Developing Innovative and Attractive CVET programmes in industrial shoe production

Train-the-Trainer Manual

Sustainability Management

IO 3

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Content

1 Introduction

1.1 Aims of the DIA-CVET Project

The aims of the Erasmus+ project «Developing Innovative and Attractive CVET programmes in industrial shoe production» are

- to develop, pilot and implement comprehensive courses for the Spheres of Activity (SoA) of foremen in industrial shoe production on European level; available in English (EN) as well as in DE, RO and PT,
- and to develop a sector qualification framework level 5 and 6 and to reference existing or newly drafted national qualifications from Germany, Portugal and Romania.

1.2 Manuals to Guide Tutors and Trainers

The purpose of the manuals is to prepare designated trainers for their role and to provide content and support. Due to the nature of the SoA of foremen, they do not include specific forms of training; but we suggest a blended approach. Successful Continuous Vocational Education and Training (CVET) programmes combine theoretical lessons with application of the acquired Knowledge, Skills and Competences (KSC) in real work environments. The tasks of a trainer are to

- impart SoA-specific KSC,
- demonstrate operations which the learners are expected to learn to perform,
- introduce the learners to each new task and supervise them during their first approaches,
- organise and supervise blended activities (i. e. projects),
- guide them towards an independent performance of the tasks of the respective SoA.

The manuals are not meant to replace a textbook. They are meant to provide support to the trainers to plan and execute their teaching. The trainers are invited to gather more information from other sources.

1.3 Refer your training to the business process of industrial shoe production

Industrial production is a complex process, where the Sphere of Activity, described in this manual, is embedded in the business process. Before you start the training on a specific SoA, please make sure that the learners are familiar with the other SoA of industrial foremen in shoe production.

For example, the learners should be introduced to the types of products the company manufactures and their intended use, the different customer segments, the distribution channels etc. They should be aware of the product creation and manufacturing processes, i.e. product design, pattern making, purchasing department, production planning, and all production departments to warehouse and logistics.

The production process (not part of DIA-CVET, for insights see: http://icsas-project.eu/) is in the core of the business process; the SoA of DIA-CVET play a preparatory, supporting or accompanying role (see Fig. 1).

