
IMPLEMENTATION OF VMI SUPPLY MODEL IN PROCESS INDUSTRY ENVIRONMENT



Bachelor's thesis

Degree Programme in International Business

Valkeakoski 13.05.2011

Janne Keskinen



Degree Programme in International Business
Valkeakoski

Title Implementation of VMI supply model in process industry environment

Author Janne Keskinen

Supervised by Jorma Hokkanen

Approved on 13.05.2011

Approved by

HAMK Valkeakoski
Degree Programme in International Business

Author	Janne Keskinen	Year 2011
Subject of Bachelor's thesis	Implementation of VMI supply model in process industry environment	

ABSTRACT

Thesis refers to a project that aims to build up a working VMI communication between UPM GlobalONE (SAP) system and a supplier material management system. VMI communication will enable UPM to harmonise material scheduling processes and to shift the supply scheduling responsibility to the supplier (currently done by UPM). The commissioner of the thesis work is UPM Sourcing.

At the supplier end VMI will enable better control of UPM product stocks, harmonised way of communicating the UPM stock levels to the supplier and increased transparency in the overall packaging material supply process.

The objective of the thesis work is to clarify and describe the process of establishing a VMI supply model between customer and supplier in process manufacturing environment. On practical execution level, the thesis will follow up a piloting project on a selected UPM paper mill.

At the UPM mill level the work concentrates firstly on organisational change management topics, secondly in development achieved in warehousing, inventory and production areas. Part of the study follows implications at the supplier side.

The introduction part of the thesis introduces UPM, UPM Sourcing and Walki as VMI vendors. The theoretical part of the thesis investigates the VMI solution itself and the use of it in industrial environment. A small section of the work also studies supply chain management (SCM) and supplier relationship management (SRM) as concepts.

The result of the work introduces a project frame of introducing a VMI communication system between UPM and Walki. The empirical study relates to the piloting project carried out in latter part of 2010. The outcome of the work is a value stream study, indicating the benefits reached via VMI.

Keywords Vendor Managed Inventory, VMI, Supply Chain Management, Industry

Pages 45 p. + appendices 5 p.

HAMK Valkeakoski
Degree Programme in International Business

Tekijä	Janne Keskinen	Vuosi 2011
Työn nimi	Implementation of VMI supply model in process industry environment	

TIIVISTELMÄ

Työ viittaa projektiin joka perustettiin päämääränä rakentaa toimiva VMI-kommunikaatiojärjestelmä UPM GlobalONE (SAP) -järjestelmän sekä materiaalitoimittajan tietojärjestelmän välillä. VMI-kommunikaatio mahdollistaa UPM:lle harmonisoidun materiaalitoimitusten aikataulutuksen sekä toisaalta siirtää toimitusten sekä varastotasojen seurantavastuun toimittajalle. Työn toimeksiantaja on UPM Sourcing.

Toimittajan päässä VMI-järjestelmä mahdollistaa paremman kontrollin UPM:n tuotevarastoihin, harmonisoidun kommunikaatiokanavan yritysten välillä sekä yleisesti parantuneen läpinäkyvyyden rullapakkaustarvikkeiden toimitusprosessissa.

Työn tavoite oli selvittää sekä kuvata prosessi, jolla rakennetaan VMI-kommunikointi asiakkaan ja toimittajan välille prosessiteollisuusympäristössä. Käytännön toteutuksen tasolla työ seuraa VMI-pilottiprojektia UPM:n paperitehtaalla.

UPM-tehdastasolla työ keskittyy organisaation muutoshallintaan ja toisaalta VMI-mallin kautta saavutettavaan kehitykseen varastohallinnassa, varastonarvoissa sekä tuotannollisissa asioissa. Osa työstä keskittyy myös vaikutuksiin toimittajan puolella.

Työn alkuosa esittelee UPM:n, UPM Sourcing:n sekä Walkin VMI-toimittajana. Teoreettinen osuus tutkii VMI-ratkaisua sekä sen käyttöä teollisuudessa. Osa työstä keskittyy myös toimitusketjun (SCM) sekä toimitajasuhteiden (SRM) hallintaan konseptitasolla.

Työn tuloksena esitellään VMI-kommunikointijärjestelmän rakennusprojekti UPM:n ja Walkin välillä. Empiirinen tutkimus viittaa pilottiprojektiin joka toteutettiin yritysten välillä 2010 loppupuolella. Työn tuloksena on myös arvoketjututkielma, joka selvittää VMI-järjestelmän kautta saavutettavia prosessihyötyjä.

Avainsanat toimittajan hallinnoima varasto, VMI, toimitusketjun hallinta, teollisuus

Sivut 45 s. + liitteet 5 s.

CONTENTS

1	INTRODUCTION TO THESIS TOPIC	1
2	RESEARCH QUESTION AND OBJECTIVES	2
3	VMI CUSTOMER INTRODUCTION - UPM	2
4	INTRODUCTION - UPM SOURCING	3
4.1	Recycled Paper Sourcing (RCP)	4
4.2	Paper Businesss Group, Direct Materials Sourcing	4
4.3	Energy & Pulp Business Group, Direct Materials	4
4.4	Logistics Sourcing.....	5
4.5	Raflatac Business Area Sourcing	5
4.6	Indirect Materials and Services Sourcing.....	6
4.7	UPM Sourcing Processes and Systems (SPS).....	6
4.7.1	Requisition-to-Pay team	7
4.7.2	Source-to-Contract team.....	7
4.7.3	Master Data Management team.....	8
4.7.4	Procurement Services team	8
4.7.5	Systems and Solutions team	8
5	VMI SUPPLIER INTRODUCTION: WALKI GROUP	9
5.1	Walki Pietarsaari and Valkeakoski units - in brief.....	9
5.2	Walki®Reel and Walki®Disc products	10
6	VMI – VENDOR MANAGED INVENTORY	11
6.1	Benefits of Vendor Managed Inventory	12
6.1.1	Benefits for both parties	12
6.1.2	Customer benefits (UPM).....	12
6.1.3	Manufacturer benefits (Walki)	13
6.2	Considered negative effects and potential risks	13
7	SCM – SUPPLY CHAIN MANAGEMENT	13
7.1	Ways to improve supply chain performance.....	14
7.2	Planning nervousness between UPM and Walki	14
8	SRM – SUPPLIER RELATIONSHIP MANAGEMENT.....	15
8.1	SRM project in UPM Sourcing	16
8.2	SRM partnership between UPM and Walki.....	18
9	UPM SAP SOLUTION: GlobalONE	18
10	INTEGRATION OF UPM-WALKI ERP SYSTEMS	19
10.1	Functional Specification for VMI within GlobalONE.....	19
10.1.1	Requested VMI message functionality.....	20
10.1.2	Requisition-to-Pay process reference	21
10.1.3	Constrains to the execution of VMI solution: Timely stock bookings..	22

10.1.4 Functionality of the VMI solution in GlobalONE.....	23
11 VMI PROJECT PILOT	24
11.1 UPM-Kaipola mill, paper machine line 4	25
11.2 UPM-Kaipola PM4 packaging department	26
11.3 Project execution with mill users	26
12 COMMUNICATION PLAN FOR THE PROJECT	28
12.1 Change management within a project	28
12.2 Communication with the VMI project management.....	30
12.3 Communication towards the VMI supplier Walki	30
12.4 Communication towards the UPM Kaipola mill organisation	31
12.5 Communication towards the UPM Sourcing category team.....	32
13 VMI PROJECT SCHEDULE.....	32
14 PROJECT PLAN AFTER THE PILOTING PROJECT IS CARRIED OUT.....	34
15 VALUE STREAM MAPPING	34
15.1 Value stream mapping (VSM) - a Lean Manufacturing technique.....	35
15.2 The seven process wastes by Taiichi Ohno.....	35
15.3 Value stream mapping process.....	37
15.4 Value stream mapping between UPM and Walki	39
15.5 Value stream study before implementing VMI communication.....	40
15.6 Value stream study after implementing the VMI communication.....	41
16 CONCLUSIONS	42
SOURCES	46
Appendix 1 UPM, JÄMSÄ RIVER MILLS - KAIPOLA	
Appendix 2 VMI PROJECT SCHEDULE	
Appendix 3 VALUE STREAM MAP - EXAMPLE	
Appendix 4 UPM-WALKI VALUE STREAM STUDY – FUTURE STATE MAP	
Appendix 5 KEY FINDINGS AT CUSTOMER AND SUPPLIER COMPANIES	

1 INTRODUCTION TO THESIS TOPIC

UPM is globally using a significant amount of packaging materials in its own paper production, e.g. paper reel wrappers and reel end plates. Packaging materials are supplied to UPM production units by several suppliers. The scheduling of packaging material supplies has traditionally been a problematic topic to handle for the production units.

Several different methods are used to communicate the UPM packaging material stock levels to the suppliers. This is confusing to the suppliers, as they need to learn the practises of each UPM mill.

Based on the known scheduling issue, the improvement request was addressed to UPM Sourcing Processes and Systems (SPS) organisation Business Experts. During the years 2008-2010, UPM paper mills rolled out an SAP based materials management platform, a solution called GlobalONE. GlobalONE enabled harmonised and effective materials management system that is similar to all the UPM mills. The system also opens new possibilities to manage and automatize packaging materials scheduling process.

UPM Kaukas, located in Lappeenranta, Finland, was one of the UPM mills that had been using VMI communication in its scheduling towards Walki before entering into the GlobalONE system. After the implementation of GlobalONE the VMI system disappeared and Kaukas mill had been approaching towards UPM SPS Process Experts to have the VMI communication embedded in the new GlobalONE solution as well. Other UPM mill locations in Finland had also similar requests to improve the mainly manual forecasting and scheduling processes.

This study concentrates on the creation of a VMI solution between UPM GlobalONE and supplier Walki (located at Pietarsaari, Finland). The technical execution includes a VMI system solution that is embedded in the UPM GlobalONE architecture, and will be used globally within all UPM paper mills.

The piloting project is executed with the packaging material supplier Walki, but as the solution is embedded in the global system template, it allows the same message flow to be used with any supplier (and material) that is found applicable to work with the solution.

At the beginning of the project, it was decided that the initial project composition should consist of the dedicated UPM SPS (Sourcing Processes and Systems) Direct Materials Process Expert and SRM (Supplier Relationship Management) team member. The work would also concern Sourcing Category responsibilities, as the VMI operation model includes some contractual obligations towards the supplier. After the team was established, the project was introduced to the UPM Sourcing Management Team and later on to the Mill Sourcing organisation.

2 RESEARCH QUESTION AND OBJECTIVES

The main question that the thesis will answer is how to improve efficiency in the supply chain via implementing VMI communication between UPM and Walki. The objective is to clarify the savings that the corporation can achieve via reduction in process costs, tied resources, and inventory turnover by changing the requisition-to-pay process from call-off ordering to VMI supply model (vendor managed supply). The result is expressed in the form of value stream map.

The research also investigates how the corporation will realise savings through implementation of a global ERP system and harmonised requisition-to-pay processes. One of the development topics is to shift the supply scheduling responsibility to the supplier (currently done by UPM).

3 VMI CUSTOMER INTRODUCTION - UPM

UPM is one of the world's leading forest industry groups and the leading producer of graphic papers. Production facilities rank among the world's best in terms of production efficiency and competitiveness. UPM products are made of renewable raw materials and are recyclable. Products are manufactured using energy that does not accelerate climate change. UPM has worldwide sales network.

As the frontrunner of the new forest industry, UPM leads the integration of bio- and forest industries into a new, sustainable and innovation-driven future. UPM comprises of three Business Groups: Energy and pulp, Paper, and Engineered materials.

In 2010, UPM's sales totalled € 8.9 billion. UPM has production plants in 15 countries and it employs approximately 22,000 employees worldwide. UPM shares are listed on the NASDAQ OMX Helsinki stock exchange. *[UPM Financial statements release 2010.]*

UPM's business portfolio comprises of six independent business areas: Energy, Pulp, Forest and Timber, Paper, Label and Plywood.

UPM products i.e. papers, label materials and wood products are produced in totally 63 production units worldwide: 53 in Europe, 4 in the US, 3 in China, one in Australia, Malaysia and South Africa. Globally UPM has paper mills in 19 locations. *[UPM Annual report 2009]*

Efficient, reliable technology and long-standing production know-how are the backbone of UPM production units' operations. The desire for continuous improvement drives the company further - interaction with all its stakeholders helps UPM treat customers' challenges as its own.

A high level of technical expertise forms the basis for cost leadership and reliability as a supplier.

UPM secures competitive access to critical production inputs. Operations are based on close integration of raw materials, energy and production. The company is self-sufficient in pulp and 85% self-sufficient in electrical power. UPM's own forests secure, in part, raw material supplies.

UPM has adopted a life-cycle approach to its operations. This means that the company recognises and manages all possible social and environmental impacts its products might have in each step of their life cycle - from sourcing of raw materials, through production to the disposal of the product.

Environmental aim is continuous eco-efficiency improvement. UPM has made significant investments in the usage of renewable fuels and consequently reduced CO² emission. This has resulted in a reduction of 40% of mill site CO² emissions per tonne of paper since 1990. Also worth mentioning is that UPM has been awarded the EU Eco -label for most of its paper grades.

One of UPM's key competitive advantages is its skilled workforce, laying the foundations for quality, continuous learning and renewal in processes. UPM's people development focuses on supporting continuous business and organisational transformation. UPM's operations are based on the company's values: Openness, trust and initiative. *[UPM Annual report 2009]*

4 INTRODUCTION - UPM SOURCING

UPM Sourcing is a business integrated global function. It provides the company supply market insight and access to optimized supplier base for UPM Businesses, delivering cost effective and innovative material and service solutions for business requirements. UPM Sourcing brings continuous added value for UPM through professional sourcing and procurement process execution and effective inbound material supply solutions.

In 2010 UPM external purchasing spend totalled 5,7BEUR, of which UPM Sourcing focus was 4,3BEUR (75%, excluding Forest&Timber and Energy from the total figure).

UPM Sourcing has about 500 employees, located in the countries and mill sites where UPM is present. UPM Sourcing global organisation also includes part of warehouse and Seaways (Sea Traffic and Port Operations) personnel.

UPM Sourcing consists of following category teams:

- Recycled Paper
- Paper Business Group, Direct Materials
- Energy&Pulp Business Group, Direct Materials
- Logistics
- Raflatac Business Area
- Indirect Materials and Services

Additionally, in the matrix UPM Sourcing also includes Sourcing Processes and Systems and Mill Sourcing as supporting streams. *[UPM-Intranet, 2011]*

4.1 Recycled Paper Sourcing (RCP)

The UPM RCP department annually purchases around 3 million tons of RCP for UPM's eight European paper mills, located in Finland, Germany, France, UK and Austria.

Main RCP markets for UPM are in Germany, UK, France, Finland, Italy and Austria. UPM has regional RCP purchasing organisations in these countries. Regional teams are contracting RCP from various sources, typical contractual partners are communities, cities, printing plants and waste management companies.

