTAL
Weighting	30%	30%	10%	10%	10%	10%		25%	10%	10%	10%	20%	25%	
supp1.	3	4	3	4	3	4	3,5	3	4	3	4	3	4	3,5
supp2.	3	5	5	5	5	5	4,4	2	5	5	2	5	5	3,8
supp3.	4	2	2	2	2	2	2,6	2	2	2	2	4	3	2,3
supp4.	4	4	2	1	2	1	3	4	4	2	1	2	1	3
supp5.	2	1	2	2	5	3	2,1	2	1	2	2	5	3	2,1
supp6.	4	4	4	4	5	4	4,1	4	4	4	4	5	4	4,1
supp7.	2	2	2	2	2	2	2	2	2	2	2	2	2	2
supp8.	1	1	2	4	4	3	1,9	1	1	2	4	4	3	1,9
supp9.	3	3	3	3	3	3	3	2	3	3	3	3	3	2,7

Based on calculations presented in table 25, all the evaluated suppliers can be drawn to the actual segmentation framework. As can be seen from figure 13 only two suppliers will reach to strategic segment, and most of the suppliers will belong to Segment of spot suppliers. The suppliers 1 and 4 that locates in the framework in the border or Potential and Niche – segments should be defined case based on which one those would be segmented. Depending how well and carefully the evaluation were done and how well it bases on statistic data, can also the results of segmentation be considered reliable and comparable with further evaluation. The segmentation in figure 13 does not present real evaluation and thus the outcome won't be fatherly discussed.

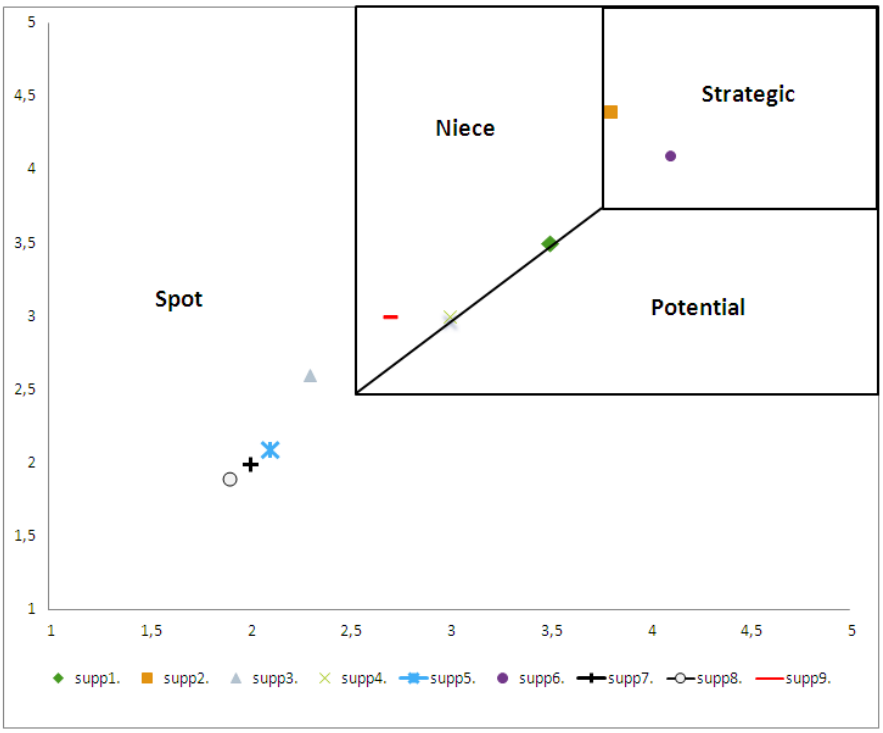

Figure 13 Suppliers' segmentation into the framework

In next chapters will be introduced the policies of each segments, what are the objectives, road mapping and definition. Definition of segments aims to provide a short description of what kind of suppliers that segment should include and what are the main reasons why that segment exists as it own. Segments' objectives aim to define what is supposed to be obtained with suppliers that belong to that certain segment and what is unique compared to other segments. The road mapping will be defining actions that should be done with supplier who belongs on that segment. Below it will be introduced only the segment's policies, road mapping and objectives. The discussion of applying results of evaluation for segments will be in chapter 7 where will be introduced instructions for implementation of this segmentation process.

