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AUTOMOTIVE SUPPLY CHAIN THROUGH THE “CONTROL TOWER”- MODEL

– Case: Valmet Automotive

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AUTOMOTIVE SUPPLY CHAIN THROUGH THE"CONTROL TOWER"- MODEL, CASE: VALMET AUTOMOTIVE

The aim of this thesis was to create comprehensive understanding about the Supply Chain management in a world class external logistics service that was created to fulfill Valmet Automotive's project D1. This thesis consists of a detailed process description of the inbound- and outbound logistics operations regarding the production of Daimler's Mercedes Benz A-series, at Valmet Automotive factory in Uusikaupunki, Finland. The process description emphasizes the important role of the 3PL service provider in the automotive supply chain, in this case the Control Tower. The functions of a logistics Control Tower are presented in detail to explain the importance and the benefits of using a control Tower as a tool for strategic logistics planning.

The thesis begins with an introduction of Valmet Automotive, project D1 and the transport companies involved in the implementation of the transportation chain for D1.

The current market situation in the automotive industry and the challenges logistics brings to the companies working in this industry is presented before the D1 supply chain process in order for the reader to understand the main features of the process set-up. The thesis also points out the special features of automotive logistics, the resources needed for project control and implementation, emphasizing the importance of IT solutions in the Control Tower model. The IT solutions used for project D1 are customized to meet the demands of the supply chain implementation and to create visibility for all parties.

After a summarized introduction to the automotive industry and its key factors, a process description of the material flow for D1 is presented to bring the thesis to completion.

KEYWORDS:

Process description, automotive industry, ERP-solutions, Project control, Control Tower

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TOIMITUSKETJUN HALLINTA AUTOTEOLLISUUDESSA “CONTROL TOWER”-MALLIN KAUTTA, CASE:VALMET AUTOMOTIVE

Tämän opinnäytetyön tavoitteena on luoda kokonaisvaltainen käsitys tilaus- ja toimitusketjun hallinnasta maailmanluokan ulkoisessa 3PL palvelussa, joka on luotu yksinomaan Valmet Automotiven D1 projektin toteuttamista varten. Tämä opinnäytetyö sisältää yksityiskohtaisen kuvauksen tulo- ja lähtölogistiikan prosesseista, koskien Daimlerin Mercedes Benz A-sarjan tuotantoa, Valmet Automotiven tehtaalla Uudessakaupungissa. Prosessikuvaus painottaa yleisesti 3PL palvelutarjoajan tärkeää roolia autoteollisuuden toimitusketjussa sekä tässä tapauksessa erityisesti Control Tower- divisioonaa. Control Tower on luotu tuottamaan kokonaisvaltaiset kuljetuspalvelut Valmetille ja divisioona toimii kommunikointilinkkinä Valmetin, kuljetusliikkeiden ja tavarantoimittajien välillä.

Lopputyön alussa esitellään lyhyesti Valmet Automotiven liiketoiminta ja kuvaus projektista D1 sekä niiden kuljetusyritysten toiminta jotka ovat osallisia kuljetuspalveluiden tuottamisessa Valmetille.

Tämä opinnäytetyö sisältää myös kuvauksen autoteollisuuden markkinoiden nykytilanteesta sekä logistiikkaan tuomista haasteista yrityksille. Työssä korostetaan myös autoteollisuuden logistiikan erityispiirteitä sekä tarvittavia resursseja projektin hallintaan ja varsinaiseen toteuttamiseen, painottaen IT-ratkaisujen ja toiminnanohjausjärjestelmien kokonaisvaltaista merkitystä kun palveluja tuotetaan ”Control Tower”- mallin kautta.

Lopputyössä käydään myös läpi projektin riskien hallintaa sekä analysoidaan yleisesti autoteollisuutta Porterin viiden kilpailuvoiman mallin mukaan.

Autoteollisuuden toiminnan kuvauksen ja avaintekijöiden esittelyn jälkeen, esitetään opinnäytetyön lopussa kokonaisvaltainen prosessin kuvaus materiaalivirroista, niin että lukija voi muodostaa ymmärrettävän kokonaiskuvan kuljetusketjun pääpiirteistä koskien projektia D1.

ASIASANAT:

Prosessi kuvaus, autoteollisuus, toiminnanohjausjärjestelmä, projektinhallinta, Control Tower

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LIST OF ABBREVIATIONS

3PL	Third party logistics
4PL	Forth party logistics
ASN	Advance Shipping Notification
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
ETA	Estimated Time of Arrival
FTL	Full Truck Load
IMDG	International Maritime Dangerous Goods
JIS	Just in sequence
JIT	Just in time
KPI	Key performance indicators
M/S	Motor Ship
OEM	Original Equipment Manufacturer
PFMEA	Process Failure Mode and Effects analysis
RFID	Radio Frequency Identification
SOP	Standard Operation Procedures
VAL	Document created when urgent transportation is needed
VATG	Valmet Automotive Transport Gateway

1 INTRODUCTION

The aim of this thesis is to create a comprehensive understanding about the supply chain management for Valmet Automotive's project D1. A brief introduction of the automotive industry in general and the requirements of the logistics operations, its special features and key factors are presented in this thesis.

In order to handle the high competitiveness and the many challenging business factors in the automotive industry, it is important to create high strategic operation models which strongly reflect on the logistics operations and the success of their execution. The industry is also constantly changing and is currently in the need of technological innovation in order to create competitive advantages.

Creating a competitive advantage in the automotive industry also requires analytical thinking in conjunction with strategic planning. The complexity of the automotive industry is presented in a five forces- analysis by Michael Porter (1985).

The importance of strategic planning in the automotive industry is presented by describing a relatively new 3PL operations model called a "*Control Tower"*- This logistics Control Tower provides comprehensive transportation services and has been established only to serve the transportation needs of Valmet Automotive.

The thesis explains the establishment of the Control Tower for Valmet Automotive and points out the resources needed to operate through the Control Tower model.

In order for the Control Tower to function in its most efficient way possible, the operation is depending on a united multifunctional IT program. The significance of tailored IT solutions that provide real time data for all parties involved for the establishment of reliable supply chain management is presented in this thesis. The IT solution plays a key role in the Control Tower supply chain, but it will not

come to its full benefit if there are no competent people and functional processes supporting the program.

The roles and functions of all parties involved in completing the whole transportation chain for Valmet Automotive's project D1, covering all geographical operation areas are specified in this thesis.

The supply chain process that is described in this thesis is based on the Standard Operations Procedures manual (SOP) that the author of this thesis was assigned to create for Valmet Automotive and DSV. The purpose of the SOP manual was to explain step by step all stages of the daily logistics operations for D1. A SOP manual normally consists of information about how, when, where and why a process is done and by whom. SOP manuals can be written for many purposes and can be very useful in the work environment for the current employees and also for the new entrants as training manuals.

The supply chain process presented in the end of this thesis is created for Valmet Automotive's transportation needs. The outcome of the strategic planning and the resources invested to create a functional supply chain, gives no room for errors. Meaning that ever input in the supply chain process must be done with a "zero errors" mindset. It is important that all parties keep developing their operations keeping in mind that even small solutions may benefit the whole supply chain in the long run and create added value for the customer.

2 VALMET AUTOMOTIVE

Valmet Automotive is a service provider of automotive engineering, vehicle manufacturing and convertible roof systems. The company also provides different types of business services related to their expertise areas. Valmet manufactures premium cars, convertibles and electric vehicles. (Arola 2013, 2)

Valmet was established 1968 in partnership with Swedish Saab-Scania, with the purpose to bring automotive know how to Finland. In 1992 The Company became completely under the sole ownership of Valmet. Valmet became owned by Metso Group after a company merger in 2000. Today Valmet is owned by Pontos group, Finnish Industry Investment Ltd and Metso group who still hold the majority of the shares. (Valmet automotive 2013)

Valmet has produced vehicles for brands such as Saab, PSA Chrysler, EuroLada, General Motors and Porsche, Garia, THINK Global, Fisker Automotive and Daimler. In Germany and Poland, the customers of convertible roof systems also include BMW/MINI, Renault and VW Group. (Valmet Automotive 2013)

Valmet Automotive has signed a corporate level contract with Daimler AG to manufacture Mercedes-Benz A-Class vehicles in Finland. The production starts autumn 2013 and is planned to continue at least until 2016. Daimler and Valmet are not new business partners; they have previously collaborated regarding trading of convertible roof systems. (Valmet Automotive 2013)

The plant in Uusikaupunki is constantly under modernization and it contains facilities such as; Technical center, body shop, paint shop, final assembly, quality and logistics areas and two test tracks. Besides the factory in Uusikaupunki, Valmet Automotive has production plants in Osnabrück, Germany and Zary Poland. Valmet has also got offices and representatives for engineering, procurement and sales in Sweden, USA, China and South Korea. (Valmet Automotive 2013)

2.1 Project D1

The main purpose of Valmet's D1 project is to implement Daimler's Mercedes Benz vehicle production at Valmet plant in Uusikaupunki, Finland. The production of the A-type vehicle shown in the picture below will be carried out according to the manufacturing agreement between Daimler and Valmet Automotive. (D1 Project plan 2013, 5)

Picture 1. Mercedes Benz A Class 2013 (SOP manual 2013)

The main goals of this project are to create an external logistics set-up from the beginning and to establish reliable operations management, within a given timeframe to meet Daimler's production ramp-up curve. During all stages of the production, all parties must strive for constant development of the cost competitiveness. (D1 Project plan 2013, 5)

Project D1 consists of the following stages:

- Production planning
- Logistics operations set-up
- Pre-series production

- Analyses of the corrective and preventive actions from all stages above during pre-series production.
- Serial production- Reaching planned volumes during production ramp-up.
- Finalizing the construction of the operational transportation network, including establishment of ferry connections and rail traffic set-up.
- Achieving a functional supply chain, with a balance between inbound and outbound logistics operations.
- Delivery of fully assembled cars

The external logistics operations for project D1 will be created to meets Valmet's and the end customers' requirements for logistics services. (D1 Project plan 2013, 5)

3 TRANSPORT COMPANIES

The Control Tower division is the key factor in transportation planning for Valmet Automotive. The division is run from a single location from where all transports are directed through three transport companies that are working in co-operation to provide Valmet Automotive a lean transportation chain. The transport companies are DSV Road Oy, Nybrok and Polar Logistics. The Control Tower division is however under the full control by DSV and therefore makes DSV the main co-operation partner in transport planning for Valmet Automotive.