RCP Resource Management target is to provide cost efficient, good quality RCP raw material to UPM mills. In practice this means both continuous searching for more economic RCP sources and striving for cost savings in the RCP value chain (collection, sorting, logistic, warehousing) together with UPM mills and with RCP suppliers. *[UPM-Intranet, 2011]*

4.2 Paper Businesss Group, Direct Materials Sourcing

UPM Sourcing Direct Materials Team is responsible for managing the global spend of paper chemicals, pigments, packaging and paper machine clothing (PMC).

The teams' way of working is cross-functional, compiling the knowledge of the internal stakeholders with the knowledge of the suppliers. Dedicated category teams consist of professionals working globally around UPM.

The team target is to create value together with internal and external stakeholders, by combining supply market expertise and technological innovation according to the business needs.

Direct Materials Team is driven towards excellence and constant improvement. The team consists of 20 sourcing professionals, all with dedicated product categories. *[UPM-Intranet, 2011]*

4.3 Energy & Pulp Business Group, Direct Materials

E&P Sourcing team supports the company business area's mainly within the Energy & Pulp Business Group. In short focus is concentrated around five UPM businesses:

- External pulp sourcing
- Biofuels
- Timber BA Sourcing
- New Business Development (NBD)
- Frey Bentos / Latin American Sourcing

[UPM-Intranet, 2011]

4.4 Logistics Sourcing

UPM Logistics Sourcing provides the company the most effective infrastructure and supplier network which will enable business optimisation of 'cost to serve' within the complete supply chain.

Roles and responsibilities of Logistics Sourcing include the following elements:

- UPM logistics strategy
- Common platform and infrastructure for businesses and functions
- Cost development and reporting
- Supplier structure and contracts (rates and tariffs)
- Supplier management and performance monitoring
- Joint business development
- Capturing synergy potentials
- Sea traffic management (UPM Seaways)

[UPM-Intranet, 2011]

4.5 Raflatac Business Area Sourcing

The mission of the Raflatac sourcing and procurement organisation is to sustain and improve the competitive advantage through efficient sourcing and supply management by succeeding in the following key areas:

- Acceptable quality (regarding specifications) - in co-operation with R&D, production and other functions
- Competitive prices and cost saving
- Efficient raw material inventory management:
- Efficient rotation of raw material inventory
- No stock outs in regular (stocked) raw materials
- Supply of special (non-stocked) raw materials according to the need

[UPM-Intranet, 2011]

4.6 Indirect Materials and Services Sourcing

UPM Indirect Materials and Services sourcing consists of UPM Capex, MRO, Function Services, Facility Management and IT Sourcing, covering together a spend of 0,9BEUR.

- Capex Sourcing focuses on UPM investment sourcing, concentrating to Operative and Strategic investments made worldwide
- Maintenance Repair and Operations (MRO) sourcing takes care of UPM maintenance spend and minor investments (MOP)
- Function Services sourcing focuses on marketing, communication, travelling and consultancy services sourcing
- Facility Management sourcing takes care of e.g. cleaning, catering, janitorial, work wear and security services sourcing
- IT sourcing consists of UPM hardware, software and IT projects sourcing

[UPM-Intranet, 2011]

4.7 UPM Sourcing Processes and Systems (SPS)

In late 2007 UPM took the decision to concentrate on its operational procurement activities in two locations: Tampere, Finland and Changshu, China. The target was to make the procurement operations less mill-concentrated, allowing increased flexibility and speed in implementing process changes and more effective implementation of harmonised procurement processes.

The main task of the procurement centres is to support GlobalONE (new UPM ERP system) implementation across the corporation. Tampere centre serves procurement operations in Finland, Central Europe and North America. The second, smaller Changshu office serves China and Asia Pacific region and was established in late 2009.

The main tasks for the procurement centres are the following:

- Back-office procurement services where performance efficiency, expertise, economies of scale and control mandate centralisation
- Operative sourcing (spot-buy) services across UPM mills in the areas where synergies can be achieved
- GlobalONE process ownership and support
- Synergies with Finance GTS (Global Transaction Services, located as well in Tampere)
- Closeness to sourcing category management: Integration of sourcing category steering and management
- Closeness to the mills: Integration to mill execution of operations

Total headcount of Tampere centre is currently 28. The organisation comprises of Specialists, Senior Specialists (Business Process Experts), led by five team Managers.

Specialists can be referred as technical buyers with sourcing category specific business expertise or procurement process related expertise (e.g. electronic invoicing). Business Process Experts are more dedicated on sourcing process development activities, being also present at the mills and assisting end users. Each Process Expert is also part of their specific sourcing category.

Business Process Experts ensure the implementation of UPM Business Rules at the mill locations, making sure that the rules are locally followed, bringing the best possible advantage to the corporation. The aim of these operations is to streamline purchasing activities and processes into more efficient and less fragmented form, creating added value and process savings for UPM.

SPS processes (streams) are divided in the following areas:

- Requisition-to-Pay Process
- Source-to-Contract Process
- Master Data Management Services
- Procurement Services
- Systems and Solutions

4.7.1 Requisition-to-Pay team

Requisition-to-Pay team comprises of five Business Process Experts and one Specialist. Process Experts are dedicated for the specific areas: Direct Materials, Indirect Materials, Warehousing, Services and to-Pay activities.

Process Experts are integrated to the sourcing category work, ensuring that sourcing managers receive the required support in their activities. Process Expert is also responsible owner, creating and maintaining the UPM Business Rules on each specific sourcing area, assisting mill end users in selecting the most optimum procurement process to use. Process experts offer also system support to the users, being linked with UPM IT organisation.

4.7.2 Source-to-Contract team

The main task of the Source-to-Contract team is to facilitate systematic and consistent ways of working and sharing best practices in the contracting related operations. The team manages UPM e-sourcing tools and supports in their usage. The Source-to-Contract team contributes to competence development by maintaining a sourcing training platform, monitoring and reporting sourcing performance related KPIs (key performance indicator) and process measures.

Source-to-Contract team ensures good knowledge management and sufficient audit trail on tendering and authorizations. On top of the other activities, the team organises different types of training related to the Source-to-Contract process and tools used by the end users.

4.7.3 Master Data Management team

UPM SPS Master Data team maintains harmonised master data management processes within the GlobalONE environment, including material and service masters, vendor masters as well as UPM global chemical database.

The Master Data team ensures that sourcing category strategies are being followed, relating to master data management. The team provides systems and process helpdesk assistance for both internal and external customers. Master Data team members work in close co-operation with the end user network, finance and control function and external suppliers in order to develop and implement the best practices in master data related processes.

4.7.4 Procurement Services team

The SPS Procurement Services team's main purpose is to provide procurement services in the area of minor contracting and purchase order creation for UPM Global Functions and Group Head Office Functions. The team also provides support and guidelines for Function purchasing and develops Function purchasing processes.

4.7.5 Systems and Solutions team

SPS Systems and Solutions team's responsible for development, management and co-ordination of the tools used in UPM Sourcing, across different business groups and functions. Team is also responsible for optimising the processes and solutions used in UPM Sourcing and to follow up process and solutions development and future outlooks outside of UPM.

The team comprises Development Managers (GlobalONE template management), supported by Senior Specialists. The team is responsible for development, request-for-change process and stability of

- GlobalONE solution for Sourcing and Sourcing Reporting in general
- Template management of operative solutions outside GlobalONE application
- Information management solutions in UPM Sourcing and
- Technologies outside SAP

Development of solutions is done together with the Sourcing Business Process Owners, Process Experts, IT Service Owners and Architects and with key stakeholders from other functions.

5 VMI SUPPLIER INTRODUCTION: WALKI GROUP

The Walki Group is an international company, producing protective packaging materials and technical laminates for e.g. paper, metal, construction and various packaging industries.

Walki has decades of experience in manufacturing food and consumer packaging materials as well as decorative and functional laminates. Additionally, Walki creates specialist liners for solid and corrugated packaging, facings for the insulation and construction industries, and solutions for technical applications.

Walki company structure is based on three business areas:

- Paper Packaging
- Consumer Board and
- Technical Products.

Walki has production facilities in Finland, Sweden, Germany, Poland, the UK and China. The combined annual net sales of Walki mills exceed 300 million Euros. [*Walki Group presentation 2010*]

5.1 Walki Pietarsaari and Valkeakoski units - in brief

Walki has two plants in Finland: one located on the Finnish west coast in the city of Pietarsaari, and the second plant in the middle of Finland, Valkeakoski.

The Walki plant in Pietarsaari specialises in wrapping materials for the paper industry, barrier lining and technical products. The factory has a production capacity of 100,000 t/a, and is employing 185 persons.

The Walki plant in Valkeakoski specialises in insulation and construction facing materials, technical papers, flexible packaging as well as heavy duty wrapping. The Valkeakoski plant also produces wrapping material for the paper packaging industry. The plant has a production capacity of 60,000 tn/a and it employs 200 persons. [*Walki Group presentation 2010*]

It was decided to conduct The VMI solution pilot with the Walki Pietarsaari plant. Pietarsaari was selected as a pilot supplier because it supplies reel packaging materials for all Finnish UPM mills. After the implementation the plan is to expand the VMI communication also to other Walki locations in Finland and Europe. To help the following implementation stages in the process, Walki Valkeakoski plant representatives were invited and were present in some project group meetings held at UPM Kaipola mill.

5.2 Walki®Reel and Walki®Disc products

Walki®Reel wrappers are tailor-made for customers, with the aim to provide maximum protection for the paper reels. The wrappers are available as traditional extrusion coated and laminated reel wrappers as well as wrappers for the hot-pack process.

The specific function of the reel wrapper is to provide the reel mechanical protection, moisture protection and to protect the paper and board reels from dirt and other hygiene hazards. The role of the reel protection is essential in UPM business as defects in this area are directly claimed by the customer, e.g. printing houses.

Walki®Disc reel end discs are assembled at both ends of the paper reel. The outer reel end discs are heat-sealable and available in three different qualities: PE-coated test-liner, kraft-liner or board.

Walki®Disc Jumbo is a special inner reel end disc, designed for protecting big size, “Jumbo” paper reels. The structure of the disc is a sandwich construction of paper chips between two paper layers. This gives the disc a high stiffness and compression strength. Due to the construction Walki®Disc Jumbo does not collapse under heavy loads. Beside the protective function, the loading tolerance is an important feature to consider when transporting the paper reels to the customer by e.g. train, truck or sea vessel. *[Walki®Reel and Walki®Disc product brochures 2010]*

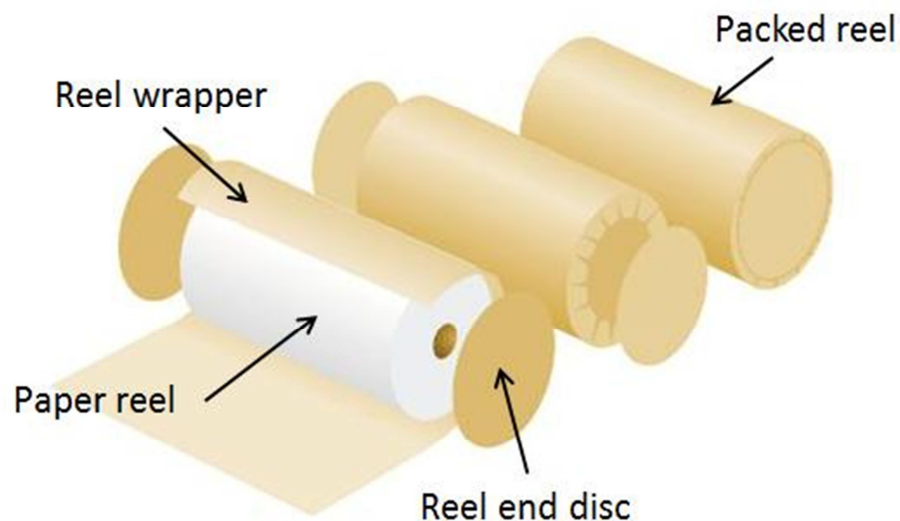


Figure 1 Reel wrapper and reel end disc use in reel protection

The VMI pilot at UPM Kaipola mill included both reel wrappers and reel end discs, specifically used at the PM4 packaging department.

6 VMI – VENDOR MANAGED INVENTORY

The VMI concept is described in the following way by Hines et al. (2000): VMI is a collaborative strategy between a customer and supplier, aiming to optimise the availability of products at minimal cost to the two companies. The supplier takes responsibility for the operational management of the inventory, within a mutually agreed framework of performance targets which are constantly monitored and updated to create an environment of continuous improvement.

During the past years, the increasingly growing trend in industry has been to outsource the inbound logistics operations. A typical operational model to steer the so called C-class and MRO (materials, repair and operations) items is based on replenishment carried out by an external supplier. Most of the applied Vendor Managed Inventory -applications in industry are based on manual work. According to studies made in this area, there are only a small number of real, ICT-technology (information and communications technology) based applications found yet. [*Hines, P., Lamming, R., Jones, D., Cousins, P. & Rich, N. (2000) Value Stream Management - Strategy and excellence in the supply chain.*]

Studies made in the field of VMI solutions indicate that VMI solutions used by the grocery industry are advanced compared to those used in traditional industries. VMI solutions used in grocery stores are based on consumption information via shop cashier, real time data. The development with articles on the shop shelves is also followed with bar-code readers. Readers (handheld) are used to visualise and update the actual situation in the shop shelves and material storage. This type of automation has not been widely utilised in the industrial systems.

IT technology utilisation is currently on a poor level in existing VMI concepts. Some bigger distributors and suppliers have built mobile solutions using SMS (short messaging system i.e. text messages on mobile phones) messaging to control customer stock levels centrally and thus minimising on-the-spot stock controlling.

To some extent IT technology has been used in extranet solutions that are available for the supplier to view customer stock levels. This type of communication requires a high level of maintenance and can be vulnerable for human errors. Extranet solutions also include issues with user authorisation management and information security. Some applications use web-cameras to identify customer's actual stock situation (e.g. raw material stock levels in large silos) to the supplier. Camera surveillance also includes several failure risks, both technology and human related. [*Häkkinen, Kai, Hemilä, Jukka, Uoti, Mikko, Salmela, Erno, Happonen, Ari, Hämmäläinen, Harri, Siniluhta, Eero, Nousiainen, Jukka & Kärkkäinen, Mikko. VMI teollisuudessa. Teoriaa, teknologiaa ja sovelluksia [VMI in industry – theories, technologies and applications]. Espoo 2007. VTT Tiedotteita - Research Notes 2406.*]

The VMI model that was planned to be established between UPM and Walki information systems would include a true CPFR (Collaborative Planning, Forecasting and Replenishment) philosophy. The information for stock control is based on communication between two independent information systems.

6.1 Benefits of Vendor Managed Inventory

Before implementing and developing any stock control solution, it is important to identify the benefits at both manufacturer and customer side. If the benefits can only be recorded at one of the parties involved, the interest and motivation of the other party to involve in the system development may suffer.

