The production processes of a pressure parts manufacturer

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SAVONIA UNIVERSITY OF APPLIED SCIENCES **THESIS**
Abstract

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Abstract

The object of this thesis was to model and document the production processes of Warkaus Works Oy's production lines. Based on renewed process charts, production travelers were renewed too. This final thesis is part of the LEKA project, which continues after this thesis is completed. The third object of the thesis was to find out problems occurring by external reasons. This part affiliates to the next phase of the LEKA project.

The research part of this thesis was carried out by getting familiarized to the production lines, the company's ERP system and by interviewing managers, production supervisors and production workers. Information was collected from literature based on this topic and from the company's documents, Intranet and general guidelines. The processes were modeled with the MS Visio software and production travelers were made with the ERP software.

Outcome for this thesis were the eight completely renewed individual process charts, located on Intranet, where everybody, with access, can use them. All the charts exploit the 200 different guidelines and production procedures, which can be found from company's Intranet. Based on renewal, the production travelers were standardized to each line with specific requirements. This lead to more specified and simplified working phases.

All the material, which are introduced in this final thesis are censored completely due to the confidentially agreement between the Savonia UAS and the commissioning company. This includes the original charts, renewed charts, original production travelers and renewed travelers. The examples, which are showcased in the thesis, are just for showing the basics and the differences between original and new.

Keywords
process modeling, diagram, traveler

~~Confidential~~ / Public

Dedication

This final thesis was done to Warkaus Works Oy at Varkaus. I want to say thanks to the personnel at Warkaus Works for the support and help. Especially for the CEO Juha Valaja, Project Department Manager Jarno Palviainen, Production Manager Jorma Peiponen, Quality Manager Kalle Holopainen and the production supervisors. Also thanks to Senior Lecturer Jarmo Pyysalo and Project Manager Petteri Heino with their guidance and support this thesis was that much better. Biggest support, of course, came from home. Thank you – baby!

Varkaus 16.05.2012 _____

Topi Piispanen

Terminology and abbreviations

Input	Information and material, which is needed for execution of a process.
Output	Is information and material, which is generated as a result of a process
ERP	Enterprise Resource Planning. Integrates company's different functions together. For example production, distribution, material handling, storage and bookkeeping.
Vaihemalli	Zero-version of the working phases, which are related to the production processes.

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1 Introduction

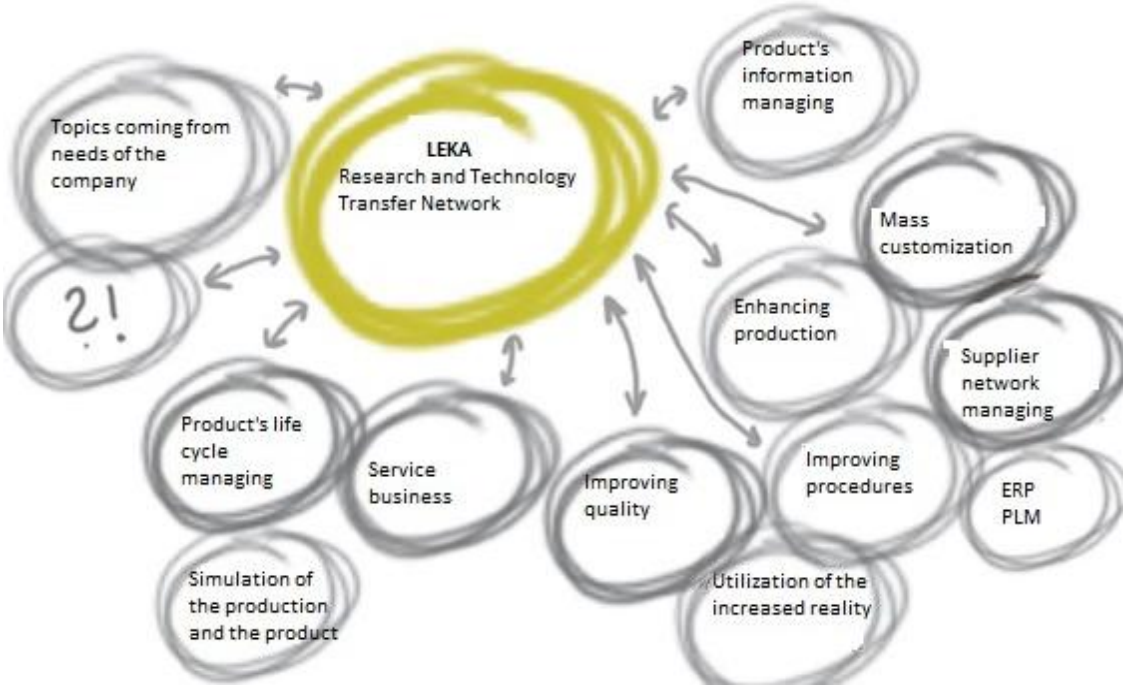
The first part of this thesis was to update the process diagrams to a modern day and second part was to standardize the manufacturing travelers in Warkaus Works Oy. Now the company had opportunity to decrease faults in the document circulation to the end customer and human errors in the production line. Rule was that the documents had to be at the end customer before the actual part. End customer has every right to deny this part, because without the papers, the part is unofficial. Enhancing document circulation and decreasing errors is the best way to increased productivity. Along with the standardization of the production travelers, the working phases are now described in more detailed manner. This helps new guys in the production understand the production itself better or experienced guys to fresh their memory. This again leads decreased errors. The purpose of this project was to describe the processes of the most important and most often produced parts in Warkaus Works Oy. The company has four different manufacturing lines and each line has its own supervisor of work. Due to four different supervisors there are also four different types of manufacturing travelers. After the process documenting was completed, the standardization of travelers began. This way the different production phases were described in more detailed manner. The third part of the thesis was to find out problems, which occurred due to external sources. This part affiliates to LEKA-project, which continues after this thesis work.

The thesis starts with an introductory part of the commission company. The next section, chapters 2 and 3 is the theory part. The theory part includes introduction to basic concepts of processes, how to document, model or draw the processes and tools. The last part, chapter four, will concentrate to the practical work, with introduction of the present state, the renewal of the process charts, standardization of the travelers, problems occurred from external sources and it ends up with a conclusion.

1.1 The LEKA Project

The LEKA project implements the North-Savo's machine building and metal field focused research and technology network, which operates closely with the local industries, UAS institutes, vocational schools and Universities of technology. LEKA's main focus is to offer local businesses competitive factors, build a lasting and evolving know-how environment and to improve the quality of education as can be seen in Picture 1. LEKA examines the products and the production simulation methods, op-

eration management, data management, network productivity and service production. LEKA is executed by Savonia UAS and some part is implemented by joint committees of Ylä-Savo, Savo and Navitas Kehitys Oy. Pohjois-Savo's union is the main investor in the EAKR publically funded LEKA (LEKA project plan).



