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**INTRODUCTION AND IMPLEMENTATION OF THE 5S-  
OPERATION MODEL FOR ST-KONEISTUS LTD**



Bachelor's thesis

Degree Programme in Industrial Management

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ABSTRACT

5S-operation model is one tool of the Lean-philosophy. It stands for improving the order and cleanliness, and creating comfort and a safe working environment. The aim is to increase the productivity of labor. At the same time all the non-value adding actions, such as the time used for searching, should be cut out. The aim of this bachelor's thesis was to introduce and implement the 5S-method in pilot targets. In addition a plan to expand this operation model to other facilities in the company was created. The commissioner of this thesis was ST-Koneistus Ltd. ST-Koneistus Ltd is a modern contract manufacturer in the metal industry specializing in demanding machining.

The theoretical suitability of 5S, for implementation in to the company, was examined in this work. A comparison to other development programs showed that 5S is a functional solution to current problems in the company. The 5S-operating model was pushed through in three well chosen pilot targets. After this, the received results were carefully analyzed. When the results turned out to be good, extensive plans for expanding the model were created.

In this project methods, which help implement changes, as well as get employees to support implement changes were examined. For a 5S-project to succeed requires the commitment of each person. Some problems, such as opposition towards changes were met during this thesis. This shows that the commitment of the employees should be altruistic and the predominant ideology should be that everyone is trying to achieve the common good.

The results of this thesis confirmed the functionality of the 5S-model with a company like ST-Koneistus Ltd. Waste was eliminated through the five (5) phases of the model. Areas of responsibilities and job descriptions were clarified and the working environment became significantly cleaner. The operation model will be upheld through internal audits and standardized working instructions which are enclosed with this work.

**Keywords** Lean, 5S-operation model, improving operations

**Pages** 45 p. + appendices 14 p.

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## TIIVISTELMÄ

5S-järjestelmä on yksi Lean -filosofian työkaluista ja sen tarkoituksena on parantaa järjestystä ja siisteyttä, sekä luoda työympäristöstä viihtyisä ja turvallinen. Tavoitteena on työn tuottavuuden kasvattaminen, sekä kaiken ei-arvoa tuottavan toiminnan, kuten etsimiseen käytettävän ajan poistaminen. Tämän opinnäytetyön tarkoituksena oli esitellä ja toteuttaa 5S-järjestelmä pilottikohteissa. Lisäksi työssä luotiin suunnitelma menetelmän laajentamiseksi muihin yhtiön tiloihin. Työn toimeksiantajana toimi ST-Koneistus Oy. ST-Koneistus Oy on nykyaikainen metallialan sopimusvalmistaja, joka on erikoistunut vaativaan koneistamiseen.

Opinnäytetyössä tutkittiin menetelmän teoreettista soveltuvuutta yrityksen käyttöön. Vertailu muihin tuotannonkehitysohjelmiin osoitti, että 5S on toimiva ratkaisu yrityksessä vallitseviin ongelmiin. 5S-toimintamalli ajettiin läpi kolmessa tarkoin valitussa pilottikohteessa. Tämän jälkeen saatuja tuloksia analysoitiin ja tarkasteltiin huolellisesti. Tulosten osoittaututtua hyväksi, luotiin kattava suunnitelma toimintamallin laajentamisesta muihin yhtiön tiloihin.

Työssä tarkasteltiin tapoja, joilla muutokset menevät läpi ja työntekijät saadaan kannattamaan muutoksia. 5S-projektin onnistuminen vaatii koko henkilökunnan sitoutumisen. Opinnäytetyön aikana kohdattiinkin ongelmia, kuten muutosvastarintaa. Sitoutumisen tulisi olla pyyteetöntä ja valitsevana ideologiana tulee olla yhteisen hyvän tavoittelemine.

Työn tulokset osoittivat järjestelmän toimivuuden ST-Koneistus Oy:n kaltaisessa yrityksessä. Hukkaa poistettiin viiden järjestelmään kuuluvan vaiheen avulla. Vastualueet, sekä toimenkuvat selkeytyivät ja työympäristö siistiytyi huomattavasti. Toimintamallia tullaan ylläpitämään sisäisillä auditoinneilla sekä standardoiduilla työhohjeilla, jotka ovat liitteenä työn lopussa.

**Avainsanat** Lean, 5S-toimintamalli, toiminnan tehostaminen

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## 1 INTRODUCTION

The purpose of this bachelor's thesis was to conduct an introduction and implementation of one form of the LEAN-production philosophy with ST-Koneistus Ltd. 5S was originally invented in the Japanese car industry and its basic idea is to keep the working environment clean and in order. Through simple steps the program aims at more systematic actions inside the company. (ST-NEWS 1/2012.) The main focus in 5S is to organize workplaces and –spaces, and also to standardize the working methods to such an order, that they increase profitability. Dissipation is weeded out and a high level of cleanliness and order is reached. These are the characteristics of a successful and well organized company. This stands for first-class workplace both at management level and at the level of the employees. (Tuominen 2010, 7-8.)

ST-Koneistus Ltd is a modern contract manufacturer in the metal industry. The company has over 40 years of experience in its field and this experience is combined with current working methods and techniques. The company has reached a leading position in manufacturing hydraulic blocks. The company's principles are to invest into high class machines and the newest machining methods and to keep the working environment in an excellent shape. (ST-NEWS 1/2012.)

The management of ST-Koneistus Ltd discovered that they had to improve their production and quality. There was a genuine need for changes and after a careful examination the 5S was found to be the best option to be implemented. The purpose of this work was to take into use the 5S– operation model in three (3) pilot targets. These targets were the cylinder and assembly stations and the warehouse of the company. Tools which are needed daily should be close to the employees and the devices should be in their own places. All the unnecessary and useless ones should be cleaned away and rarely needed tools should be removed away from the workstations to where they are easily found. Information sources used in this thesis, besides literature in the field included several interviews, company visits and smaller publications.

To reach the best possible implementation, there was a reason to do a mature survey before the implementation. The introduction of the 5S played also an important role in the thesis, because it created the whole base for understanding the method. After introducing and implementing the 5S in the pilot targets, the aim was to create plans on, how the system would be taken into use in all the other workstations and material warehouses in the production of the company. After this project the company should possess the information required and the working methods to expand the system from the pilot targets to rest of the manufacturing area.

## 2 INTRODUCTION OF THE COMPANY

A limited company named ST-Koneistus Ltd, owned by the family of Peltonen, was found in the early stage of the year 1970. Then it was a company of two guys but now a day it employs about 45 professional employees. The company is a modern contract manufacturer and it is specialized to service companies and providers which needs demanding machining. Their portfolio includes especially the special sub plates made from aluminum and steel, valve blocks and special cylinders. The products they are producing can be divided into two categories; their own products and products that are made according to customer's drawings. (ST-Koneistus Ltd 2012.)

The company goal is to be a strategic partner to their customers. They want to be responsible of the whole production process, all the way into the assembly phase. In addition, they offer also designing and explosion services to their customers. TEM (thermal energy method)-explosion machine cleans out fins and burrs of the products. With their experience, they know how the products can be made cost-effectively with saving raw-materials. The manufacturing of their products is wise also logistically and qualitatively and very inexpensive to their customers. Their design unit helps their customers to tailor their products so that those can be manufactured as cost-effectively as possible. (Romppanen, interview 20.12.2012; Sélin, interview 20.12.2012.)

### 2.1 History

The company was founded in the year 1970 by brothers Seppo and Tuomo Peltonen. At first, ST-Koneistus Ltd was a very small company which located in the garage (Figure 1) at the brothers' grandparents' home in Soppeenmäki, Ylöjärvi. In the year 1973 the company moved to its current location, Hopeatie 3, Ylöjärvi (Figure 2). Continuous growth of the company has enabled extensions and modernization of the facilities. No less than the 11<sup>th</sup> annex to the building was finished in 2009. Now the whole building provides a working area of 4800m<sup>2</sup>. (Peltonen, interview 3.1.2013.)



Figure 1. The starting point of ST-Koneistus Ltd.



Figure 2. ST-Koneistus Ltd in 2001.

Some important years in the company's history were 1996, 2002 and 2012. In 1996 Tuomo bought out his brother Seppo and took the lead by himself alone. Six (6) years after that, Tuomo's son Tommi took the place as CEO and Tuomo left out from the daily actions, but continued in the member of board of directors. Last year, in 2012, happened a historical moment in ST-Koneistus. The very first time a CEO came outside of the family. Current chief executive officer Jarkko Selin took Tommi's place 1 of April 2012. All the same, family Peltonen has still a complete, one hundred (100) percent ownership of the company. (Peltonen, interview 3.1.2013.)

The growth of ST-Koneistus Ltd has been quick and rough. 2003 was the first year when the turnover raised over 20 percent in one year. It lasted all the way to 2009 when came the first decrease in six (6) years. In 2012 the turnover of the company was about 5 million euro. (Peltonen, interview 3.1.2013.) The variation of the turnover is quite impressive all through the years 2002-2012 (Figure 3).

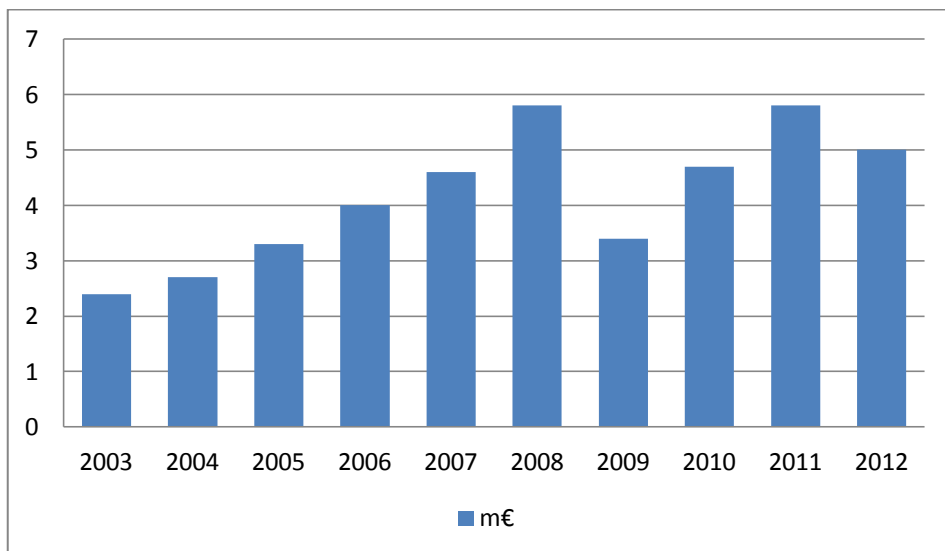


Figure 3. Turnover of ST-Koneistus Ltd. (Haavisto. interview 3.1.2013.)



### 2.2 Production

In the beginning of the ST-Koneistus, Seppo and Tuomo Peltonen were focusing only in the field of cylinders but step by step the hydraulic components came in the picture. Nowadays ST-Koneistus is producing a lot of different kind of products which needs a special machining. They get their advantage with professional and motivated staff and modern, highly-automated machinery. (Haavisto, interview 3.1.2013.)

In 2010 they pushed about 577 tons of raw materials through their machines. By that number we can see that ST-Koneistus is running well despite the times of quite weak economy. (Romppanen, interview 20.12.2012; Haavisto, interview 3.1.2013.)

#### 2.2.1 Products

ST-Koneistus manufactures mainly two types of products, standard products and special order products. “Standard products are products that we have always in stock. Those are products like bar manifolds, sub plates, valves and cylinders that we are capable to manufacture at short notice. Our range of standard products is based on our in-house designs and production.” (ST-Koneistus Ltd 2012.)

Special order products are made by customer drawings and demands. The scope of the products is although quite same than standard product scale. There are just more details and special demands which are specific for each customers. ST-Koneistus Ltd offers also design and assembly as their service products. Customers are in important role in there, because employees in planning are in close connection with them. By that way they can ensure the best result for each product. ST-Koneistus Ltd uses CAD/CAM machining technology and their designs are based on that. “It involves the use of 3D-modelling, which enables semi-automatic preparation of machining programs” (ST-Koneistus Ltd 2012).

Qualified assembly team makes sure that the customers can get a totally finished product in their hands, if they want so. Company offers to order components what needed for products in assembly phase. After the work of assembly team, the customer gets a finished product, where assembly actions are already done. Quality is confirmed with the usage a hydraulic block testing apparatus. (ST-Koneistus Ltd 2012.) The best finish is usually gained in co-operation with the customer. With the help of feedback from the clients, problems can be fixed and deficiencies in processes and services can be avoided. In addition, when they make products by their customer’s printings, those are made as how the customers wish. Guidelines, given by a customer, are followed precisely for example in such a critical area as surface finishing. (Selin, interview 20.12.2013.)