6.1.1 Benefits for both parties

- Data entry errors will reduce due to computer-to-computer communication. At the same time the speed of data processing improves and the number of human mistakes reduces due to automated communication between the two systems.
- Both manufacturer and customer are interested in reaching better service level. Having the correct item in stock when the customer needs it, benefits both parties in the business.
- A true partnership can be formed between the manufacturer and the customer: The parties learn to work closer together and thus strengthen the ties between the two companies.
- VMI solution stabilises the timing of purchase orders while the order generation is executed on a predefined basis. [*Vendor Managed Inventory.com (2011)*]

6.1.2 Customer benefits (UPM)

- Normally one of the goals in the co-operation is to improve fill rates from the manufacturer to the end customer. Also, a decrease in stock-outs and a decrease in inventory levels can be reached.
- Planning and ordering process costs will decrease due to the scheduling responsibility that is being shifted to the manufacturer.
- The overall service level is improved by having the right product at the right time.
- The manufacturer is more focused on providing better service to the customer. [*Vendor Managed Inventory.com (2011)*]
- In the case of UPM one of the main benefits was order process standardisation across the mill locations. Implementing a VMI solution would ease the harmonisation within the packaging materials
- After completing the piloting project with Walki, UPM is able to implement the VMI solution with any supplier (or material group) in the future

6.1.3 Manufacturer benefits (Walki)

- Forecasting can be improved through better visibility of the Distributor's Point of Sale data.
- Sales promotions can be more easily incorporated into the inventory plan.
- It is possible to reduce Distributor ordering errors (which normally would lead to a claim or return of goods delivered)
- The visibility of customer stock levels helps to identify priorities in replenishment. Before entering VMI, a manufacturer has no visibility of the quantity and the products that are ordered by the customer. With VMI, the manufacturer is able to see the potential need for an item before it is ordered.
- Improved visibility on customer stock levels also gives the possibility for the supplier to better adjust production capacity to the fluctuations on demand. [*Vendor Managed Inventory.com (2011)*]

6.2 Considered negative effects and potential risks

Although aimed to bring positive effects for both parties, VMI solution will also have some negative effects and potential risks. Following topics were identified when creating the project plan:

- In the initial project phase the workload at Walki will increase
- Also UPM workload will be higher in the initial phase, as VMI the system functionality needs to be monitored
- UPM warehouse process discipline will be essential to successfully implement the solution at mills. This is critical especially when UPM has just lately implemented new SAP solution at its production units around the world
- System updates will be required at UPM side
- High change management effort at UPM mills
- Challenges in the invoice handling process, followed by the Requisition-to-Pay process changes at mills using VMI
- Simultaneous project for harmonisation of UPM material masters

7 SCM – SUPPLY CHAIN MANAGEMENT

Kauremaa et al. (2007) state that the management of inter-organisational material and information flows (referred to as supply chain management or SCM) has emerged during the last two decades as an increasingly relevant perspective and as a set of tools for companies in various industries.

One particular way of employing SCM is to adopt specific supply chain collaboration models, such as the vendor-managed inventory (VMI) approach. Supply chain collaboration models (particularly VMI) have been studied via only little empirical research. There is a clear lack of studies examining the phenomenon in multiple industries from the point of view

of both parties – suppliers and buyers. [Kauremaa, J., Småros, J. & Holmström, J. (2007) "Empirical Evaluation of VMI: Two Ways to Benefit"]

An additional concept, related to the supply chain management is collaborative planning, forecasting and replenishment (CPFR), which is an evolving business practice that seeks to reduce supply chain costs by promoting greater integration, visibility and co-operation between trading partners' supply chains. The VMI solution built between UPM and Walki includes these same targets.

7.1 Ways to improve supply chain performance

Riikka Kaipia (2007) states that supply chain information flow significantly influences material flow behaviour. To improve supply chain performance, efficient information sharing practices are largely recommended for companies to use. There is however limited knowledge existing on how companies should choose their supply chain planning approaches and the extent to which information is required. According to Kaipia the existing literature does not give proper answers to the question of which situations, or during which supply chain phase, vendor managed inventory (VMI) is an efficient replenishment mechanism.

Kaipia also suggests that there are two main reasons that cause imbalance between material and information flow between two companies. Firstly frequent supply plan updates, made according to demand changes, varying planning processes and horizons cause the phenomenon called "planning nervousness". This phenomenon is the main reason for a bullwhip effect and large volume changes at the supplier side. The second identified reason is lack of planning capability, inadequate information or inability to use shared information at the company.

According to Kaipia, planning nervousness can be reduced by stabilised planning and synchronising information sharing between the companies involved in supply chain. The suitability of the VMI system in materials management can be measured by reaction time that is available for the supplier. The time benefit for the supplier is depending on the delays caused by order batching. Suppliers' long production planning horizon and infrequent production makes benefiting out of the VMI system more challenging for manufacturers. Improving the quality of shared VMI information takes place by offering the right information and improving downstream planning. [Kaipia, Riikka. *Supply chain coordination – studies on planning and information sharing mechanisms*. 2007].

7.2 Planning nervousness between UPM and Walki

Planning nervousness had been recognised in the communication between UPM and Walki. Walki is different to UPM compared with many other material suppliers, as on the one hand Walki supplies the reel protection material to UPM, but on the other Walki also acts as a client to whom

UPM Pietarsaari supplies kraft paper as raw material to be converted as reel wrapping material. In order to have the VMI planning operating properly, the complete supply chain from raw material production to delivery to end customer (UPM mills) needs to be paid attention to.

Change to GlobalONE materials management system had also caused additional pressure in the supply planning, as all UPM mills had just lately started to use GlobalONE and its requisition-to-pay processes in ordering the material from Walki. There had been only a little time for UPM mills and Walki to adjust to these processes. At the same time the system change had caused a situation where some existing, working requisition-to-pay processes needed to be replaced by a new harmonised process of which the end users had limited knowledge.

After the VMI project group had been joining the first meetings it became obvious that a representative from UPM Supply Chain (paper sales) organisation was required to be included in the project steering group. Valuable input regarding the reasons for the planning nervousness increase was collected from the Supply chain representative.

One fundamental issue that had ruined Walki's supply performance since the early 2010 was the fact that UPM Pietarsaari mill decided not to keep any buffer stock of raw materials supplied to Walki. This caused a domino-effect in the supply chain, the final result being that the supply performance of Walki towards UPM mills dramatically decreased. As the UPM mills were no longer having respect towards Walki supply schedules, the mills started to increase safety stocks of finished Walki products (reel end discs and wrappers) to cover the uncertainty. At the same time the forecasting became obsolete, while the forecasting was made through direct purchase orders. At Walki's end this caused different forms of uncertainty, e.g. machine down-times (due to missing raw material) and production cuts.

Summarising the effects of the increased planning nervousness it can be stated that the implications of decreased information flow and planning quality are severe for both the supplier and customer company. This also generated the request to implement VMI communication between UPM and Walki, while UPM mill procurement organisations started to create alternative supply plans to replace Walki as packaging material supplier.

8 SRM – SUPPLIER RELATIONSHIP MANAGEMENT

To maximize the profitability in the business, a company must optimise the use of supplier base and move towards close, long-term relationship with the chosen suppliers. The systematic way of managing the suppliers is referred Supplier Relationship Management, SRM [*www.mckinsey.com, 2011*]

Burton and Boeder see SRM concept as a more technically robust version of e-procurement. SRM is primarily concerned with extended procurement

processes such as sourcing execution, financial transactions, sourcing analysis, and sourcing performance measurement and feedback. In many contexts, SRM is integrated with product lifecycle management (PLM), supply chain management (SCM), and enterprise resource planning (ERP), because organizations need these touch points throughout the business cycle, from new product development to customer order fulfilment and post-sales service and support. SRM has many features which can be summarized into the following categories:

- Transactional automation: SRM automates the recurring transactional processes between the company and its suppliers. This includes activities like sourcing, contract management, direct purchase order and invoice routing, payment and reconciliation, and real-time transactional monitoring.
- Single-enterprise integration: Concept provides a single-pipeline view of the supply chain with multiple facilities, departments, processes, and software applications for the organisation and its entire supply base.
- Supply and demand visibility: SRM provides visibility of information and requirements between the company and its suppliers. Technically this is achieved via portals and application integration.
- Collaboration: SRM allows the company and suppliers to share real-time information and collaborate on various supply process issues.
- Analytics: SRM concept includes real-time analytical capabilities to measure and optimise process performance.

The strategic advantages of SRM visualise in terms of leveraging the supply base for competitive advantage. SRM enables the company and its supply network to make improvements in the areas of new product development, sourcing and procurement processes, procurement reactivity, information exchange, collaboration, and strategic relationships. [Burton, Terence T.; Boeder, Steven M. *Lean Extended Enterprise: Moving Beyond the Four Walls to Value Stream Excellence*, 2003. p 163-164.]

8.1 SRM project in UPM Sourcing

UPM Sourcing took the strategic decision to improve its sourcing strategy from traditional tactical buying towards supplier development and value chain integration during the 300T cost saving program, initiated in 2005.

Following this new strategic alignment, UPM Sourcing decided to introduce a program called SRM in 2009. As UPM Sourcing did not have sufficient resources (nor knowledge) to execute SRM operations, the decision was taken to recruit SRM specialists from other companies having longer history in the field of SRM.

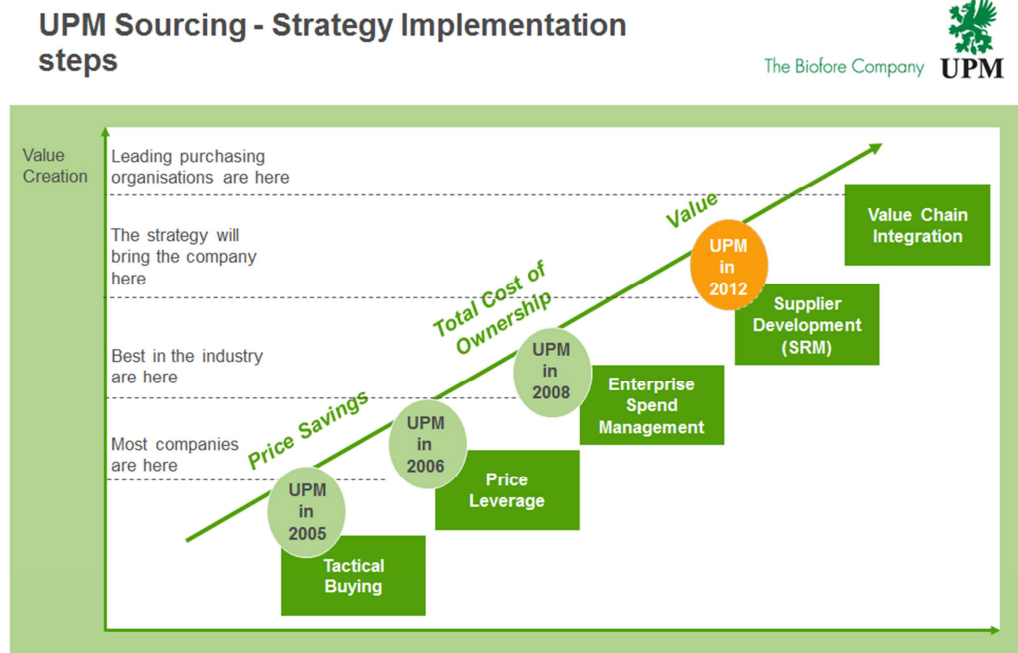


Figure 2 UPM Sourcing strategy implementation

One of the consultants awarded to support the UPM SRM program was McKinsey. McKinsey & Company is a global management consulting firm and known as a trusted advisor to the world's leading businesses, governments, and institutions. McKinsey has about 9.000 consultants, located at 95 offices in over 50 countries. Forbes (an American publishing and media company) estimated the company's 2009 revenues at USD6.6 billion. [www.mckinsey.com, 2011]

Before the SRM program UPM Sourcing identified itself to be at the level of price leverage and spend management (Figure 2). SRM program was established to build a systematic supplier relationship management program in UPM. The process and its contents will be prepared and taken into use with all stakeholders. The result of the program was expected to be the UPM Sourcing's next step closer to the UPM vision realisation: Total value chain integration between suppliers, UPM and end-customer. [Lean Sigma Manufacturing Green Belt –programme material, 2010]

SRM program starts with supplier classification which is made based on the importance of suppliers and focus of internal resources. Supplier performance measuring based on selected KPI's (key performance indicator) and supplier surveys play important part in the supplier classification, followed by feedback to support continuous improvement of the relationship.

The program also generates a frame for systematic project management in co-operation with the suppliers, aiming to generate and identify new cost saving opportunities and value generation. Established supplier projects also promote internal competence development and create a culture for SRM in UPM.

UPM core values trust and openness will be emphasised throughout the SRM program, meaning that transparent relationship between UPM and the supplier is seen as one of the most important enabler for successful implementation of SRM. [*Lean Sigma Manufacturing Green Belt – programme material, 2010*]

8.2 SRM partnership between UPM and Walki

Typically 70-80% of the sourcing spend is formed by just a small percentage (1-10%) of total supplier base. This is the case also with UPM, where 250 suppliers were identified as strategic for the company operations. The target of SRM program is to invest in these strategic suppliers to get the best efficiency out of the co-operation and to reach maximum cost saving potential.

SRM further classified the strategic suppliers, and came down to a group of approximately 10 “Level 1” suppliers. Level 1 supplier classification is partly based on the conducted supplier survey that indicated the motivation and willingness of the supplier to participate the UPM SRM program. Walki was one of the suppliers that qualified in this group.

Level 1 suppliers belong to the category of Supplier Development, having a commonly agreed development strategy, business plan and related KPI's followed by continuous improvement program between the parties. Focus with Level 1 suppliers is on continuous end-to-end TCO (total cost of ownership) development program together with UPM. [*Lean Sigma Manufacturing Green Belt –programme material, 2010*]

9 UPM SAP SOLUTION: GlobalONE

As the history of UPM is fragmented and consists of several company acquisitions, this has over time lead to the problem of having practically each mill using its own legacy data systems. Fragmentation of the data systems has become a growing problem for UPM, as today it is more required to have one operating system, which integrates the operations between different production units.

When defining the ERP (Enterprise Resource Planning) business case, UPM selected SAP/R3 (Systems, Applications, Products in Data Processing, Real Time, /3Tier Architecture) as supplier for its global ERP solution. The UPM solution is called GlobalONE, defining the SAP template UPM will use.

More precisely, GlobalONE is a new common work environment for production, maintenance, warehousing and sourcing within UPM. The main advantage is that all UPM mills will work according to the same processes within maintenance and sourcing operations. This means that mills and people can learn from each other and use the collective know-how throughout the company.