Picture 1. LEKA structure (LEKA)

This final thesis is first part of LEKA-project and it continues with a second part, after the thesis work is completed. This first part was called introduction part to the company's internal processes. This was a logical in order to get the know-how from how the processes work, what processes are, etc. After the goal was achieved in the first part (completing the final thesis), the project focuses on the external network, which includes the main suppliers, the designers and the subcontractors (see Picture 6). The goal in the second part is to create the basic and solid ground rules between the commissioning company, the main suppliers and the subcontractors. The output of this second project will be a network manual. The manual goes to every operator who operates in the network, or is involved some way. If, and as it is expected, this increases productivity and decreases unnesseary movements inside different processes, the project result is succesful.

1.2 Action research

This research was carried out by using empirical research method. “Empirical research is defined as research based on observed and measured phenomena.” (Norfolk State University 2012) Generally, empirical research divides into two groups, the non-numerical qualitative research and the numerical quantitative research. This thesis used the qualitative method and especially the action research. The action research can be defined as a process, which goal is to improve and evolve the specific functions and procedures of the company. Researcher has a big role in this by being part of the organizations every day routines. Action research combines two parts, which are, the analysis of the company and the second, affecting the company’s functions and procedures based on the analysis.

The technical method was to interview every supervisor from every production line and few chosen production workers from the ground level. Also Production Manager, Project Department Manager, Quality Manager and CEO were all interviewed as well. Most of the interviews were recorded. This way it was possible to analyze and go through the interviews later, if needed.

This project started with the interviews and perceiving how the organization’s production works. Simultaneously, when interviewing the line supervisors we got acquainted with the ground level. This made it possible to understand the production lines, not only from the paper but inside the workshop, too. This will be explained later in the thesis, what differences between internal and external networks. In this case the production lines are part of the internal network.

The main point was to understand the big picture from the four different production lines, make renewed process charts and unify the working travelers and figure out problems caused by external sources. When doing the thesis, a very important part was to give an objective perspective to the inputs. This way a person who has little experience from this kind of environment could bring something new to the table. These perspectives were analyzed step by step in weekly meetings. The weekly meeting group consisted of CEO, Project Department Manager, Production and Quality Managers.

1.3 Warkaus Works Oy

Warkaus Works Oy is an engineering company, which operates in Varkaus. The company specializes in manufacturing pressure-bearing components for recovery boilers and power plant boilers. They deliver the parts for new customers and also for rebuilds. (Warkaus Works Oy.)

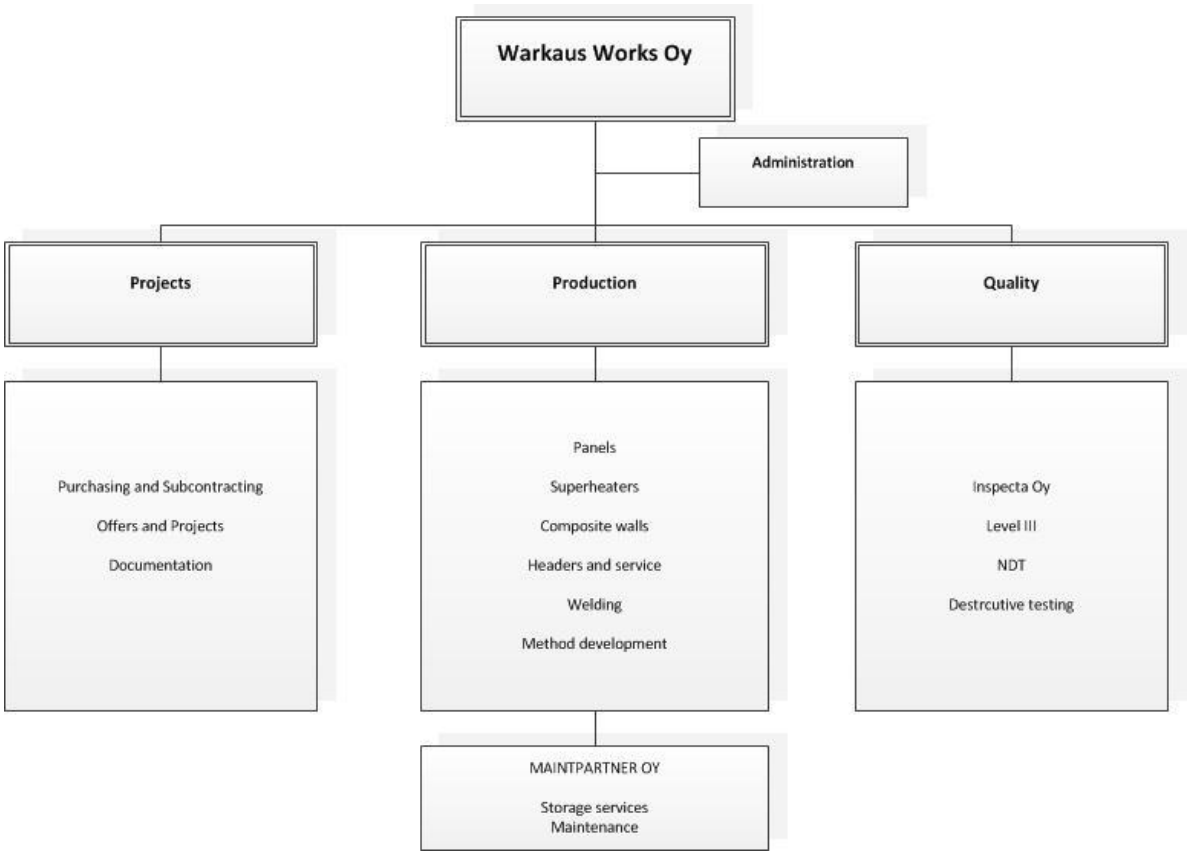
The Workshop's history goes all the way to 1900th century. In 1866 the workshop worked as a shipyard and steam boiler manufacturer in Pirtinniemi (Picture 2). In 1909 the Ahlström family bought the workshop. The workshop was known as Ahlström steam boiler factory until 1995 when Foster Wheeler bought the company. Warkaus Works Oy was established in 2000. The company is a joint venture company owned by Foster Wheeler Energia Oy and Andritz Oy, with 50% of shares each. The organization can be divided into three branches, which are projects, production and quality (Picture 3). (Warkaus Works Oy.)