5.4.1 Strategic Supplier Segment

The segment of strategic and key suppliers is for suppliers who are enough big to have resources to develop their relationship with Borealis, among other things

with deliveries, communicational and quality issues. To be strategic, supplier needs first to convince and give proof about their capabilities for longer term relationship. Strategic supplier segment is for close relationship suppliers with whom Borealis could benefit from applying deeper collaboration. This collaboration could be integrated deliveries within the limits of process industries special conditions. With suppliers Strategic segments the level and stage of relationship and suppliers abilities will define the form of collaboration that could be applied between Borealis and certain supplier.

In strategic segment it should be considered suppliers who would be able provide regular and enough big volumes. The objectives of Strategic segment would be establishing regularity on deliveries with timings and volumes. Also creating more efficient way to share information, possibly with common information sharing system, would be target. Overall objective for strategic segment is to increase the integration and eliminate unnecessary and duplicated work, with deliveries of suppliers in this segment. Anyhow, requirement for these suppliers is that they will have abilities for that and that their reliability ranking supports their dependability.

Road mapping for segment of strategic suppliers should include estimated minimum amount of meetings, operational and commercial, and varying and permanent task list of issues that should be discussed in meetings. In strategic segment there should be at least one operational meeting per year where would be represented by both sides, the operational and logistical team, including also the commercial representative. Commercial meetings should be hold whenever there appears a need, in order to maintain good connections and enable open communication with supplier. Quarterly should also be performed commercial review, which would provide besides the agenda, subjects for discussions on meetings. Also quarterly evaluation should estimate if supplier should still be in strategic segment or if there have occurred changes which effects highly on the overall situation, that applied SRM policy should be reconsidered. Instead of making supplier performance review to provide information only for Borealis,

with suppliers should be hold feedback sessions, so that both party could discuss how the other side does perform actions that are from their side vital for overall success in supply process.

For allowing better follow-through with suppliers, for each supplier should be created so called supplier data card where would been collected all required information about suppliers every day issues till their performance reviews. Supplier data card should include summary of all meetings. With easily updated card could be enabled that operational side could also add notes and comments on card in order ensure that required issues will be on agenda of next meeting even the meeting would be only commercial and not operational. Supplier data card relates on other project going on, and this thesis won't comment it more than whit short mentions of the benefits it could bring on segmentation.

5.4.2 Niche Player Segment

Niche player's – segment should include suppliers with lower capability but higher willingness. These suppliers might be smaller player, with lower volumes so that they might never have possibilities for regular deliveries or that their abilities with flexibility would not allow it. Anyway suppliers in this segment are reliable, good suppliers providing more or less regular supplement quantities, why they should be considered with effective SRM policy. As these suppliers are likely to have lower points with capability, which means they might locate far or have overall smaller volumes to provide, they won't likely never move from this segments to strategic segment. But in case these lacking capabilities are possible to overcome, develops with their communication systems or accuracy and quality issues, these supplier could also be developed to reach to strategic segment. Thus besides overall scores should be considered are those lacking capabilities unchanging or fluctuating, and if improvements could be done.

Objectives with this segment are to stabilize relationship and regularize deliveries. Suppliers in this segment are important, and because their higher willingness, they

might usually be more ready to bend the rules and adjust with Borealis needs. The importance to maintain good relationship and connections with these suppliers should not be underestimated and even the increasing with volumes might not be possible, the suppliers which capabilities allows flexibility by time with less operational effort from Borealis should be hold well connected. With this segment suppliers' could be established regular and integrated deliveries, which one benefit would be better scheduling.

Road mapping for this segment will constitute of at least one operational meeting per year where would be, as in strategic segment, represented the whole operational and logistical team with trader. Besides this, commercial meetings should be held on demand. The agenda of this meeting should include feed backing, future plans like volume estimation and going through common objectives for relationship and doing business together.

Also with these segment should be applied the supplier data card, with all same applications as with strategic segment. As data card would collect history data of supplier, with card should be easy to make some follow up if supplier's capacity is developing.

5.4.3 Potential Supplier Segment

Segment of Potential suppliers, should constitute of suppliers who have a more capabilities but are less willing than suppliers in Supportive segment. Potential suppliers would probably be able to provide bigger and regular volumes, or they might be flexible with short delivery time, but because lower willingness they are not considered as strategic. Lower willingness grades with these suppliers might be result from their low dependency, which may outcome also as bad attitude or that supplier might be rather new and the current volume purchased from them is low. Also if certain supplier is considered to have lover overall value, as outcome of higher price or less cracking value, it is unlikely that it would be considered as strategic, because weighting importance of value – factor.