GlobalONE solution comprises of the GlobalONE template (95% of the solution) and required localisation elements (5% of the total solution). Local elements are local configurations, localised template interfaces, localised forms, local developments etc.

Global template is fixed part of the GlobalONE solution which is used to rollout GlobalONE at UPM mill locations. Template includes processes, interfaces, technical elements and documentation. Any change in the GlobalONE template requires a legal reason or a solid business case. If changes to the global template are required, backward implementation to the live production units has to be taken into account. *[UPM GlobalONE project education materials, 2008-2010]*

10 INTEGRATION OF UPM-WALKI ERP SYSTEMS

As UPM recently finished the GlobalONE project implementation within its worldwide production units, the company now seeks to find benefits of the integrated ERP solution. One way to utilise the GlobalONE platform is to make UPM internal stock levels visible to the chosen suppliers.

The stock level of each packaging material item is the main information that is requested to make the VMI communication enabled between UPM and Walki materials management systems. Regularly communicated stock levels from each UPM mill location would be the key information to decrease the planning nervousness that had been generated between the companies.

In order to bring the project into the execution level within UPM and GlobalONE platform, it was requested that UPM SPS process expert organisation prepared a functional specification, describing the requested change in the GlobalONE system. The functional specification also explains the requested change to the IT experts more in detail. IT experts will then further evaluate the workload required and bring the proposal further on technical system execution.

UPM IT organisation is a centralised function located in many different locations. Also the VMI communication request was made in co-operation with IT department owners and specialists both in Finland and Poland. UPM IT also allocated some external consultants to process the programming of the requested system change.

10.1 Functional Specification for VMI within GlobalONE

To be able to start the change request process in GlobalONE system, the UPM SPS process expert created the functional specification first that is required to describe the change more in detail. The functional specification consisted of the elements explained in the following chapters.

10.1.1 Requested VMI message functionality

A new SAP transaction was required to enable the end user (Mill Buyer) to create and modify the inventory data (specified in Z-table) content, defining the message that will be communicated to the supplier.

As a result, SAP (GlobalONE) generates a file and sends an MQ-message (Message Queue) to the supplier (Walki). Message generation is scheduled to take place once a day.

For the packaging materials (reel packaging) it was estimated that each storage location (in the production plant) will have maximum 20-30 different material items.

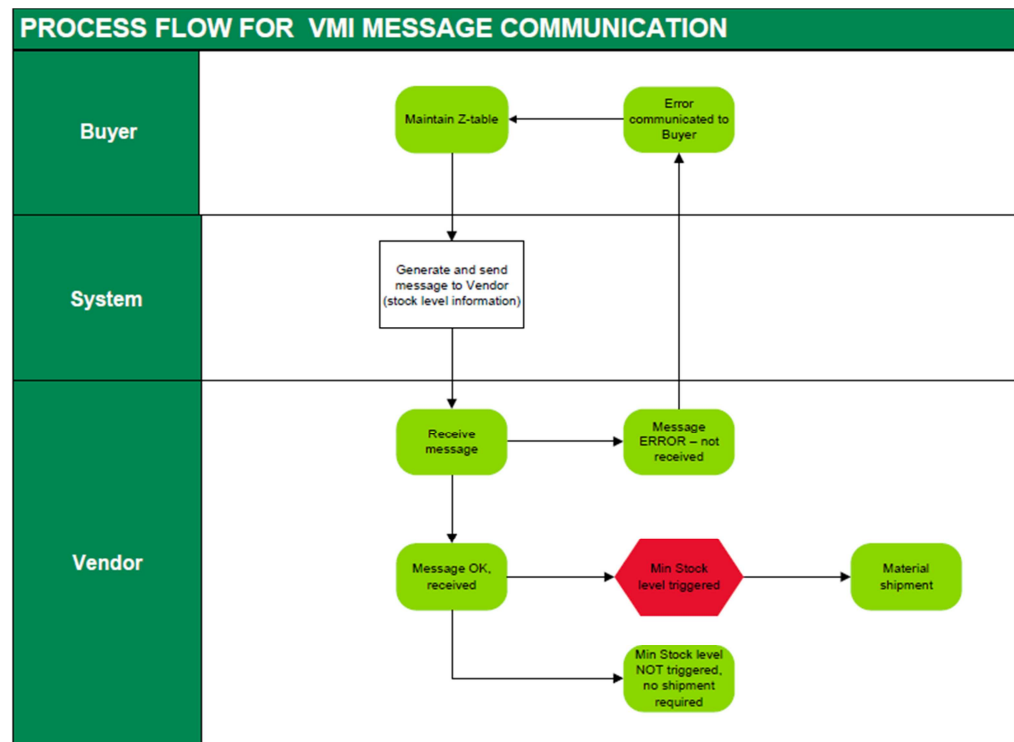


Figure 3 High level process flow for VMI message communication

Figure 3 describes the principle of VMI messaging between UPM and Walki material management systems. UPM mill buyer maintains a Z-table, which contains all the data that will be communicated to the supplier. This also enables control at buyer side to separate messages if there will be more suppliers or materials within the scope of VMI in the future.

UPM GlobalONE system generates the VMI message, including the actual stock balance of each included material. This is the only daily changing data in the message. The message is received at the Walki material management system and converted directly as demand plan which Walki sales department is using as input for supply plan.

In case there is some error in the message communication, Walki system recognises this and this is communicated back to UPM mill buyer (via SMS message), who will then take necessary corrective actions. To be able to trace and monitor message traffic, each message includes a time stamp referring to the moment when the message was generated.

Depending on the stock level information, Walki takes either the action to replenish UPM stock (with pre-agreed material batch) or waits for the agreed stock level trigger to be reached. Before starting the VMI communication each mill buyer will agree the optimal safety stock levels and replenishment batch sizes in co-operation with the supplier. These stock level triggers are important to be agreed as those are the safety stock values for each mills' packaging department.

When defining the lead times for stock replenishment, Walki will also guarantee delivery times for each material. To be able to guarantee the delivery times to UPM, Walki is also responsible of keeping required safety stock of UPM materials on hand. Walki is thus contractually obliged to supply UPM the materials requested, on agreed price levels.

10.1.2 Requisition-to-Pay process reference

UPM SPS Requisition-to-Pay process owners created process descriptions and supply solution alternatives to steer each material group. These guidelines were referred while designing the UPM-Walki VMI solution. Harmonisation of Requisition-to-Pay processes UPM-wide will enable the company to steer its procurement operations towards suppliers in a controlled way.

It was also decided that VMI pilot will finally be developed towards the VMI consignment solution where the supplier owns the inventory until the point of stock-out at customer, but for the system development phase it was decided to start with VMI messaging without focusing too much on the inventory ownership.

The most important process step in the VMI solution is the scheduling control, being transferred to the supplier. In practise this means that as soon as the supplier has visibility over the UPM stock items, the local UPM mill buyer or production scheduler will not need to control the stock replenishment decisions. Supplier will own the replenishment responsibility, and has the freedom to operate within the pre-agreed contractual terms (prices, volumes etc.) Frame supply agreement is prepared on a corporate level by UPM Sourcing Manager, defining e.g. payment terms, delivery terms, prices and other global contract terms. VMI solution is then agreed locally between each mill Buyer and the supplier.

Before implementing the VMI solution between UPM and Walki, a traditional replenishment process was in use, where UPM creates an order to Walki at every step of the supply chain. Eventually this system results that both UPM and Walki end up keeping safety stocks of the same product items. This procedure increases the amount of unnecessary inventory in

the entire supply chain and paradoxically, reduces the level of customer service and results a poor response level. [*SAP Business Maps: Vendor Managed Inventory (VMI)*]

Through the VMI solution, a manufacturer, like Walki, can offer the customer a value added service by performing the replenishment planning tasks. The manufacturer will have increased visibility into the actual customer demand by sharing a system view from the customer inventory (via VMI message). Additionally, the suppliers may occasionally have better decision-support systems in place than the customer has. In the optimal case this will improve customer service level, lower logistic costs, reduce inventory levels and lower resulting sales cost. Due to automatized processing both parties will also improve process cycle times and thus decrease overhead costs. [*SAP Business Maps: Vendor Managed Inventory (VMI)*]

10.1.3 Constrains to the execution of VMI solution: Timely stock bookings

To enable accurate and up-to-date stock information it is required to secure that the stock balances at UPM materials management system are correct. This means that both goods receipts (material booking into stock) and goods issues (stock-outs) have to be made timely. If the UPM stock inventory level information is not up to date, the VMI system message generated and sent to the supplier becomes obsolete. As the GlobalONE solution has just lately been introduced at UPM mill locations, this also includes a significant change management effort among mill end-users.

To enable the timely goods receipt at UPM warehouse, it was agreed between UPM warehouse personnel and Walki that during each material shipment Walki will send UPM receiving warehouse an in-fax message, including the delivery details. To secure this communication the contact information file of Walki and UPM warehouses was updated. As Walki sends out the packing list copy of each shipment to UPM, warehouse personnel has a sufficient amount of time to book the shipment into Global ONE system, before the shipment physically arrives at the warehouse. This way also boking delays resulting from e.g. late Friday afternoon shipments or employee absence will be reduced, as the message triggering goods receipt is received before the actual shipment arrives at UPM. GlobalONE stock balance remains updated and correspondingly Walki is able to see the UPM stock level changes directly after the shipment.

At the other end of inventory booking, the goods issues need to be as timely executed as the goods receipts. To secure this a VMI mill must have portable mobile bar-code reading devices in use. Mobile handhelds were introduced at UPM mills together with GlobalONE.

One of the discovered challenges was that the UPM mill users were not using the mobile devices in a harmonised way at each mill location and there were also some software related issues with the devices. The use of the devices was recognised as training topic and UPM SPS process owners gave the required on-site training to the end-users. Software topics were

resolved during late 2010 between the software manufacturer and UPM IT organisation.

10.1.4 Functionality of the VMI solution in GlobalONE

In order to have the GlobalONE system communicating requested data to the VMI supplier, a pre-requisite is that a data table is created, defining the information that is required to be communicated between the two materials management systems (UPM-Walki). In the system terminology, the data table is called Z-table.

To ensure the correctness of data included in the Z-table, table creation and data maintenance was decided to be in the responsibility of the mill buyer in each UPM mill location.

Following information is required to be included in the Z-table:

- Supplier number
- UPM plant code
- UPM mill storage location
- UPM FO (Framework order) reference
- Material item number
- UoM (Unit of Measure: KG or PCE)
- Min Stock level
- Max Stock level
- Current Inventory value (the only daily changing data)
- Timestamp when the last VMI message was sent

According to the above listed data, the requested SAP program prepares MQ-messages (Message Queue) in specified format. UPM mill, plant and storage location related is important to the supplier, as it enables the supplier to identify correct delivery address in each UPM mill. As the plan is to expand VMI communication practise to all UPM mills, this means that multi-mill-suppliers (like Walki) will receive approximately 20-30 different VMI messages daily from UPM mill locations.

SAP data field MARD-LABST (abbreviation stands for current inventory -value field in standard info tables for SAP Material Management functional module) contains the actual stock balance value which is communicated to the supplier with the other information listed above. [*sapbrainsonline.com, 2011*]

There is a separate message for each UPM mill storage location (for each record of the Z-table). MQ-messages are sent to specified supplier once a day (at 06:00am). Every time when the MQ-message has been sent, the respective timestamp is updated to the Z-table to enable the checking possibility in system communication error situations.

11 VMI PROJECT PILOT

After the technical specification of the VMI solution within the GlobalONE system was defined, the implementation proceeded into mill environment. The project organisation included at this point UPM SPS Process Expert, SRM project manager, mill sourcing managers and also Walki process owner. SRM project provided the steering and control of the VMI project, planning of the implementation schedules was agreed together with SPS process expert. As the project was defined, the discussions were started with the UPM mill sourcing managers, in order to find a suitable mill location to perform the pilot project.

When defining a suitable mill location for the VMI pilot project the following topics were considered:

- Location in Finland (as Walki Pietarsaari supplies packaging material to all Finnish UPM locations)
- Motivation of the mill organisation to commit to the project
- Number of development requests received by SPS process experts
- Complexity of mill area: Some mills have one packaging material location, others having or multiple locations
- Walki supply scope to the mill
- Workload situation and attitude of the of the mill procurement, packaging department and warehouse towards the development project
- Status of the mill in using mobile devices

After evaluating the above criteria and discussion with the mill sourcing managers, it became clear that UPM Jokilaakso mills at Jämsänkoski and Kaipola were the most suitable places for VMI pilot project.

Out of the two locations Kaipola was selected for the VMI pilot, the decision being supported by the positive attitude of the mill organisation. Kaipola had been using an automated ordering system with Walki before the GlobalONE implementation. The workload of the procurement organisation had increased significantly while the old, automatic ordering system could no longer be used in GlobalONE. Other topic that decided pilot for Kaipola was that lately nominated mill buyer at Kaipola had been transferred from UPM SPS organisation, having experience of UPM requisition-to-pay processes. Buyers' SPS working experience and contact network among SPS process experts supported the decision to nominate Kaipola as piloting mill.



Figure 4 View over UPM Kaipola paper mill

11.1 UPM-Kaipola mill, paper machine line 4

UPM Kaipola operates three paper machine lines: PM4, PM6 and PM7. These three lines have an annual production capacity of 710 000 tons. The main products are magazine- (PM6), newsprint- (PM7) and directory papers (PM4 and PM7). The most used raw materials are saw mill chips, recovered paper (RCP) and pulpwood (spruce). Kaipola houses the biggest deinking plant in Finland, “washing” two thirds of the Finnish household recovered paper. [UPM-Jämsä River Mills Presentation 2010]

PM line 4 started operating on March 30th 1961. Newspaper machine 4 was originally manufactured by Beloit and represented the latest technology of its time. The width of the paper line was 674cm and running speed was up to 915 m/min. Capacity of the machine line was up to 120 000 tons per year.

Paper machine start-up was successful and the managing director Juuso Walden was inspired to praise the machine to be the “highest level in the world.” During the first year of operation PM4 produced 59 200 tons of paper.

The first super-calender was integrated to the machine line in 1964, followed by a second one in 1971. The machine line was dedicated to the production of news and magazine papers. After this stage PM4 was dedicated to thinner paper qualities: directory paper. To be able to do this the press- and wire section of PM4 was renewed in 1985.

Drying section, soft-calender and latest technology Optireel-winder were renewed in 1996 and capacity of the machine line was significantly increased. At the same time the complete directory paper manufacturing within the UPM group was concentrated to Kaipola mill.

The latest revision of the wire section was made in 2005 and simultaneously new head-box technology was implemented in the paper machine line. After these modifications PM4 represented the latest technology in the markets, just like when it started in 1961.

During the four decades of operation, PM4 has produced about 5.25 million tons of paper. All that is left of the original technology is in the suction section of the machine line.

Continuous improvement and first class quality have been the bottom line throughout the history of PM4. In 2008 the machine line was awarded by the “Best improver” award in the UPM printing paper division. Looking at the efficiency of the machine it stands out of competition even today.