### 2.2.2 Machinery

The employees of ST-Koneistus are in blissful position. They are allowed to use highly automated and modern machines. After the latest reforms, their capacity is over 150 000 machine work years annually and new machines in FMS-line offers no less than 50 000 plates more production power in a year. (ST-Koneistus Ltd 2012; ST-NEWS 1/2012.) Company's machinery includes for example 10 NC lathes, 15 horizontal NC machining centers (Figure 4), 3 vertical NC machining centers and a number of manual vertical drills, milling machines and lathes as assistant engines. (ST-Koneistus Ltd 2013.)

As a special machinery, can be mentioned at least an automated FMS production system. That rotates continuously 70 palettes and 24 products which enable to produce bigger series. Moreover, they have also a DAEWOO MX2500 ST, which is a nine-axel NC lathe machining center with a robotic cell and bar feeder. It is good to mention also that their horizontal machining center is one of the most advanced in Finland. (ST-Koneistus Ltd 2013.)

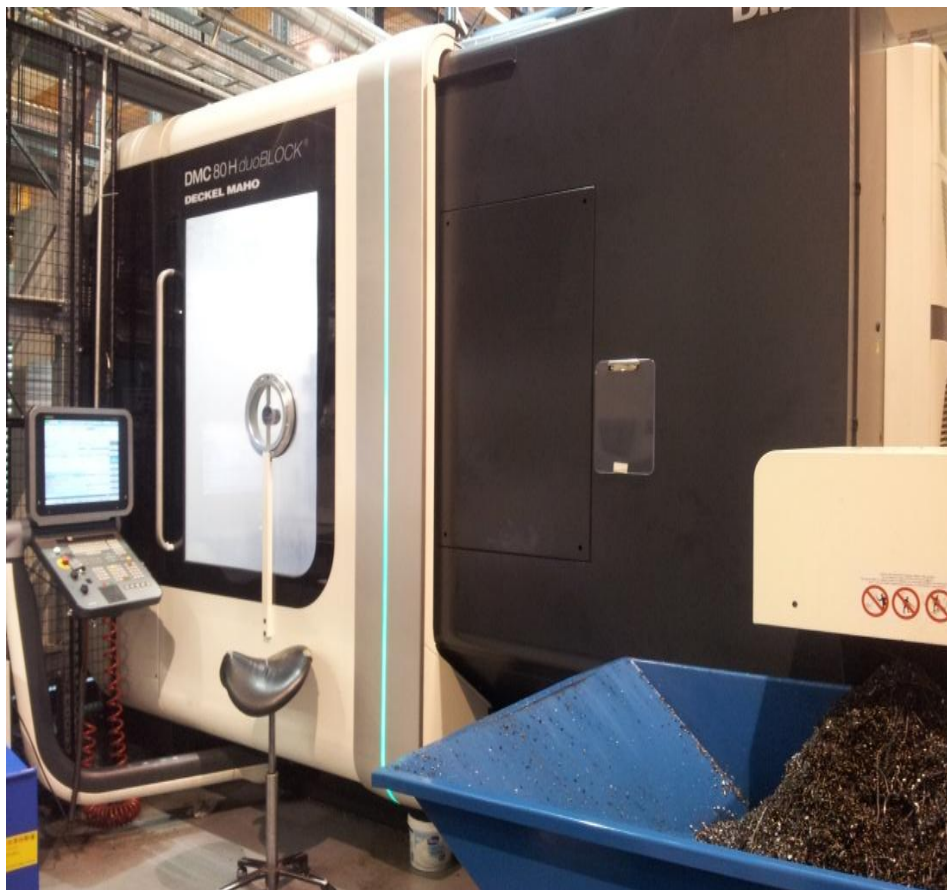


Figure 4. DMG 80 Duoblock, horizontal machining center.

In the finishing treatment they have extremely high-tech machines. TEM (Thermal Energy Method)-explosion machine (Figure 5) uses gas to create an explosion. That method makes all the threads and channels clean. If the products have any dust or burr after machining, TEM-explosion machine removes those. ST-Koneistus Ltd is the first subcontractor and machining

workshop which has take in use this powerful method. (ST-Koneistus Ltd 2013; ST-NEWS, 1/2012.) After explosion the products goes into ultra-sound washing machine which makes them clean and shining from the inside and outside.



Figure 5. TEM (Thermal Energy Method) –machine.

### 3 LEAN MANAGEMENT

Lean-operation model was created in Japan, on the strength of Toyota production philosophy. Researchers found some differences in the methods used in Japanese car manufacturing, especially in the make Toyota. These methods were gathered and called Lean. The model gained ground first in the car industry but nowadays it is the leading manufacturing philosophy almost in every field of operation. “Thread of Lean is tenacious elimination of waste. In ideal situation every action in organization is increasing the value which the customer lives through.” Vanhamaa (2009) relates that Womack and Jones have boiled down the lean-thinking into five basic principles. These principles are:

- Defining the value from the customers’ point of view.
- Recognizing the flow of value.
- Implementing the value flow.
- Arranging a slipstream.
- Trying to achieve perfection.

The operation model is confined only not to the production of a company. It is extended into research and development and there it is called Lean-research and development. (Vanhamaa 2009, 183.)

“Lean is a powerful and continuous improvement initiative that is highly focused and employee dependent. The simplicity of the Lean tools, combined with a systematic implementation methodology, allows all employees of the organization to participate in process improvement. Yet, the most powerful aspect of Lean is not what participants do to *add to* process or *improve* a process but what they *remove* from the process to improve it.” (Nash, Poling & Ward 2006, 17-20.) The main focus in Lean process is aimed to identify and eliminate all waste from the product or service provided. The whole basis of the Lean Management-outlook is concentrating on actions which produce additional value for the customer. Ambition is to lighten cost structure continuously and take into notice a functionality of the wholeness. Idea is that the company can achieve efficiency and productivity with Lean Management. (Nash et al. 2006, 17-20.) This leads into situation where the cost-effectiveness gets better. Though, when implementing, every person needs to remember that it is not just simple daily action to jump into Lean. The change can be huge and it can take as much as years.

As said, improving production will not be achieved through increasing the amount of the workload. All that is useless is removed and with useless we mean everything that is unnecessary and all the non-value adding actions. It is self-evident that each and every single phenomenon which creates any kind of waste is preventing effective working. The aim with Lean should be, to systematically eliminate waste and thus to increase the productivity and quality of work. (Kouri 2009, 10-11.)

The Lean-operation model leaves a mark wherever it is in use, whether it is organization of production or continuous development work. Lean can

be clearly seen in the culture of the company. Each person participates in development projects and that way knowledge towards operations is increasing in daily actions. The model develops operations everywhere in the company, especially in the manufacturing. There the value towards customers arises. This is also the most important point for creating appropriateness, rationality and accuracy. “Uncompromising quality thinking, where everything possible is done to confirm products and services quality, includes into Lean activity. Responsibility of the quality belongs to every person of the company.” (Kouri 2009, 6.)

### 3.1 5S

The 5S-operation model is one part of the Lean model. It is just one of the many tools which the Lean-ideology includes. 5S consists of five (5) different phases and it was also created in Japan. The names of the phases come from Japanese and all of them begin with the letter s. That is where the name 5S stems from. The phases are:

- Seiri = Sort
- Seiton = Stabilize/Set in order
- Seiso = Shine/Sweep
- Seiketsu = Standardize
- Shitsuke = Sustain.

Cleanliness and order characterize significant issues both for customers and potential labor force. The starting point is that profitable and high-quality tasks can be conducted only in a clean environment. The basic idea is to increase productivity, to improve the level of quality and to raise work ethic. These factors are reached when the working environment is clean and in good order. 5S is a practical tool for maintaining these. It helps to find and eliminate problems in time. The 5S-model is special because it can be applied in to an office as well as in the production of a company. Systematic and disciplined operations are developed also with the 5S-model. (Kouri 2009, 26.)

The 5S-system has several vital targets. The work station is an important area in the employees' daily life. It should be clean, in good order and safe. In addition to these, 5S gives the company tools to make it an efficient and comfortable place to work. There the staff members must feel easy to simplify the ongoing progresses. The operation model should cause fewer accidents, rejection discards, waste running, stoppages and mistakes. Instead it creates comfort to the environment, better productivity and a good impression to the customers. (Tuominen 2010, 7.)

#### 3.1.1 Phase 1

The first phase is called Sort. Main point in this first phase is simply to sort everything. Every tool, object and instrument is looked through and every one of those will be recognized and the demands of those are evaluated. This phase includes also a task where criterions are created. These

criteria define the difference between useful and useless products. Removable products will be sorted and after that, disposed of. Also useful products will be sorted and new places must be created after sorting. (Teknologiateollisuus ry 16/2001, 8-9; Tuominen 2010, 25-27.)

Mostly used method in sorting-phase is “Red-tag”-program. In there the removable or somewhere else storable products are marked with a red tag (Figure 6). That tag tells for example name of the inspector, date, demand, reason of the tag, storage place and disposition date. Jigs, moulds, junk and work-in process are often accumulated all over the stations and the purpose is to get rid of all these. First, those tagged products are moved into the red tag-area and after that, either positioned again or removed for good. (Teknologiateollisuus ry 16/2001, 8-9; Tuominen 2010, 25-27.)

SStoday.com

**RED TAG**

Date: \_\_\_\_\_ Tagged by: \_\_\_\_\_

Item Name: \_\_\_\_\_ Tag ID# \_\_\_\_\_

Location: \_\_\_\_\_

**Reason:** \_\_\_\_\_

Scrap

Not Needed

Defect

Old/Obsolete

Extra

Other \_\_\_\_\_

**Action to take:** \_\_\_\_\_

Discard  Shred

Recycle

Move to Red Tag Holding Area

Move to \_\_\_\_\_

Return to \_\_\_\_\_

Other \_\_\_\_\_

Figure 6. Red Tag (Creative safety supply. n.d.)

Removing useless items clarifies working environment and gives more space to act. Sorting helps everybody to keep places clean and in good order. Moving and safety at work gets better, it saves and increases space, clarifies processes and gives a chance to save up in cleaning. (Tuominen 2010, 25.)

### 3.1.2 Phase 2

The main purpose of stabilization is to find practical depository for every requisite instrument and those depositories should be marked properly. Every single item, which is necessary in working, will be organized in a way that those can be found easily when needed. Setting in order assures that it is a snap for everyone to find, take in use and put away the needed item. Target of all these actions is to eliminate pointless searching, improve safety at work and make working environment better. Places of the equipments are not the only things which are marked. It is advisable to mark tools itself for example with colored cable ties. Marking off the floor and dividing it into stations is a wise thing to do. That creates passages and clarifies movements in the production areas. When pulling the lines, it is useful to mark places for pallets, pallet jacks and garbage cans at the same time. Color-codes and signs are used to prevent equipments getting

mixed-up. (Teknologiateollisuus ry 16/2001, 10-11; Tuominen 2010, 35-38.)

“Taking an object to its own place takes one minute but finding it might last an hour, at the worst” (Teknologiateollisuus ry 16/2001, 10). Time used into taking something to its own place or getting it, is pointless when thinking from works point of view. Because of that, pointing places is critical. Belongings needed rarely are moved beyond and equipments needed daily are staying near the stations. (Tuominen 2010, 35, 40-41.)

### 3.1.3 Phase 3

It is not enough if phases one and two alone are implemented. Those remove problems in relation to space but one problem is hiding around the corner. Dirt wear down machines and makes quality worse. Third phase, Shine, is created for these problems. Everything will be cleaned up when operation model reaches this point. Floors, tools, tool racks, devices and especially machines. Engine life increases and everything is ready for instant use when those are cleaned. This leads automatically into situation where everything is kept in top condition. That creates user maintenance and whit user maintenance is easier to notice possible errors and deviations. (Kouri 2009, 27; Tuominen 2010, 49)

Clean environment creates optimal offset for working. Everybody watches out mistakes and from the other hand, even the smallest mistakes are easier to register. It is self-evident that oily and dirty floors can cause slips and objects in wrong places can be fatal if something drops from high or someone stumbles over. This all can be discounted if 5S-model is carried out properly. Some kind of manual or instructions should be created in touch with cleaning. There can be a kind of sorting into daily, weekly and monthly actions. Those instructions define precept for how to keep environment clean. (Tuominen 2010, 51-54)

### 3.1.4 Phase 4

“Carrying out a 5S-campaign once in a cell or work station is a pushover. Without daily discipline and clear follow-up and operation routines it is too easy to return into old habits. That is why the management level should set annual 5S-goals for every station and employee.” (Teknologiateollisuus ry 16/2001, 13.) Fourth phase is Standardization. This stage is destined to create procedures and routines. Those should be guiding three (3) earlier phases into continuous and developing course of actions. Purpose is to take in use and maintain all that, which is created earlier in sorting, stabilizing and shining. Target is to change constant methods into standards which employees are expected to obey. Mundane tasks are established and those are followed precisely. Instructions should be so crystal clear that almost everyone could check the station with the help of those. (Tuominen 2010, 61-64.)