3.1 DSV Road

DSV is one of the leading international transport companies with operations in over 70 countries. The company is divided into three divisions: Air &, Sea, Road and Solutions. All divisions offers industry specific solutions covering the entire supply chain including inbound- to manufacturing flows, sequence centers and

aftermarket service operations. DSV has also been a major player in the global automotive industry for over 20 years. (DSV 2013)

DSV Road is specialized in organizing any types of transportation and solutions by road. DSV Road has got 17,000 units on the roads all over Europe every day and they have established a large network of subcontractors and partners which makes them able to offer customers worldwide services. The customer base that DSV has got consists of everything from small enterprises needing occasional cargo transport to large international customers that have outsourced their logistics management to DSV Road. (DSV, Automotive Solutions 2012, 10)

DSV offers services that cover all logistics processes from pick-up, consolidation and shipment to distribution and delivery to the final destination. (DSV Automotive Solutions 2012, 10)

3.2 Nybrok

Nybrok is a Finnish transport company operating with international transport management all over Europe; however are they specialized in Scandinavian and west-European traffic. Nybrok was established in 1972 and was originally named Uudenmaan Teminaali Oy. At the time the company was operating with domestic transports, forwarding, terminal operations and freight clearance for vessels in traffic. After providing domestic transport services for 10 years, started Nybrok to expand its operations internationally. The company tried new grounds by establishing a regular transport route to France. To create more international credibility the company's name was changed to Nybrok Oy. Soon after expanding the operations started Nybrok to develop a wide transport network throughout Europe working together with numerous partners and sub-contractors. Nybrok is still today a privately owned transport company, with the office based in Uusikaupunki. Nybrok provides transportation services tailored according to the customers' demands. (Nybrok 2013)

The fleet of Nybrok consists of modern hauling trucks, mega trailers and road trains. Mega trailers are today an essential part of any company's transporting equipment, due to their inner height of 3 meters. The height allows mega trailers to take more advantage of the loading space than conventional trailers with the height of only 2.70 meters. (Nybrok 2013)

Nybrok provides different services in the variety of groupage transports, less than truckload, full truckloads and additional services for customs clearance and forwarding. (Nybrok 2013)

3.3 Polar Logistics

Polar Logistics Group was established through a company merge of Polar logistics international and Wilson Logistics in 2001. During 2011 Polar Logistics became the cargo agent representative for airline Aeroflot in Finland. Polar Logistics then expanded its operations by establishing warehouse facilities near Helsinki-Vantaa Airport and opened a head office close to the International airport. (Polar Logistics 2013)

Polar Logistics has been chosen as one of Valmet Automotive's key logistics partners during the duration of project D1. They will handle all transportations going south- and northbound between Valmet Automotive and East European countries. (D1 Project plan 2013, 3)

Polar Logistics has recently opened several new offices in East Europe enabling them to established strong connections and a wide network of partners in the East European countries. The wide network of partners and own offices enable Polar Logistics to offer customer based solutions with the most suitable transportation modes and routes. (Polar Logistics 2013)

Besides traditional transportation services, Polar Logistics provide value added services for their customers which include: Consultant services, warehousing, customs clearance and business process outsourcing that goes beyond regular logistics services. (Polar Logistics 2013)

4 LOGISTICS IN THE AUTOMOTIVE INDUSTRY

The materials and components needed in production, the ways these products are obtained by procurement, transportation and warehousing, the manufacturing control process, distribution and sales of the final products combined with the after sales services, can all together be defined as logistics operations. (Karhunen etc. 2004, 23)

The automotive industry faces many challenges due to the ongoing globalization and the rising energy costs together with the increasing flow of materials and the extensive amount of distribution channels. This means that the industry is dependent of vast geographical coverage, due to the amount of suppliers and customers located worldwide. (PWC 2012, 12)

The automotive companies must focus on optimizing distribution networks to create functional automotive supply chain and to reduce warehouse and transportation costs. This can be achieved by analyzing production and customer locations, order quantities, transportation costs and delivery times. The logistics professionals believe that the most successful companies in the automotive industry will be those manufacturers who continuously focus on improving the efficiency of their supply chains and who has better understanding of their total logistic costs. (IBM 2009)

The competitive business environment forces the vehicle manufacturers to demand innovative and reliable partners to help them cope with the market challenges. If the service providers and the suppliers that are working together with the vehicle manufacturer are innovative, flexible to adapt to any changes in the customers' business operations and are constantly improving their own performance, will the business relationship most likely develop to a reliable partnership. (Booz& Co 2012)

The Automotive industry requires a great deal of investments in the logistics functions, due to the nature of the industry and to the high vertical integration. It is not enough to just establish one supply chain strategy around the automotive manufacturing. A diverse range of supply chain strategies are needed to ensure the continuance of the production process. (DSV Automotive solutions 2012, 4)

4.1 Challenges in the industry

The automotive industry is constantly going through changes and it is currently facing the need for fast and broad technological innovations. The innovations concern many scientific fields of expertise, such as chemistry for development of new battery types, materials science for creating lightweight materials and infotainment for creating consumer electronics in vehicles. Because of the broad technological innovations, it is becoming almost impossible and too expensive for the OEM's to develop solutions for all the technologies by themselves. The OEM's manufacture some of the products and some of the components themselves, but they lack the resources to manufacture every component needed for the assembly of a new vehicle. (Booz& Co 2012)

Like many other industry is the automotive industry constantly focusing on cost savings. This is why the automotive manufacturers are challenged to reduce lead-times, maximize floor space and reduce inventory levels and still provide products and services reaching high quality standards. (DSV Automotive Solutions 2012, 8)

The pressure in the automotive industry is subjected to the OEM's and that is why they are constantly looking to outsource everything from the inbound- to the manufacturing processes. The OEM's are relying highly on the logistics service providers to deliver the right components to the right assembly lines on the right time in a predetermined sequence at the lowest cost possible, but still with the highest possible quality standards. This is a challenging equation for all logistics service providers and that is why the companies are trying to develop their business strategies and creating new functional operations models to meet the customers' demands. (JDA 2013)

Because of the high pressure in the industry, has it become a common fact that the OEM's depend on their supplier base to manufacture a great deal of the components, sub-assemblies and semi-finished products. The suppliers are also expected to execute task such as: Production, product development and logistics operations including in-house warehousing and managing internal and external product flows to the customer's assembly plants. All these functions were earlier on the OEM's responsibility but now when the supplier's range of activities have increased, has also their amount of total investments risen. (DSV Solutions 2012, 8)

5 PORTERS FIVE FORCE ANALYSIS

To manage the high rivalry of the automotive industry in a successful way, must the companies create strategies that are differentiating from the competitors. Porter's model analyzes five competitive forces which help to determine the competitive position of a company and to identify the possible weaknesses and also the advantages when creating a new business strategy. (Investopedia 2013)

5.1 Threat of New Entrants

It is impossible for an ordinary person to start manufacturing vehicles. The automotive industry is very labor intensive and requires expensive investments on a long term base and is therefore dependent on huge amounts of capital and other resources. Only the labor costs for experienced and professional vehicle designers and engineers require a great deal of capital. Cost arises from functions such as: Materials from suppliers, machines and robots needed for the production line, warehouse space and utilities where to assemble the vehicles. Also a big part of the total costs goes to marketing and market research, which are inevitable to make analysis about the consumer trends and to create reliable sales forecasts that are connected to the production planning. A large network consisting of partners and agents is a vital resource needed to create productivity through shared resources. (Investopedia, 2013)

In the competitive business environment, it has become an ideal solution to create logistics clusters. Logistics clusters are formed of several types of companies providing services such as: 3PLs, transportation, forwarding, and warehousing and after-market services. The logistics clusters reach complete synergy benefits when service provider’s to the actual logistics companies also contribute with their area of expertise. These service providers consist of: Truck maintenance operators, software providers, catering companies, specialized firms for insurance and consulting and other relevant interest groups. Transportation synergies are also an important factor for successful Control Tower operations. (MIT, 2011, 1)

5.2 Power of Suppliers

The automobile supply business is spread out all over the world map. One automotive manufacturer needs an average of 400 different suppliers to create a full assembled vehicle.