With regards to the future outlook, new paper grades are continuously designed, for example EcoLite which is already in the commercialisation phase. *[UPM-JokiNet publication 29.03.2011]*

11.2 UPM-Kaipola PM4 packaging department

Kaipola PM4 packaging department is located at the end of the paper machine line. PM4 has two winders that in 2011 produced totally 160.000 tons of paper for further processing at the packaging department.

The packaging department has 11 employees, the work is organised in five shifts, seven days a week. *[Seppo Ruuhijärvi, interview 02.05.2011]*

As packaging is the last operation in paper production, it is also very critical from the customer point of view. It is important that the paper reel is properly packed, to avoid any quality deviations in paper. Beside the quality it is also important that the reel is delivered against correct customer order, in ordered quantity and finally labelled according to the customer specification.

Quality control by packaging department personnel is mostly visual, thus it is critical that the personnel are properly instructed to find and report any products deviating from customer order. Visual control pays attention to reel winding, wrapper gluing and reel end disc attaching (press) processes. Any uncontrolled packaging material folds during winding process could eventually cause quality issues during reel transport, e.g. reel package breaking or allowing humidity to enter inside the packed reel. Firmly packed paper reel is a sign of a quality product for both reel packaging operator and end customer (e.g. printing house).

The main target of PM4 packaging department quality control is to secure customer reel packaging according to the customer specification requirements (during handling, transport and storing phases). The packed reel must be tolerant against humidity and properly labelled (inner marking and other etiquettes). *[UPM Kaipola: Operating manual - PM4 reel packaging, October 2008]*

11.3 Project execution with mill users

As the piloting mill was decided, the next step was to define project organisation within the Kaipola mill. For efficiency reasons the group was

planned to be as compact as possible, eventually involving the following resources:

- Packaging department supervisor
- Material scheduler dedicated to packaging materials
- Mill buyer and
- Procurement process expert

Besides the mill resources, the SPS process expert and SRM project manager were co-coordinating and facilitating the team meetings. Meetings were scheduled every two weeks: one meeting organised online and the second on-site (at Kaipola mill), face-to-face meeting. At the later stage of the project mill group also joined meetings with Walki project members, but in the initial phase this was not required.

After nominating the project group, the task was to select the packaging materials required in the VMI communication. This selection was made by the mill resources, as they have the best visibility and experience over the product items. To limit the total number of items to as low as possible, seldom ordered, low stock turnover (less than once per year) and trial items were excluded. Figure 5 lists the items and stock replenishment parameters that were defined for Kaipola PM4 VMI communication.

Plant: KAI1

Storage location: PAK2

Purchasing doc: 4300003285

Item no	Mat no	Description	Min stock	Max stock	Base unit
10	18566480	REEL WRAP 1200 KPUG/PE/KPUG 220	14,00	22,00	tn
20	18627221	REEL WRAP 1600 KPUG/PE/KPUG 220	10,00	17,00	tn
30	18566486	REEL WRAP 2000 PAINAMATON 220	10,00	18,00	tn
40	18300239	REEL WRAP 2400 KPUG/PE/KPUG 260	12,00	23,00	tn
50	18976021	REEL WRAP 2800 KPUG/PE/KPUG 120/20/120	9,00	18,00	tn

Plant: KAI1

Storage location: PAK2

Purchasing doc: 4300003293

Item no	Mat no	Description	Min stock	Max stock	Base unit
10	18566968	OUTER DISC 980 DUPLEX/PE 280	0,80	2,00	tn
20	18975841	OUTER DISC 1030 DUPLEX/PE 280	0,30	1,00	tn
30	18566970	OUTER DISC 1080 DUPLEX/PE 280	0,30	1,00	tn
40	18566885	OUTER DISC 1130 DUPLEX/PE 280	0,80	2,40	tn
50	18566886	OUTER DISC 1180 DUPLEX/PE 280	1,00	2,40	tn
60	18566973	OUTER DISC 1230 DUPLEX/PE 280	4,00	9,00	tn

Figure 5 Selected VMI material items for Kaipola PM4

After the VMI communication implementation at UPM mills in Finland, Walki will receive messages daily from nine paper mill locations. Some of the mills (like Kaipola) have also more than one packaging material location, creating more data flow for Walki. Thus it was essential that the number of items per storage location was kept in minimum.

As listed in Figure 5, Kaipola users defined in total 11 item lines that should be communicated to Walki on a daily basis. Out of the 11, five items are reel wrappers and remaining six items are reel end discs.

As the delivery performance of Walki had been deteriorating during 2010, the mill users first defined the safety stocks on too high levels. This was however discussed and after the end users understood the system functionality better, the stock levels were adjusted on realistic levels that would enable targeted inventory value reduction at Kaipola PM4 warehouse.

12 COMMUNICATION PLAN FOR THE PROJECT

As in most projects, the communication of the project proceeding was regarded as high priority item. Well organised and timely communication is the best enabler of commitment within the project group and also the key to overcoming the change resistance.

Effective communication includes the following:

- Informing the employees
- Enabling feedback
- Promoting wide-scale consultation

According to Bennis and Carnall communication is a key process skill required from change agents to get others to understand and accept change. Firstly, this requires an ability to communicate clear objectives to the target audience. Secondly, the change manager must be consistent and finally be able to ensure that others understand and are aware of the reasons and intentions of change. [*Colin Carnall: Managing Change in Organisations, 5th Edition, Pearson, 2007*]

The early phase of the VMI system implementation included communication between SPS business process expert and representatives from the UPM IT department. The later mill execution phase included a wider group of employees, and also information that needed to be split into internal and external communication.

12.1 Change management within a project

According to Baca, change is inevitable and a well-managed project changes leads to projects that are on time, on budget, and within defined quality guidelines. Most people tend to think of change in terms of problems or negative consequences, but change can also be good. [*Baca, Claudia. Project Manager's Spotlight on Change Management. 2005. p 1-2.*]

Baca states that there are three different elements to change management.

1. The first element of change management deals with the authority level of the project manager. This person must have the authority to approve and deny changes that impact the project.
2. The second element involves setting up an environment that fosters good change management. It is required to communicate with the entire project team to set expectations on how changes on the project are to be handled.
3. The third element includes setting up a system that helps to determine that a change has been requested. This system also helps to decide if a change should be made and allows tracking the change regardless of whether it is approved or denied. [Baca, Claudia. *Project Manager's Spotlight on Change Management*. 2005. p 2]

According to Baca, projects proceed in the following sequence:

Initiating phase. Initiation is the formal recognition that a project, or the next phase in an existing project, should begin.

Planning phase. This is the largest of all the process phases. Created project plans are the road map for achieving the goals the project was undertaken to address.

Executing phase. While the planning process is the heart of determining project success, the executing process is where the real work of the project actually happens.

Monitoring and controlling phase. This phase involves monitoring the work of the project and taking performance measures to assure that the work performed is on track with the project scope and that the project deliverables are being met. If performance checks show that the project is off course, corrective action is required to re-align the work of the project with the set goals.

Closing phase. The closing process is the one that project managers often tend to skip. Once the project at hand is complete, it's easy to start focusing on the next one. Manager should obtain project sign-off, document lessons learned, and close out a project that's complete? [Baca, Claudia. *Project Manager's Spotlight on Change Management*. 2005. p 112-115]

Change resistance is typically met during the project phases. Managing the change also includes managing the reactions from the employees that are affected by the change. Particularly the persons who feel they have not been part of decision making quite often criticise the project. More than seeing the resistance as purely negative behaviour, it should be considered as a valuable source of knowledge (learning for any future project) and critique of change programmes.

Change resistance is a part of the human nature. If the people's reactions will not be regarded and managed in a proper way, the change process will

be painful and in the worst case will not succeed. Actually the fact is that more company transformation attempts fail than succeed.

Resistance originates from many different sources: people fear for their jobs and organisational position that might be threatened due to the change. New working arrangements (e.g. new data systems, working premises, re-locations etc.) also shake the feel of stability that has been reached in the organisation over long time. Especially for employees that are closing to their retirement age these changes may be difficult to overcome. Younger generation employees are more used to the continuous change, not fearing the change in the same way.

12.2 Communication with the VMI project management

The UPM-Walki VMI project was initiated as a common effort of SRM project member and SPS process expert. The two organisations had different requests in the background, SRM project had chosen Walki as one of the project partner companies and on the other hand SPS process experts continuously received requests from different UPM mill locations to improve and automatize the scheduling process of packaging materials. Summarising these two demands initiated the project to start.

SRM project manager had the UPM Sourcing management “official blessing” to initiate the project. Project sponsors were nominated followed the kick-off meeting that was organised to inform other members of the sourcing management team. SPS process expert was nominated to the project team to steer the technical implementation within the GlobalONE system and to see that the project follows the requisition-to-pay guidelines and UPM business rules.

Communication towards the project management was agreed to be made monthly, in monthly category flash reports. The report summarised the most important proceedings during the month and also initiated potential risks that were to be noted as the project proceeds.

12.3 Communication towards the VMI supplier Walki

VMI project involved Walki already from the starting phase. Similar to the UPM mills requesting for scheduling improvement on packaging materials, Walki had noted same demand at their end. In Finland Walki supplies totally nine UPM paper mills, some mills having more than one packaging material storage place. On Walki’s side this means the need to deal with each location separately, and time had developed several local scheduling and ordering practises that were in use. In practise this caused challenging situations and surprises when e.g. summer workers started at both companies and the usual staff members were not handling the communication process.

The first step was to build up the UPM-Walki ERP system communication. From Walki this involved two persons: supply chain manager and IT

resource. As the stakeholder group was this small, the daily communication (emails, telephone calls) was normally including all members.

The supply chain manager of Walki was nominated as key stakeholder in the VMI project, participating in the steering meetings held every two weeks. One meeting was online, the second face-to-face. Meeting memos were distributed to all the participants, to secure that the decisions made were also documented and followed up.

Later, during the Kaipola pilot project Walki project owner also participated in the meetings with Kaipola mill project group to share the opinions with the mill network.

12.4 Communication towards the UPM Kaipola mill organisation

As it was known that too many projects had failed due to poor and insufficient information towards the mill stakeholders (lack of ownership), it was decided that the mill stakeholder group would be rather over- than under-communicated. Mill sourcing management already participated the early meetings (during the technical system implementation phase) to clarify the motivation topics and technical preparedness of UPM Jokilaakso mills for pilot. It was also good input from the local mill sourcing manager to inform that either of the two mills would be willing to be piloting. As soon as the mill project group was selected, this was naturally informed to the resources.

As the project moved over the system implementation phase, the communication started with Kaipola mill project team. At the same time the pilot project mill level steering responsibility was shifted from mill sourcing manager to the VMI project steering. The tasks that mill project group needed to prepare before the pilot started were clearly informed to the resources. In the beginning the control was organised through two weekly meetings, to collect the basic data for VMI pilot starting phase (required material items and replenishment volumes). A short meeting memo (or email summary) was prepared after every meeting to make sure that discussed topics were documented and followed up. Any possible misunderstandings were clarified at first hand and the communication was kept on practical level. The communication language was Finnish; knowing that at the mill level English was not required to be used. Any feedback from the mill was commented without delay.

After the initiation phase was concluded, the pilot project moved to system testing and mill users were constantly kept in loop about the next steps of the project. After system testing was successfully finished, mill project group was involved in meetings with Walki representatives. For practical reasons these meetings were facilitated at Kaipola mill.

12.5 Communication towards the UPM Sourcing category team

Although the nature of the VMI project was mostly technical (system and requisition-to-pay process related), there was involvement required from global sourcing team as well. Packaging materials are in the responsibility area of direct materials sourcing team, and the respective sourcing manager was involved in the project from the beginning. Sourcing manager was not present in all the meetings, but was informed via meeting memos and emails about the topics that required his attention.

VMI solution requires also contractual commitment with the supplier, and this is the responsibility area of sourcing manager. UPM and Walki already shared a VMI contract model, which had actually not been utilised earlier. As the contract existed, this speeded up the project as supplier negotiations were not required to be started together with the VMI project.

Category sourcing manager was also important person to be noted when the discussions with UPM sales organisation (Supply Chain) were conducted. As the raw material stock was rebuilt at UPM Pietarsaari mill, this needed decision to tie additional capital in UPM stocks. This information is essential for sourcing contract negotiators, as the VMI project finally brings the complete UPM-Walki supply volume under the same agreement scope.

13 VMI PROJECT SCHEDULE

In order to visualise the proceeding of the VMI project, it was decided that a project schedule will be regularly updated. Firstly the project schedule was used to clarify the project plan to the UPM sourcing management. As the approval to proceed with the project was given, the project schedule was built down into a more accurate level, expanding the schedule also to other interest groups like category sourcing, mill sourcing management and IT department.

To control the information flow, it was agreed that project steering group accepts the changes in the plan. The plan (a Powerpoint file) was stored on a UPM server location, enabling constant access to the latest update of the project for all project team members. As the plan was used in several meetings with interest groups, it was easily available at the server when required.

The VMI project involved work of several parties: SRM project, SPS process expert, IT resources, category sourcing, and mill project team – to name a few. Due to this it was agreed that the plan is split into four main headlines: Technical specification, stakeholder communication (mill), roll-out plan and other communication. This structure made the plan easier to follow for the involved parties. Groups were not necessarily depending on each other's work, but it was important to indicate that everybody is part of the plan and the project needs the input of all related resources.

Project schedule – UPM-Walki VMI pilot
- Communication chart (copy of 05.October 2010)

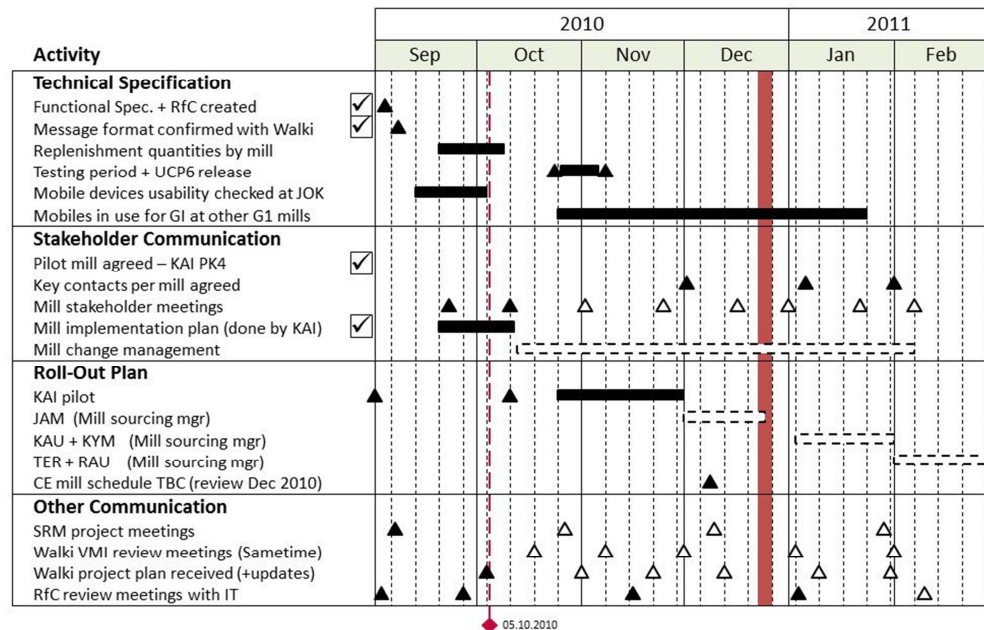


Figure 6 Project plan update, October 2010

At the beginning of the project there was one master plan that was used (illustrated in Figure 6), but at the later project stages it was noted that a separate plan was required for internal, external (Walki) and mill level communication. All these plans were getting more details as the project proceeded and it became too complex to demonstrate the whole project content on one communication chart. The message for different stakeholders became also easier to understand as each chart included only the topics that were of biggest interest to the audience in question.