Objectives with potential supplier segment are to maintain good relationship and possibly to develop it. These suppliers, with high capability and considerable willingness, are likely to be able to provide big volumes as needed with smooth delivery process. In target there should be working for increasing the volumes purchased from these suppliers in order to meanwhile also develop their willingness. With developing their willingness could be considered increasing their purchased volumes, better pricing terms or improvement with supplier's operational communication. Also through meetings and better connecting with them could in some cases be positive impact on suppliers overall attitude.

Road mapping for Potential segment will include as other segments scheme of agendas which issues will be discussed in meetings, in operational as in commercial. In this segment operational meetings will be arranged ad hock and commercial meetings according to purchasing responsible outlook. With potential considered suppliers should also execute in every quarter performance review, and provide feedback. With supplier be defined SRM and policies and depending on suppliers, and which of its capabilities and willingness factors would be on high level, will there be different type of steps that should be looked through.

The main goal of supplier data card for this segment would be providing same data as for other segments, but also place for speculation if these suppliers situation have changed.

5.4.4 Spot Supplier Segment

Spot segment with constitute of suppliers that will receive lower grades both with willingness and capability factors. These suppliers might be in this segment for many reasons. Some could be only just extremely new suppliers for Borealis and without further experiences the evaluation can't provide comparable results, or suppliers might perform extremely badly with certain factor, that could also be highly weighted, and thus regardless of well performed issues, supplier will stay

in transactional segment. In this segment volumes are purchased as spot, without longer-term forecasting or any integration with supplier. Only if supplier is considered to have high potential and it is only nearly left out from either potential or supportive – segments there could be considered development support in order that this supplier would in next evaluation reach to one of these segments.

Objectives for transactional segment are to purchase complement volumes as efficiently as possible to ensure the whole required quantity, and to maintain relationship and good connections with these suppliers too. Also these suppliers should be "tested" every now and again, in order to follow if their potential would better.

Road mapping for transactional segment will only involve commercial side of purchasing representative. Only commercial meetings will be held with these suppliers in order to maintain relationships. The agenda for these meetings would be pruned version of agenda for Potential – segment's agenda. Also the supplier performance review, for this segment, will not be done as often as with other segments but feedback will be provided when needed and as it is possible.

As for every supplier, also suppliers within this group should be collected the so called supplier data card, that would include all required information about supplier, it performance reviews and short description about why it is in certain segment. From data card should be also available all claim and demurrage history, but also positive issue that supplier has done.

6 IMPLEMENTATION

The actual implementation of this segmentation model requires a longer time frame and thus can't be presented in this thesis. Anyhow here will be an introductive description of how the implementation would be done and which steps would be required. These steps will differ a bit from steps introduced in

chapter 3.3, and these are going to be more practical and made for Borealis. All of these steps are listed and then explained and described below in this chapter.

Overall the Implementation should go with following steps:

1. Defining evaluation team and responsibilities
2. Collecting data and required information
3. Implementing the evaluation
    - Critical considering if evaluation works well
4. Grading
5. Segmenting
6. Evaluating and considering if it should be modified
    - Are the boundaries for segments are good
    - Is the weighting of factors efficient
    - Are grading scales of evaluation good

The actual implementation of this evaluation model should be done with involvement of all persons who are related to the whole supply chain process of purchasing Feeds to Porvoo cracker. The main responsibility should be on person who works with operational side and has access to required information.

Before the implementation can be done it must be collected data and enough wide perspective of suppliers' thoughts towards issues that evaluation bases only scenarios and suppliers estimated impressions. Data collection would require some issues to be discussed in meetings with supplier and some would require collecting of statistical data to a form so that it could be used.