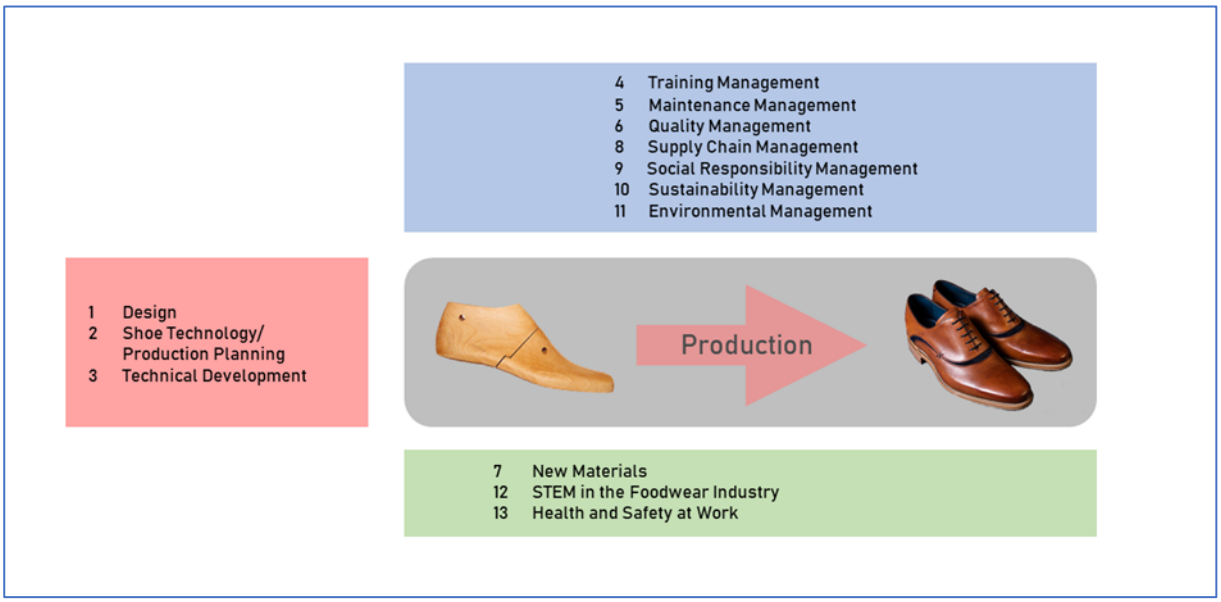

Fig. 1 Spheres of Activity of DIA-CVET and their relation to the production process.

2 Sustainability Management

2.1 Introduction

All lessons in our training material are related to sustainability in some way. Sustainability should be applied in the development of footwear, the selection and use of footwear construction methods, the technical improvement of machines or processes, production planning, the selection of suppliers, the selection of sustainable materials that can be composted, reused, reworked, etc., the application of correct management methods and many other aspects.

The sustainable approach is also subject to standards and audits. In many countries, there are laws to reduce harmful chemicals contained in some footwear materials or used in the production process. Environmental impact, health and safety concerns should be at the forefront of sustainability standards and regulations. The content includes some general topics should be considered in any production activity, as well as some rules and standards important for sustainability management. The main part will focus on the footwear manufacturing process and examples of sustainable activities under the plant manager in footwear companies.

2.2 Standards and certification supporting the sustainability management.

There are a number of norms and standards that are important for sustainability management.

ISO 9001

Is a quality management system that allows the control of all the critical points of the company to be improved, reducing production costs and improving the productivity of the company. Quality management is an important part of a sustainability approach to reduce waste.

ISO 14001 and EMAS

ISO 14000 is a set of environmental management standards. The requirements of ISO 14001 are an integral part of the European Union's Eco-Management and Audit Scheme (EMAS). EMAS is a voluntary tool designed by the European Commission for the public registration and recognition of companies and organisations that have introduced a system of environmental management which enables them to evaluate, report and improve their environmental performance, thereby ensuring an outstanding performance in this respect.

ISO 45001

ISO 45001 is an ISO standard for management systems of occupational health and safety. It was published in 2018 and has replaced OHSAS 18001.

SA8000

SA8000 is a voluntary certification created by the American organization Social Accountability International - SAI, with the purpose of promoting better working conditions

ISO 26000

ISO 26000 is a standard that provides guidance on social responsibility

REACH (Regulation nº 1907/2006)

REACH (Regulation nº 1907/2006 of the European Parliament and of the Council) is the European regulation relative to the Registration, Evaluation, Authorisation and Restriction of Chemicals. This Regulation assigns the industry with the responsibility of managing the risks associated with the substances that it manufactures, imports, sells and uses in its processes. To do so, each company must comply with one or more of the requirements established by the regulation depending on the type of chemical and preparations that it manufactures, uses and/or imports, their origin (whether they are from the European Union or not) and how they are applied in their industrial process. The future of the footwear industries and of their components, such as tanneries, the manufacture of adhesives, outer soles for footwear, etc., is conditioned within the European Union by this Community regulation.

The European Chemicals Agency (ECHA) is the official body charged with coordinating all the Member States of the European Union to comply with that Regulation.

2.3 The general focus on wastes

All decisions and plans, if executed incorrectly or resources are misused, can result in WASTES. Some typical types of waste are mentioned here:

- Large inventory
- A lot of work in progress
- Overproduction
- Unnecessary travelling
- Waiting times - (machine issues, unbalanced production flow)
- Corrective operations = No adding value operation
- Any deviation from the best quality
- Material defects
- Rework
- Rejects
- Not properly skilled or instructed worker
- Other reasons

We will describe the entire shoe manufacturing process and mention some key sustainable approaches and rules. Remember that each company is unique and therefore the description of activities cannot be applied to all shoe companies as a sufficient and complete process.