Picture 2. The factory area of Pirtinniemi 2011 (Intranet)

In 2012 the company employs 110 people. They are divided into 92 production workers and 18 office workers. The company's annual revenue is 20 million Euros, and they export approximately 90% of their products. The market area covers almost every continent in the world. Most important areas are Europe, North and South America, Asia and Oceania. (Company's general introduction power point 2012)

Warkaus Works Oy produces pressure parts such as recovery boiler furnaces, boiler banks, economizers, superheaters and headers to their owners. The workshop has four different manufacturing lines; a superheater line, a panel wall line, a compound part line and a header line. Service works are a big part of manufacturing. Service

works don't have their own production line; however these works are made in the same manufacturing lines that were mentioned above. (Warkaus Works Oy)

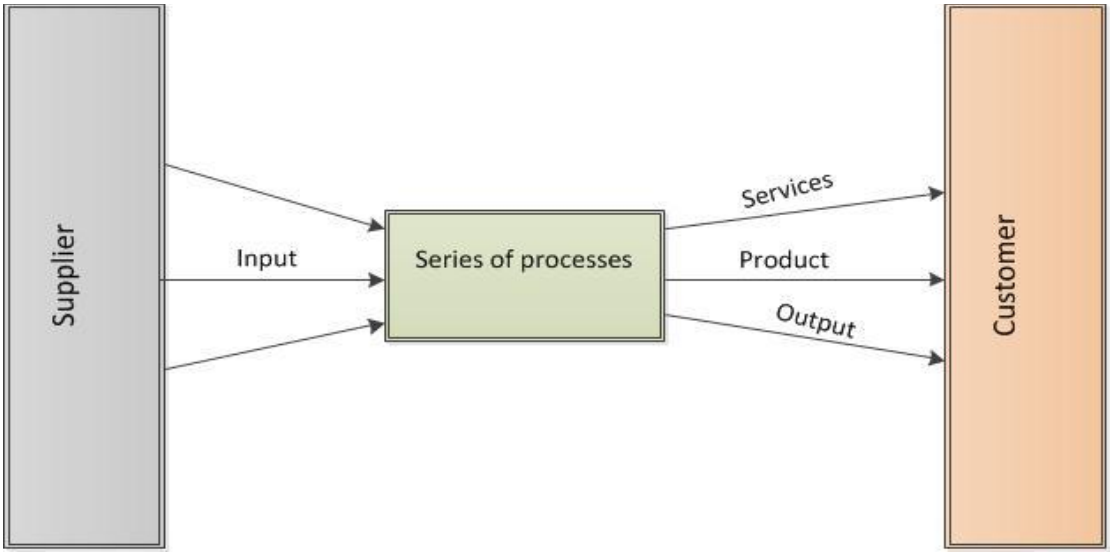


Picture 3. Warkaus Works Oy's organization chart (Intranet)

2 Introduction to processes

A process is a series of logical tasks related to time and place. A process starts in one point and ends in another. The goal of a process is to make profit from transferring the defined inputs through different tasks and deliver the outputs to the customer. This is explained in Picture 4, where input goes through process and comes as an output, which means service or a product. Outputs can be defined as internal or external sources. Internal exists inside the company and external outside the company. Internal can be for example products going between different work phases or production lines. External can be for example the product sent to a subcontractor or to an end customer, out of organization borders. (Laamanen & Tinnilä 2009, 121.)

The organization should specify and control numerous of functions, which are linked together. When the functions are specified and controlled properly, it helps the company to operate smoothly and effectively. A task or a set of tasks, which are transformed from input to output, could be considered as a process. Normally the input was a former output from another process. (SFS-EN ISO 9001 2008, 9.)



Picture 4. Process series

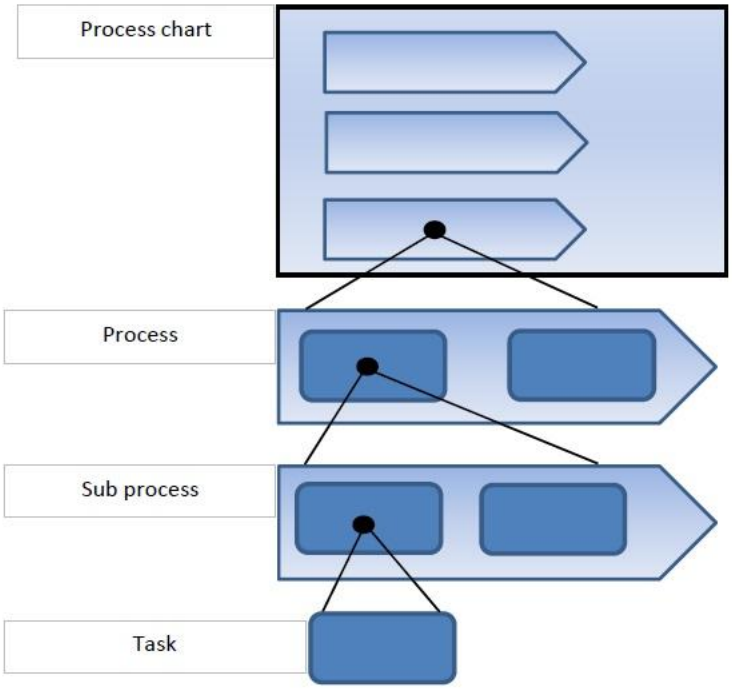
What brings value to the customer? In an organization the processes that bring value are called core processes or business processes. Core processes can exceed organizational borders. A core process can be, for example, a supply chain, which illus-

trates the customer's order to a finished and delivered part for the end customer. For these kinds of processes, the above mentioned is very characteristic. If a large process needs to be broken down (Picture 5) into smaller processes instead of activities, these are called '*sub processes'.* (Laamanen & Tinnilä 2009, 122.)

Organizations cannot work only through processes, which bring value to the external customers. Organizations need to create requirements. These requirements can be called supporting processes, for example, budget planning, strategic planning, developing know-how, etc. (Laamanen & Tinnilä 2009, 122.)

Previously the factory processes were functional. This meant that similar actions were accumulated together. Nowadays the workflow has been rationalized. This means similar processes can be done in numerous of workstations. (Salomäki 1999, 117.)

A task is a basic unit of working, with no logical reason to make an individual process chart of a sub process. Instead of a process chart, task is a simple way was to make separated working instructions. A task can be one phase of manufacturing process, for example, machining. (Salomäki 1999, 117.) Picture 5 demonstrates how the different processes are attached to each other.



Picture 5. Basic concept of a process

2.1 Identifying production processes

When presenting process descriptions, it was very important that the description includes the most critical functions, definitions and interfaces between different processes. This way it is easier to understand the process. A process description is usually called a process diagram or a process chart. These charts include graphical presentations, activities, persons and their roles. Processes are described for different purposes; such as production processes, project management and organization processes. There are different detail levels when describing processes. Some processes need more specified information than others. (Laamanen & Tinnilä 2009, 123.)

The first thing when identifying processes is to look the whole process in the level of whole organization or even within the whole network level. There are numerous starting points for this, e.g. company's mission, vision and goals or developing extra value to the company. In the end there should be similar understanding of processes between managers and workers. (Voutilainen, Ritola, & Moisio 2001, 140.)

One tool to identify the company's processes is the Big Picture method. This method observes the company's operations from above. This method is useful for identifying the company's present state. The method identifies the operations inside the company and also operations between the networks. (Voutilainen, Ritola, & Moisio 2001, 142.)

2.2 Modeling production processes

When the processes have been identified, the modeling can begin. Modeling, in other words, is describing the content of a process by using sub processes, activities and tasks as an interaction of logical chains. Processes can be split up to more detailed information by for example these tools: fish bone technique, mind map technique, demolition technique, walk through technique, simulation technique. (Voutilainen, Ritola, & Moisio 2001, 143.)