Implementation of the evaluation would require that the responsible person provides all evaluators and evaluation table where instructions for grading and specific instructions on how evaluation should be done. The grading scale should also be included and it should be enough simple so that with quartile evaluations it is possible to get comparable results. The evaluations methods aim to be as

statistical as possible in order to allow comparability and more factors would have available data better. The best that evaluations of certain factors would be performed the evaluation with group of people who are involved in related issues, so that wide range causes could be taken on account in evaluation instead of counting averages. Also some part of evaluated factors will have higher impact on different task and evaluator who is not involved with certain type of sub factors in that factor could underrate it which may cause error in final results. For example if evaluating “communication systems”, person from accounting is only involved with invoices, but evaluation table do also consider demurrages and scheduling, and if he/she fills the evaluation table it is alike that he/she expects those other factors to be average with grade three, even those according to logistical person would be graded with one. Thus is important that evaluators would concentrate on ones expertise so that coordinator will evaluate “scheduling” and accounting “invoice” issues with factor- Communication systems. In evaluations that bases on knowledge instead of statistic data, would also be good have one supplier as an example, and do other suppliers grading as compared to this “average supplier”.

To actualizing the segmentation the suppliers will be placed on segmentation framework based on their total points. With total grade 3,75 from both capability and willingness evaluations supplier will reach to strategic segment. In figure 13 was presented an example of arranging suppliers on segmentation chart, with excel. As in that chapter 5.4 was explained the results from grading can be collected in excel table which will calculate the total grades for willingness and capability, adding the weighting coefficients impact so that each supplier will have the co ordinates and the chart can be drawn. When all suppliers are drawn in the chart it can be drawn the boundary values and it can be seen if the segmentation seem overall relevant.

After the evaluation is done and segmentation is ready to implement should be considered if the model provided results were so what was expected. Because in developing the segmentation model, the segments were somewhat made for certain real case suppliers, who would more or less be the embodiment of certain

segment. Afterwards should be evaluated if these suppliers actually did end up on these segments, if they didn't why so. If immediately the results of segmentation seem irrelevant, it should be define what the main reasons for mismatching are and those variable should be redesigned. If there are not recognized rough problems with segmentation outcome, it should be implemented, by applying the management policies with suppliers, and starting to collect the supplier data cards. As the segmentations is meant to be continuous process should the evaluation be performed quartile and after couple segmentation rounds, awareness of if the timeframe of evaluation cycle is good. If the results are systematically unchanging, there is probably no reason to replicate that often.

Overall the implementation requires more than on opinion and evaluation should be implemented so that all visions would be at present, and results and grading would be outcomes of open communication. Calculation of numerical averages should be avoided and instead grading should base on compromised evaluations if statistic data is not available. Implementation of management strategies should be gentle and slow process, and the current stage and characters of relationship should define the progressing. Evaluation afterwards should be underestimated and overall the iterative character of segmentation should once more highlighted.

7 CONCLUSIONS

The reasons for this study were the big amount of suppliers with different characteristics. As all suppliers were delivering Feeds that were considered somehow as substitutes, the supplier selection was rather pricing-oriented. As all suppliers were considered nearly with equal importance there was no possibility to systematically prioritize some supplier over others in certain situations. This thesis should provide a tool to control and manage wide supplier pool where each supplier has its own role and management instructions. With clear instructions regularity with deliveries could be increased, which would ameliorate in ensuring the quality. Clear relationship management policy could likely enable better communication and match resources better with relationship outcomes. Systematic management of suppliers would also allow better comparison among suppliers.

Based on theory the main problems related on suppliers and their management issues are defining the right amount of suppliers, allocation of resources and volumes to them while ensuring sufficient supply base. In the case of Borealis this could be demonstrated by a situation where Borealis has a big amount of suppliers with varying special benefits, such as short delivery time of one supplier and ability to provide big quantities of another. In case it would be extremely important that the supplier would deliver its goods quickly with high accuracy, it would be efficient to use the supplier who is located close to Borealis' site. Also if there is missing a big part of monthly volume it would be important to ensure that requirement would be the simplest if could be bought from one source. If suppliers would be grouped based on their abilities, it would be easier to find the proper supplier from the segment of suppliers with certain capabilities. As against, if the supplier pool would be unorganized the probability of the risk that Borealis wouldn't notice to use the best supplier for certain situation would be higher than if suppliers would have clear roles.