Actions are being supervised and followed by persons proposed. Everyone should know what to do and which are each ones responsibilities. Check lists are created in standardization phase and on by a way of those the level of operation model is monitored. (Teknologiateollisuus ry 16/2001, 13; Tuominen 2010, 64-67)

### 3.1.5 Phase 5

Last phase is sustaining the level which is reached with four earlier phases. Brought standards and balanced workplace are maintained and followed all the time. Methods are under adoption and those are improved continuously. Improvement has to be one part of sustain because the environment should be improved with the help of results from follow-up. Internal audition lists should be created in the phase five, and auditions should be made at regular intervals. The results from the auditions should be gathered and put on to bulletin boards so that everyone can see and follow up the development of 5S-actions. Evaluation should include happened changes and comparison to earlier months. Audition is essential tool in progress of pushing cleanliness and sustaining a creditable level of order. (Teknologiateollisuus ry 16/2001, 15; Tuominen 2010, 75-77.)

Sustaining should create a situation where each and every operational principle and applied method becomes a natural part of daily actions and development. Creating some kind of competition between cells in implementation phase is not a bad idea. It pushes developing in the next level if stakes steps forward. Another option is a bonus system. Suitable prize motivates employees and by that way gives better results. (Tuominen 2010, 77-78.) Economic situation of course determinates rewards. It can be for example clear productivity bonus or just a dinner financed by employer.

### 3.2 Benefits of the 5S

5S-operation model brings a lot of benefits. Some of those are economical and some improves human capital. Results can be seen in staff, environment, quality, production and offices. It can be said that the main benefits are:

- Upgrade of productivity and the quality of actions.
- Reduce of work in-processes and shorten lead-times.
- Better working circumstances and rising comfort.
- Decreasing searching times and costs.
- Rising company image.

5S gives a better starting point to notice problematic and deviations before major troubles and every complication should be putted in record. If in auditions turns up several times a note from same machine or station, should that ring a bell. There should be conversation even about the smallest blips. Roots of every problem should be traced and eliminated. (Teknologiateollisuus ry 16/2001, 22; Tuominen 2010, 83-87)



### 3.3 Potential stumbling blocks

No method includes only good and positive parts and effects. New operations model brings always challenges and difficulties. Stabilizing and implementing new is demanding hard work and variable amount of resources. If the new model is managed to push through, problems do not end there. Pushing out the old habits might be even bigger and tougher process to do. There are possible blocks but an organization have to find methods to go around or cross those. Regardless the whole process can suffer a fatal hit right in the beginning. If the basic idea of 5S is not understood precisely, everything is pointless. Targets have to be clear to everyone so that the program is not considered just as a single task. Employees might think that working with project is a waste of time and quality will be in accordance to those thoughts. (Teknologiateollisuus ry 16/2001, 23.)

Attitudes are playing a huge role in these kinds of projects. If attitudes are not positive, those might prevent effective and powerful communication. Negative atmosphere assists creating mistrust and anxiety and those factors are unwanted. However, management level can drop the ball if they do not trust on their employees. The absolute truth is that employees' skills and creativity are the most important resources what a work group can get for implementing 5S. (Teknologiateollisuus ry 16/2001, 23.)

This kind of big and demanding operation model needs a lot of time and that must be gave from the chief of work group. Changing things and matters are not fulfilled overnight. Long-term results as well as forgetting old habits are achieved with patience and hard work. Quality-, delivery- and financing problems have to be seen as possibilities, not as problems. (Teknologiateollisuus ry 16/2001, 23.)

## 4 INTRODUCTION OF THE 5S-OPERATION MODEL

The company had formed a decision that they are going to improve their production. The method for that would be 5S. A lot of information and recommendation for that came from the customers. Of course the delegates from the management level had done some research work concerning the method, but because of recommenders they were quite confident with the idea. (Peltonen, interview 27.2.2012.) The job that waited for was to find specific information, experiences and so called tacit knowledge. Pros and cons have to be measured and the whole idea should be introduced and also sold to every employee in the production parts.

After the research phase there was incontrovertible need for the introduction session. Employees as well as the administrative persons of the company needed a thorough education. These sessions should give readiness to work with the 5S-operation for everyone.

### 4.1 Quality manual

The company had already a quality manual which created a create basis for new production management program. Manuals latest update is from 2012 so it gave clear and easy stepping stone for developing the whole production. Idle time and non-value producing working were big problems for ST-Koneistus and the 5S operation model was started mostly because of those. 5S shortens lead times, decreases sick leaves and improves the quality of the products and also quality and satisfaction of the whole work place. This means that both, the company and the customers benefits from it. (Romppanen, interview 20.12.2012)

Because of the already existing quality manual, it was a lot easier to work with 5S-method. There was already clear basis for almost everything because a working methods and habits had clear templates and everyone knew how they should work to keep quality and image in high level. By the large survey done in company's premises with the quality manual, the weaknesses and grievances were easier to observe.

ST-Koneistus Ltd is commendable in the field of quality and environment. Det Norske Veritas have admitted both ISO 9001 (Figure 7) and ISO 14001 (Figure 8) certificates for ST-Koneistus Ltd on 03 of January in 2011. This shows that the company works hard to reach high class level in the field of manufacturing. Also this pushes intent to improve actions continuously. Certificates require a lot of hard work and with a system like 5S it is clearly easier to achieve the requirements of those. (Romppanen, interview 20.12.2012; Selin, interview 20.12.2012)



Figure 7. Certificate ISO 9001. (Romppanen, e-mail 10.1.2013)

Figure 8. Certificate ISO 14001. (Romppanen, e-mail 10.1.2013)

“The ISO 9001 certificate proves that your quality management system has been certified against a best practice standard and found compliant. Certificates issued by a third party certification body/registrar, such as DNV Business Assurance, lets customers know that they can trust on that you have implemented the necessary internal processes to meet obligations.” (DNV, ISO 9001 n.d.)

“The ISO 14001 certificate proves that your environmental management system has been measured against a best practice standard and found compliant. The certificate is issued by a third party certification body/registrar, such as DNV Business Assurance, and proves that you are actively minimizing the environmental impacts of your company’s processes, products and services.” (DNV, ISO 14001 n.d.)

Certificates like these gives professional and convincing picture of a company. If it is possible to introduce certificates and process like 5S, it tells to customers that the company is really working hard to achieve highest level of quality in different fields.

#### 4.2 Research

First thing to do was to gather and find information as much as possible. Information was searched from the internet and books. The books were dealing with both LEAN and 5S. Those are used also as sources in this thesis. No matter how much reading and searching the text from the internet, the best information came from the people who have worked with the system.

### 4.2.1 Printed information and the internet

The books for this pretreatment, was found with the help of HAMK and members of it. One student for example recommended a book which “gives a lot of universal information and specific, practical examples from 5S-actions.” (Vihersaari, e-mail 5.3.2012) Other books were found from the library of HAMK. These were valuable help for the work because the never ending amount of information can deceive. In the library there are thousands of books but knowing which ones are good is important so you do not waste time.

CEO Selin invested on Teknologiaoteollisuus, MET-publish-5S booklets for every workstation and that was quite handy help for the research phase also. Material in that booklet is based mainly for the Sandvik Tamrock Ltd Tampere unit application. Concrete actions gave perfect picture from what is going to happen in each step. All that was shaped in short form and by that way also the employees managed to go through that material and received some kind of image what is going to happen. (Teknologiaoteollisuus ry 16/2001, 5.)

The internet is a good tool also. There is not such a thing which you cannot find from internet. Of course there are problems because no one can trust on every source running into. The best offering from it was definitely pictures. By those it was possible to show happened changes to others in information sessions. That was for one’s part helpful for the members of the company, so they were able to understand what is tried to achieve with the model.

### 4.2.2 Company visits

Gratefulness for the production managers of Bosch Rexroth Ltd and Bronto Skylift Ltd Ab is never ending. Visits to both of those were extremely important when thinking the final outcomes and decisions choosing the method to improve the production. A chance to see with own eyes the progress, what a company can achieve using 5S, was a thing what cannot be learned from books. The persons who have worked with 5S more than one and a half years, gave thorough and important information and examples. With the memorandums made from visits (Appendices1&2) it was a lot easier to start implementing 5S.

Lot of new and tacit knowledge came to consciousness and that is the most important kind of information. Problems and misfortunes that they have faced and learned issues concerning those, was that kind of knowledge what can get only with experience. “5S is continuing and it’s kind of improving itself all the time. It is self-pushing and on-going operate.” (Jaatinen, interview 26.3.2012.) This kind of positive information was priceless when thinking the crucial differences between the production improvement methods.

Indirect benefits are often variables which can vary between the information sources. One book says this and another says that but that all is

widespread text. Bronto Skylift and Bosch Rexroth are ST-Koneistus Ltd's customers and they know roughly the situation in the company. Audits, for example have given a big picture for them and they can tell by that way the best profits of the program for ST-Koneistus. "5S is perfect tool for controlling and for continuous improvement. Waste decrease and quality standard develops." (Helvilä, interview 30.3.2012.) Those for examples were targets which were in the improvement list of ST-Koneistus Ltd's customers, given in audits. By this way it was easy to see that an information flow between companies can help even to choose the best possible tool for changing the direction of one. (Romppanen, interview 20.12.2012.)

### 4.3 Introduction

The introduction to the personnel was done in two parts. First meeting was held only with administrative part of the company and on the second time everyone was present.

Only small amount of persons was attending the first meeting. It was agreed that at first, things is good to go through with main group of the company. There was gone through the basic meaning and the purpose of the 5S-program. It was presented all the findings gathered on the searching phase and basis of those, proposals were made on which could be good working methods and manners to approach. During the meeting were eliminated all that were felt unnecessary and worthless. All learned in company visits came useful in this phase because it was not easy to choose the best things from several opinions to execute.

The second introduction phase was held to all of the personnel. All were gathered together for the occasion and the purpose for this was to introduce the 5S-operation model. Employees' knowledge regarding to 5S was quite minimal. In the company's quarter meeting was mentioned that this kind of program is coming but that was all the information given for them previously.

The basics and purpose of the 5S-program was examined more detailed this time. The introduction was held with PowerPoint-presentation (Appendix 3) and the phases of the program were specified. Also all the methods that will come into use in implementation phase were presented. The purpose was to keep it simple and because of that a lot of pictures were used (Figure 9) to concretize the main problems. It was easier to push the need of this change to everybody's mind with tangible examples. First, a lot of photos from ST-Koneistus' facilities were to be seen. After that, figured out a pictures from a production environment, where the program was already executed. This showed quite well the problems that the company was struggling with.



Figure 9. 5S-phases. (TPF Europe BV. n.d.)

The ultimate purpose was to get employees familiarized with the 5S and also to give them knowledge about what was going to happen in their workstations. At the end of the presentation there was time for questions and opinions concerning 5S. Information flow was reciprocal and discussion continued a while but final result was that the idea was received well and almost everyone was looking forward to start working with the 5S.

#### 4.4 Why 5S? –Opinion of the company

The decision to take 5S-operation in use was jelled up from many factors. Romppanen told that external demands had tightened a lot and that creates automatically actual pressure to improve actions continuously. Competition had grown tighter and that involved constantly increasing expenses. Variable circumstances creates strain on the daily actions and because of that, operating should be developed so that the company could be able to answer the needs of the customer even better than before. In addition to that, suppliers are evaluated more often and also more precisely than before. Internal actions are taken into notice and the evaluation bites especially functionality, efficiency and methodicalness. Some kind of proofs, demonstrations and showings are often asked. Standards and systems, like quality systems are most common examples which the customers pushes for. It is discovered that 5S could give answers and tools to achieve all these demands. (Romppanen, interview 30.1.2013.)

With internal audits the management level of ST-Koneistus Ltd had noticed that time for searching and picking up tools, equipments and other materials was significantly too long. Useless time goes by and it harms the fluency of working and taking care of the given assignments. General level of

cleanliness and order gives fluent working environment and facilitates moving and performing in daily actions. It also reduces the time needed to searching tools. Moreover, clean environment and good order improves the comfortableness of workplace and makes the working safety much better. (Romppanen, interview 30.1.2013.)