2.3 The tools for modeling and documenting the processes

The visual flow chart of a process can be presented in many ways. One option is the traditional IT chart with different features. Characteristic to a flow chart is that it uses symbols between start and end points of different processes. In the flow chart there can be different highlighted points of production, quality or documentation, which should be taken into attention. One of the biggest risks to ruin this simple but effective flow chart is to fill it up too much. The visual side of the flow chart depends on the maker's imagination. (Voutilainen, Ritola, & Moisio 2001, 146.)

There are a lot of different modeling tools available in the market. Some of the programs were more simplified than others. In the following list are the examples of modeling tools: MS Visio, MS PowerPoint, MS Excel, Smart Draw and ARIS.

In this final thesis, the process charts were done by MS Visio. This software was chosen, because it had all the right features to draw visually pulchritudinous production charts, and if later needed, the charts would to be easy to modify. The modification was done by the Quality Manager of Warkaus Works Oy.

3 Present state in Warkaus Works Oy

3.1 Production process charts

At the moment Warkaus Works Oy has four individual manufacturing lines. These lines are designed to produce pressure bearing parts for recovery and power boilers. The production lines are: a superheater line, a panel wall line, a compound line and a header line.

Service works are a big part of the production load and their purpose was mainly for renewals or rebuilds of power plants, etc. Service works don't have their own manufacturing line. Basically, service works are done at the compound line or header line.

Final thesis goal was to modernize and model these production lines. There were some charts premade in company's Intranet, but they had to be renewed completely. Old charts used only black and white colors and were made by using MS Excel. MS Excel is able to do these kinds of charts, but very primitively, as you can see in Appendix 1. The visual appearance was missing, also lack of exploitation of the Intranet's 200 different instructions. These said instructions consist of different procedures, which company requires following on e.g. procedures, such as, welding instructions, project management to procurement and work safety, so called general guidelines of the company.

3.2 Production travelers

The purpose of a production traveler is to guide the workers to do the right work phases, register the working hours and send this information to the project department workers, who are then able to see all kind of information including the present work load, and make the strategic planning based on that information. Travelers are used by the production line supervisors and line workers. They consist of different information based on the work and the project. The traveler is one part of the company's ERP-system features. Normally in mass production, these travelers go along with the products, but in this case the parts are in bigger scale e.g. producing one part can take up to 2-3 months. So the travelers do not literally go along with part itself, but it stays in the specific point close to the production. The place is defined so that there's easy access to the traveler by everybody. In practice the traveler is a piece of paper with information on it.

The ERP (enterprise resource planning) software of Warkaus Works Oy is provided by Tieto Oyj and it's called the Lean Systems. This system enables the company to use the lean thinking in their production, which derives the company to increased productivity. The ERP software gives the company a better reaction time and flexibility for fast changes. This software is used for the production of work, material procurement, stock awareness, project management, scheduling and work load awareness. Warkaus Works Oy provided the test version of this system for the thesis worker. This gave an opportunity to get familiarized to the ERP systems before the modification, without doing any harm to the real data collection. (Tieto Oyj.)

As mentioned above, four different production line supervisors equals to four different kind of working travelers. All the travelers had same elements but in the end they differed from each other a lot. After the process charts were made, it was time to move to standardizing the production travelers. The main need was to have an equal visual appearance, more specified details, and the work phases similar on the renewed charts. In addition for every new worker in the production line, it was easier to follow and learn the production flow, when the phases were described in more detailed manner. All the travelers are collected from the work shop after the work is finished. These travelers stay at the company's archives in a so called work folder. Big questions was also whether the worker signs the individual work phases, or is it the production line supervisor in the end who sign the entire traveler. The idea of this signature, distributes the responsibility at the ground floor in the production.

Travelers were done by the supervisor of each line according to the present project and work information, with the ERP system. One production line can use numerous travelers, for example, when producing an economizer; one entity can be produced from six different products, which are assembled together either in the workshop or on the site. Assembly depends usually on the size of the part. All these parts need individual travelers. This means that the supervisors have to write many travelers per each work. When doing something with a computer and things start to get repeated often, the desire of copying previous work is quite low. This leads easily to an error, which might be copied unintentionally to every new traveler, because of the copy and paste method. The answer of decreasing this possible fault can be found in Chapter 3.4 'Standardization of production travelers'.

3.3 Renewed production process charts

Renewing of the production charts started with a meeting where the management pointed out their views of what they wanted and where to start. Time and resource management took a lot of planning and scheduling because there were four supervisors, four production lines and each line had multiple processes. Old charts were done in 2004, so as expected, something had changed in eight years.

One of the key issues was to find a right tool for process documentation. The software needed to have functions to draw visually beautiful, yet simple charts but also so, if processes would change in some point in time, it would be easy to make the changes for chart's layouts. MS Visio was found to be a working tool for that and it has same features than all the MS programs have.

The first production line to study was the superheater line, which was a perfect choice, since that line was one of the simplest to renew. Having success in the first production line, it gave the confidence in continuing this project.

The first step was to sit down with a line supervisor and start sketching down different processes subprocesses and tasks, proceeding step by step. After the sketch was drawn on paper, it was transformed into electric form by using MS Visio. In this point the basic icons and layout were chosen for the software. This helped the general view to be similar between different production line process charts. When the sketch was fully described with the program, it was give for a second round to the supervisor again. The second round was generally about checking and correction of errors. After this, the comparison of the actual production line and the sketch was made. This meant that sketch was checked task by task so that everything went hand in hand, both in the paper and inside the workshop. This minimized the differences between reality and the process chart.

Then it was time to get the final acceptance for the process chart from the management level. Everything that was done was presented to the steering group. In every weekly meeting there were present the manager of project department, the CEO, the manager of production department and the quality manager who checked what was done, and if needed gave instructions and practical hints. The process charts went through serious inspections before the final publishing.

The company's Intranet contains almost 200 different procedures. These are the general guidelines of the company. Since the first meeting it was clear, that those guidelines could be one big asset for these process charts. These guidelines were exploited just by hyperlinking different task to right instruction. Also different documents of inspections were added to the process charts. Now the worker who needs to fill up a document, for example, on bending, can find the document layout from the Intranet's process charts, print it, and fill it with the data that concerns the bending operation.

As mentioned earlier the imagination was the only obstacle of doing simple but visually beautiful charts. The first thing the charts should do is to point out the critical points in production, where things have to be full proofed. These points are, for example, the inspections and the document outputs (certificates) from the inspections. In the renewed charts those can be clearly seen from the red color figures shaped like a paper and those with a green color figures. Difference between these two is that the red ones are inspections with additional document coming out and the green ones are inspections, for example, the worker inspects that the material quality is right for the work. Blue figures represent the working tasks of production such as welding or bending. Purple figures are the subcontractors. All the inspection points include also the person who is responsible of the task. This was done by abbreviations, for example, Supervisor equals to SV and PM to Project Manager. To understand this change between old and new see charts in Appendices 1 and 2.

These charts were later translated into English. This helps the company in the case if foreign auditors come to audit manufacturing and orders. Project Manager can easily explain production processes, inspections and work flows through the production with the renewed charts.