Further actions based on this thesis would be the data collection and the implementation of the segmentation. Currently the problem would be that there does not exist enough sufficient data that all the factors could be evaluated. Many of the factors in final evaluation table are issues that have not earlier been considered and thus there is not ready data about how a supplier would react or act in certain situation. As the required information and data is available and collected, the actual evaluation could be executed and suppliers segmented. If the results from evaluation do not provide enough variation between suppliers some parameters should be modified. As suppliers are segmented, it should be considered how well suppliers suit the segments and if the management instructions of suppliers segment could be applied. If with segments, their objectives, or roadmaps are conflicted, segmentation model should be modified. One of the main requirements for getting the promised benefits is that when defining the evaluation table, all the mattering issues should be represented and the evaluation should be focused on the right issues.

Direct answers to the research questions stated in chapter 1.2.2 are as follows:

RQ1. Where should Supplier Management strategy base on?

Supplier management should base on the main requirements in that certain supply process. The stage in supply chain curve and overall degree of upgrading of the supplied items should define the baseline for requirements of supplier management. Besides the baseline, the special elements of the field of industry and businesses would specify the additional requirements that supplier management should cover.

RQ2. How could suppliers be allocated?

For allocating suppliers there are possibilities, which are more or less systematical. A systematical way to allocate suppliers is segmentation. In segmentation the allocation can base on various policies. For example, one way

to allocate suppliers is with resource based view and another way is to segment based on suppliers' potential. The potential-based view is considered in this thesis with additional elements from resource-based view.

RQ3. How could Borealis Feed suppliers be evaluated and what are the mattering factors in suppliers operations that reflect to Borealis?

For Borealis Feed suppliers could be defined a table of questions that would be about the actual supply process. In this thesis the evaluated factors are divided to willingness and capability based factors, whereas willingness issues base more on evaluating the current relationship and capability factors merely evaluate supplier's abilities and capacity–related issues. The mattering issues that reflect to Borealis are mainly suppliers' actions that come out during the delivery process. The most mattering factors that were considered to be possible to evaluate are collected to table 4 of evaluated factors in page 86. In this table the weighting values are in sight and describe what the considered importance of that certain factor is compared to others. The weighting values vary from 10% to 30%

RQ4. How could different types of Borealis Feed suppliers be managed?

For Borealis Feed suppliers was developed a management strategy that bases on managing suppliers with four different segments that each include suppliers that have equal characters, requirements, and roles in Borealis' supplier pool. Each segment has its own objectives and road mapping, so that the management takes the resource-based view of allocating resources into account in same relations as suppliers creates value to Borealis. Depending on suppliers' potential in capability and willingness factors and their relations, suppliers will be managed differently.

8 SUMMARY

The reasons for this Master's thesis were the wide amount and range of Feedstocks suppliers who supplier the Porvoo steam cracker. Currently these suppliers are considered more or less with equal importance and no systematic prioritizing among them has been applied. The purpose for this study was to define solutions for rationalizing supplier base and prepare some method for further guidance in field of supplier management.

The main focus in this study was in suppliers who were delivering goods from eastern market and which was presumption in most examples, and considering how they could be grouped and managed. The research can be divided in 10 steps with 8 levels and be presented with figure 14. This thesis starts from defining the problem and continues for mapping supply chain theory to find corresponding situations and possible solution. Solution proposal is for rationalizing supplier base is considered to be supplier allocation and allocation theory will be going through. When supplier allocation methods are mapped, most suitable application as segmentation with Rezai and Ortt's method is chosen.

In this point, in chapter 4, the process will follow two "lines" of developing process. The other "line" is for defining the form of segmentation model and the other "line" is about defining the evaluation table. Based on theory, this segmentation model and questionnaire table are modified, completed and improved with evaluation factors from literature and those are ready proposals to be presented in expertise workshop. With team of expertise it is defined which factors are considered to be in the evaluation table and what is the form of segmentation model. Form of segmentation model, covers the amounts, definitions and objectives of segments, which will after all be the actual outcome of the whole procedure. In the "line" of evaluation table, as the evaluated factors are defined, it must also determine the methods how these factors could be evaluated in Borealis case, and also how would the grading scale for these factors be. After the both "lines" are clear segmentation model and evaluation table will

combine to Segmentation framework. Stage of ready segmentation framework includes instructions for implementing the segmentation.