Project communication chart had another meaning as well: it was to be used when creating a roll-out plan for the UPM mills to enter VMI after the pilot project at Kaipola. Especially the internal, mill level plan was clearly identifying the project sequence, required steps for project preparation and execution at mill level. After successful piloting, it was important that the VMI communication was to be established at other UPM mills in a similar way as Kaipola. This is the only way to avoid creation of any local practises in the communication to Walki.

14 PROJECT PLAN AFTER THE PILOTING PROJECT IS CARRIED OUT

In the initial phase of the VMI project the plan was that the same project team would bring the VMI communication system to all Finnish UPM mills. Walki also supplies Central European mills, but mostly from Walki's Central European mill locations (Steinfurt in Germany and Jatne in Poland). The intention was to expand the VMI practise to Europe as well, but this was to be decided after the Finnish UPM mills projects due to the fact that the data systems that Walki used were not fully harmonised within all production units. This was the reason why European implementation was to be decided at later stage.

As the plans typically change, the scope of introducing the VMI to UPM Finnish mills was changed during the Kaipola pilot. UPM Sourcing vice president made a decision that after the Kaipola pilot is finished; the remaining Finnish mills implementation would be steered by direct materials category sourcing. After this decision it became obvious that pilot project group needs to make proper hand-over material for category sourcing, in order to enable smooth transition of the implementation project.

The steering responsibility change also included risks, as the only involved person from category sourcing had been the sourcing manager. His role had been mostly to secure the contractual obligations, not involved heavily at the practical implementation work with the systems or with mill stakeholders. On the other hand the decision made sense, as the implementation responsibility clearly helped the sourcing category to be closer to the actions at the supplier and mill sourcing level.

During the Kaipola pilot, VMI project group received a request to come and present the project to UPM Kymi mill, located at Kuusankoski, Finland. Kymi had been in contact with Kaipola mill people about the pilot project and requested to be the next mill getting the Walki VMI communication in use. For the project this was positive news, as in many cases well proceeding projects are considered positive from the mill user perspective. As a result, a meeting was held with Kymi stakeholders and it was agreed that the VMI implementation would continue at Kymi. The mill group was also left with a task list to be prepared before the project arrives at the mill.

15 VALUE STREAM MAPPING

In order to clarify the benefits that both UPM and Walki will realise with VMI solution, a value stream mapping (VSM) study was conducted. Value stream mapping compares the supply and scheduling process before the VMI communication for packaging materials was taken into use at UPM Kaipola mill against the current scheduling process where VMI is not utilised at all (call-off ordering process).

One aim of vendor managed inventory is to integrate key customers in supply chain planning. In the case between UPM and Walki, the main driver for VMI implementation were the high transaction costs for order processing and production planning. On the other hand the material scheduling process at Kaipola mill was causing too high workload for the production managers, as the inventory control was performed outside GlobalONE system by production manager, who regularly went into packaging material storage area and manually checked the inventory levels. As GlobalONE was lately introduced, this task was recognised to be made via the system, releasing production manager free for other duties.

15.1 Value stream mapping (VSM) - a Lean Manufacturing technique

Process waste elimination is one of the most effective ways to increase the profitability of any business. Processes either add value or waste to the production of a product or service. "The seven wastes" is a tool to further categorize "muda" (non-value adding waste in Japanese). This technique was originally established under direction of Toyota's chief engineer Taiichi Ohno (who later became executive vice president of Toyota) and it is the core of the Toyota Production System, also known as Lean Manufacturing. To eliminate waste, it is important to understand exactly what waste is and where it exists. [*The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003*]

Manufacturing companies create value stream maps to identify the unnecessary waste in production processes. Maps are also used to help companies to eliminate the waste from the process. Following Taiichi Ohno's learning's from 1940's, value stream mapping was later on popularised by the book Learning to See (The Lean Enterprise Institute, 1998), by Rother and Shook.

Taiichi Ohno defined seven types of waste that describe all activity that adds cost but not value. In an enterprise that calls itself lean, these seven types of "muda" are the target of an endless waste elimination process. [*Gemba Research: The 7 Wastes of Production*]

15.2 The seven process wastes by Taiichi Ohno

1. Overproduction

Overproduction takes place when an item is manufactured before it is actually required by the customer. This is high cost to a manufacturing plant because it prohibits the smooth flow of materials and degrades quality and productivity. Overproduction (also referred as "just in case" production) creates excessive lead times, results in high storage costs, and makes it difficult to detect defects. [*The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003*]

2. Waiting

Whenever goods are not moving or being processed, the waste of waiting occurs. Typically more than 99% of a product's life in traditional batch-and-queue manufacturing will be spent waiting to be processed. Much of a product's lead time is tied up in waiting for the next operation. This is usually resulted by poor material flows, too long production runs, and too great distances between work centres. [*The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003*]

3. Transporting

Transporting of the product between processes is a cost which adds no value to the product itself. Too many steps in product movement and handling are potential causes of damage to the product and are an opportunity for deteriorating quality level. Material handlers of the company must transport the materials inside the facility, resulting in another organisational cost that again adds no value to the customer. [*The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003*]

4. Inappropriate processing

Many organisations operate with expensive, high precision equipment in processes where simpler tools would be sufficient to satisfy the requested quality level. This often results in poor plant layout because preceding or subsequent operations are located far apart from each other. In addition they encourage high asset utilisation (over-production with minimal changeovers) in order to recover the high cost of the production equipment. [*The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003*]

5. Too high inventory

Work in progress (WIP) is a direct result of overproduction and excessive waiting times between the production steps. Additionally, excess inventory tends to hide problems on the plant floor, which should be identified and resolved in order to improve operating performance. Excess inventory levels increase lead times, consume productive floor space, delay the identification of problems, and inhibit communication. [*The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003*]

6. Unnecessary or excess motion

This type of waste is related to ergonomics and can be identified in all instances of bending, stretching, walking, lifting, and reaching. These are also health and safety issues, which in today's society are becoming an increasing problem for many organisations. [*The 7 Manufacturing Wastes: 7*

Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003]

7. Defects

Quality defects that result in rework or scrap of material are a big cost to companies. Associated costs include inspection inventory, re-inspecting, production rescheduling, and capacity loss. In many organisations the total cost of defects is often a significant percentage of total manufacturing cost. *[The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003]*

If a company strives to become a world class organisation or lean enterprise, the first step in achieving that goal is to identify and reduce the seven wastes. As Toyota and other world-class organizations have come to realise, customers will pay for value added work, but never for waste. *[The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003]*

15.3 Value stream mapping process

One commonly used way to recognise waste in processes is to conduct a value stream study. The first step in value stream mapping process is to draw a current state map (also referred as present state value stream map, PSVSM) which is done by gathering the process information on the shop floor. This is the way to collect the information that is needed to develop a future state (also referred as future state value stream map, FSVSM), which is the most important document in VSM process. Future state ideas mostly come up while mapping the current state. *[Rother, Mike, Shook, John. Learning to see : Value stream mapping to create value and eliminate muda. 1999. p 5]*

After the stage maps have been created, the final stage of VSM is to prepare and begin actively using implementation plan that describes how the future stage is planned to be achieved. To follow the idea of simplicity, the implementation plan should be expressed on a one-page document. As the future state finally becomes reality in the company, a new future-state map should be drawn. This is the way continuous improvement is expressed at the value stream level, an existing future state map must always exist. *[Rother, Mike, Shook, John. Learning to see : Value stream mapping to create value and eliminate muda. 1999. p 5]*

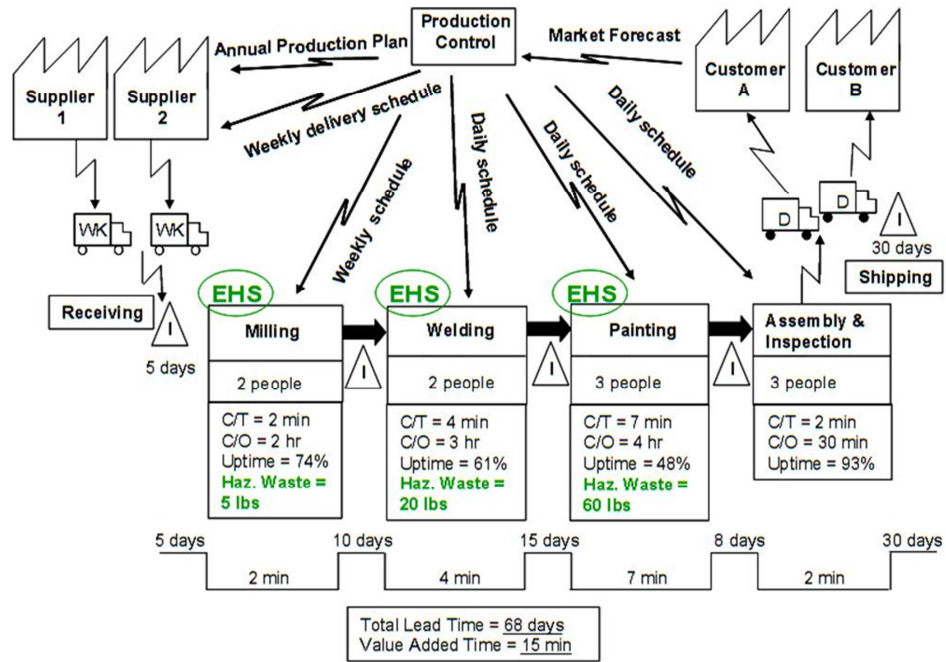


Figure 7 Example of value stream map [US EPA Lean and Environment Toolkit, 2010]

Value stream map uses typically seconds as time units to identify cycle times (takt times) and available working times. There are also standard symbol libraries (as referred in Figure 8) that are used to describe different process phases and to illustrate e.g. locations where the inventory is accumulated in the process. [Rother, Mike, Shook, John. *Learning to see : Value stream mapping to create value and eliminate muda*. 1999. p 5]

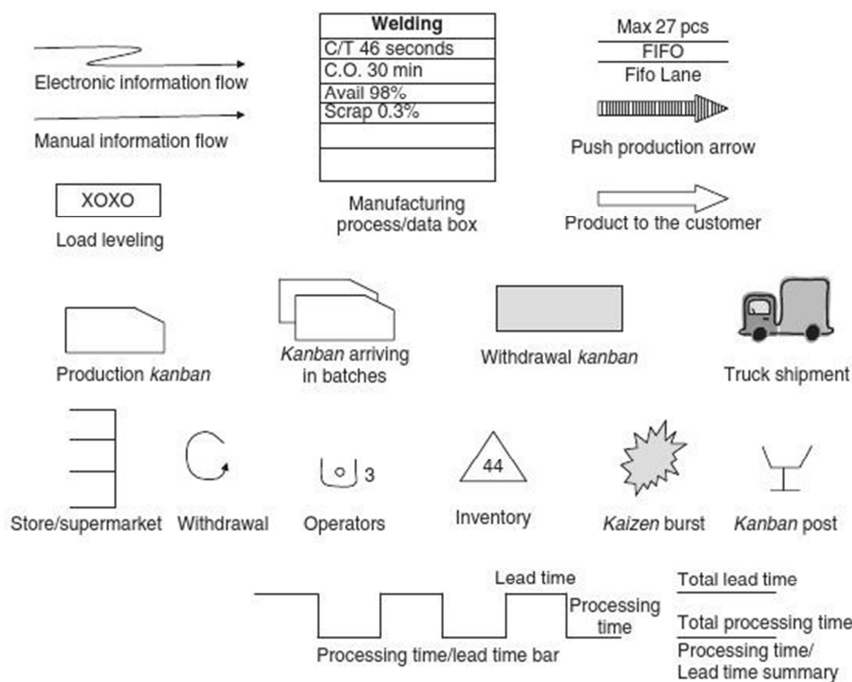


Figure 8 Typical value stream mapping icons [Wilson, Lonnie. *How to Implement Lean Manufacturing*, 2009. p 129]

15.4 Value stream mapping between UPM and Walki

The VSM study targets to identify the implications that VMI communication will have on number of employees engaged in the packaging materials scheduling process. The VMI system saves UPM from time-consuming routine work and releases resources to develop other production areas.

Inventory savings were also considered as one important development area, preliminary study made for the project yielded 100.000€ savings expectation [Kimmo Ståhlberg, *VMI business case -material, 2010*]. Inventory savings were not included in the study because proper following of the costs would have required a longer examination period. Inventory is expected to reduce when the planning nervousness between UPM and Walki reduces, creating trust against Walki delivery schedules and reducing unnecessary safety stocks at UPM mills.

Moving the material scheduling responsibility to Walki was one important target of the VMI system implementation. Additionally, UPM seeks to realise process cost savings achieved through GlobalONE system implementation. Generally it was expected that the number of operations within the requisition-to-pay process will be decreased and many of the manual operations can be handled through system communication.

At the supplier end, Walki will gain harmonised scheduling practise across UPM mills in Finland. This reduces planning errors that result from poor communication (e.g. lost faxes, mistakenly sent emails and other human errors) and eventually decreases the number of emergency orders from UPM.

The VMI communication between the two companies will provide Walki with real-time information about the raw material needs and inventory status of UPM, enabling Walki to deliver products to UPM without separately issued orders. Simultaneously, the number of invoices will significantly decrease as collated invoices will be taken into use (one or two invoices monthly, instead of invoicing every shipment separately).

Raw material scheduling between Walki and UPM Pietarsaari mill will stabilise due to increased communication by the customer. Similar to UPM, fewer order-to-delivery process steps will decrease the employee involvement in the operations, releasing the resources for other tasks. The raw material supplier can efficiently plan its production on the basis of real-time information about customer needs.

To be able to follow up the progress in the supply chain, specific process measures need to be created to identify changes that result from VMI communication. These measures were defined in co-operation with Walki and Kaipola mill representatives. Most important measure was the value of stock items before and after the VMI implementation. Walki was also measured by how accurately the UPM items stock balances remained within the defined min and max tolerances.