Some of the suppliers are focusing on providing many different components to one manufacturer. These types of suppliers rely on only a few vehicle manufacturers to buy a majority of their products. If the manufacturer decided to switch supplier, could it be devastating to the supplier's business. This is why suppliers are extremely responsive to the demands and requirements of the automobile manufacturer and hold therefore almost no bargaining power. (Investopedia 2013)

Some of the automotive suppliers are doing deep research to develop a certain field of expertise in the industry. The suppliers who use their resources to develop unique components and innovative solutions have got a great deal of bargaining power, due to the competitiveness of the automotive industry and the fact that the market situation is always determined by the consumers. (Investopedia 2013)

5.3 Power of Buyers

In the automotive industry the customers' needs and desires to buy a specific product are determining the markets. It is a known fact that if the customers become disappointed with the products being offered by vehicle manufacturers, they start to look for other alternatives.

While the most of the consumers are focused on the vehicle price, they don't have that much buying power as they never buy cars in large quantities. The automobile market however depends heavily on consumer trends and tastes and the manufacturers must always be one step ahead with the designs and marketing of new vehicle types.

The car companies sell a great deal of vehicles to businesses and car rental companies, but the consumer sales are still the largest source of revenue. Even if the customer's would have buying power, the industry will remain quite powerful due to the large customer base compared to the vehicle manufacturers. (Automotive industries 2012, 14)

5.4 Availability of Substitutes

In this section is it necessary to analyze from the point where substitutes are something else than customers buying different car brands. People are becoming more environmental and cost conscious and people may choose to take the bus, train or airplane to reach their destination. The higher the cost of operating a vehicle, the more likely people will seek alternative transportation options. The high price of fuel has the largest effect on consumers' decisions to buy or not to buy vehicles. This is why there is a high pressure for the automakers to develop the use of alternative fuels. At the moment hybrid and electric cars are not that convenient due to the high costs and restrictions that follow the use of the vehicles, e.g. there are a restricted amount of plug-in places for electric cars. (Automotive industries 2012, 16)

Substitutes can also be analyzed by comparing personal preference and convenience and Sub-Urban Vehicles (SUV's) with smaller cars. SUV's have a

higher profit margin, but they also consume more fuel than small cars. If the consumer lives in a big city may they choose not to buy a car, due to the high parking costs, road fees in the city and congestions, but on the other hand some people may choose to buy a car because of convenience and achieved time saving by always being able to move freely from one location to another. (Investopedia 2013)

5.5 Competitive Rivalry

The vehicle manufacturers have since a long time back tried to avoid price based competition, even though the competition in the industry is becoming more intense. The companies are trying to get as many customers as possible to choose their auto brand by giving good discounts, long-term warranties and low interest financing with long payment periods. All these offers also put pressure on the profit margins for vehicle sales. The automotive industry is an oligopoly, meaning that every brand has an impact on the market situation. If one brand lowers the prices, the competing brands soon follow. This leads to a situation where every part will obtain the same market share as before but with lower returns. This is why the companies in the automotive industry are trying to achieve an advantage over the competitors by differentiating from the others. (Investopedia 2013)

The competitiveness in the automotive industry grows parallel with the technological innovations. The vehicles are becoming more individual despite the mass production, due to the fast and extreme development of electronic components used in the vehicles. New rising competitive opportunities lie in the development and design of infotainment. Meaning consumer electronics in vehicles that are compatible to interface with mobile phones and tablet computers. (Global purchasing 2013)

The automotive industry is recognized for constantly generating innovative logistics solutions to achieve significant cost reductions. Outsourcing non-core activities such as production, assembly and logistics services are a part of the strategic planning. The production plants have been relocated to countries with

low wage costs and this has led to relocation of many subcontractors as well. The new location can however cause problems because the existing capacity cannot be reduced as fast as the new production capacity is created. This results in increased pressure on the unit costs per vehicle. (Kuehne & Nagel, 2013, 4)

The automotive industry is spread all over the world map and this causes it to have different demands compared to other industries. The industry is in a need for wide networks because sourcing, maintenance and the production take place all over the world. The function of logistics in this industry is to create a competitive geographical balance across the globe. This puts the logistics providers under pressure to be able to meet the constant relocation of the complete production capacity. (Kuehne &Nagel 2013, 5)

6 LOGISTICS CONTROL TOWER

The Control Tower concept is a relatively new operations model in Finland. This operation model has been used for a while worldwide and has become a new trend in logistics. The logistics service providers offer this model of operation mostly to customers who are looking for integrated logistics services or for end to end solutions. The Control Tower model is often provided to customers whose production levels are on a high scale, end products very valuable or if operations in the supply chain network requires special security procedures

A logistics Control Tower can be defined as a service provided by transport companies in order to provide industry specific solutions by directing transports through a network. The main purpose of a Control Tower is to organize transportations in the most cost effective way that reflects on 100 % on-time shipment without endangering any defined security standards or compromising the document accuracy. A Control Tower monitors the operations through a network that is dependent of several service providers and therefore requires multi-dimensional transport organization. The operations that must be monitored are: Border crossing, consignment collections and deliveries in

several regions and use of multiple transportation modes and merge-in-transit. If the customer's transport requirements are organized with neglect to their importance, the result may be shown in high costs, high inventory, low on-time shipments and finally customer dissatisfaction. (Kuehne & Nagel, 2013)

The concept of supply chain control towers refers to gaining control of the information flow around transportation, inventory and order activity, and managing those activities from a single location.

The most important tool for controlling the transportation network is a united software application. The united software enables real-time data exchange between customers, transport companies, suppliers and all other parties that are key elements for a successful supply chain. The united software application used between carriers, logistics service providers, senders and receivers is a great advantage for the Control Tower when coordinating all transports. Control Tower operations are many times centralized into working units, operating in the same environment as the customer or close by. A Control Tower can be defined as a hub that brings functionality across the company's operations by bringing the right information to the right person at the right time. (Kuehne & Nagel, 2013)

One important benefit of a Control Tower is that there is only one contact point from where the information flow is integrated between multiple parties. As the picture on page 22 shows, the Control Tower is the centralized point for the information flow. A Control tower brings visibility to the companies because the shipments and the consignments can be traced in transit on multiple carriers.

The shipments can be planned easier when all transportation co-ordination is done from one point. This will result in optimized routing which again can lead to significant cost savings. The transportation efficiency will be improved and shipments will most likely arrive on time when the control of transport lies within one unit. It will also be easier to advice the customers with the correct ETA which in order creates a trustful relationship between the business partners. The Control Tower model gives a beneficial advantage to react proactively to

the constantly changing automotive industry. Flexibility is needed to adapt quickly to new situations when facing changes in the customer's production processes.

KPI monitoring is also a huge part of the control tower operations. The measurements help to detect warnings in an early stage and to eliminate potential week links. (Vithalani 2013).

Picture 2. Control Tower operations (Vithalani, 2013)

The Control Tower tasks also include proactive identification of possible upcoming bottlenecks or problems and try to find a way to minimize or to prevent them. (Biederman, 2013)

Supply chain Control Towers are considered to be more tactical in their operation, even if there is an enormous strategic plan behind the operations. 4PL service providers in other hand are usually more strategic and involved in network design and other strategic activities and have got agreements with forwarders and suppliers on the behalf of their customer. That is not how the

Control Tower-based services are provided. Control tower services are usually billed on a transactional basis, providing good value for clients. Control Tower can also operate by providing services for several clients at the same time and through this create economy of scale. (Biederman, 2013)

Control towers can be beneficial for International companies with wide operations in several different regions. These companies may use Control Tower units to support and control the operations in a specific area. An international company that has established several Control Towers with the same IT solutions can benefit from the uniform access to business intelligence and other information on global levels in one single portal.

Control Towers that are established at the request of customer's are usually very much involved with planning and strategy. The first consideration in establishing a requested Control Tower is finding a location that maximizes regional and global flexibility. Establishing logistics Control Towers is becoming a trend in the automotive industry. This is due to the huge increase in global vehicle production and increased pressure on supply chains. The pressure can be reduced when people, technology and systems are in one single location, where proactive responding comes much more quickly. (Kuehne & Nagel, 2013)

Control towers can be used exclusively for transportation management and they can be ideal for centralized planning and execution of localized transportation functions. The main functions in a Control Tower ERP system should include global reporting metrics, regional templates for transportation planning, procurement and invoicing tools. (Biederman, 2013)

6.1 Control Tower main tasks

The main tasks of Control Tower are:

- Receiving pick-up orders
- Transport planning in co-operation with transport companies involved

- Forwarding transport requests to transport companies and supervision of all shipments the whole way.
- Problem solving in case of exceptions with transport companies and the customer.
- Coordinating trailers to right loading / unloading places according to the customer's priority list.
- Informing the customer about operations at all stages
- Assuring to fulfill the set KPI's and their reporting requirements

A Control Tower is also responsible for monitoring the shipments and reporting their status to the customer. Preset KPI's are determined and it is on Control Tower's responsibility to do retrospective reporting of the performance. Control Tower also tries to find ways to promote continuing improvements in the operations. (SOP manual 2013)

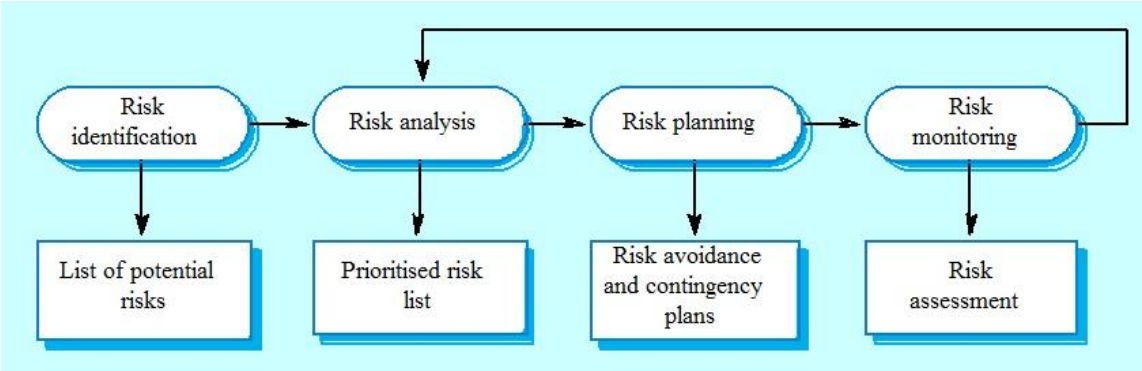
The Control Tower for Valmet Automotive will function as a link between Valmet Automotive, transport companies and the suppliers. All communication concerning transport operations for Valmet Automotive will be carried out through the Control Tower. (SOP manual 2013)

7 PROJECT D1 RISK MANAGEMENT

Valmet, DSV and the transport companies involved created a risk management plan at the planning stage of Project D1. The main purpose of a risk management plan is to guarantee success in all operational areas during the project implementation. The plan also indicates the professional engagement with a high quality approach from the early stages towards all operational processes.