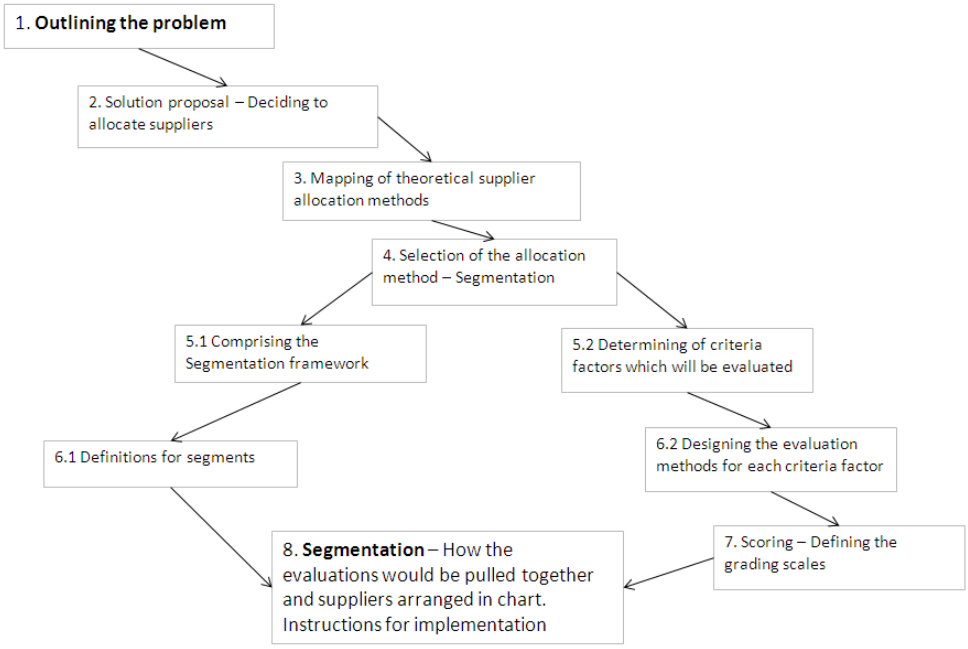

Figure 14 Thesis summary

1. Outlining the problem
2. Solution proposal – Deciding to allocate suppliers
3. Mapping of theoretical supplier allocation methods
4. Selection of the allocation method – Segmentation

5.1 Determining of criteria factors which will be evaluated

5.2 Comprising the Segmentation framework

6.1 Definitions for segments

6.2 Designing the evaluation methods for each criteria factor

7. Scoring – Defining the grading scales

8. Segmentation – How the evaluations would be pulled together and suppliers arranged in chart. Instructions for implementation

REFERENCES

Bensaou, M., 1999. Portfolios of Buyer-Supplier Relationships. *Sloan Management Review* , Volume summer, pp. 35-43.

Borealis 1, 2012. *Borealis Facts_and_Figures_2011-12.* [Online] Available at: http://www.borealisgroup.com/pdf/199203/Facts_and_Figures_2011-12_web.pdf [Accessed 2 July 2013].

Borealis 2 , 2010. *About Borealis history.* [Online] Available at: http://www.borealisgroup.com/about/about-borealis/history/ [Accessed 2 July 2013].

Caniëls, M. & Gelderman, C., 2007. Power and interdepence in buyer supplier relationships: A purchasing portfolio approach. *Industrial Marketing Management,* Volume 36, pp. 219-229.

Chopra, S. & Meindl, P., 2010. *Supply Chain Management - Strategy, Planning and Operation.* New Jersey: Pearson Education.

Dyer, J., Cho, D. & Chu, W., 1998. Strategic supplier segmentation: The next "best practice" in supply chain management. *California management review,* Volume 40, pp. 57-77.

Fisher, M. L., 1997. What is the right supply chain for your product. *Harward Business Review,* Volume 2, pp. 105-116.

Garvin, D., 1984. What does product quality really mean?. *Sloan mangement review,* Volume Fall 1984, pp. 25-43.

Jonsson, P. & Zineldin, M., 2003. Achieving high satisfaction in supplier-dealer working relationship. *Supply Chain Management,* Volume 8, pp. 224-240.

Kamesky, M., 2010. *Strateginen Johtaminen - Menestyksen Timantti.* 2nd ed. Helsinki: Talentum Media Oy.

Kraljic, P., 1983. Purchasing must become supply management. *Harward Business Review,* Volume september-october, pp. 109-117.

Krause, D. & Ellram, L., 1997. Critical elements of supplier development; The buyer perspective. *European Journal of Purchasing & Supply Management,* Volume 3, pp. 21-31.