The company management decided to start a development project. That decision was made during the year 2011. The function of the development project was to test the 5S-operation model in the production side of the company. The actual development project though started not until than after the last change of the chief executive officer. First part of the year 2012 they employed a person to lead this project. That action gave the trigger to the project and now it is going on. The different levels of the company members had hoped for some kind of change on the course of actions. This kind of bigger process is hoped to clarify and eliminate problematic and maybe at the same time improve the company image and reputation in the eyes of the customers. (Romppanen, interview 30.1.2013.)

## 5 IMPLEMENTATION OF THE 5S

The whole process started by taking pictures. All the faults and shortages were photographed so that it is easier to observe the points which should take into notice. That also gave clear picture of the starting point for all the employees in the production, as well as in the management side of the company. Pictures are in high role in this thesis so it was really important to take a lot of those. By using figures it was easy to see what kind of differences the project had achieved and where is still the need for improvement.

The actual job was done in three pilot targets. These three targets were chosen because of two major factors. First of all, those had a small amount of workers and wherefore quite small amount of tools, materials and other belongings. The second thing was that these stations were located in kind of separated part of the workshop. The company's facilities are in three sections. Administrative premises are in own section. Production and raw materials take the biggest part of the facilities and then, in the newest part of the company, locates all of these pilot targets. Almost only finished products were handled in those stations, so all of the machining work was already done when the goods arrived in those parts of the facilities.

As said, in the pilot targets was quite small amount of people, so it was easier to try all new things. With smaller amount of factors, it was simpler to notice some issues which need to take care of. These spaces were also per se cleaner and out of metallic scrap because there was no machining tools. Mentioned issues helped a lot of pushing through the program at very first time. All three pilot targets were under construction at the same time. It means that also the phases of 5S-program were implemented almost at the same time in all three stations. Only blow-by-blow cleaning and all kind of finishing activities were done one by one.

The actual work started with small meeting with the workers in these targets. Discussion concerned about what was necessary and useful, and what instead was futile and useless in those posts. Employees themselves had a chance to tell what tools and equipments they need oftentimes and what can be moved away from their desks. Their opinions were examined critically, because there are always these kinds of hoarders who cannot give anything away. But anyway, when this kind of situation happened, there was conversation about what was really necessary and what was not. These conversations helped to understand needs and lacks. For example some tools which were needed more than once a week were always missing because the company had only a few of those. Workers told important things which were only in their knowledge. That kind of things are impossible to notice if the workers do not get a chance to come listened up. They are the persons who are working there every day so they have the best knowledge concerning those areas.



### 5.1 5S Phases

The five phases were executed mostly at the same time in all three pilot targets. The area was not too big for that, so it was easier to implement the method in tandem. If not so, it would be too laborious to do everything over and over again in that small area. Everything would have looked like unfinished and messed up. Especially the lines on the floor would have looked extremely stupid if those would be ending up in some random point. Gathering and removing all the waste and useless stuff many times would not be too smart thing to do.

The first phase, sorting, started by gathering everything unnecessary away from the workstations. Tools, accessories and else, which should not be there was gathered on two desks on area. Those desks had also one box for the tools that can be fixed so those were not misspent.

All rarely used and disposable equipments and materials were gathered away on these desks. Those “red tag”-materials were sorted in two groups immediately so it was a lot easier to move those forward. The objects were not accumulated much because of quite small amount of stations and materials. Main part was formed by old bore bits and other tools that have lost their ability to function. All the electronics out of order, and all the empty and unnecessary chemical packs were also gathered away from the workers to be removed correctly.

Second phase of the 5S was the hardest in these pilot targets. Lot of parts and tools were in wrong and bad locations. For example in the assembly station, there is a lot of different size of plugs in use. A position of those was not so optimal (Figure 10) before the second phase. Tools were also often mixed up between the stations because of the borrowing-culture prevailed in the company. So when the equipments were placed again, tools (Figure 11), tool racks and tool cabinets were marked with colorful cable ties. That prevented the tools getting lost and mixing up.



Figure 10. Location of the plugs before the work.



Figure 11. Marking tools with colorful cable ties.

Measuring devices got own cupboards so those are staying on place and everyone can find those when needed. Drawers were also marked with name stickers so basically all the materials, tools and other things remaining were identified in stabilizing-phase. New depots and repositories were planned and belongings were moved to own places.

Phase Shine started partly at the same time with the phase two. Cleaning and sorting up the places was not a huge process which it probably will be in the rest of the manufacturing area. In pilot areas everything was quite new and because of that, quite clean also. Metallic dust, oil or cutting fluids were not a problem neither in this part of the production. Benches, work surfaces and closets were cleaned and floor was washed by the cleaning service. Passages (Figure 12) and the areas for the pallets were drawn with yellow and black-and-yellow marking tapes on the floor. Washing room for the cylinders and other products was also cleaned extremely carefully with strong chemicals, so that all the rust and other sticky dirt came off. Different kind of signs and plates, like place for the truck and incoming and outgoing goods were installed in this phase. It was tried to hammer one idea into employees' heads: they should realize, that cleaning had a multifold benefits. Checking the places was taken care at the same time. With cleaning, it is easier to see where the problems come from.



Figure 12. Passages on the floor.

A standard work instruction was made in phase four. Employees started to follow that immediately. That standard (Appendix 4) told for everyone in the company, what kind of tasks should be done and when. The tasks were divided in three main groups which were daily, weekly and monthly actions. By that way all the important tasks were in visible form and at hand to workers. It was noticed that employees sensed it easier to observe these kinds of tasks when they have a list what to do.

The ultimate aim in phase four was to specify the segmentation of responsibilities and work assignments. Standard work instruction gives needed directives so that cleanliness and order are going to be maintained continuously. With standardization it was also possible to make 5S-results visible and by that way to give more motivation for the employees. A problem was that it is really easy to accomplish this system once, but without standardization it is a lot easier to get back to earlier types of actions. With shop floor the tools in each post, dustbins emptying intervals, cleaning schedule and the places for the passages were standardized.

So in phase four (4) all necessary were standardized and taught for the employees. For keeping achieved goals up, it was created an audition list for the company (Appendix 5). Internal audits are not executed yet and the numbers on appendix five (5) are just examples how it could be. The audition will be made by the production manager after the system is working in the whole workshop. The results will be marked in the excel-sheet in wrong/right-style and the index is coming from the ratio of those. The index number is going to be followed with a diagram and main idea is to keep the index number as high as possible with continuous improvement.

The list should tell what is going to be checked and when. With that, it will be a lot easier to keep track of 5S development. By filling it fortnightly the company will get clear and current data from the system. Received

data will be analyzed and results are going to be seen for every person in the workshop. With solid results everyone knows where they are going with 5S, and they can make changes on their own working methods if needed. This will motivate the staff members because they can see the results of their work.

Sustain is going to be success only if everyone acquires the operational principles and methods. It means that every person should commit themselves for sustenance and development and also know their responsibilities. Workers took this immediately for themselves and concerned if someone was breaking the standards or agreed working methods. It was managed to sell the idea for the management level so, that showing the results continuously for the employees, it improves the motivation to create continuous improvement with the 5S-system. Employees instead get the idea that the system has not a finish line and that is why it needs to be improved all the time.

### 5.2 Cylinder station

Cylinder station was relatively small station comparing for example to machining stations. It was destined only for making cylinders, what the name tells also. Cell includes two hydraulic presses for assembling the cylinders and one test bench, which was used to test the functionality of the cylinders. The station was used by three employees, mainly one or two of them working at the same time. It included also two countertops and a movable tool rack.

#### 5.2.1 Expectations

At the cylinder station the expectations were not so high and critical, because of the quite limited spaces. The station was in quite a good shape already to start with and the biggest problems concerned the tools and other equipment that was needed there. The targets were to get the critical tools and equipment used in the assembly closer to the workers at the station and to get them organized and marked. The wish from the workers was that if possible, the post should be separated from the other spaces by floor markings. (Romppanen, interview 30.1.2013.)

#### 5.2.2 Results

Results of the project were better than expected. The workers at the cylinder station were active and they greeted the changes well. The phases of the system were carried out well and the worker attitude towards it was great. People really wanted some changes to take place. This was easy to be seen in their style of working with this project. Not a single argument was heard during the implementation phase. On the contrary, new suggestions and types of action were given and a positive atmosphere towards 5S was tangible. Changes made at the station were not major but they were important. More space for the station was created and practicality was increased by stabilizing the tools and other materials needed.

The changes made gave a better basis for the work at the cylinder station. Useless and unnecessary tools were removed away and everything that was out of use was disposed of. Needed tools and items were marked and re-organized. The order of the station was changed slightly and it was marked as its own working area (Figure 12). Tape as the marking material on the floor was chosen, because it can be removed if there is a need for changes afterwards. Tape was chosen also for testing purposes. Pilot targets will show how long it lasts on the floor. If it wears out within a short time it is better to choose paint for the rest of the production spaces because it lasts longer and the abrasion is slower.

The highest benefit was achieved by organizing and stabilizing all the different small parts and accessories. For example springs and rubber seals were one big mess before the operation (Figure 13, Figure 14) as was the case with bearings. Also these parts are needed in the assembly phase of the cylinders.



Figure 13. Springs before the 5S-implementation.



Figure 14. Rubber seals and bearings before the 5S-implementation.

All these were stabilized and stored with the new system. Springs got a completely new storing system and space closer to the station. Seals got their own small blue boxes and the bearings were moved closer to the station because of their high utilization rate. (Figure 15, Figure 16, Figure 17). This helped the assembly phase a lot, because the workers at the station got everything closer and better visible. They did not have to use any more time for searching parts in a huge amount of small boxes. This made it faster and easier to carry out operations.



Figure 15. Springs after the 5S-implementation.



Figure 16. Rubber seals after the 5S-implementation.



Figure 17. Bearings after the 5S-implementation.

The working desk was cleaned and stabilized (Figure 18, Figure 19) and standard working instructions (Appendix 4) were listed and shared with the employees. Afterwards there will be pictures of a clean environment on a bulletin board, so the employees can easily see the required condition. A concrete example clarifies the target and acceptable level of cleanliness. This way the company tries to keep the motivation and vitality of the staff members at a high level.



Figure 18. Workbench before the 5S-implementation.



Figure 19. Workbench after the 5S-implementation.

### 5.3 Assembly station

The assembly station is located before the warehouse when thinking of the production flow in the production area. Products come into this station from production, as well as from the warehouse. Some products may continue to surface finishing outside the company, but when they come back, products which need assembly are handled in this area. The assembly station contains only three work benches and the work is done mostly by the warehouse personnel. Work tasks done are mostly cleaning the products and assembling plugs to them before sending them to customers. Cleaning includes removing rust and possible oils from the pieces and on the other hand cleaning burrs. Assembled accessories include mostly plugs and seals.

#### 5.3.1 Expectations

The major target and expectation at this station was that a common order be improved. Tables and work surfaces were one big mess (Figure 24) and the program was to give answers for improving it. Also the tools were here and there, so a cure for this was on the waiting list.

The flow of the work at the assembly station was not optimal. Products might lie around for a long time, because there was no clear working order. Uncompleted and finished products were mixed up when lying around on the floor. The transfer of finished products into the warehouse was not working. There was a wish that the project would provide some kind of tools to pick up the slack and improve the operating rate. Some kind of routine was clearly needed at the station and 5S should be the provider of this. (Romppanen, interview 30.1.2013.)



### 5.3.2 Results

Also in this area, the biggest changes were achieved by removing all the unnecessary away from the workplace and around it. A massive amount of old and obsolete plugs were removed with tools and products which were useless. This created a lot more space on the tables and especially underneath (Figure 10) of them was cleaned and emptied. This was a big problem and also the customers had stepped in saying that this was harmful. When the sorting was done, it was possible to mark the tools (Figure 11) and stabilize everything again. The plugs found themselves in a new position (Figure 20, Figure 21) as well as the tools. The tools were divided onto two benches and the floor was cleared out of everything unnecessary.



Figure 20. Plugs after the 5S-implementation.



Figure 21. Plugs after the 5S-implementation.

After these duties had been conducted the shine phase was easy to be executed. Lines were drawn at this station and the desks were cleaned. The lines were ruled off for the pallets which convey the products, coming for the assembly process. That was an important improvement, because before the program the pallets were lying all over the place (Figure 22). The new marked area (Figure 23) gave more space to operate and transfer the movable tables which function as a working level.



Figure 22. Pallets before the 5S-implementation.



Figure 23. Pallets after the 5S-implementation.

At the assembly station the project was conducted mostly without the station's own personnel because there was only one man working and he was always busy. The post was also quite small and there were not so many elements to be improved. The desks were one big issue what needed to be improved and with standard work instructions (Appendix 4) the achieved results are to remain constant. The starting point was not optimal (Figure 24) but the results were quite impressive (Figure 25).