In the end, total of eight different process charts were made. These charts are located in the company's Intranet and all who have access to the Intranet are able to exploit them. All of these have the same formula as described before. These process charts are: superheater production, assembly of superheater packages, panel wall production, recovery boiler's economizer and boiler bank production, recovery boiler's screen tubes and CFB boiler's furnace screen, compound walls, grate production, header production.

3.4 Standardization of production travelers

The standardization of the travelers came almost as a by-product from the renewal of process charts. These two goes hand in hand from the tasks' perspective, excluding some minor details. Both give straight answer to a question, what were the work phases in the production.

All supervisors need to make new travelers quite often. This leads to copy and paste -method, which might lead to an error that repeats itself in every new work. When the standardization began, the first thing realized was that there should be a so called zero-version of the traveler. This zero-version is a version, which is used when making a new production traveler for manufacturing. This concerns both big projects and service projects.

Standardization started with meetings with the supervisors individually. In the meetings the supervisors explained how many different travelers they needed. Approximately there were three different travelers per production line. Every individual traveler had its specified work phases, according to how the supervisor saw what was important. Working phases were chosen so that they preferred the extra information, which could be easily removed, if the coming project didn't require the specified working phase(s). These phases were studied with the supervisor by comparing them to the renewed charts. Then the phases were drawn down and after this added to the test ERP-program for further analyzing. The test pieces were presented in the weekly meeting to get the management approval. Also a meeting was set up where the finalization could be decided all together. This meeting required both the management's and the supervisors' presence. This way the decision was made together and the last possibility to affect the output was possible. More information of this meeting can be found in the following chapters.

One big issue was the layout of the traveler. Three out of four production supervisors insisted that the traveler's working phases should fit in one A4 page. This document locates inside the workshop or bunch of documents, because the traveler is not the only paper there. The bunch of papers contains a sheet where are calculations of the contract. Thinking about documenting this paper, when it has been circulating in workshop conditions, which was questionable. In some cases the auditors wanted to see the travelers and the company didn't want to show them messy papers. This problem was figured out by collecting these faults in the traveler's layout and planning it so that it works for everybody. First, a simple sketch was made by highlighting the

weaknesses or the changeable areas in the traveler. One example of the weak spot would be the drawing number. The original traveler had very limited space where to write the components drawing number. These specific numbers have only increased during the years, bringing extra details and information on it. A problem will arise, if you have similar products for different projects simultaneously under production and all of them have the same ending number in the traveler. A lookalike product with different material could end up in a wrong place. This could cause highly dangerous situations in a long run.

All of the above mentioned planning and ideas were finalized with the project manager. Some ideas came from the supervisors. After this it was time to contact representative of Lean system provider, a person who could make these changes possible. Planning and ideas were introduced in a meeting that was held on 17.4.2012.

Then it was time to get everybody together and finalize the standardization of the travelers. That was the final place to give own opinions about the standardization. The meeting was held on 23.4.2012. Before the meeting a discussion session with Production Manager was held. In the pre-meeting he gave the last advices, and the agenda was introduced to him beforehand to see, if there were anything to add on it.

Every supervisor was invited to the meeting from each production line. Also invitation was sent to CEO, Project Department Manager, Production Manager and personnel who could substitute the supervisor if needed (sick leaves, etc.). The goal for this meeting was to get the final decision of standardization. After the meeting was over, this goal was achieved. Inserting the renewed travelers to the company's lean system was now possible. All the crucial points and topics were now decided when every key person was present.

Now, every time when a supervisor starts a new work for a project, the zero-versions are chosen from a list. The supervisor fills up the detailed information according to the project and the work. After this the supervisor chooses the zero-version from the section that says *vaihemalli (*see Appendix 5)*.* This leads to a list appearing up with all the premade phases for every production line, just the way the supervisors have always wanted (see the appendix 6). This gives the detailed working phases for every new traveler that is made. This reduces dramatically the writing work of a supervisor and gives time for planning and scheduling, which in turn gives more value and reliability for the project. After all, Warkaus Works Oy still has a record of 100% delivery reliability.

Last summer Warkaus Works had plans and meetings held up for this kind of modernization. As mentioned earlier, the concern and opinions of supervisors and production workers were taken into serious consideration. The hypothetical scenario, needed to be avoided, was to make the changes and standardizations without doing cooperation with these assets. Scenario in this case would be that only after few months, the standardized travelers would be forgotten and the supervisor would go back to the previous versions. This was considered as one of the highest risks in the risk assessment.

In the end, total of 13 travelers were made and every single one of them are now in the use of the supervisors. Travelers are: superheaters, superheater blocks assembly, panel walls, wall assembly, grate assembly, bypasses, carbon steel walls, economizers, lower part screens, headers, reductions, bending, machining.

4 Problems detected from external sources

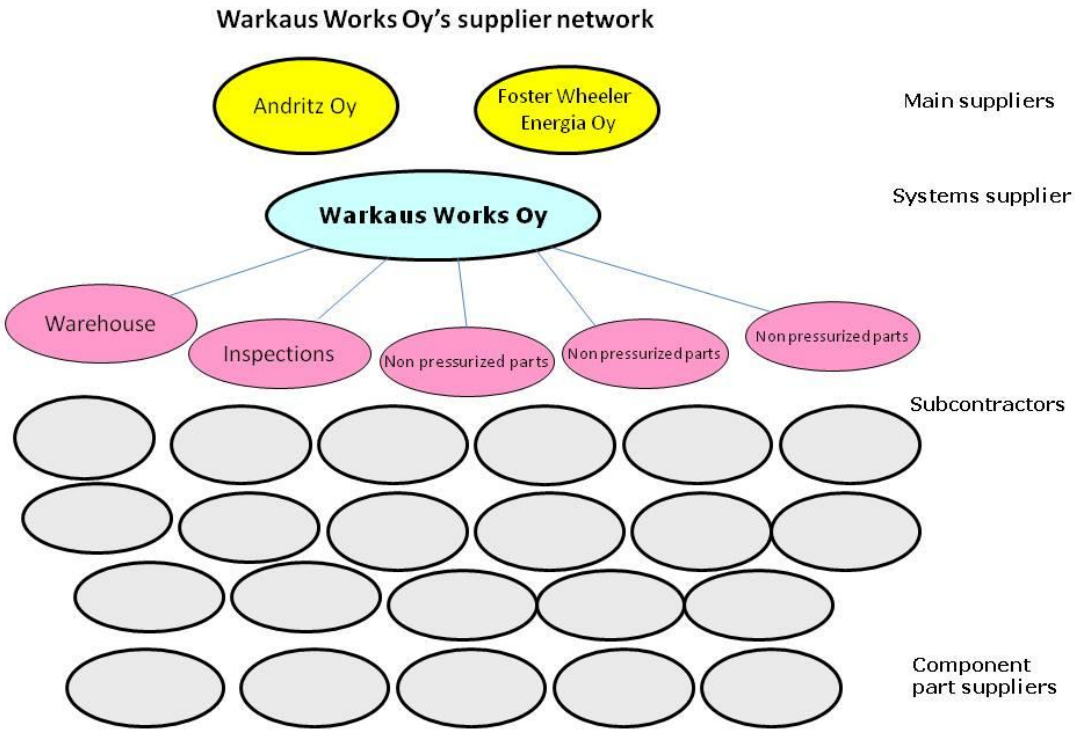
A problem can be an obstacle, which is difficult to pass when reaching to a goal. A problem can be related to a situation that hasn't been solved yet. A problem emerges when person figures out difference between the present state and the desired state.