The project management team created a risk management plan according to the PFMEA- model. PFMEA is an abbreviation of Process Failure Modes and Effects Analysis. The main purpose of PFMEA is to systematically analyze the

systems to whatever level of detail is required to demonstrate that no single failure will cause an undesired event. It is both common sense and responsible design practice to carry out an FMEA on an item of equipment or a system whenever it is required to work in an environment where any failure mode has the potential for a catastrophic effect on the process. It is commonly defined as “a systematic process for identifying potential design and process failures before they occur, with the intent to eliminate them or minimize the risk associated with them”. FMEA procedures are based on standards and the picture 3 show the process flow which can be used as a frame when creating a FMEA. (Guidance on Failure Modes & Effects Analyses, 2002)



Picture 3. Project risk management process flow (Striking Project Management 2013)

The FMEA created for D1 is divided into two separate analyses, one covers the risk management of the transportation chain and the other analysis covers the project risk management.

7.1 Transportation chain FMEA

The transportation chain FMEA is divided into nine sections covering the main processes. Each section is also divided into its main functions. The risks of failure in the functions and the possible consequences are analyzed individually. The probable cause for each functions failure is stated in the analyses. The failure avoidance and the recommended actions for prevention of failure are also stated in the analyses. (Project FMEA 2013)

7.1.1 Receiving transportation bookings

This category includes functions such as: The volume list, booking requests from the suppliers and the information flow in general.

If the main functions are not successfully executed can the consequences lead to shipments not being collected on time or that the content does not correspond to the actual order.

Suggested correcting measures are implementation of same routines for all parties which include: Double checking and confirmations of orders, collection and delivery dates and packaging amounts. The responsible part must make sure that all documents for shipping are in order so the transportation process does not get interrupted. (Project FMEA 2013)

7.1.2 Preparing collection orders

This category includes order input in the IT system, dividing collection orders from suppliers to either direct or terminal transports and calculating the needed loading meters. In this category is sending collection requests further to the terminal and import divisions also relevant.

The typical failures in these functions are: Orders getting directed to wrong suppliers, completely missing orders or wrongly calculated loading meters. These failures may lead to shipments not being collected or not having enough loading space in the trailers or that the collections will be severely delayed.

These failures can occur due to suppliers having same or similar names or that one supplier has several different alternative locations for loading. Wrongly calculated dimensions for shipments or other human errors such as forgetting to forward correct information can cause failures.

To prevent order preparation failure, are all suppliers provided with an individual supplier number, that they must use when placing a pick-up order. It is also necessary to inform suppliers of the correct ways to place orders and the use of reference numbers. The drivers should be told not to accept carriage of the

cargo if deviations in the amounts occur. To avoid wrongly calculated shipments sizes are standard packages used and the parties involved are trained to recognize the sizes and types of standard packages.

7.1.3 Transport planning

This category includes function such as: Capacity planning, combining the consignments, instructing drivers and booking train and ferry places. Failures that can occur in this category are that there is too much or too little cargo planned in the trailers or that the driver gets wrong information about the pick-ups. Failures can also occur in missing or wrongly made train and ferry bookings.

These failures may lead to loading capacity difficulties and no booked places on the onward transportation modes, which will lead to delays in delivery. The failures in transport planning are most likely to arise from human errors, that the booking information has been wrongly inserted in the IT system or that the information sent from the supplier is not correct.

The correcting measures to avoid failure are to keep the drivers informed and not let them leave the loading place with a shipment that differs from the original booking, all incoming orders must be confirmed and the capacity planning must be uniform where ever it is done. The communication between the Traffic controller and the Traffic coordinators must be very active, to avoid important information getting neglected or not reaching the right persons.

7.1.4 Loading

This category includes loading procedures and securing the cargo. Typical failures can be that the shipment is not ready when the truck arrives for collection, the driver is late and has no access to the warehouse, there is not enough space in the trailer or that the ordered amount differs from the actual shipment size. Lashing failures can occur because of the lack of correct equipment to secure the cargo or due to carelessly made lashing.

The failures can lead to many problems such as: The Goods are not being loaded due to lack of space, lost driving time, delays and damages during transportation if the goods are not secured properly. Causes to these failures can occur due to planning and calculation failure from the suppliers or the transport companies. Also misunderstandings and language barriers between different parties can cause failures.

To avoid these failures everything must be double-checked and the information flow must be ongoing. It is also important that the traffic planners assure that the trucks are equipped with all necessary gear needed to complete the loading and to make sure that the driver has all certificates and licenses needed to transport the goods.

7.1.5 Transport by road or train

The functions in this category are road and train transportation. Failures in the road segment can be interruptions in traffic caused by accidents, congestions, technical reasons or exceeding driving times that causes delays in delivery. Failures in train traffic can be damages occurring during loading, trailer not being properly closed or falsely loaded by the rail company. If the trailer is left in the wrong place, it will lead to the trailer not getting loaded. The trailers may also not be accepted on the train due to various reasons e.g. missing documents or bulging cargo from the tarpaulin. The consequences can lead to delays in delivery or in worst case missing trailer.

To avoid all these failures the planning of transportation has to be started as early as possible taken the drivers resting hours in consideration.

7.1.6 Preadvising

The main functions are shipments being advised, milk run reporting and trailer summaries. The failures in preadvicing can occur because of IT problems, missing documents from the supplier and wrong information getting forwarded or no information at all.

The consequences with defective advising can lead to shipment getting lost in the huge material flow. IT problems can lead to many mistakes or faults in the transportation chain if the advice cannot be made in proper time or if the information is wrongly inserted from the beginning by human errors. Further problems can occur without proper prevising, e.g. trailers are not correctly rated on the priority list and are called to unloading in a wrong order. If the trailer called for unloading is not in the country it may lead to urgent shipments which lead to increased transportation costs and a possible production shutdown.

The causes of these faults can be system failures in the IT setup, human errors where supplier forget to send further all necessary documents or mistakes such as typing failures.

The best way to avoid supplier related faults are to train all suppliers to operate in the same ways. To support this method is it recommended to draw up an operations manual that is equal for all suppliers. Other preadvicing problems can be avoided by creating routines for the staff at Control Tower. Routines that enable following up the transportation orders and other methods that create a backup system for checking and keeping track of the incoming shipments. The outbound shipments are mostly Valmet packing material or new cars and these operations require routines and united operation ways between Valmet, Control Tower and the transport companies.

7.1.7 Ferry transportation

Relevant in this section are the ferry bookings, trailer deliveries to the harbor, ferry timetables and loading procedures on the ferry.

Typical failure issues can be: Bookings that are not done, done too late or are incomplete with missing information such as IMDG-declaration or wrong trailer number. The trailers may also not be loaded due to: Delivery to the harbor after official closing time or trailers lacking proper labeling. Faults that can occur from the ferry company’s operations are delayed departure or late arrivals, trailer wrongly loaded or in on a wrong ferry.

These failures may result in trailers not being loaded, leading to severe shipping delays and trailers not arrive in time for the production needs.

The causes can occur due to the suppliers providing insufficient documents. Also disturbances in the traffic and bad weather conditions can lead to delays. Other reasons that may cause delays are strikes, technical failures on the vessels or damaged trailers. The drivers can also forget to label the trailers or to secure them property, which may lead to denied loading onboard.

To prevent failures must follow-up of the orders be done and double checking all the bookings. To avoid trailers left in the harbor must all outgoing trailers be given place numbers and the loading information must be visible for Control Tower staff, in an electronic form. The ferry company must also be reliable with the departure and arrival times. It is also important to have manual checking at all stages, even though there is high quality IT-systems that gives information all the time. Ones again we also come to the crucial point that all parties must be trained and educated to operate in similar ways.

7.1.8 Trailer hauling in Finland

This section is divided into two main categories, trailer pick up from the harbor and trucking from the harbor to Valmet factory. The risks are only analyzed concerning trucking in Finland, because this part is under the direct control of Control Tower or the partner transport companies. A great deal of the trucking done in mainland Europe is mostly done by subcontractors and is therefore harder to control with own resources.

Failures with trucking can occur because of trailer not being unloaded from the ferry in time or that there is not a balance between the capacity to pick up trailers or the incoming or outgoing amounts. If there are problems with the unloading from the ferry will this most likely lead to a delays in all following phases until the trailer has been loaded on the ferry again, assuming that there is little a margin for delays.

Consequence due to the failures can lead to shipments do not arrive in time for unloading and disrupting the whole unloading process and in worst case scenario leading to production shutdown.