Figure 24. Workbench before the 5S-implementation.



Figure 25. Workbench after the 5S-implementation.

### 5.4 Warehouse

The warehouse was located in the newest part of the company. The extension of the building gave new space for the warehouse, which was also called the last station of the company. The flow of the products ended up and it was also the place where the products were dispatched for the customers. The warehouse was medium sized, including about 250 pallet places for the products. Moreover there was no separate storage place for the products which arrived from surface treatment for onward transmission. The warehouse was a simple but busy working area. There was one staff member who took care of the storing, dispatch and reception of the products.

#### 5.4.1 Expectations

There were a few problems in the warehouse which the project should tackle. The packing materials had no safety stockpile which was a critical shortage. The area between the shelves and in front of the doors had to be cleared and emptied. Within these areas there should be unrestrained routes for the operations. The 5S-program should secure a fast exit and a clear access to the fire hydrants and foam extinguishers in case of emergency. Incoming and outgoing goods should be separated from each other. Drivers had told that there were some problems to recognize which items were which. (Romppanen, interview 30.1.2013.)

#### 5.4.2 Results

The results of the work in warehouse were quite reassuring. It was quite a mess before the program but afterwards the warehouse was in a much better condition. One of the main targets was to get the floor emptied. The pallets, pallet trucks and tables were put wherever a space was found (Figure 26) and that way all the passages were either blocked or difficult to cross. With floor tapes and clearly marked places for the pallets this problem was eliminated. The floor was emptied from pallets and cleanliness and order improved a lot (Figure 27).



Figure 26. Space between shelves before the 5S-implementation.



Figure 27. Space between shelves after the 5S-implementation.

Earlier incoming and outgoing pallets and products were in the same spot (Figure 28). These were separated into incoming and outgoing cargo. One big shelf was removed to the warehouse and now all the entranced products and materials go first there (Figure 29). This prevents incoming cargo from lying all over the floor. That brought clarity to the shipping room personnel but also to the truck drivers. Now it is easier for the drivers to see immediately which items are going out. There were eight spots ruled off for the pallets leaving for customers or for surface treatment. Also the place for the cargo, which the drivers are bringing in, is now easier to detect (Figure 30).



Figure 28. Incoming and outgoing products before the 5S-implementation.



Figure 29. Incoming products after the 5S-implementation.



Figure 30. Outgoing products after the 5S-implementation.

Packing materials (Figure 31) and crates were a problem too. Crates could run out whenever and so could pallets too. No one was taking care of the sufficiency of those and that created a lot of problems in packing station. Time of delivery of big boxes and packing tapes was long and if no one noticed on time that those were going to end, a bunch of big problems came with that. That was a reason why the place of those was cleaned, re-organized (Figure 32) and after those, a safety stock was created. By a safety stock it is easy to avoid previous mentioned problems. Standard working instructions (Appendix 4) includes also a mention about packing materials, so the warehouse employee sees how often s/he has to check those. It was ordered also new packing materials, like plywood boxes to avoid products suffering any damage during shipments. For example in shipments to Sweden, the products had suffered damages and those issues were tried to solve out with new packing materials and solutions.



Figure 31. Packing materials before the 5S-implementation.



Figure 32. Packing materials after the 5S-implementation.

## 5.5 Problems in the implementation phase

As always in projects, at this time also, there turned up a few problems. A project without any problems is a miracle. That miracle did not happen this time.

### 5.5.1 Attitudes

One of the biggest problems was attitudes of some employees. This kind of bigger project changes working methods quite a lot in the company, so everyone is not necessarily taking those in use by just lying down. ST-Koneistus Ltd is quite old and also old-fashioned company and there are few older employees. Their habits concerning their work tasks had deep

roots and they were not so responsive towards new methods. Of course it was completely natural and understandable defense mechanism but the work was done to achieve the common good and everyone should have understood that. Ones were extremely happy and satisfied with this program, when others just doubt almost everything. Skeptics were not just the elder ones, but also younger employees expressed their suspicions against 5S-model. The most common argument was that the program is going to be just a waste of time and that there are no real benefits, it is just more specific cleaning process. But when reached a point where results started to show, little by little these suspicions fell silent.

### 5.5.2 Disposal of material

Another bigger problem was with belongings which are going to be removed completely from the working premises. Tools, materials and equipments which were discovered to be useless in the first phase of the program were gathered together and moved away from the stations and tool cabinets. The problem appeared after that. The final dispose of those turned out to be anxious and frustrating process.

If something should be changed afterwards, it should be the organizing of the first phase so, that everything would be sorted better when throwing away. All items gathered away were in one big pile on the tables used. All that was standing there and sorting had to be done almost completely again. One big point escaped totally from attention. It is not possible to dispose all the waste at once. Everything should be sorted by the type. Is it hard metal or rapid steel, electronic or mixed waste? If this question had been asked before starting the whole process, it would have been easier and simpler to carry out.

Sorting was one problem but the fact remains that new problems came with the final removal. Hoarding has been a major problem almost in everywhere of the world. People had had stashes of something for years and when the time came to give it away, it was not the easiest part. It brought also a situation where more precisely done sorting created of course a bigger amount of different kind of waste bins to be disposed of. Actual problem with that were the bins which stayed and lied around. No one did take care of that phase where those should be removed away from the premises. Something should took somewhere else than others and that was an insuperable problem. Or on the other hand some bins were not checked yet by the management level or other employees. Hoarding raised its head again.

### 5.5.3 Schedule

Scheduling the work was a bit hard to because the program was totally new and there were no experience with 5S-operation before. There was no knowledge about how long should be time reserved for researching phase or implementation of each stage, and how long those will really take. This made the planning phase more difficult than expected. There was not an



ability to give clear answers about the length of the whole process. That was understandable and however, it was managed to reach an agreement with questions concerning schedule. It was agreed that deadlines and timeframes will be created while the process goes forward. By that way it was easier to see how long something took and it created a possibility to establish more exact schedules.

Time itself created an unusual challenge. The original idea was that this thesis will include only research phase and in the realms of possibilities, the implementation phase. It was clear that the 5S-operation model would not be finished and the purpose was only to set the project into action. Afterwards came out news that ST-Koneistus Ltd. wants to expand the topic so that it includes also the plans for expanding. That gave a lot more time to work with the actual 5S-operation, not just to create a basis for it. Of course it was excellent news and gave an opportunity to do this final thesis wider. The problem was that almost every schedule and timeframe had to be planned again. Some changes on the organizing and writing process were forced, but totally that extra part was not so difficult to settle as a new part of the thesis.

## 6 PLAN FOR EXPANDING THE OPERATION MODEL

After the actual implementation of the 5S-operation in pilot targets, the company wanted to expand the work so that it includes a plan for expanding the operation in the rest of the facilities. The purpose of this last section was to create instructions and directions for the management level how to carry out this program in the rest of the production premises. Course of actions and working methods were phased on the experiments on the implementation phase of the 5S in three (3) pilot targets.

Most important thing to do is to create a work group. Work group that will carry out the whole process. A group which it will take care of the researching phase, if needed, and the implementation phase also. The group should stay together all the way from the starting point to the finish line. The group must have a leader, who takes the biggest responsibility from the process. S/he will take care about the education of others, distribution and supervision of the work and obeying the planned timetable. The management level should harness this person only for the tasks of the 5S-operation and give needed time for that. It will take one person's whole day to lead this process and if creditable results are wanted, selected person should concentrate only for that work. The leader names needed amount of persons into the group and their job together will be deciding, what, when and by whom the following tasks will be done.

### 6.1 Going through the 5S-phases

The actual work should be started by taking pictures. The persons in charge should photograph all work stations, all passages, machines and also offices. If all places have been photographed, it will be easier to do comparison, after the implementation, between the starting point and current stages. With photos and figures will be easy to see what kind of results has they achieved with 5S-project. It is good to remember that it is not acceptable to mark off the offices because the best example comes straight from the top of the company. Management level should also put the 5S-operation into action in office spaces.

After taking photos it would be good to keep some kind of information and introduction phase. Although a PowerPoint-presentation concerning 5S-method (Appendix 3) had been already presented, it will be good to recall the key points of the coming efforts. Given presentation (Appendix 3) can be used as a basis for that info-session and chosen persons in charge can add something important or take out those points which they see unnecessary at that point. With this kind of meeting it is possible to come over with employees. It will also be a great opportunity to bolster up the need and benefits of the program and by that way to sell it for the employees. There was noticed a little bit of opposition rising towards the 5S when it was under construction in the pilot targets, so this kind of prime helps to conquer it.

### 6.1.1 Creating new

The first phase, sorting, should be done with extreme caution. Pilot targets showed that this phase is the most important. If all the useless and rarely used tools and belongings stay in the working stations, all the rest phases go for nothing. In the sorting phase all the belongings should be looked through and everything useless is good to throw away immediately. In that point though is good to sort everything useless immediately, to avoid it in the later stage. One mistake done in pilot phase was that everything was just gathered in the same pile without sorting that waste. Try to avoid doing that again. Everything that is saved up will be placed on pallets on the “red tag”-area. New 5S-group has to decide if those tags are needed. Those were not used in pilot targets but because of the bigger amount of belongings those might be useful. Red tag-area might be good to be placed in the warehouse-part of the company. There it will be least in the way. Everything that goes in that area on would be marked and listed. Lists stay with the pallets because by that way it is easy to see what is on those and needed materials are easier and faster to found.

It is recommended that the second and third phases are implemented a little bit at the same time. That is because it is smarter to wash and clean the workbenches, tool racks and tool walls before the belongings of each work stations are stabilized. This part of the shining phase is better to do before the order of tools is changed commonly. After cleaning those parts, the stabilizing continues by organizing the belongings which are staying in each station. Tools are placed on tool racks and everything is marked. Marking takes the biggest part in this phase. Borrowing culture has been a big problem in this company and that is why it is recommended to mark everything possible. It could be a little bit expensive to purchase colored cable ties and other equipments, but with that it will be easier to prevent this borrowing problem. Dividing the production in to colors and marking the tools with those colors is justifiable. By that way it is always easy to see which tool belongs on which cell. Using name tags to mark tools, cupboards and equipments and making everything visible decreases the time used into searching something.

In second phase will be shared a name washers. Those are ordinary washers with employees name on it. The purpose of those is that when someone takes something common property, s/he puts a washer to replace it. When someone else needs that same equipment and comes to get it, s/he sees the name washer and knows immediately from whom to find the tool which s/he is looking for. This kind of system prevents wasting time to searching something for long times.

The third phase continues after stabilizing tools and other belongings. Floors, rack doors and machines are cleaned carefully at the same time. It is profitable to clean environment of the working stations at the same time, because that prevents cleaned tools and places getting dirty again. There is no need to divide these bigger cleanings into several sections. More like doing everything remaining cleaning at once because it prevents earlier cleaned equipments to get dirty again. All the tools, equipments and appointments can be putted in their own places and rule out the possibility to

mixing up the order again. After the shining phase it should get back again to stabilizing. Passages will be pulled with yellow marking tape and places for the pallets should be drawn with black-and-yellow marking tape. Also fronts of every foam extinguishers and fire hydrants will be marked with that, because of the statutory space demands. Places of the rubbish bins, oil tanks and forklifts will be marked with tapes, whose color will be chosen at that point. For example places of rubbish bins with green and oil tanks with black tape. With this system the places are made visible and it is easier to observe environment. Tape is recommended to take in use because it is easier to remove it if necessary. Paint would be cheaper and easier to use but if and when there is going to be changes in the layout, the tape is easy to remove or transplant. The tape is also found functional in the pilot targets.

### 6.1.2 Changing new methods into stable form

The standardizing phase should start with making the standard working list for every station or cell. The company can use the list which is already made (Appendix 6) or use it as a basis of a new one. The members of the 5S-group can have a small meeting with the employees and decide together the important tasks to do in each cell or station. The most important thing is that everyone knows and sees what they should do and when. It would be good to do the segmentation in three parts; daily, weekly and monthly tasks. By that way every employee can see what kind of tasks are needed concerning the 5S-method. This promotes the cleanliness and order in the company and reminds everyone, that the operation is continuous and it must be sustained also after the implementation of the five phases. It might be a good idea to add a few pictures to the work lists. From those it is easy to see the level what the operations should reach. Those pictures give a concrete example of what condition each cell should be at all the time and an employee is easy to check from those if there is some lacks in order.