This was the third aim of the final thesis. This part concerns the problems in the production line, which occurred because of the external parties of the network. The third parties in the production were, for example, the subcontractors, designers, suppliers, etc. After completing the final thesis the phase two of the LEKA project will start. As mentioned previously, the target was to make a network manual for Warkaus Works Oy and its external network as can be seen in Picture 6. This picture demonstrates Warkaus Works Oy as a customer provider for numerous subcontractors, above all, of course the owners and main suppliers. As being the last part of the thesis, the timing for this problem detecting was perfect, because it came after defining the detailed production lines from the ground level up. The personnel and management were aware that problem detecting was as one part of this thesis and they knew that if problems came into their mind, they should give the feedback.

Problem solving started with interviewing some of the persons who were dealing with subcontractors at the most, the supervisors. In this point the accurate descriptions of production processes were already done, so pointing out the places where the problems might occur was simple. Hardest part dealing with the supervisors was to make them understand that the goal of this project phase was only to identify the problems from external sources - not internal. In the end, four lines were identified from start to end and problems were written down for later analysis. This analysis was done in the weekly meetings, where the so called support group was present. If the problems needed further attention or information, the supervisors would be contacted again. The analysis happened so that the every single problem was discussed and brainstormed. This supports mostly the start of the next phase, when it was already known that there were misunderstandings between different parties. Also, the demand for a network manual increased. Warkaus Works Oy wants to set the ground rules between everybody they affiliate with and this might be one of the best solutions for that.

In the end, problem solving was made for the superheater-line, panel wall-line, compound wall-line and header-line. From every production line some issues could be found and see as a problem. For example, with the hydro pressure test, the question

was whether it was done inside the workshop or on the site and some of the part drawings were late. These problems were detected and presented in this point but not analyzed in any specific manner. Later when the LEKA project continues, these studied and solved if possible.



Picture 6. Warkaus Works Oy's supplier network (Intranet)

5 Conclusion

The main goal for this final thesis was to renew the production process charts, standardize the production travelers based on the process charts and find problems from the production, which were caused by external reasons.

As a result of the thesis work the process charts were defined successfully and they are now in the company's Intranet for use. These charts also utilize the company's over 200 different instructions in the Intranet. This feature was lacking completely before. The first process charts were made eight years ago, so it was time to update them to a present stage, not only by visually but in content wise as well. New group of travelers were born with new features, for the commission company to use.

The standardized working travelers were now identical compared to the production process charts. These renewed travelers are more accurate but at the same time simplified from the originals. What was more important was the renewal that was made in close contact with the people who are using them, so a lot of people had a possibility to influence on the output of this document.

The last part of the thesis was to find out problems caused by external reasons. The second part of this work is going to start after this thesis. This part advocated that there's an obvious need for a network manual, due to the problems, which were detected between the network and the company.

This thesis was done between 16th of January and 16th of May. The given timeline was long enough to go through this project. There were a lot of things to learn and problems to solve. The reason for this was the well planned schedule and the weekly and monthly meetings, which were held to assure the continuity and quality of this work.