The causes of the failures and their consequences can depend on delays in the vessel traffic and the vessel unloading. Also system failure is a possibility and weather conditions or technical problems with the ferry such as engine breakdown or in worst case full disaster such as sinking or grounding.

7.1.9 Unloading at Valmet

Failures with unloading can occur because trailers are not in time on site, technical problems at the factory due to unloading staff and their equipment. Unloading problems can also occur if the trailers are not called in according to the priority list or that there is incorrect information on the trailer call list. Failures can also occur due to transport damages or wrong trailers delivered for unloading.

Consequences can lead to disruptions in the unloading program and delayed goods. Also trailer capacity can get out of balance if they are not being loaded and unloaded with an even flow at Valmet.

These faults can be caused engine breakdown, lack of capacity for unloading the trailer and system failure. Also the importance of preadvice has been pointed out earlier and the cause for failure in this part can be caused by wrong preadvising. Problems may also be caused by quality problems in the production at Valmet.

Avoiding failures in trucking yearly inspections of the trucks conditions and tire inspections should be done by each driver on a regular base. Flat tires and breakdowns occur frequently in road transportations and they have a severe impact on the goods flow.

Failure avoidance can also be done by rechecking again and again. The drivers are also responsible for conducting transportation according to the laws and

regulation, such as securing the cargo, and to check the packaging materials condition during loading at the sender's location. The standard of activities must be uniform at all levels of operation.

7.1.10 Invoicing

It can happen that the invoicing is falsely composed and rejected by the recipient. The failure can be caused by typing or system failure. The false information on the invoice can occur due to wrong shipment information being filled in when creating consignments, suppliers sending wrong booking information or suppliers making double bookings.

To avoid invoicing failures should an automatic invoicing or a self-billing system be merged to communicate with the ERP-system, in this case VATG that is used by Valmet and all other parties involved with the operations in Project D1.

7.2 Project risk management

The project risk management is divided into six categories: Project management, operational processes, resource management, IT systems, key interfaces and cost management. All categories are analyzed in the similar way as the process risk management. The possible failures in each function are scored according to their effect on the project. The functions are also evaluated according to the severity of the failure and how it may affect the whole project.

Only the following categories will be present in this chapter: Project management and resource management.

7.2.1 Project management

The most important factor in project management functions is contract signing. Potential failure lies in prolonged contract signing, which affects everything and the project will not proceed anywhere. The only potential cause in prolonged contract signing is differences about contract stipulations.

Valmet also needs to provide a detailed supplier list to the transport companies, so they are able to plan the optimization of transports in time. Failure can occur because of lacking information or delays in the information flow.

Task prioritizing and scheduling can possibly fail due to delays in the project or task that are done in a wrong priority order. The failure can be caused by lack of information or resources. The correcting measures are to create an action plan and a task prioritizing project plan.

7.2.2 Resource management

The main functions include hiring skilled workforce and training new workforce. If there are not enough skilled employees available can the efficiency of work be compromised. Potential risks for failure lie in hiring new workforce. Because of the high pace work environment can it be difficult to find enough time to train the new entrants to complete task according to the requirements or the new entrants maybe not meet the expectations of competent workforce. The prevention mode for these failures is to have employees ready for internal transfers.

Subcontractors are also important in resource management, if there are not enough available trucks and drivers will the amounts of transport not be done according to the volumes. The drivers must also be trained in advance to avoid failure in loading and delivery procedures. Valmet is also obligated to provide a correct volume list for shipping weekly, so the transportation planning can be done in advance.

Every transport company involved in the project must have a terminal for groupage goods which are collected in milkruns. If the terminals are not determined on time, it is impossible to organize collections and deliveries on time in a cost-efficient way. The terminal staff must also receive proper training for the operations procedures. To prevent failure must a training schedule be made in advance and comprehensive operations instructions must be available for everybody involved.

All needed transport equipment must be specified in advance and planned. If the amounts of units are not enough, it will lead to late collections from suppliers that cause delays for the goods to arrive to the production line.

The transport modes and equipment includes the multi-modal concept, ferry and rail transportation. If there is unbalance between the transportation modes, it will lead to delays. To prevent these failures the transportations must be planned according to the volumes of components needed weekly on the production line. The production planning is a key component for successful JIT and JIS deliveries.

8 ENTERPRICE RESOURCE PLANNING

A customizes ERP program is the key component in successful Control Tower operations. The operations are reliable of a specially designed IT system which enables better control of the total material flow.

IT systems must be able to provide all parties reliable real-time data, parts planning functions and traceability with online access and complete track and traceability based on their individual needs. The state-of-the-art IT systems can be fully integrated with the companies own systems.

8.1 Valmet Automotive transport gateway (VATG)

Logistics operations at Valmet Automotive are based on JIT and JIS deliveries. In order to enable these deliveries, Valmet requires a fully electronic communications system with the Supplier. EDI messages are used to guarantee a fast, efficient and secure communication channel between Valmet and suppliers. The suppliers must use a standardized EDI communication method or have a third party EDI provider, who will provide the EDI communication directly to Valmet. Connections are handled by a third party EDI provider who is also responsible for the implementation in cooperation with the suppliers. The requirement is that the usage of EDI communication will not create additional costs to the suppliers. DSV and Valmet have co-operated for

the decision of a suitable IT solution for management of the shipments. (SOP manual 2013)

VATG is considered to be the most reasonable solution for all communication from call-offs and transport bookings to reporting between Valmet Automotive, Control Tower, transport companies and suppliers. It contains functions such as: Order management, transportation management, tracking, financial management and reporting. The great advantage of having a united IT-program is that the possibility of human errors decreases when every party uses the same system. VATG makes the information flow faster, more reliable and contributes to a faster goods flow, more accurate transport planning and greater flexibility. Using IT solutions where transportation information is shared between several parties will result in significant savings in personnel costs.

Invoicing is also made easier with VATG and the program has a self-billing function that is done on a weekly base directly from VATG. The amount to be charged from Valmet by the transport companies is based on the actual pricing formed in VATG. VATG also makes it possible to follow the pre-set KPI's and to report the actual results. Trailer tracing will also be possible through VATG, based on the status messages that are sent from the transport companies. The main aims of electronic communication are fast, secure and paper-free data interchange. VATG also eliminates repeated data entry by the recipient and reduces errors caused by multiple data input. (SOP manual 2013)

8.2 DSV CargoLink

CargoLink is DSV's own ERP-program used for consignment registration. CargoLink has also many support functions for tracking and invoicing. Control Tower uses CargoLink mostly to register consignments and to follow up the delivery status. Consignments can be moved between departments according to the import or export country. CargoLink can be used to create documents such as Waybills and also Claims reports can also be created and filed through CargoLink. CargoLink is compatible with VATG and will be integrated for use as

a supporting tool in conjunction with VATG for shipment management. (SOP manual 2013)

8.3 Track and trace

There are several options for tracking of Valmet shipments. Control Tower can use the reference number of each consignment booking for tracking. When the reference number is inserted to CargoLink's history page, does it show in which department the consignment currency is and where it has been and who is the user who has moved the booking. The program does not give an exact position for the consignment, but if it has been loaded in a unit and is on its way, can the unit registration number be found and traced through DSV's routing program called Eplan. Eplan is DSV's own program used for transportation planning. When every consignment is registered in CargoLink, the program creates a reference number. DSV has got functions for tracking on their intranet pages. By entering the reference number, the shipment can be traced. It shows the information where the consignment is at the moment, where it is going and which transport unit is the carrier. The modern IT systems make it possible to do full real time track and traceability based on individual needs. (SOP manual 2013)

8.4 Back-up system

The risk of insufficient information flow is much higher in manual work before VATG is fully integrated in the transport companies own IT systems. There are much more possibilities for human errors and functions such as Track & Trace and reporting are also hard to make without having VATG in function. For the time being has VATG not yet been taken into operation and it makes it very important that all parties keep all relevant transportation information stored so that it is easy accessible. As long as the bookings are done separately in transport companies own ERP- systems, must there be good communication and cooperation between all parties. Every transportation booking made by Control Tower, is written down on an excel-sheet. The document is named "milk

run” and it clearly specifies every booking, reference number, consignment details, dates and if the shipment is direct transport or terminal pick-up. The milk run is updated every day and sent to Valmet. Polar and Nybrok also has their own milk run lists that are updated every day. The transport companies send their milk runs to Control Tower. Control Tower can easily follow up the transport companies existing bookings, keep track of them and keep Valmet informed. In addition to the milk run, Control Tower does also arrange all transport bookings in separate files to simplify and to speed up the search for specific booking information in case needed.

9 THE SUPPLY CHAIN PROCESS FOR D1

9.1 Process flow-chart

The process flow for D1 is created to indicate the high importance of Control Tower’s involvement in all process stages. The roll of Control Tower is centralized in all operation processes and the figure below shows the information flow between all parties involved in the whole supply chain.