15.5 Value stream study before implementing VMI communication

To illustrate the call-off ordering system that was in use for UPM Kaipola packaging items prior to the VMI implementation, a process chart defining the major steps in requisition-to-pay process was defined. Figure 9 illustrates the study.

UPM - Walki value stream study – Present state value stream map (PSVSM)

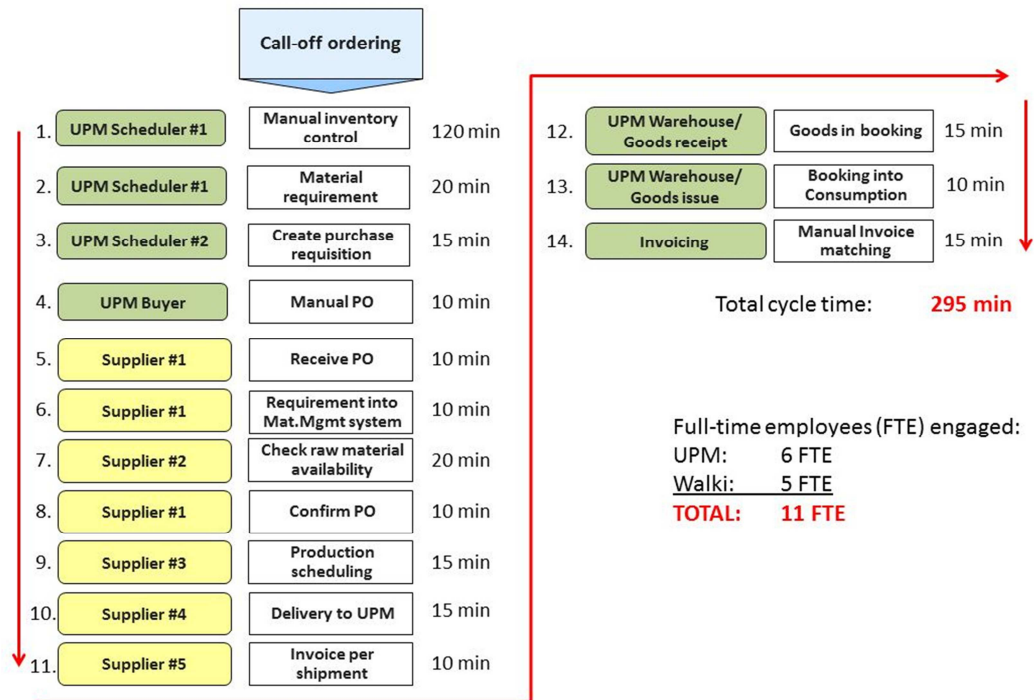


Figure 9 Value stream (PSVSM) before the VMI communication is implemented

As stated in Figure 9, the first four steps of the process are performed at UPM production area, while the supervisor is collecting the item level data in the material storage area. Supervisor makes physically a tour in the warehouse to check each item for replenishment needs. If some of the items are below replenishment level, supervisor collects the data and forwards this to the material scheduler who prepares purchase requisition to the mill buyer. The buyer then generates the requisition as purchase order that is then sent to the supplier.

The purchase order arrives at Walki, where sales department person is handling the order and putting the material requirement into materials management system. The system then checks the raw material availability and depending on the result the planner adds the requirement in the production system. After this the UPM purchase order is confirmed with quantity and delivery time information. The confirmation is sent to UPM Buyer who then confirms the order in UPM system.

After the production at Walki is finished, the material is packed and sent to UPM warehouse for goods-in booking. Finally the material is booked to the consumption at UPM. Additional to the earlier described process, Walki prepares invoice and sends that for UPM Finance department for

processing. After Finance department finds a matching shipment for the invoice, it can be processed and payment transaction is released.

As Figure 9 shows, there are totally 14 different steps in the requisition-to-pay process, and most of the steps are manually handled. Each step takt time is also estimated in the calculation, giving total cycle time of 295 minutes for the process. Some of the process steps can be processed by the same persons, but it is estimated that the call-off ordering process engages six employees at UPM and respectively five employee resources at Walki.

15.6 Value stream study after implementing the VMI communication

Process described in Figure 10 illustrates the requisition-to-pay process after the VMI system is implemented. Call-off ordering is changed to VMI process, where a framework order is created to Walki. Framework order defines order limits for each of the packaging materials, and Walki replenishes the materials according to the defined min-max levels, using the framework order as order reference. This method reduces the number of processed purchases orders, and respectively the number of generated invoices.

According to value stream mapping process, the VMI process chart describes the future state of the process.

UPM - Walki value stream study – Future state value stream map (FSVSM)

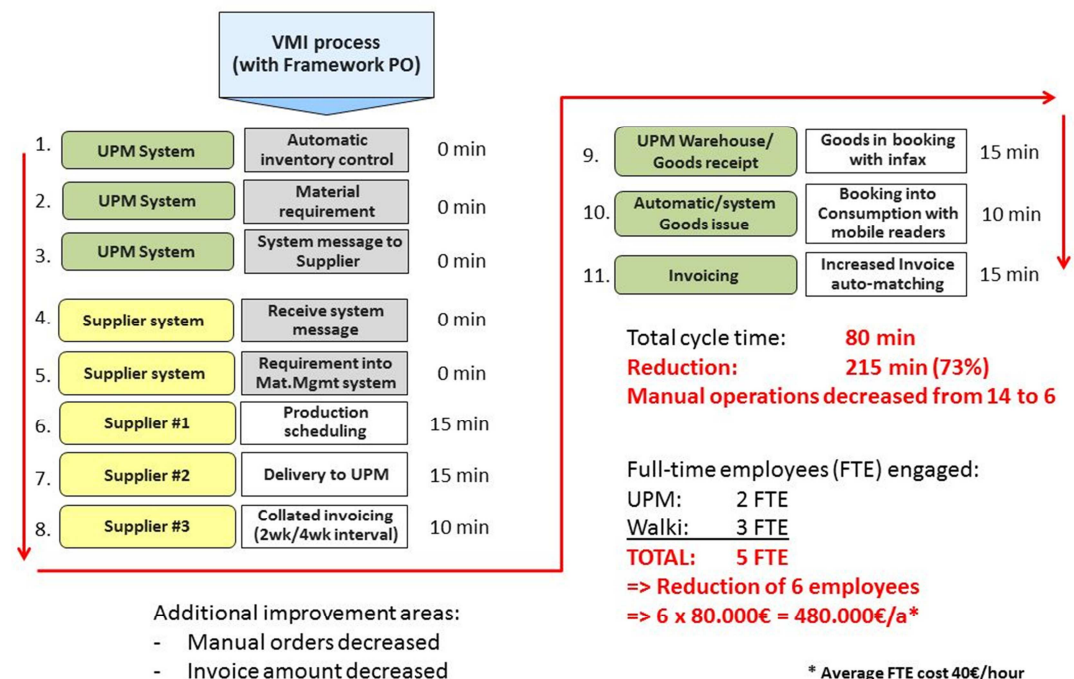


Figure 10 Value stream (FSVSM) after the VMI communication is implemented

Figure 10 illustrates the comparison to the current state process chart, described in Figure 9. As the system-to-system communication is in use, the automatic inventory control takes care of the demand definition, which

formerly was done manually by the UPM supervisor. Also material requirement is generated and sent to Walki materials management system automatically. Therefore, first three process stages require no manual involvement at UPM side.

As the inventory levels are communicated to Walki system, the first required manual operation at the supplier side is the production scheduling. Delivery to UPM also requires manual intervention due to the processing of shipping and invoice documents. Total number of engaged employees is however decreased from the call-off processing mode.

As the material is shipped to UPM, the goods-in booking has already been made into the UPM system based in the in-fax information. Based on this information, Walki will receive updated UPM stock level information already on the following day, when the shipment is physically reaching UPM premises. Booking into consumption is made with mobile readers, having direct connection to the GlobalONE system, reducing inventory value instantly, without manual intervention in the material booking.

Invoice handling is reduced in the system as only one framework order reference is used and invoices are collated, either in two- or four-week intervals. To reach as high as possible three-way-matching efficiency, it is essential that Walki shipping notes information matches with invoices.

The calculation shows that total requisition-to-pay cycle time between call-off ordering and VMI ordering process reduces by 73%, from initial 295 minutes to 80 minutes. What is even more impressive is that the number of employees engaged in the process reduces from eleven to five persons. According to a calculation based on 40€/hoursalaried employee this gives saving of 480.000€ in a year (on one storagelocation). Manual process steps are reduced from fourteen to six steps.

Summarising the results, it can be said that clear reductions are reached on every calculated process measure, added by the fact that the savings are realised at both UPM and Walki. This result emphasises the true benefit of VMI process implementation.

16 CONCLUSIONS

The main question this thesis answers is how to improve efficiency in the supply chain via implementing VMI communication between UPM and Walki ERP systems. Thesis work clarifies the savings potential that two corporations can achieve via reduction in process costs, resources, and capital tied in inventories (WOC). For UPM it is also important to see how lately invested ERP system (GlobalONE) can bring savings to the company through harmonised requisition-to-pay processes. The thesis also describes how the supply chain planning nervousness is created and more precisely, how the nervousness can be reduced via VMI communication.

The empirical part of the study relates to a UPM VMI piloting project carried out in latter part of 2010. On the theoretic part project and change management topics are studied with references to the bibliography. These findings are then related to the actual implementation project that was carried out at UPM Kaipola mill. Change management issues were handled with care during the project, as the UPM project responsible persons had earlier experience of conducting change processes in large organisations.

The pilot project result of UPM Kaipola mill proves that major project management set-backs were avoided during the pilot, but there is always room for improvement when considering the project outcome and feedback received from the project organisation after the pilot.

One intention of the study was to analyse how the project implementation is carried out in a large process industry company like UPM, with several challenges that are caused by wide contact surface with the stakeholder groups. At the beginning of the VMI implementation project end-to-end thinking regarding the total supply chain had to be reconsidered, while it became obvious that also the sales organisation (UPM Supply Chain) plays an important part regarding the success of the project. In the initial phase, the project group mostly concentrated on the sourcing activities and technical set-up of the VMI communication, almost putting aside the fact that the VMI operations of Walki will not succeed if the raw material supply is not properly considered. After the UPM sales organisation representative was taken into project group this part of the project work was handled well.

As with many VMI implementation attempts, the benefits are not as clear to the supplying company as those are for receiving company. Due to this, the motivation and commitment level within the companies is not the same and project outcome is in most cases not successful. UPM is a remarkable customer to Walki, but only the turnover between the companies does not guarantee the success if the resources working on the project are not fully committed to the project. In the Kaipola pilot project UPM had clearly more resources committed to the project as Walki, but on the other hand there is a significant difference in the size of the two companies. As Walki had earlier experience of VMI communication with its customers, the resources nominated to the project were effective. The only challenges were faced when the resources needed to be travelling due to other duties and nobody could take responsibility in the UPM piloting project. This caused eventually about one to two weeks delay in the project schedule.

The VMI pilot started with a technical platform specification in the UPM GlobalONE ERP system. This was made before the pilot project was started, to enable as short as possible implementation time for the mill end users, avoiding frustration effect during the project. As with many IT projects, also the VMI communication system testing and start-up was delayed by approximately four weeks' time. The delay was, however, technically well justified and connected to other, higher priority system changes in the company ERP environment.

The result of the thesis study is a value stream mapping –study (VSM), which materialises the savings achieved via VMI communication, and finally answers the research questions towards UPM. The VSM-study was made as a “desk-drawer” –exercise, because it was not conducted in the real production environment as a profound VSM study would be. As the author of thesis was working as requisition-to-pay process expert during the VMI pilot project, the VSM study figures are very close to the actual. The accuracy of the takt times in the study were also confirmed with the key stakeholders. In this respect the study result can be regarded as good baseline for further VSM investigation that has been planned by UPM SRM project team.

Results achieved in the VSM study indicate that UPM as the customer company is able to reach cost savings in all the main areas that were considered for development:

- Requisition-to-pay process time reduction
- Scheduling process is harmonised and follows the UPM business rules for requisition-to-pay process
- Less engaged resources in the process
- Inventory cost reduction (TCO, unnecessary safety stocks)
- Planning nervousness reduction, reduced emergency orders
- Less manual ordering, reduced invoice amount and handling
- No manual forecasting
- VMI system can be extended to any supplier or material group
- Clear system instructions for mill end users have been created

Requisition-to-pay process time reduction of 73% can be considered as remarkable change. Also automatized operations reduce the head-count in the process from eleven to five resources, which already generates savings that are remarkable for any production company. In case of UPM the first wave of VMI system implementation will concern the Finnish paper mills. In total this means nine paper mills and eleven packaging material storage places. Effect on the resource allocation is therefore high.

Also Walki as supplying company reaches benefits from setting up VMI communication with UPM:

- Reduction in planning nervousness (less emergency deliveries)
- Harmonised scheduling process from all UPM locations
- Performance increase: Gaining back the reputation as reliable supplier towards UPM mills
- Resources engaged in the process reduced
- Inventory cost reduction (TCO, just-in-time raw material shipments and reduced waiting times)
- Improved efficiency in production due to the improved planning efficiency and transparency in customer demands
- Less invoice and order handling

Summarising the outcome, there are almost similar outcomes resulting of the VMI system implementation for both companies, which generate the motivation to work and develop the system further. It was also worth noticing that as the pilot project proceeded, the VMI project team already received requests from other UPM mills to start new roll-outs of the system. As it was decided at the UPM sourcing management, the same project group will not continue implementing the VMI solution at other mills; this will be the responsibility of respective sourcing category.

As the VMI pilot was carried out between UPM and Walki, it can finally be concluded that according to the presented results, VMI solution is an effective way to cut costs in any production company. Mostly for part manufacturing environment developed lean manufacturing theories (e.g. Toyota Production System, TPS) can be well referred to and found correlating also in a modern process industry environment, a company like UPM.