Lasschuit, W. & Thjissen, N., 2004. Supporting supply chain planning and scheduling decisions. *Computers and Chemical Engineering,* Volume 28, p. 863–870.

Lyssons, K. & Farrington, B., 2006. *Purchasing and supply chain mangement.* 7nd ed. London: Pearson education limitted.

Micheli, G. J., 2008. A decision-maker-centred supplier selection approach for critical supplies. *Management Decision,* 46(6), pp. 918-932.

Moller, M. M., Johansen, J. & Boer, H., 2003. Managing buyer-supplier relationships and inter-organisational competence development. *Integrated Manufacturing Systems,* Issue 14, pp. 369-379.

Narasimhan, R., Talluri, S. & Mendez, D., 2001. Supplier Evaluation and Rationalization via Data Envelopment Analysis: An Empirical Examination. *The Journal of Supply Chain Management,* Volume summer, pp. 28-36.

Oberoi & Khamba, 2005. Strategically managed buyer-supplier relationships across supply chain:An exploratory study. *Human Systems Management,* Issue 24, p. 275–283.

Olsen, R. & Ellram, L., 1997. A portfolio Approach to supplier relationships. *Industrial Marketing Management,* Volume 26, pp. 1001-113.

Ordoobadi, S. & Wang, S., 2011. A multiple perspectives approach to supplier selection. *Industrial Management & Data Systems,* Volume 111, pp. 629-648.

Park, J., Shin, K., Chang, T.-W. & Park, J., 2010. An integrative framework for supplier relationship management. *Industrial Management & Data Systems,* Volume 110, pp. 495-515.

Rezaei, J. & Ortt, R., 2012. A multi-variable approach to supplier segmentation. *International Journal of Production Research,* 50(16), pp. 4593-4611.

Sarkis, J. & Talluri, S., 2002. A model for Strategic Supplier Selection. *The Journal of Supply Chain Management,* Volume winter, pp. 18-28.

Svensson, G., 2004. Supplier segmentation in the automotive industry - A dyadic approach of a managerial model. *International Journal of Physical Distribution & Logistics Management,* Volume 34, pp. 12-38.

Van Weele, A., 2005. *Purchasing & Supply Chain Management.* 4th ed. London: South-Western Cengage Learning.

Wagner, S. & Johnson, J., 2004. Configuring and managing strategic supplier portfolios. *Industrial Marketing Management,* Volume 33, p. 717–730.

APPENDICES

Appendix 1. The grading scale for evaluating the factor of Communication systems

	timing	language	format and adjustment	validity
1	Allways so late that need to be asked	Allwas with some other language than english and hard to understand	Allways in the form that for further use it requires retyping	Allways some mistakes, need to ask new version
2	Sometimes need to be asked	Often with some other language than english and risk of misunderstanding	Format varies and nearly allways requires retyping	Often mistakes and multiple corrections, somentimes need to ask new version
3	Sometimes early sometimes late, but not too muc	Not perfectly in english, but understandable	Format causes extra work	Often mistakes, corrections, but does not cause too grate problems, corrections will be done quickly
4	Nearly allways good timing	In english but with spelling mistakes that complicates understanding	Format sometimes causes extra work	Sometimes mistakes, but which supplier corrects before asking
5	Allways good timing	In english and easy to understand the content	Format is correct and easy for further use	Everything correct

Appendix 2, . The grading scale for evaluating the factor of Communication systems

	Language Skills	Openness	Accessibility	Strain
1	No common language and spoken communication not possible (operational level)	Everything needs to be asked, and no explanations for delays will be given. Extremely low level in operational communication	Not possible to reach suppliers contact person	Supplier requires lot of extra attention and arrangements
2	English is really poor, and risk of misunderstanding is high	Low level in operational communication	Hard to reach contact persons	Supplier requires more attention and arrangements than others
3	Problems with understanding, smal risk of misunderstanding	Varying information providing considering deliveries	Only some of the contact person can be reached	Supplier requires more attention than others
4	Nearly always communication is good and understandable	Open information providing considering deliveries	Good accessibility with suppliers contact persons	Whit supplier everything works smoothly with no extra arrangements
5	Everything is understood (by both sides)	Open information sharing, and forecasting	Close and constant communication with suppliers contact persons	Supplier is extremely easy, and does require less effort with operational issues than others