An audition list (Appendix 5) is a tool which should be created in standardization phase if one is needed. One example is created for the company and again, that can be used in the whole production or the person in charge can create a new one. This audition list can be used in all targets. There is no reason why there should be used own in each cell. The purpose of this list is to give a tool to monitor a progress of the 5S-operation. When all the actual changes have done, it is time to take this list in use for example once in a week, or twice in a month. A surveyor makes the markings on the sheet in wrong-right style, depending on the condition of the observed target. Audition list gives clear numbers and values for the work which continues after the first implementation of the first three phases. If decided to use this in whole company, it is recommended that the production manager takes the responsibility of making the tours and evaluation in interval twice in the month. S/he is independent and sees all the cells and stations in the same way.

The purpose is that received results are fed in the excel-chart and by that way the total is followed regularly. Production manager tells received re-

sults for everyone and so called “5S-diagram” will be visible for everyone on the bulletin boards. Visible results also motivate the staff members to do continuous improvement with the system. Some kind of competition between the cells could be a good motivator. Some rewarding ideas could be for example an extra day or half off, lunch paid by the employer or just few sport bills. This kind of bonus system brings extra charge for following the program and gives healthy competitive spirit in the production site of the company. Bonus can be given for example if some station takes ten times straight a correct mark on the audition list. Some kind of limitations will be good to think, like reward cannot be achieved over than two times for the same person or group per annum. If this kind of reward system is going to take in use, there must be drawn up specific instructions and constitutions so that it is clear for everyone how the system really works.

Fifth and the final phase, sustain, is going to depend a lot on the attitudes. When that phase is at hand, remain target is to uphold the reached results. At this point the company should have found that kind of working methods which keeps the results and achievements in creditable level. Ideas and suggestions should go from staff side to management side and the other way around. Every proposal for improvement should be taken seriously and feedback box should be created if not existing already. The employees are the persons who work with the program every day and they know the best ways to improve course of action.

### 6.2 Instructions for carrying out the process

First of all the company has to have effective and functional plan for implementation. This kind of project is long and laborious and it can easily become as never finished one. Timetable is the most important tool here. First thing to do in this process is to create specific and strict but practicable schedule. That is why there have to be involved and hard-working group which carries out the whole 5S-system.

Order is one big thing to take into account. The work should be divided into two parts. In the first phase it is smart to handle the FMS-side of the company and after that the rest of the production area. By that way it is divided in two main areas and the stressfulness for the production and for the employees is made smaller. This gives also a possibility to make changes in course of actions if some kind of lacks or poor methods in use is noticed. After the implementation of 5S in the FMS, the work group can ask a few questions from the workers about the work done on that side and list tips and suggestion. By that way the level of performance can be improved in the next stage and the quality of work increases all the time.

The marking of the floor might be useful to do in the evening or during the weekend. Marking is time-consuming, slow and pedantic job. The lines are long and every one of those should be plumb on the floor. It is a fact that the persons who are doing that job are on the way of everyone. There are at least two persons moving on hands and knees, running the lines and blocking the passages. Forklifts and other pallet traffic are prevented and if those persons go near by the machines to draw lines, the whole work

process stops in that station. By that ground it is reasonable to do that phase on proposed occasion. It is not justified to interrupt the production with this kind of task if it is by any chance possible to do outside of the normal working hours. As matter of fact the whole 5S-operation should be implemented so that it gives as small as possible amount of adverse factors for the production site. The purpose is to increase the productiveness, not to run the program at all costs.

Monitoring lists are good tool to get rid of the unnecessary items. With those it easy to follow how much and what tools are used and how often. Those could be shared in every station and there the workers fill up the list day by day. They mark there everything which are used and how often. Test period could be for example quarter or half of a year. After that time the management level check the lists with workers and observe the real need of listed items in each station. Development ideas from employees will be gathered and some kind of feedback/attention box will be created near to the main bulletin board. There the workers can put thoughts and development ideas. Bonus system can be taken into use only in that point, if employee invents some kind of idea which increases the profitability of his/her station or otherwise clearly upgrades somehow the company's' production or result.

### 6.3 Purchases

Purchases are not central but essential part of the operation. Mostly of the purchased products, equipments and gears are small and low-priced but necessary and the high level of demanding those might raise the cost. Mostly these items are linked into storage or cleanliness, but some amount of new tools needs to be purchased also. For every bigger cell, needs to be purchased a private bulletin board. In those, the employees can put their worksheets, a couple pictures to remind how everything should look alike, standard working instructions, audition results and other important information. The boards should locate in central place so that everyone has a clear visual connection on those.

Beforehand undetermined amount of tool racks and stands is going to be on the invest list. In the stabilizing phase it is good to have enough space and tools to position everything necessary wisely and ergonomically. Also several hangers are going to be needed for the tools and other equipments. Before those are scattering where ever but not anymore with hangers. Shelves and shelf units are good instruments to handle a big amount of small materials. As seen before (Figure 16, Figure 17), those are good to have if there is need to get large amount of smaller particles near to the work station. With shelves, it is recommended to invest different size of plastic boxes for seals, screws, small amounts of waste and for that kind of needs. Whit boxes it is easier to make everything visible and easier to find. Those also makes environment cleaner because it is possible to get rid of all indefinable cardboard boxes (Figure 13, Figure 14).

Floor tapes which were ordered for the pilot targets are not going to be enough for expanding. Sufficient amount have to be estimated after the

shining phase is reached. There are few rolls left and those can be used as examples when ordering more of those. It is profitable to order all the colors at the same time. It is easier to make all the needed markings at the same time because there is going to be a lot of work when doing that. There is waste oil and other lubricants on the floor so it is laborious to do that phase twice.

New tools and equipments needed at the stations are taking the highest statement of expenses. For example there is high need for dial indicator series. Workers from FMS need own series for their stations and now they have to use shared series with other employees. There are also needs for other measuring instruments which are going on the purchasing list. Some other tools are also in insufficient state. None of the ring spanner series are not full, hex key series are not full and some of drilling bits have too small reserve supply. Critical tools and equipments should be at the satisfactory level in all work stations and that should be secured.

## 7 CONCLUSION

The main purpose of this bachelor's thesis was to introduce and implement the 5S-operation model for ST-Koneistus Ltd. The implementation was conducted at three pilot targets and plans for expanding the operation model were created to the management of the company.

The work was extremely interesting and educational. The working environment was totally new for the author and that, contributed to learning. Lean manufacturing as well as the 5S-operation model got a whole new meaning and working concretely with these gave to me a totally new perspective towards their benefits and disadvantages. The opportunity to work for a modern contract manufacturing company, which is specialized in demanding machining, opened my eyes as to the field of metal industry and hydraulic components.

The requirements as well as wishes of the management and the employees were taken into account when implementing this work. Managing to push through this kind of an operation model requires the co-operation and commitment of the entire staff and that principle was good to implement from day one in the project. Reform was to be carried through with as low a degree of friction for production as possible. When something came up, we tried to find solutions from inside the company. Reconditioned, already existent articles were taken into use and that saved a significant amount of money. Eye was aligned for procurement of new goods if the needed tools did not found from inside the company.

The goal of this work was to get rid of non-value adding operations. Time-wasting and useless movements had been a problem for the company and the 5S-program was an efficient method to break the habit. The results in three pilot targets were encouraging and gave a good starting point to start expanding the operation model to the rest of the enterprises premises. The project itself kept mostly to the schedule so that duties progressed as planned. Major problems appeared only right at the starting phase of the implementation. It was not so clear where to start, because the model was totally new for the author. When things go started the implementing continued quite smoothly, however.

Expanding the model remains to be seen. The know-how and the basics should now be in order but harnessing new persons for the follow-through of the 5S is not necessarily as easy as expected. That is why I recommend the company to continue cooperation with HAMK or other educational institutions. By using this possibility, they might get a new person, from outside of the company, to focus full time on expanding the 5S-operation model to the rest of the production floor and to the office spaces. ST-Koneistus Ltd has operated as a commissioner of theses before but there are no clear instructions for creating any changes. This comes from a very small amount of alternation works in company history. Management of changes will be easier in the future because of the guiding principles were created during this thesis project.



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Figure 9. 5S workplace organization and standardization. N.d. TPF Europe BV. Referred 11.1.2013. <http://www.tpfeurope.com/cms/view/44>

Memorandum concerning a visit to the Bronto Skylift Oy Ab

MUISTIO

Aika: 26.3.2012 klo 9.00-12.00  
Paikka: Bronto Skylift Oy Ab Tampere,  
Kokoustilat

Läsnä: Jaatinen Markus, Tuotantopäällikkö  
Sélin Jarkko, Toimitusjohtaja  
Romppanen Mari, Tuotanto- ja laatuinsinööri  
Pirttijoki Veli-Pekka, Harjoittelija

Käsiteltävät asiat: Yritysesittely, 5S-menetelmä

Yritysvierailun tarkoituksena oli saada lisää tietoa käyttöön otettavasta 5S-menetelmästä sitä jo toteuttavalta yritykseltä. Bronto Skylift Oy Ab:n Tampereen toimipisteen tuotantopäällikkö Markus Jaatinen otti meidät vastaan, sekä piti meille infotilaisuuden ja kierroksen yrityksen tiloissa.

***Lähtötilanne***

Yritys oli tullut tilanteeseen jossa he halusivat jollakin tavalla parantaa työn tuottavuutta. Selkeinä kehityskohteina yritys näki erityisesti turhan tavaran poistamisen, sekä tarpeellisen tavaran uudelleenjärjestelyn, systemaattisen ja järkevän varastoinnin.

***Miksi 5S?***

5S oli Jaatisen mukaan läpikäydyistä tuotannon parannusmenetelmistä ylivoimaisesti paras ja sopivin. Ohjelma pureutuu nimenomaisesti liiallisen tavaran karsimiseen, sekä kaikenlaisen hukkaamisen ja ei-arvoa tuottavan toiminnan karsimiseen. 5S:n avulla yritys saisi järjesteltyä ja varastoitua uudelleen myös kemikaalit, joiden kanssa on aiemmin ollut ongelmia. Bronto Skylift tunsu 5S-ohjelman omakseen, koska sen toteuttaminen tarjoaa yhtiölle jatkuvaa, huomaamattaan tapahtuvaa kehittyvää toimintatapaa. Asiat pystytään pitämään tarpeeksi yksinkertaisina, mutta kehitystä ja parannusta tapahtuu tästä huolimatta. Tavaroiden löydettyä omat paikkansa on mahdollista myös piirtää tiloista uudet layoutit joista nähdään kunkin kappaleen oma paikka.

***Toteutus***

Brontolla koettiin tärkeäksi johdon näyttämä esimerkki alaisille. Yhtenä vaihtoehtona siellä on väläytetty siististä toimistotilasta otettavaa valokuvaa. Työntekijän päivä päättyy vasta kun oma huone on kuvassa näkyvän tyyppinen. Näin myös toimisto- ja kokoustilastoissa siisteys pysyy päällimmäisenä mielessä.

Selkeimpinä pääkohtina Jaatinen esitti lattia- ja värimerkintöjen tekemisen, sekä ”sälän” poistamisen. Lattiamerkinnät helpottavat esim. lavojen asettelua tuotantotiloissa, kun niille on omat paikat maalattuna. Samoin roska-astiat, pumppukärret yms. löytävät helpommin omat paikkansa kun ne ovat visualisoitu. Värimerkinnät taasen auttavat vaikkapa työkalujen pysymistä oikeilla työkaluseinillä, -kaapeilla tai -kärryillä. Varastointiin kiinnitettiin huomiota tarkastamalla se ja tämän jälkeen laputtamalla ja merkkäämällä tuotteet. Jaatinen painotti eritoten järkevän varastoinnin merkitystä.(älä pakkaa 2-3 kertaa)

Sälän poistaminen oli myös isossa roolissa Brnton listalla. Sälälaatikot kelmutettiin ja sitä mukaan kun kelmu rikkoutui, nähtiin kyseisen tuotteen tarve. Nopeasti rikutut kalvot osittivat tuotteen isoa tarvetta kun taas jotkut laatikot saattoivat olla kuukausia koskemattomina. Myös työpisteet voivat kokea totaalimuutoksen prosessin aikana. Ne voidaan esim. tyhjentää kaikesta tavarasta ja työntekijät sitten hakevat tarvitsemiaan tavaroita/työkaluja. Tästä nähdään niiden todellinen tarve ja vähemmän tarvittavat voidaan joko siirtää kauemmas tai hävittää kokonaan. Visuaalisuus on kuitenkin avainasemassa. Lokeroiden päälle on liimattu tai teipattu lokerossa oleva osa tai kappale jotta työntekijän ei tarvitse kiskoa jokaista lokeroa auki etsiessään esim. tiettyä priikkaa. Kun kappale on heti nähtävissä löytää työntekijä helposti tarvitsemansa. Sälän hävittämisen apuna on ollut myös viistokattojen teko hyllyjen ja kaappien päälle. Ennen niiden päälle lojumaan jääneet tavarat ovat hävinneet työympäristöstä, koska niille ei yksinkertaisesti ole paikkaa mihin niitä voisi piilottaa tai hylätä.