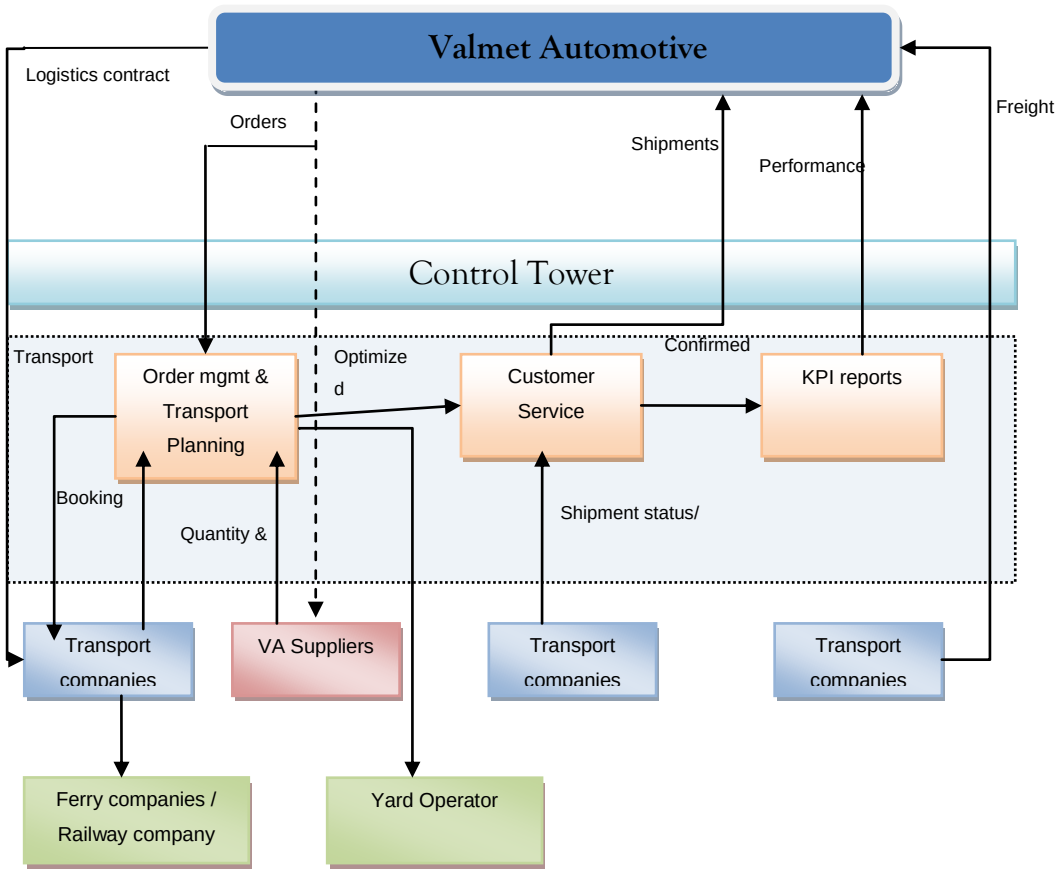


Figure 1. Process flow-chart (T.Vaahtera, personal announcement, 11.4.2013)

9.2 Inbound logistics

The amounts of inbound shipments are determined by Valmet's material planning division. The calculations are done according to Daimler's sales forecasts. The quantities are determined according to the cumulative vehicle orders and Daimler's sales forecasts. Forecasts do not however represent any authorization to ship materials. The Material Control division at Valmet sends the Delivery Schedule to the suppliers and to Control Tower on a weekly basis, if not agreed otherwise. If a new Delivery schedule is made, it does replace the previous one. However the old schedule is valid until suppliers receive the replacing one. When Valmet has placed the order to the suppliers they must wait for confirmation from VATG. When Valmet receives confirmation, does the liability no longer lie with Valmet and the supplier is responsible for ordering collection transportation for the shipment. (SOP manual 2013)

The Delivery Schedule from Valmet is based on current inventory values, transportation lead times, package sizes and cumulative vehicle orders**.** The part-specific delivery dates and quantities are mentioned in the Delivery Schedule as well as the latest Dispatch Note number and the cumulative numbers from the beginning of calendar year. The delivery schedule is sent from Valmet's ERP system to the suppliers as an EDI message. EDI communication increases the order process synchronization. The quantity of goods to be collected and the pick-up times are specified on the delivery schedule. The supplier is obligated to accurately provide the parts according to the Delivery Schedule. If the supplier has difficulty to fulfill the request or has not received a new Delivery Schedule for any reason, is the supplier obliged to inform Valmet's Materials Control division immediately. When the suppliers have received the delivery schedule, they must place the transportation order to Control Tower latest by 12.00 am the day before collection day. It is important to understand that the date in the Delivery Schedule is the shipment date and not the arrival date at Valmet. The suppliers must inform Control Tower immediately whenever the actual shipments differ from the booking. (SOP manual 2013)

Control Tower receives all transportation orders from the suppliers. The suppliers cannot place the order directly from Valmet; it must always go first through Control Tower. Every supplier has been assigned with a contact person from Valmet material planning division. The supplier, the material planner and the personnel at Control Tower will co-operate together to establish reliable communication ways and to establish a smooth information flow. After an incoming order, Control Tower informs the transport company who is responsible for the specific pick-up area (DSV, Polar Logistics or Nybrok). The booking request is inserted to VATG and afterwards all information concerning the booking must be visible for transport companies through VATG. Control Tower has made a requirement to Valmet that VATG has functions that transfer the booking information automatically to transport companies own ERP-systems, in order for the transport companies to be able to make the transportation bookings required. (SOP manual 2013)

9.2.1 Collection orders from suppliers

The suppliers must co-operate with the transport companies in a way that complies with all relevant instructions from Valmet. Valmet is responsible of defining the transportation method for each supplier. Co-operation between the suppliers and Control Tower is very important and the level of co-operation between all parties shall result in 100% on-time shipments. All the dates and Delivery Schedule volumes agreed have to be observed on all accounts regardless of public holidays, religious holidays and country-specific limitations. The suppliers are obligated to inform Control Tower immediately if the booking data has changed from the original booking. All parties must strive to relate proactively to their core task in order to improve the efficiency and to create visibility in the supply chain processes. The suppliers have been instructed to always make the transportation booking through Control Tower and let Control Tower arrange further transportation. It is strictly forbidden that the supplier contacts other carriers directly for booking requests or that they hand over the shipment to other freight carriers, if not separately agreed otherwise.

9.2.2 Dividing orders

Currently VATG is not yet available for operation so the booking process is following: All transportation bookings are sent from the suppliers to Control Tower. Control Tower divides the bookings and assigns them to the right transport company. The responsibility is divided as following: If bookings request has pick-up from Germany from the postal code beginning with 2, 3, 4 or 5 has Nybrok the responsibility to collect the shipment. DSV handles collection from the remaining postal codes within Germany. DSV is also responsible for arranging transportation for import shipments from Southern and Western European countries e.g. France, Switzerland, Belgium, The Netherlands, Italy and Spain. If the booking comes from Eastern Europe e.g. Hungary, Poland, Czech Republic or Romania, is Polar responsible for the collection of the shipment. Summarized can it be stated that Control Tower forwards transportation bookings and also arranges all transportations that fall

under the responsibility of DSV**.** The booking information is inserted to DSV's CargoLink and forwarded to DSV partners. During operations and transport co-ordination without VATG is it very important for all parties to cooperate and strive for a seamless goods flow for the mutual benefit. (SOP manual 2013)

When the supplier has received an order from Valmet, the supplier makes a booking for the collection of the shipment. The booking request will be sent to Control Tower from the suppliers. Control Tower is the communication point between Valmet and the suppliers. The transportation planning is done at Control Tower according to the information sent from the suppliers. Control Tower forwards the planned transport information to Nybrok and Polar Logistics and they all co-operate with planning of the transportation, depending on the pick-up area and the transport company who is responsible of the transport area. Transport Company then sends information about a shipment that must be collected to the driver who is ordered to complete the pick-up. The driver will receive relevant information about the loading places from the Transport Company. (SOP manual 2013)

9.2.3 Pick-up from suppliers

The transportation unit must arrive at the supplier's location within the agreed timeframe stated on the booking request. The driver is given specific orders from where to collect the shipment. When the driver arrives to the loading place he must prepare the transportation unit ready for loading. Loading is carried out according to the rules and requirements of Valmet and Daimler. The picture below on page 41 shows how the goods can be loaded in a trailer. The supplier is responsible of sending parts exactly according to the content of the call-off from Valmet. If the pick-up falls under DSV's responsibility, Control Tower does make the transportation planning, deciding if the shipment will go through a terminal first or if it is a direct pick-up. The supplier must ensure that there are no wrong deliveries, meaning that the content of the packing unit does not correspond to the writing on the material tags. There cannot be any delays due to short deliveries or to non-deliveries and over-deliveries, meaning deliveries

without a delivery schedule or excess deliveries in terms of quantity. Every possible supply bottleneck, which has an effect on dates or volumes, has to be communicated to the respective Materials Control department. The suppliers are obliged to inform Valmet Materials Control about the possible production shut downs at supplier facilities as soon as such information is available. Valmet maintains the right to return the non-conforming material at the Supplier's cost. (SOP manual 2013)

Picture 4. Loaded trailer (DSV 2013)

9.2.4 Loading

The shipment must be ready for loading at 09:00 AM local time on the scheduled pick-up date. Deviations from the schedule must be mutually agreed between Daimler and Valmet. To avoid disturbance in the traffic co-ordination must the precise consignment measurements and quantity be notified by the supplier when sending a booking request. The driver is responsible for securing the cargo properly and using correct lashing equipment during loading. It is also on the driver's responsibility to check that the consignments have been properly packed. The lashing instruction from Valmet is attached in the drivers' handbook. The supplier is obligated to load the transportation unit within a time frame agreed with Control Tower. If no superseding written agreement exists, is the window of loading-time maximum two hours. (SOP manual)