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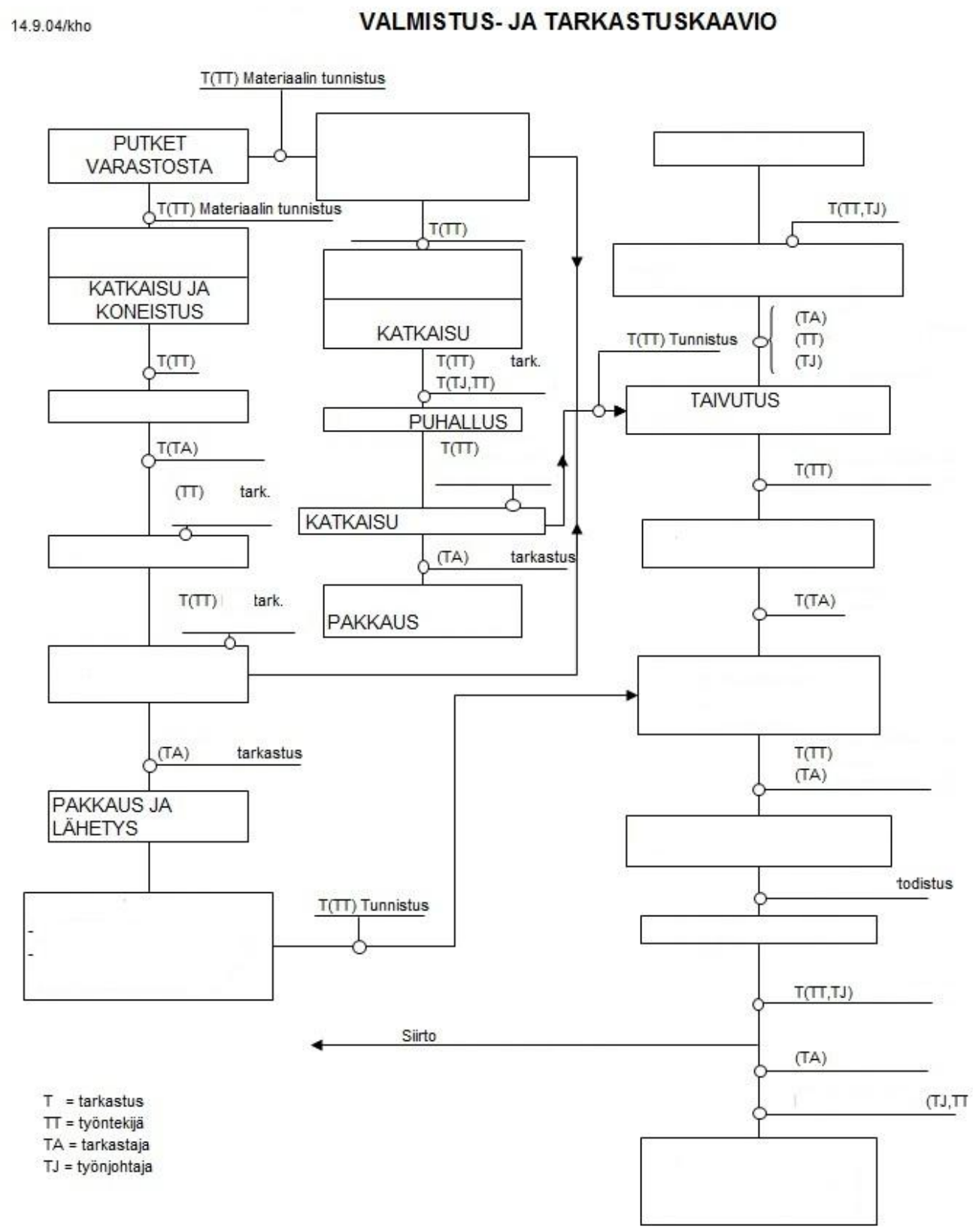
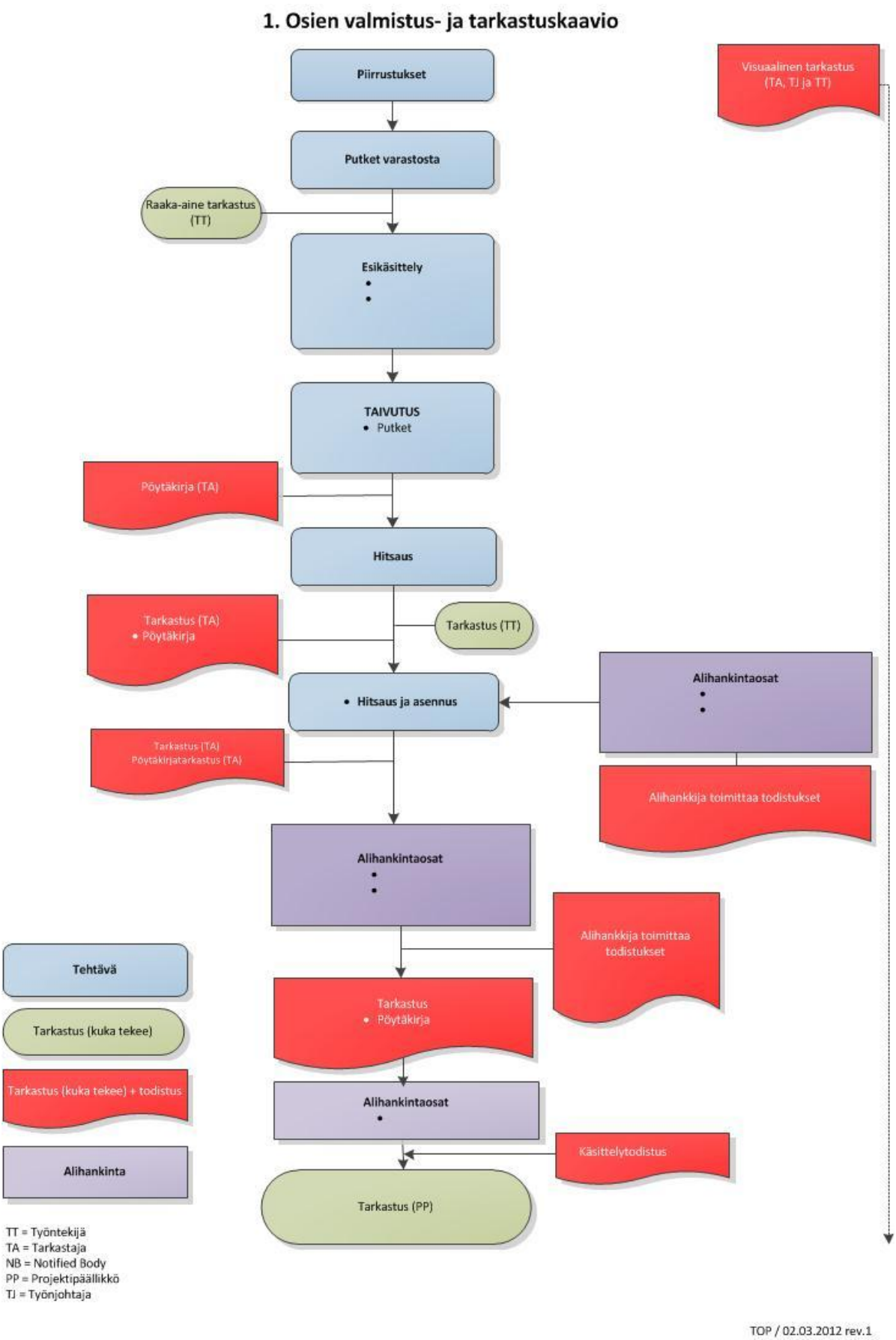
Warkaus Works Oy [Intranet]

Warkaus Works Oy's general introduction [power point 2012]

Original process chart of Warkaus Works Oy's production lines



Renewed process chart



Original production traveler

WARKAUS WORKS OY **TYÖKORTTI**

[redacted]

Työ **11111111111** 1 kpl **Tyyppi**
TESTI **Tila** Suunniteltu

Vastuuhenkilöt

Nimike

Rakennemalli

Nim. **Piirustus**

Projekti

Kuvaus/Työohje

[redacted] 003 SINKOPUHDISTUS P.200X100 / NPC201 / L=33
M X 1 KPL TARKASTUS

[redacted] 005 HITSAUS TARKASTUS

[redacted] 009 KEMPPI, HITSAUS JA TARKASTUS

TARKASTUS
KALIBROINTI
TARKASTUS

[redacted] 010 HITSAUS, KATKAISU JA
KONEISTUS

[redacted] 020 HITS. JA YHDISTYSHITS. MITTA-JA
HITS.TARKASTUS

MATERIAALIN TUNNISTUS, TARKASTUS
KALIBROINTI JA SILLOITUS MITTATARKASTUS

Renewed working traveler

WARKAUS WORKS

TYÖKORTTI **09.05.12**

[redacted]