Vastuuhenkilöiden merkitys on huomattava. Jatkuva kehittäminen vaatii vastuuhenkilöiden ja vastuualueiden nimeämistä. Näiden avulla mahdollistetaan myös palautapalaverit, valvonta sekä kehityskohteiden jatkuva tarkkailu. Kun tietyt henkilöt ovat jatkuvasti tekemisissä järjestelmän kanssa, asioita myös kyseenalaistetaan, ideoita syntyy enemmän ja luodaan ns. todelliset tarpeet vs. mielikuvitustarpeet -asetelmia enemmän. Vastuu on toisellakin tavalla läsnä Brnton arjessa. Jokainen henkilö on sitoutunut palauttamaan lainaamansa tavarat. Kun jokainen hoitaa ruutunsa tässä suhteessa, eivät tavarat huku eikä niitä joudu ylimääräisiä aikoja etsimään. Jokainen on vastuussa omalta osaltaan järjestelmän ylläpitämiseen ja toteuttamiseen.

Brntolla oli huomattava määrä ideoita ja ehdotuksia järjestelmän läpiviemiseen. Kaikesta huomasi, että he ovat paneutuneet ja panostaneet tilojensa kuntoon laittamiseen. Vieraille jaetaan aina ns. vieraslätkät ja myös liivien käyttöpakkoa vieraille on ollut ehdotuksena.

Memorandum concerning a visit to the Bosch Rexroth Oy

MUISTIO

Aika: 30.3.2012 klo 9.00-12.00  
Paikka: Bosch Rexroth Oy Vantaa,  
Kokoustilat

Läsnä: Helvilä Tatu, Tuotantopäällikkö  
Sélin Jarkko, Toimitusjohtaja  
Romppanen Mari, Tuotanto- ja laatuinsinööri  
Pirttijoki Veli-Pekka, Harjoittelija

Käsiteltävät asiat: Yritysesittely, 5S-menetelmä

Yritysvierailun tarkoituksena oli saada lisää tietoa käyttöön otettavasta 5S-menetelmästä sitä jo toteuttavalta yritykseltä. Bosch Rexroth Oy:n Vantaan toimipisteen tuotantopäällikkö Tatu Helvilä otti meidät vastaan, sekä piti meille infotilaisuuden ja kierroksen yrityksen tiloissa.

***Lähtötilanne***

Yritys oli tullut tilanteeseen jossa he halusivat jollakin tavalla parantaa työn tuottavuutta. Ylimääräisen tavarain ja työkalujen karsiminen, tuhlauksen vähentäminen, läpimenoajan lyhentäminen, sekä kustannusten vähentäminen olivat päätekoja menetelmiä valittaessa.

***Miksi 5S?***

Tuotantopäällikkö Tatu Helvilä kertoi infotilaisuuden aikana useita syitä siihen, miksi he ovat ottaneet käyttöön juuri 5S-järjestelmän. Se vastasi parhaalla tavalla suunniteltujen parannusten toteuttamiseen, sekä puutteiden korjaamiseen. 5S tuo kaiken lisäksi mukanaan suuren määrän välillisiä hyötyjä joita ovat esim. etsinnän, materiaalihukan, joutoajan ja laatuvirheiden väheneminen ellei jopa kokonaan poistuminen.

Mielenkiintoinen yksityiskohta oli myös Helvilän esittämä fakta siitä, että 83 prosenttia ihmisistä havainnoi ensisijaisesti silmillään. Näin ollen siisteys/likaisuus on tekijä, joka valitettavasti näkyy heti ovesta sisään astuessa. Myös tähän asiaan Bosch halusi panostaa ja näin ollen 5S tuntui parhaalta vaihtoehdolta.

### *Toteutus*

Helvilä painotti useaan otteeseen, että kaikki lähtee korvien välistä. On siis erittäin tärkeää, että jokainen henkilö yrityksessä sitoutuu 5S:n toteuttamiseen alusta asti. Kuten Bronton, myös Bosch Rexrothin työntekijät kokivat johdon antaman esimerkin olevan suuressa roolissa alaisten käyttäytymisessä. Se, miten myyt idean halliin, on ratkaisevaa hankkeen onnistumisessa.

Helvilän mukaan kannattaa lähteä liikkeelle mahdollisimman helpolla ja yksinkertaisella tavalla. Kaikkea tullaan kehittämään pikkuhiljaa ja onkin ollut huomattavissa, että ohjelma ruokkii itse itseään, kun henkilökunta alkaa huomata etuja ja hyötyjä. Tätä ohjaa kuitenkin se, että pidetään asiat simppeleinä. Se, että tehdään kaikesta visuaalista, eli nähdään mitä haetaan, helpottaa kaikkien elämää ja turhasta ajankäytöstä päästään eroon.

Toteutuksen onnistumisen avainasioita ovat vastuuhenkilöt. On tärkeää, että jokainen henkilö tietää kuka valvoo ja ylläpitää mitäkin osa-aluetta. Mitä kohtia halutaan tutkia ja mihin kiinnittää huomiota? Työn tulosta on myös tultava seuraamaan. Henkilökunta motivoituu, kun asiat ovat mitattavissa ja tulokset esillä. Oikein/väärin arviointitaulukko on hyvä työkalu ohjelman valvomiseen ja jatkuvaan kehittämiseen. Asioita pitää systematisoida ja toimintatapoja sekä -menetelmiä standardisoida.

Introduction to 5S, a presentation

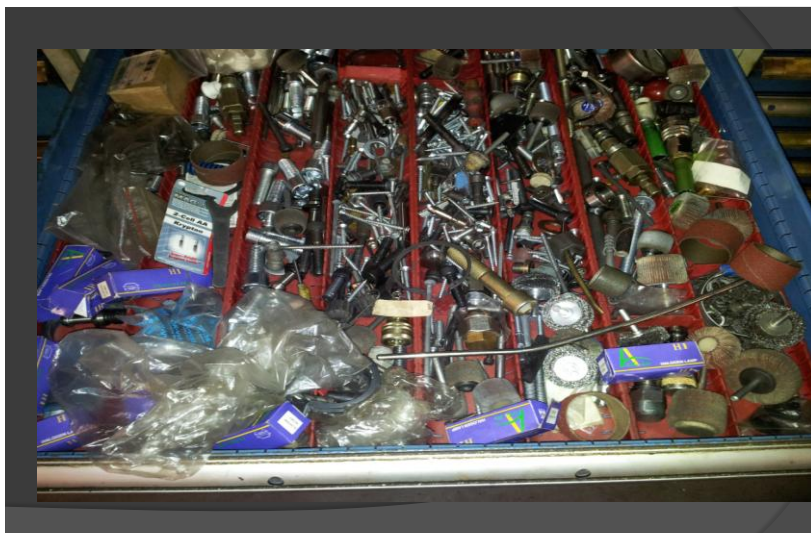
# 5S-JÄRJESTELMÄ

83% ihmisistä havainnoi  
visuaalisesti

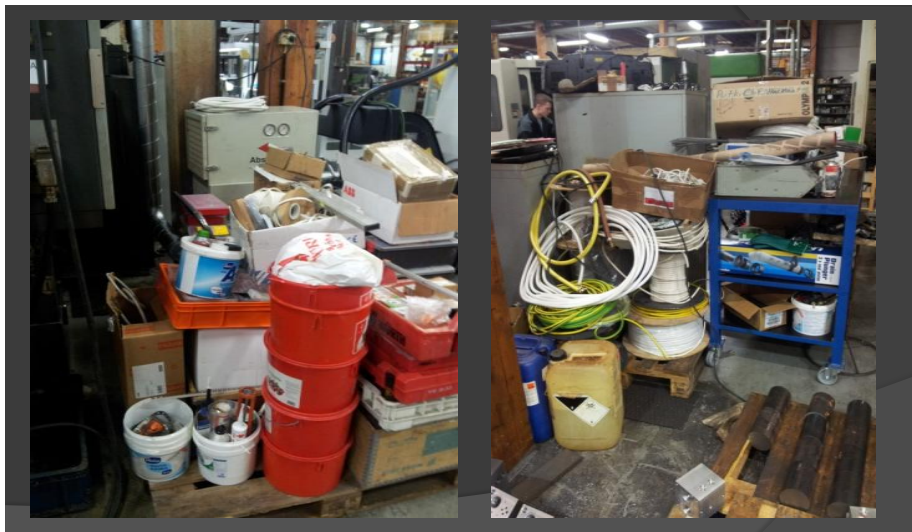
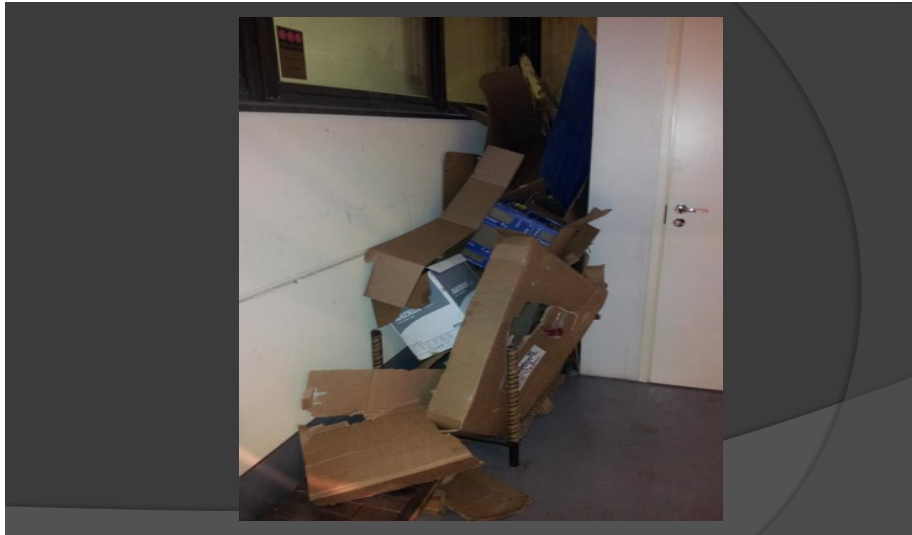
- Siisteys vai likaisuus??
- Et saa KOSKAAN uutta tilaisuutta ensivaikutelman korjaamiseksi!

Tämän asiakkaamme näkevät









## 5S

- Japanissa kehitetty, organisointiin ja työmenetelmien standardointiin keskittyvä menetelmä.
- 1. erottele (Seiri), 2. järjestele (Seiton), 3. puhdista (Seiso), 4. standardisoi (Seiketsu), 5. ylläpidä (Shitsuke)
- Päättavoite kasvattaa työn tuottavuutta.
  - Vältetään hukkaamista ja tuhlaamista.
  - Poistetaan ei-arvoa tuottavaa toimintaa.
  - Parannetaan laatua ja turvallisuutta.
  - Luodaan miellyttävä ja tehokas työpaikka.

## 1. Erottele

- ⦿ Ylimääräisten tavaroiden poisto työpisteeltä ja –paikalta.
  - ”Katso ympärillesi ja näe kaikki tarpeeton.”
- ⦿ Punalaputus
  - Merkintä → Arviointi
  - Kalvotus
  - Kaiken poisto → Tarvittaessa haku
- ⦿ Tärkeät, mutta harvoin tarvittavat etäämmälle.
  - Tilan säästö
  - Helpompi löytää tarvittaessa
- ⦿ **KYSEENALAISTA!**
  - Tarpeellinen vs. tarpeeton?
  - Todelliset määrät?

## 2. Järjestele

- ⦿ Käynnistetään vaiheen 1 yhteydessä.
- ⦿ Järjestelemällä tavarat:
  - Vältetään etsimiseltä.
  - Helpotetaan tavarantoimittajan esin ottamista, käyttöä ja poistamista.
- ⦿ Tunnistetaan jäljelle jääneet materiaalit, työkalut ja muut tavarat.
- ⦿ Suunnitellaan varastointi-, työ- ja säilytyspaikat.
- ⦿ Siirretään materiaalit, työkalut ja muut tavarat niille kuuluville paikoille.