After the shipment departure from the Supplier's site, an ASN must be sent to Valmet as an EDI notification. The ASN contains detailed information about the pending delivery and must include at least the following information: Supplier number, part numbers (Daimler), quantities, Dispatch Note number, pick-up date and transport unit number. It is a demand from Valmet that the suppliers send the ASN within one hour after departed shipment. The information in the ASN contributes to automated acceptance of the goods at Valmet plant. The invoicing processed will also be automated with the information send through ASN. Valmet depends that the data from the supplier is reliable and accurate. (SOP manual 2013)

9.3 Orders for sequenced-parts (JIS)

Just in sequence means that the parts are delivered to Valmet factory in a specific order. Valmet, suppliers, Control Tower and the transport companies are working in co-operation to sequence the deliveries of right parts for manufacturing, right as they are needed on the production line. JIS components are delivered in a specific order and they are practically discharged directly to the assembly line, without first being stored in the warehouse. Valmet specifies the order of the parts and it is highly important the right parts are delivered to Valmet when they are needed. The supplier is responsible of labeling consignments consisting of JIS components with the vehicle´s production number. It is important to establish from the beginning smooth and flexible JIS delivery procedures, in order to meet the increasing deliveries of JIS-parts during the production ramp-up. (SOP manual 2013)

The order for sequenced parts is made every day. This differs from standard part orders which are made once a week. Upon the receipt of a vehicle order from Daimler, a shipment schedule will be sent electronically to the suppliers. A vehicle-specific module list will be transmitted of the queue sequence for the assembly. The posted date of the module list correlates to the start date at the body shop at Valmet. It defines the daily start-point for the queue sequence. (SOP manual 2013)

9.3.1 Booking of transportation

Control Tower receives all incoming booking requests and it is on Control Tower's responsibility to delegate bookings to the correct transport companies. The transport company is responsible of making the booking based on the information forwarded from Control Tower. When the transport company has made bookings to subcontractors, Railway Company or ferry operators and received confirmation are they to inform the status to Control Tower without delays. When VATG is taken into use, the booking information must be inserted in the transport company's own ERP-system in order for the booking information to be visible for all parties in VATG. (SOP manual 2013)

9.3.2 Rail transportation

If the trailer is being transported by rail, the driver takes the loaded unit to the railway station according to the given instructions. The driver is responsible for leaving the trailer at the correct place on the railway company's departure lot and report the trailer to the rail way freight clearance. After the driver has carried out the trailer drop-off, he must report the status to the transport company responsible for assigning the transportation. The transport company who has arranged the transportation, reports the status of the shipment to Control Tower. Control Tower keeps track of the incoming and outbound transportations and reports further to Valmet if there is any disturbance in the delivery schedules. (SOP manual 2013)

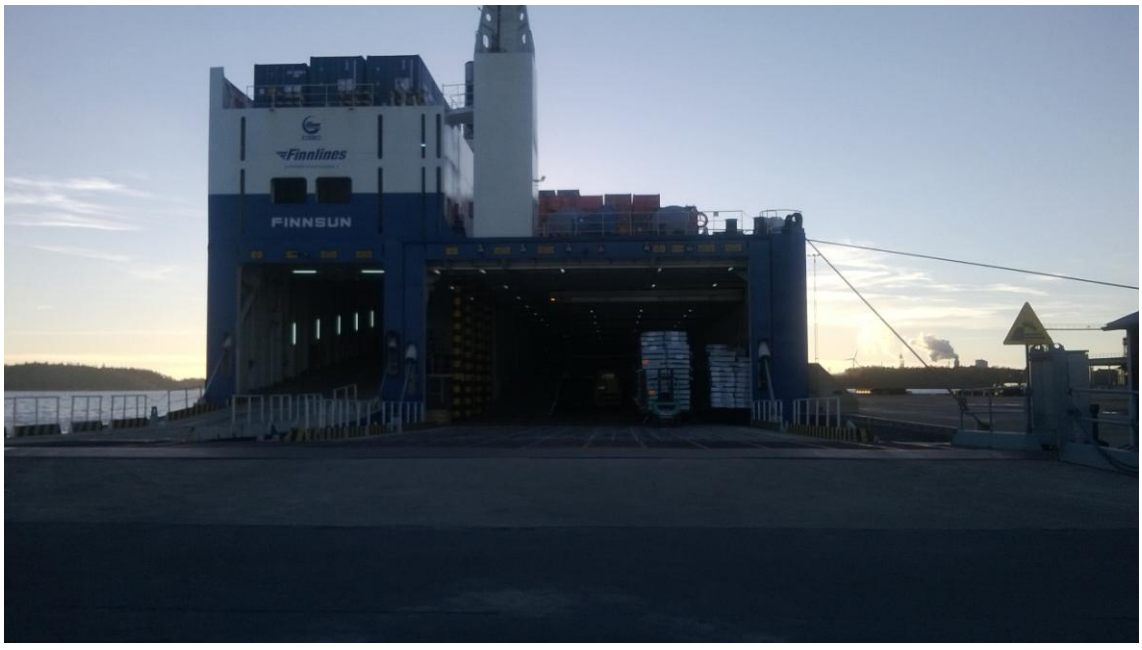
9.3.3 Sea transportation

If the transportation unit is taken to the harbor for sea transportation, the driver must leave the trailer at the correct lot for departing units. The driver must inform the status directly after the drop-off to the transport company assigning the transportation. Due to the high level of material flow inbound and outbound from Valmet factory in Finland, a ferry connection will be established between Uusikaupunki and Bremerhaven. The ferry has been planned to depart once a week in the beginning of the production and later during the production ramp-up

twice a week. The ferry connection will be operated by Finnlines and will also be available for other carriage than just Valmet goods. The picture below shows the loading of M/S Finnsun in Uusikaupunki.

Uusikaupunki Harbor will however not be the only harbor used for inbound and outbound transportation. The trailers will also arrive to and depart from other ports in Finland e.g. Helsinki, Turku and Naantali. Before the established ferry connection in Uusikaupunki is the route Travemünde-Helsinki used constantly for incoming trailers. Trailers will also arrive to Turku harbor and occasionally to Naantali. (SOP manual 2013)

When the trailers start to arrive directly to Uusikaupunki, is the delivery plan of trailers to Valmet factory area made according to the Valmet's trailer priority list. Control Tower receives the priority list from Valmet who checks the list, comparing it to the incoming trailers on the ships loading manifest. Centralized transport co-ordination from the Uusikaupunki port to Valmet factory area is made according to the plan done by Control Tower based on Valmet's trailer priority list. (SOP manual 2013)



Picture 5. M/S Finnsun loading in Uusikaupunki (DSV 2013)

If the trailers arrive to other ports in Finland shall following procedures be carried out: The drivers who is collecting must be informed about arriving trailers and their registration numbers. The driver then picks up the trailer from the harbor at the right time according to the given information from Control Tower. The driver hauls the unit to Uusikaupunki and delivers the trailer to Valmet factory area at the time agreed. At delivery to Valmet factory area is the responsibility of the unit turned over to the yard operator. When incoming trailers arrive to Valmet factory area, must the driver leave the trailer to the correct lot and inform the transport company about the drop-of. At this point the responsibility is turned over to yard operator. Yard operator takes the trailers to the right unloading place at the right time according to the information given by Control Tower. (SOP manual 2013)

9.4 Outbound logistics

Outbound shipments consist of ready assembled vehicles and packaging material from Valmet to suppliers or terminals in various locations in Europe. The delivery of ready assembled vehicles and packaging must be considered as two different transportation processes.

9.4.1 Outbound packaging material

The supplier is obligated to order packaging material according to Valmet's instructions. The delivery terms, locations and frequency in delivery times are named by Valmet. The supplier makes all orders for packaging material themselves. The orders are sent directly to Valmet and Valmet confirms the order. Control Tower then receives the data and inserts the information about packaging material orders to Partner Web and Valmet confirms the order again. In case of an incomplete booking Valmet has got the right to modify the booking by adding or removing items. (SOP manual 2013)

After the booking has been confirmed, Control Tower organizes transportation for the packaging material or forwards it to the correct Transport Company depending on whose geographical responsibility area is in question. The

transport company receiving the booking is responsible for organizing transportation for the outbound trailers from Valmet factory in Uusikaupunki. (SOP manual 2013)

The order placed by suppliers shall include the correct ship-to-address for the packaging material. All orders of packaging material must be inserted in Valmet's Partner web. Partner Web is Valmet's extranet for business partners and contains tools for continuous operations improvements. Partner Web accounts will be implemented for the Suppliers by Valmet and the usage of Partner Web will not create any additional costs to the users. All information in Partner Web is secured and every party can only see the data they have an authorization to**.** Every organization has a main user authorized by Valmet, for handling internal user management. If the supplier orders re-usable packages, containers, totes, etc, must the order be placed using Partner web's "Packaging request function". Valmet has the right to monitor the Suppliers bookings and Packaging orders as well as the way of handling the Packaging material at the Suppliers location**.** Valmet requires and expects the suppliers to make an inventory of the standard packaging material every four months, without any additional notification. The inventory results must also include all damaged material. The amount and type of damaged materials must be reported to Valmet's personnel. Inventory results can be inserted in Partner Web. (SOP manual 2013)

All transport companies have also got packaging material in their terminals close to the suppliers. The terminals who are storing packaging material have pre-set order points. When the stock levels hit the order points, orders for replenishment must be placed. The terminals have stored many different types of packaging so that they are able to provide the suppliers with any kind of packaging in small amounts. There are however some types of packaging material that are only stored at Valmet and these packaging's must be transported directly to suppliers upon an order. DSV has packaging material stored in Schwieberdingen terminal, in Stuttgart. They send Control Tower a

weekly report of the inventory levels of the packaging material. (SOP manual 2013)