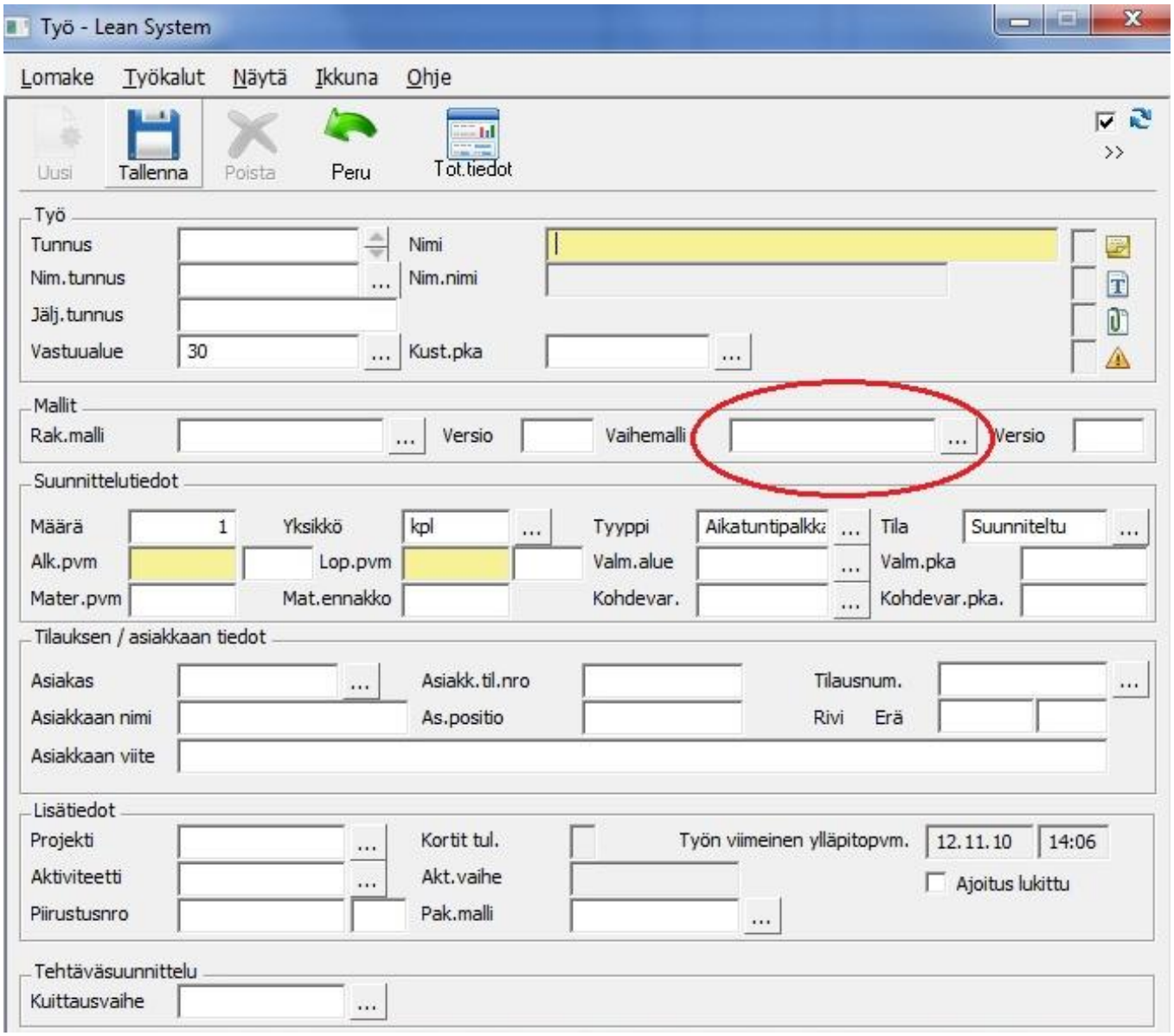
Vast.alue	30		**Laskettu aika**
Työ	TESTI	1 kpl	**Tyyppi** 09.05.12 - 09.05.12
Vastuuhenkilöt	TOP	Topi Piispanen	
Projekti			
Työnumero			
Vaihemalli	1074 / ARINA	0	**Piirustus**

Kuvaus/Työohje			KR	VR-koodi
[redacted]	005	ESIKÄSITTELY - Materiaali tarkastus (TT) - Hiekkapuhallus	1074	TVR
[redacted]	025	PANELEIDEN VALMISTUS - - - -	1074	TVR
[redacted]	040	KOKOONPANOTYÖT - - - - Varusteluosien tarkastus (TT) - Hitsaus -ja mittatarkastus (TT ja TA)	1074	TVR

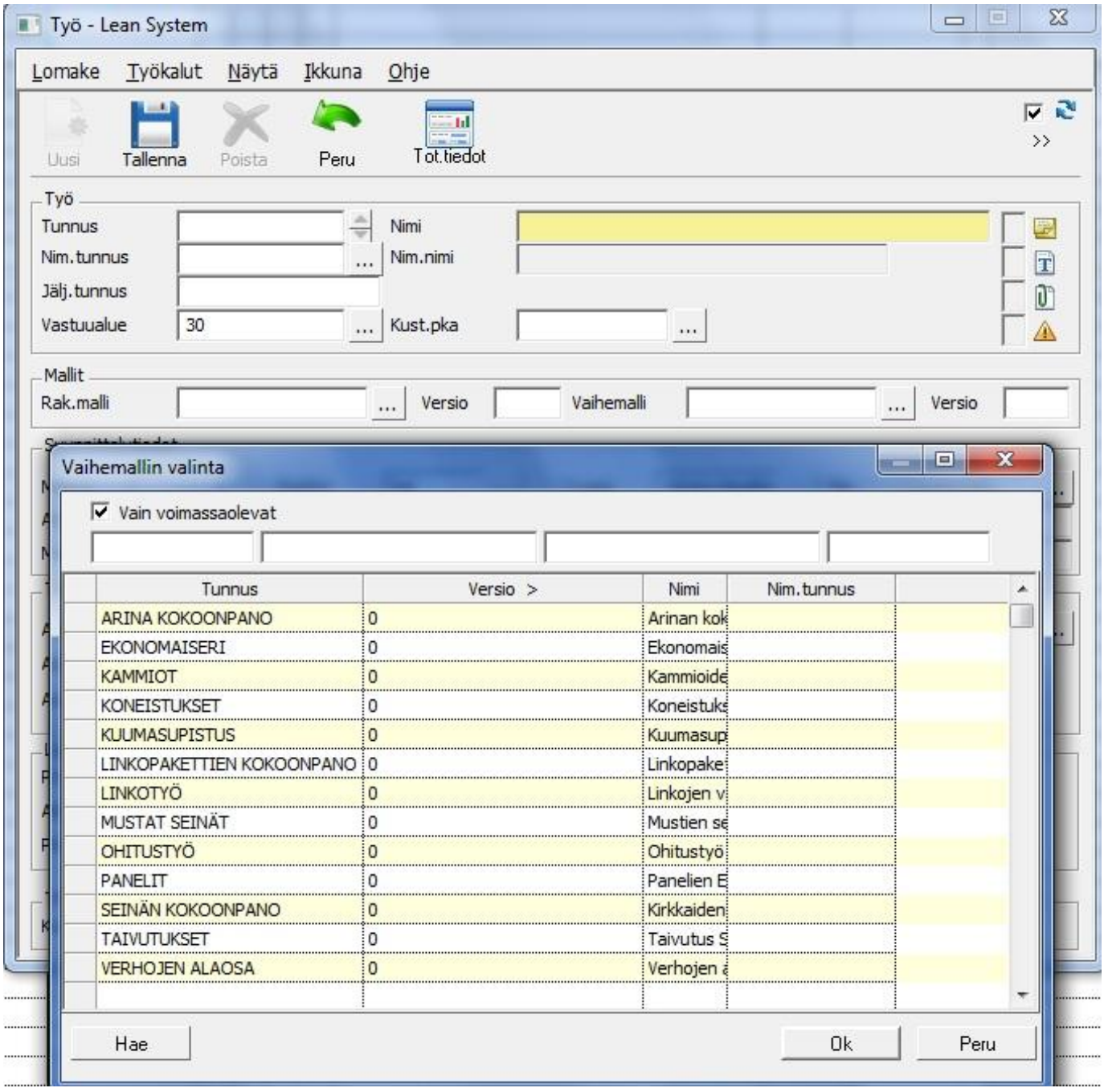
Työnjohtaja / Supervisor of work:_____pvm:_____

TYÖ VALMIS JA TARKASTUKSET TEHTY

Production traveler's data collecting interface



List of the zero-versions

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