- ⦿ Tarpeellinen tavara sijoitellaan siten, että kenen tahansa on se helppo löytää, käyttää ja laittaa pois.
- ⦿ Käytävien ja työpisteiden rajaus.
- ⦿ Roskakorien, lavojen, pumppukärryjen paikat
- ⦿ Merkitseminen esim. nimilapuilla tai värikoodeilla
  - Visuaalisuus! Näet mitä haet!
- ⦿ Kyltit esim. lähtevä tavara, reklamaatiot, kemikaalit...
- ⦿ *Kaikelle paikka ja kaikki paikallaan.*

### 3. Puhdista

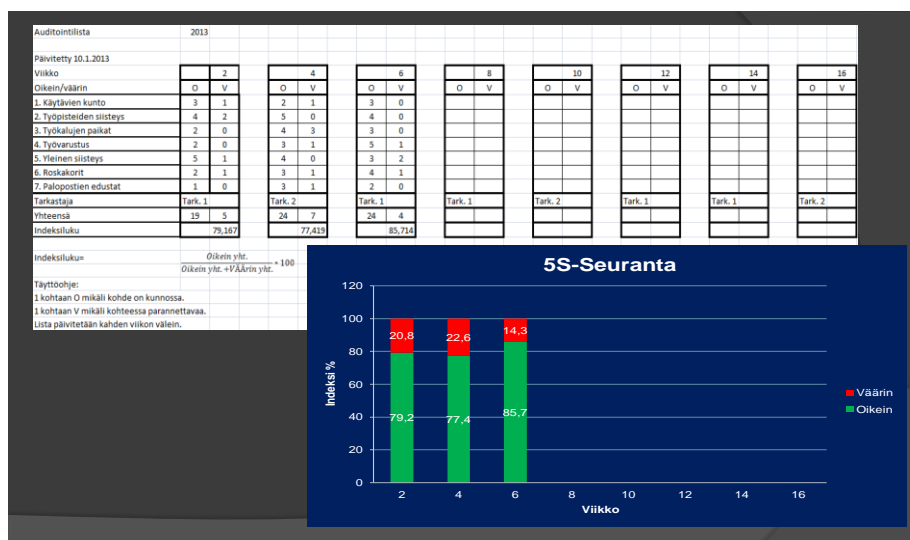
- ⦿ Kun puhdistat, tarkastat samalla. → Näet mistä ongelmat johtuvat?
- ⦿ Jokapäiväinen rutiini
  - Työvuoron päätteeksi
  - Paljastaa vuotoja ja sotkuja
- ⦿ Selkeät tavoitteet ja aikataulut!
- ⦿ Sovitaan siivousalueet, velvoitteet ja vastuuhenkilöt.
- ⦿ Lajitellaan sekä pidetään siivous- ja puhdistusvälineet käyttövalmiina.
- ⦿ Sovitusta kiinni pitäminen ja velvoitteiden hoitaminen!

### 4. Standardisoi (vakioi)

- ⦿ Järjestelmän *suorittaminen kerran* on äärimmäisen helppoa, mutta *ilman vakiointia* vanhaan toimintatapaan on *liian helppo palata*.
- ⦿ Johto asettaa vuosittaiset tavoitteet.
- ⦿ ”Tekee selväksi oman roolini kolmessa ensimmäisessä S:ssä”
- ⦿ Standardoidaan parhaat käytännöt työntekijöiden kanssa
  - työpisteeseen kuuluvat työkalut
  - kuinka usein jätteet vietään pois
  - siivousaikataulu
  - käytävien paikat
- ⦿ Vastuu- ja tehtävänjakoa täsmennetään, sekä 5S-tulokset tehdään näkyviksi.

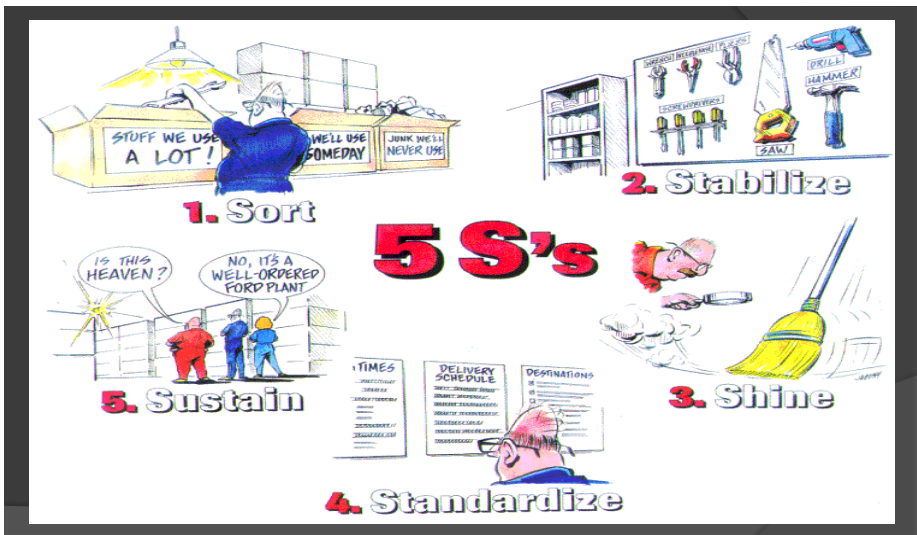
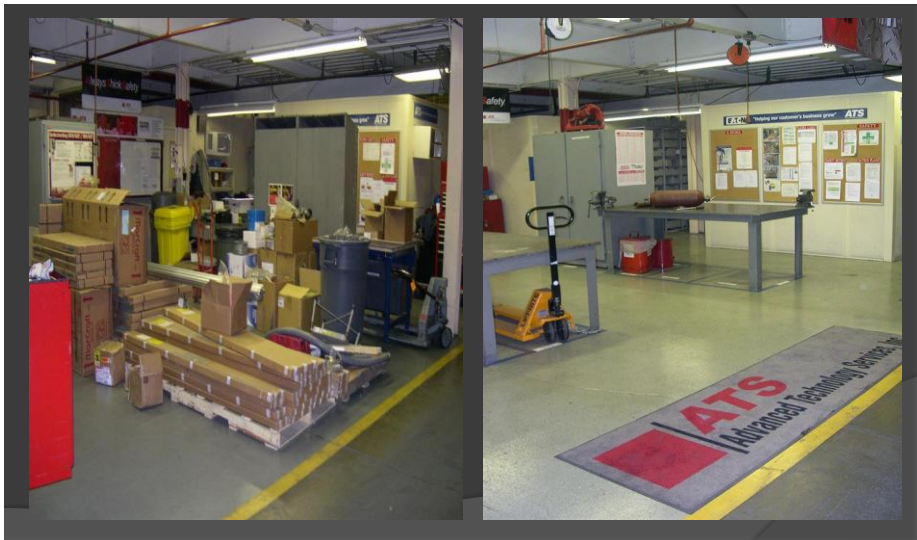
### 5. Ylläpidä ja kehitä

- ⦿ Toimintaperiaatteiden ja menetelmien omaksuminen = Jokaisen henkilön tulee sitoutua ylläpitoon ja kehittämiseen, sekä tuntee vastuunsa.
- ⦿ Pelisääntöjen noudattaminen!!
- ⦿ Välitön puuttuminen standardien rikkomiseen.
- ⦿ Jatkuva hyötyjen esilletuonti parantaa ylläpitoa.
- ⦿ Kehitä jatkuvasti, järjestelmällä ei ole maalia!
- ⦿ Kaikki tarpeellinen tullaan vakioimaan ja kouluttamaan.



## Tavoite



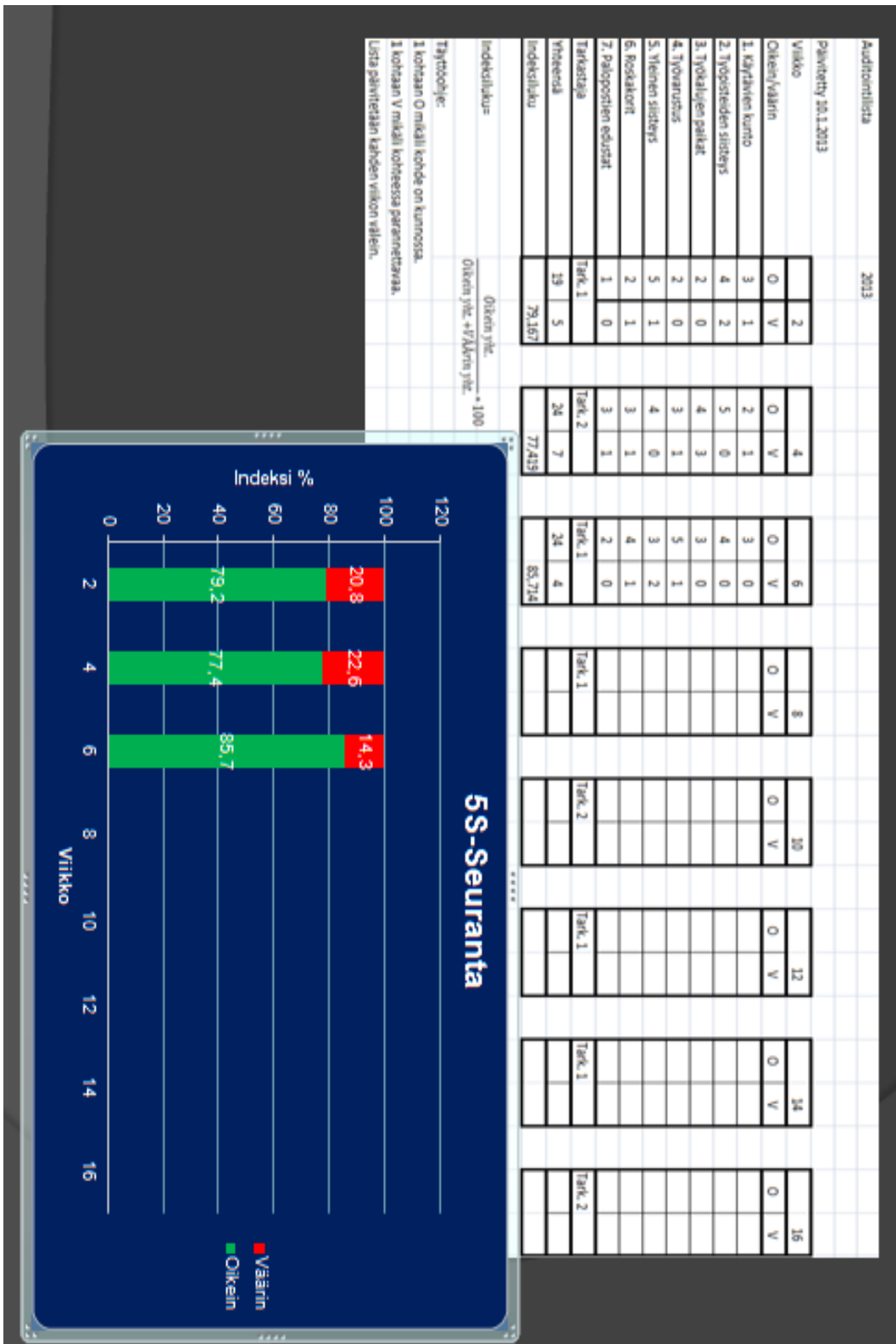


## 5S Standardityöohje

Toimenpiteet, sylinteri- ja tulppauspaikalla sekä varastossa

<b>Päivittäin</b>	<p>Työkalut ja -tarvikkeet omille paikoilleen          Työpöydän/-pisteen siivous          Pinkkarit ja pumppukärryt paikoilleen          Työkalujen akkujen lataus          Käytävien, palopostien ja poistumisteiden esteettömyyden varmistaminen</p>
<b>Viikoittain</b>	<p>Työkalujen inventointi          Roska-astioiden sekä pahvirullakon tyhjennys (tarvittaessa)          Pakkausmateriaalien riittävyys tarkastaminen          Trukin kaasupullojen riittävyys tarkastaminen          Pinkkareiden lataaminen</p>
<b>Kuukausittain</b>	<p>Kemikaalisäiliöiden tyhjennys (tarvittaessa)          Kemikaalien tarkastus          Hyllyjen järjestely ja siistiminen</p>

Audition list



## 5S Standardityöohje

Toimenpiteet tuotantohallissa

<b>Päivittäin</b>	Työkaluja -tarvikkeet omille paikoilleen Työpöydän/-pisteen siivous Pinnarit ja pumppukärryt paikoilleen Käytävien, palopostien ja poistumisteiden esteettömyyden varmistaminen
<b>Viikoittain</b>	Työkalujen inventointi Roska-astioiden tyhjennys (tarvittaessa) Pinnareiden lataaminen Työalueen tarkastaminen ja siistiminen
<b>Kuukausittain</b>	Kemikaalisäiliöiden tyhjennys (tarvittaessa) Kemikaalien tarkastus Mullu- ja öljysäiliöiden tyhjentäminen Lastu- ja jäteastioiden tyhjentäminen Hyllyjen järjestely ja siistiminen