Control Tower receives transportation booking from suppliers and completes the transportation planning. Control Tower informs Transport Company about departing trailer from Valmet factory area. The transport company responsible for the outbound booking shall book a ferry place and other needed transportation meant to deliver the trailer to its destination. (SOP manual 2013)

9.4.2 Delivery of ready built vehicles

The transportation of ready built cars starts with deliveries of the cars manufactured during the pre-series production. The transportation process itself will be the same during serial production. Valmet informs Control Tower when a lot of the ready produced cars are ready for transportation. Control Tower must make bookings for the ready vehicles for every transportation mode used from end to end, including ferry, train and road transportation. (SOP manual 2013)

Control Tower gives the yard operator orders when the cars are to be collected and transported to Uusikaupunki harbor. The picture on page 48 shows how the cars are transported to the harbor. The ready built vehicles are scanned at the factory gate. The scanning of the cars can be completed in two different options: If the cars are loaded on to a car transporter, will the driver scan the cars with a portable reader. If the cars are loaded into a regular trailer, someone from VA's logistics department will complete the scanning. The scanning is done from a RFID-tag that is attached to every vehicle. The scanning will be successful if the vehicles are not banned for delivery. The first scanning will take place at Valmet's premises. The yard operator shall inform Control Tower immediately when the cars are moved away from the factory area. The cars are being transported to the warehouse in Uusikaupunki harbor. The warehouse provides enough capacity to store 400 vehicles at the same time. The cars are to be scanned again before they are loaded on the ferry. The cars are loaded on the ferry to Bremerhaven. The estimated time of the voyage is about 35 hours. The ship operating between Uusikaupunki and Bremerhaven has a

capacity of 3300 lane meters, meaning that it has the ability to carry 600 vehicles at ones. (SOP manual 2013)

Picture 5. Delivery of ready built cars to the harbor (DSV 2013)

When the ship arrives in Bremerhaven are the cars unloaded to the arrivals bay at the harbor area. The cars must be scanned again before they leave the harbor area. The cars are transferred from the ship to the harbor warehouse from where they are being scanned a final time before handed over to Daimler. A complete inspection of the vehicles is made in Bremerhaven. (SOP manual 2013)

9.5 Terminals

The picture below shows the DSV terminal in Stuttgart in Schwieberdingen, where all Valmet's general/bulk goods are collected. The shipments are picked-up from the suppliers during the week and collected in the terminal's automotive warehouse, from where they are loaded into groupage trailers. The trailers depart from the terminal every week on Friday heading to Finland. When the amount of general goods increases during the production ramp-up are the departure days for the trailers increased. If there are Valmet's goods in the terminal that need urgent shipments, is there also a possibility to send

consignments on Tuesdays with DSV's trailers that are carrying other consignee's goods. (SOP manual 2013)

All terminals handling Valmet's goods have been instructed to perform correct operation procedures concerning the transportations. The focus of the instructions has mostly been on providing accurate and precise information about the packaging material. (SOP manual 2013)

6. Schwieberdingen Terminal in Stuttgart, Germany (DSV 2013)

9.6 Direct transport

If the size of the consignments to be collected exceeds 1.2 loading meters, are the goods picked up at the supplier and transported directly to Valmet without passing a terminal first. Control Tower receives the booking information from the supplier. Based on the shipment size, it is decided if the transport goes directly to Finland or via Schwieberdingen terminal first. All transportation bookings handled by DSV are at the moment first entered in DSV's Cargo Link. If the booking is a direct transport, Control Tower transfers the booking data to DSV's German Import department. (SOP manual 2013)

Occasionally may it occur that goods with the final destination at Valmet plant first needs to be transported from one location to another, within the borders of a country, before the goods are finally transported to Finland. In this case must Control Tower arrange transportation for the movement within the country and also ensure that the goods will reach their final destination at Valmet factory. (SOP manual 2013)

10 URGENT SHIPMENTS

All urgent shipments are handled by Valmet's material planning division. All urgent shipments creating extra costs are only allowed by a written agreement between Valmet and the supplier. Control Tower does not take any part in transport coordination for urgent shipments. Valmet material planner places the urgent order to the supplier and Valmet is in direct contact with the transport company arranging the needed transportation. The transport companies handling the urgent shipments for Valmet are DHL or TNT. The material planner creates a VAL, when the shipment is ready for collection. A VAL can also be created if a delivery that is already in transit must arrive faster, than the standard shipment to VA. When a VAL is created in Valmet's ERP, a waybill will be formed automatically. The waybill and its information will be available for the transport company in their ERP. After the transport company has received the VAL, the liability of delivery according to the agreed schedule has transferred to the transport company. The urgent shipment must be at Valmet's premises the following day after the booking, latest by am 11:30. If the supplier causes shortage in the supply chain due to late delivery, incorrect delivery or poor quality, is the supplier liable for arranging special transports at its own cost. In this case the special transport must arrive at Valmet plant on the day determined by Valmet. Should disturbances in the production occur and therefore related additional costs, is the supplier held responsible for any additional work and to it related costs. (SOP manual 2013)

If trucks carrying Valmet shipments cannot use ordinary routing, due to e.g. strikes, technical failures on connection carriers, weather restrictions or other

conditions that limit the use of ordinary routes, there are several options for alternative routing. Trucks have the option of using the route Via Baltica, Sweden or in worst case scenario all the way north through Haaparanta. The party responsible for the special transportation shall bear the extra costs. (SOP manual 2013)

10.1 Road and sea transportation

In case Valmet requires an urgent shipment, will Valmet first try to use the services provided by DSV or Control Tower. Control Tower and DSV will provide only road or sea transportation. It is agreed that Control Tower will try to organize the urgent shipments, but if not able to fulfill Valmet's requirements for delivery time, then the option is to use companies providing air freight services. (SOP manual 2013)

10.2 Air transportation

The lead time for a regular shipment is 4-5 days. It is critical that every shipment is delivered accurately according to the agreed delivery time. In case the need for urgent shipments occur, is air freight the reasonable solution. Valmet will then use airfreight services provided by companies DHL or TNT depending on which service provider is most suitable taking into consideration the whole situation and the location of the urgent consignment. Creating VAL and other booking procedures of the airfreight, including the follow up until the goods arrive at Valmet factory will be under the direct control of Valmet. It is often not necessary to use urgent shipment for the whole consignment. In case an urgent shipment is needed, does Valmet's material planner calculate the amount of urgently needed parts and places the air freight order for the specific amount needed. The remaining components can be transported regularly as agreed, which is highly recommended due to lower shipment costs arising in total. (SOP manual 2013)

11 CONCLUSIONS

The production of Mercedes Benz vehicles at Valmet's plant in Uusikaupunki is a historical milestone in the Finnish automotive industry. As it can be seen from the scale of this project, the production will be vital for the Finnish national economy, as the economy is constantly under the threat of severe recessions and economical fluctuations. The production contract between Valmet Automotive and Daimler will create many job opportunities, not only for employees of Valmet but for all stakeholders involved. The project will create work for an estimate of 4000-5000 "man hours"- and will have a positive impact on the Finnish foreign trade. The trade balance is forecasted to surplus over the next years due to increased amount of exports and also because of the growth in imports. The forecasted numbers look very positive, but if the trade balance surplus is based on a growth in exports and a decline in imports, the national economy will not develop in the positive direction. After Daimler and Valmet Automotive signed the corporate level contract, are the hopes up that this project will revive the gloomy economic forecasts.

The production contract between Daimler and Valmet Automotive may raise many questions about the business profitability, due to the location of Valmet's production plant. Finland as a country is located in a challenging place on the world map and is therefore considered to be an island when overlooked from a logistics professional's point of view.

Daimler has got own production plants in central Europe close to the suppliers and close to the actual market, but the production capacity of A-class Mercedes Benz is not enough to correspond to the unexpected high sales forecasts. The automotive industry in central Europe has suffered a decline in demand for the past year, but Daimler is still confident that the sales forecasts are meeting up to the actual sales figures and this is why additional production capacity was needed. Daimler's decision to establish a partnership with Valmet Automotive is based on the fact, that Valmet is able to meet the high quality demands and is able to reliably implement the production process. The production line for

Daimler has been built up in a multifunctional way, which enables Valmet Automotive to produce other Mercedes Benz models in the future. Daimlers choice to collaborate with Valmet Automotive shows that Finnish engineering and innovative logistics skills have created a competitive advantage when compared to the countries that could have offered production capacity in the same region where Daimlers current supplier's and the majority of customers are located in.

The scope of the logistics set-up needed for project D1's implementation is higher than any other logistics strategy executed in production processes made in Finland. Valmet automotive has planned an innovative logistics strategy and has therefore only engaged partners who were willing to commit to the project with great investments and who were able to meet the requirements of geographical coverage, area-specific knowledge, process orientation and flexibility. (Nuutila 2013)

The innovative logistics strategy also includes the establishment of the Control Tower function, where all transportation planning is managed with open communication between all partners. The whole Control Tower concept is planned for Valmet's production needs and includes special designed routing, new transportation means, faster transit times, traffic control from environmental aspects and never before seen logistics processes.

As the final sentences of this thesis are being written, the production ramp-up has reached a stage where finished vehicles are being produced according to the amounts matching the production planning. The vehicles can be seen daily on the factory yard, being prepared for shipment. They are an outcome of great accomplishments in Finnish engineering and they give confirmation about the great technical competence that exists in our small nation.

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