SOURCES

UPM Corporate communications: UPM Annual report 2009

UPM Corporate communications: UPM Annual report 2010

UPM Financial statements release 2010. www.upm.com (accessed on 12.03.2011)

UPM GlobalONE project education materials, 2008-2010

UPM-Intranet, 2011

UPM-Jämsä River Mills Presentation 2010

UPM-JokiNet publication, 29.03.2011

Walki Group presentation 2010. www.walki.com (accessed on 19.2.2011)

Walki@Reel and Walki@Disc product brochures 2010. www.walki.com (accessed on 20.02.2011)

Häkkinen, Kai, Hemilä, Jukka, Uoti, Mikko, Salmela, Erno, Happonen, Ari, Hämäläinen, Harri, Siniluhta, Eero, Nousiainen, Jukka & Kärkkäinen, Mikko: VMI teollisuudessa. Teoriaa, teknologiaa ja sovelluksia [VMI in industry: Theories, technology and applications]. Espoo, 2007. VTT Tiedotteita - Research Notes 2406. 142 pages

Hines, P., Lamming, R., Jones, D., Cousins, P. & Rich, N.: Value Stream Management - Strategy and excellence in the supply chain. Prentice Hall, London, 2000

Vendor Managed Inventory.com: www.vendormanagedinventory.com (accessed 05.03.2011)

Kauremaa, J., Småros, J. & Holmström, J.: Empirical Evaluation of VMI: Two Ways to Benefit. NOFOMA publication, 2007

Lean Sigma Manufacturing Green Belt –programme material, UPM Raflatac, 2010. Smallpeice Enterprises Ltd. www.smallpeice.co.uk, (accessed on 05.03.2011)

McKinsey&Company information, 2011. www.mckinsey.com, (accessed on 06.03.2011)

SAP Business Maps: Vendor Managed Inventory (VMI), SAP AG, 2008. www.sap.com/solutions/businessmaps (accessed on 12.03.2011)

sapbrainsonline.com, 2011. (Accessed on 12.03.2011)

Kaipia, Riikka. Supply chain coordination – studies on planning and information sharing mechanisms. Dissertation, Helsinki University of Technology, Laboratory of Industrial Management, Doctoral dissertation series 2007 / 2, Espoo, 2007

Burton, Terence T., Boeder, Steven M. Lean Extended Enterprise: Moving Beyond the Four Walls to Value Stream Excellence. J. Ross Publishing, Incorporated, 2003

Liker, Jeffrey: Toyota Way. McGraw-Hill Professional Publishing, 2004

Rother, Mike; Shook, John. Learning to see: Value stream mapping to create value and eliminate muda. Brookline, MA: Lean Enterprise Institute, 1999

The 7 Manufacturing Wastes: 7 Wastes Muda Article on the Seven Wastes of Lean Manufacturing, August 29, 2003. www.emsstrategies.com (accessed on 25.04.2011)

Baca, Claudia. Project Manager's Spotlight on Change Management. Sybex, Harbor Light Press, 2005

UPM Kaipola: Operating manual - PM4 reel packaging, October 2008

Seppo Ruuhijärvi, UPM Kaipola PM4 superintendent: Interview on 02.05.2011

Kimmo Ståhlberg, SRM project manager: VMI business case -material, 2010

Web-site summary:

<http://www.upm.com>

<http://www.walki.com>

<http://www.vendormanagedinventory.com>

<http://sapbrainsonline.com>

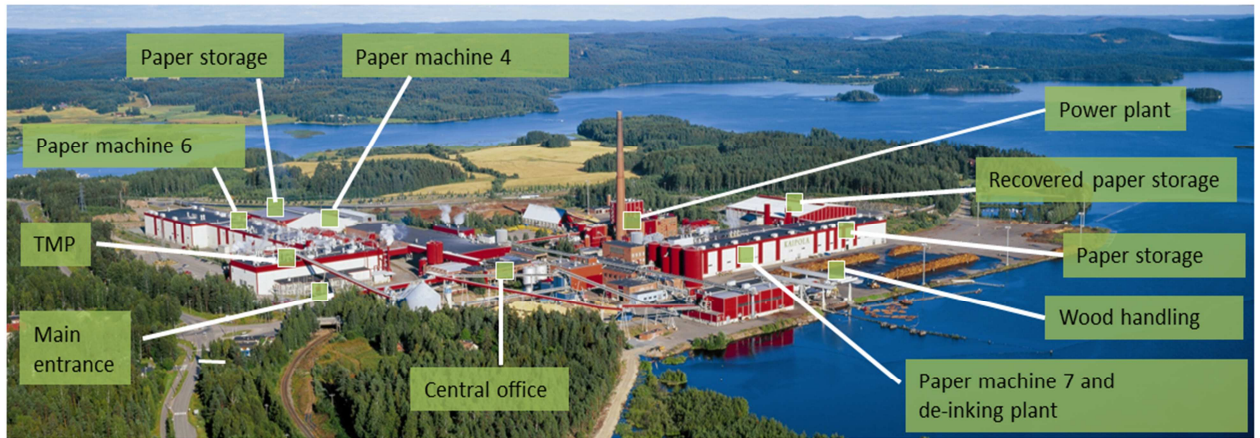
<http://www.sap.com/solutions/businessmaps>

<http://www.emsstrategies.com>

<http://www.smallpeice.co.uk>

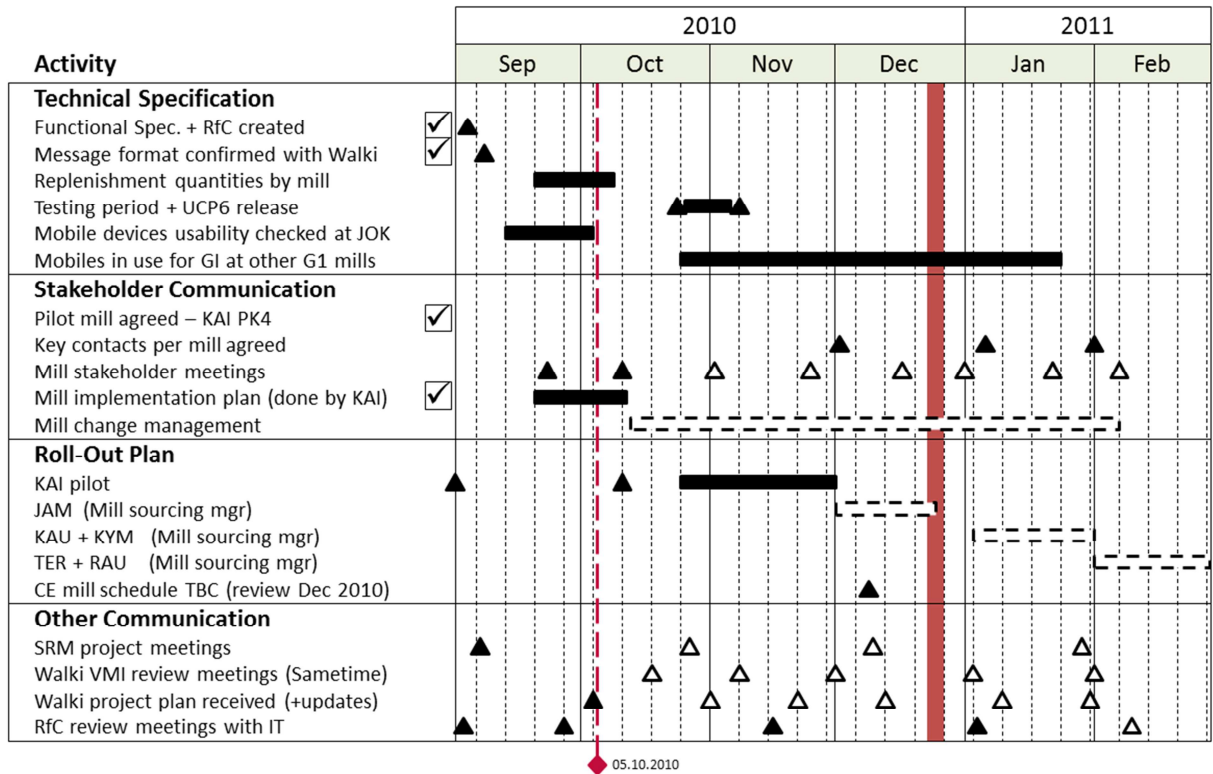
<http://www.mckinsey.com>

UPM, JÄMSÄ RIVER MILLS - KAIPOLA

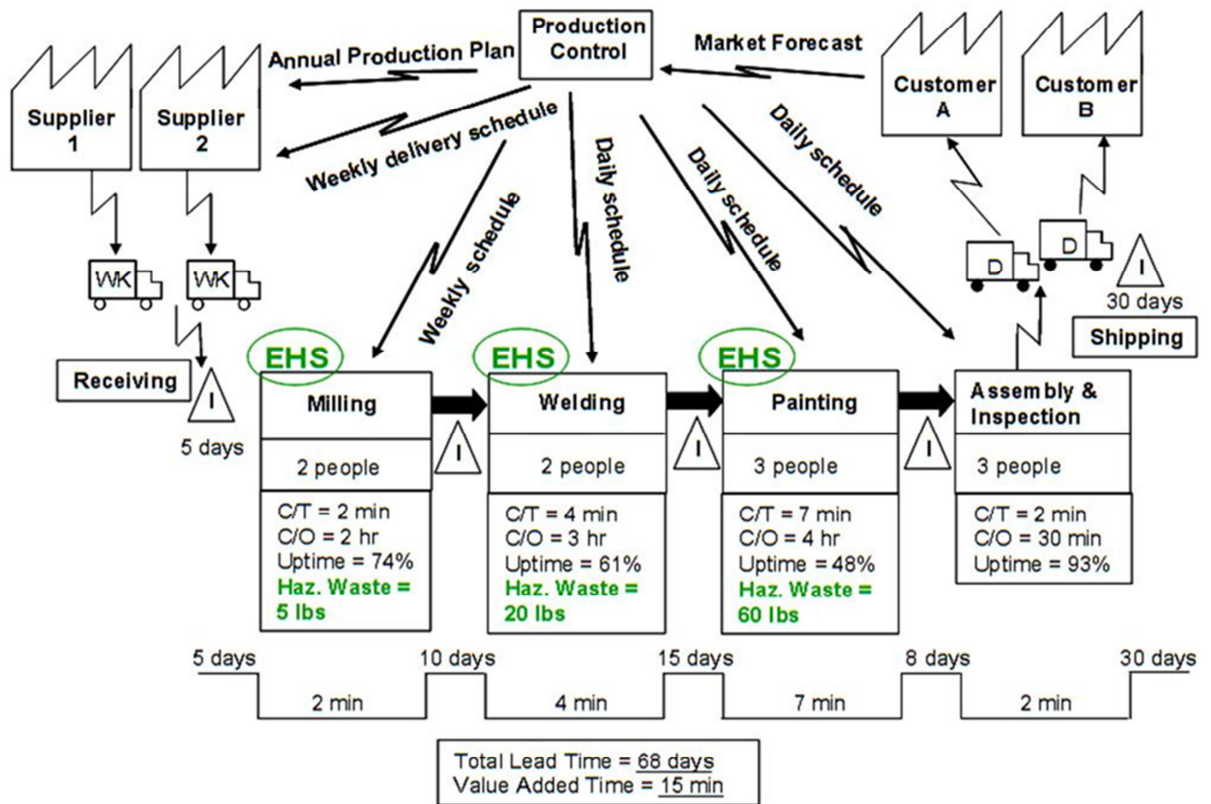


VMI PROJECT SCHEDULE

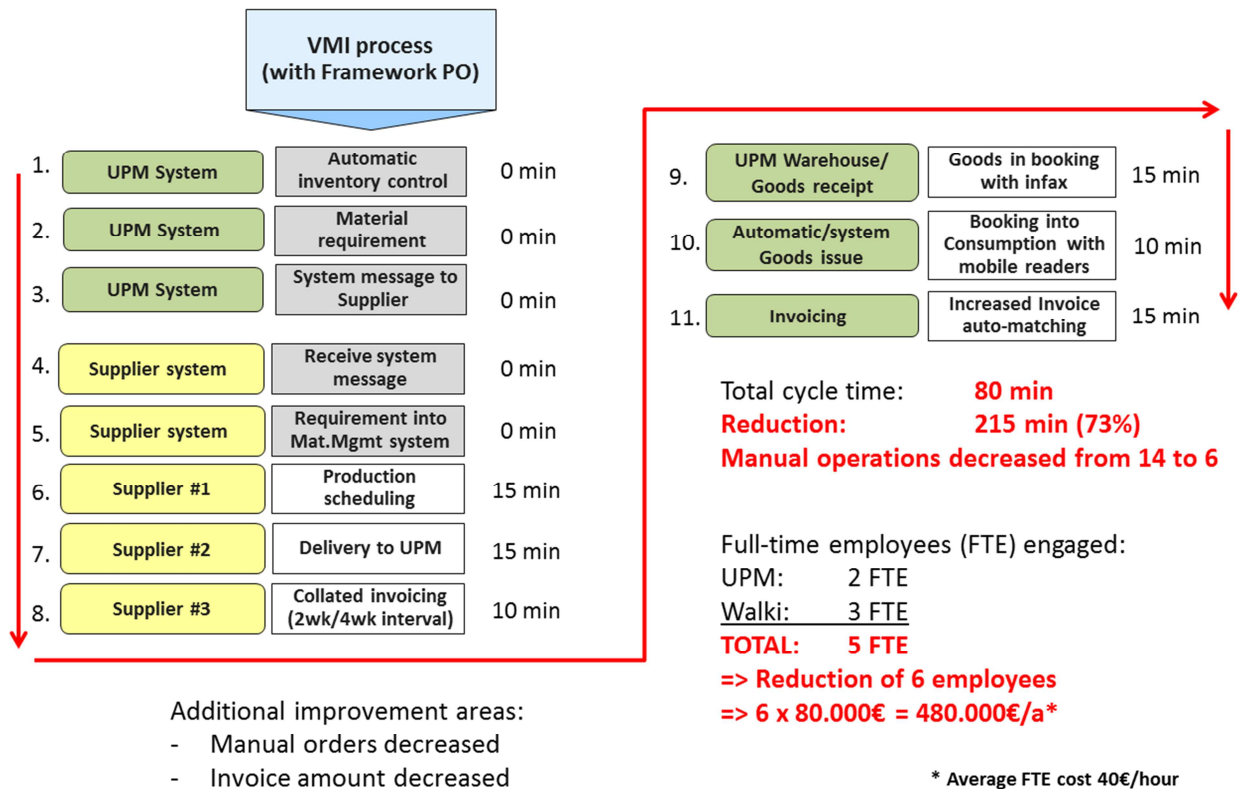
Project schedule – UPM-Walki VMI pilot
- Communication chart (copy of 05.October 2010)



VALUE STREAM MAP - EXAMPLE



UPM-WALKI VALUE STREAM STUDY – FUTURE STATE MAP



KEY FINDINGS AT CUSTOMER AND SUPPLIER COMPANIES

Key findings at Customer and Supplier

At UPM (Customer company)

- Requisition-to-pay process time reduction
- Scheduling process is harmonised and follows the UPM business rules for requisition-to-pay process
- Less engaged resources in the process
- Inventory cost reduction (TCO, unnecessary safety stocks)
- Planning nervousness reduction, reduced emergency orders
- Less manual ordering, reduced invoice amount and handling
- No manual forecasting
- VMI system can be extended to any supplier or material group
- Clear system instructions for mill end users have been created

At Walki (Supplier company)

- Reduction in planning nervousness (less emergency deliveries)
- Harmonised scheduling process from all UPM locations
- Performance increase: Gaining back the reputation as reliable supplier towards UPM mills
- Resources engaged in the process reduced
- Inventory cost reduction (TCO, just-in-time raw material shipments and reduced waiting times)
- Improved efficiency in production due to the improved planning efficiency and transparency in customer demands
- Less invoice and order handling