2.4 Product development

Product development starts with ideas for the final look of the shoes. CAD systems can be used to create a virtual collection with a realistic look that can be used for internal pre-selection and sometimes also for customer pre-selection.

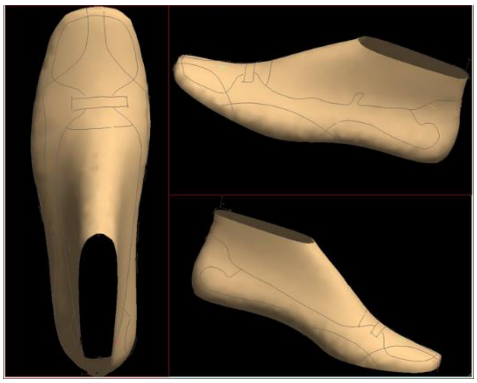

Fig. 2: Virtual 3D last © PFI

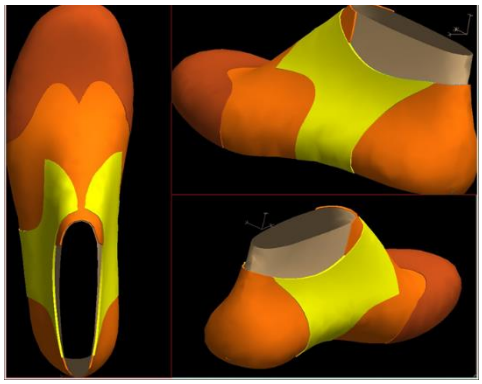

Fig. 3: Virtual 3D upper construction © PFI

Fig. 4: Virtual look of final shoes © PFI

Virtual look of final shoes © PFI

This process save the costs and time for samples preparation.

The next step is decision about materials.

- All must be free from harmful particles or fulfil the allowed limits.
- Next step is to decide about recyclable materials which could be used for the same purpose. Example is granulated waste plastic materials which could be used in allowed percentage in the new mixture
- Some materials could be reworked for different use like insulation, surface for sport places
- The best materials could be composted or used as fertilizer. The new way of tanning allows to use the wastes from tannery, the waste after cutting and send all to company which prepare natural fertilizer out of that.

The material is also selected according to the kind of product, expected properties and look. This is not possible to use all the time the best eco-friendly materials because of the market price expected from customer and capacity of the production of eco-friendly materials. The new materials are also not able to fulfil all limits like special levels of flexing, wear resistance dampening, breathability, structure strength and others.

Production from crust leathers and finishing the leather on final shoe is also example of sustainable approach. The waste after leather cutting is not with finishing chemicals and there are more ways how to re-use this waste without applied finish chemicals than the waste with final finishes.

When the last and sole are already selected the decision about needed investment into new tools could be done.

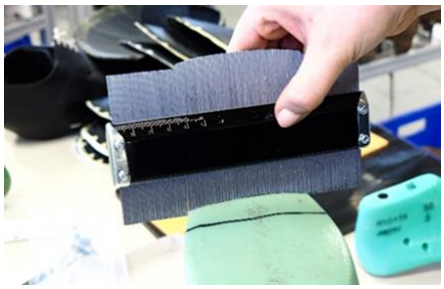

Fig. 5: Copy of last shape © PFI

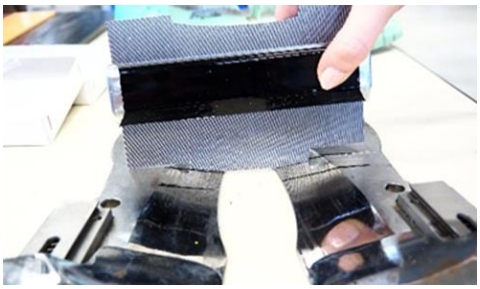

Fig. 6: Identical last shapes must be on tools © PFI

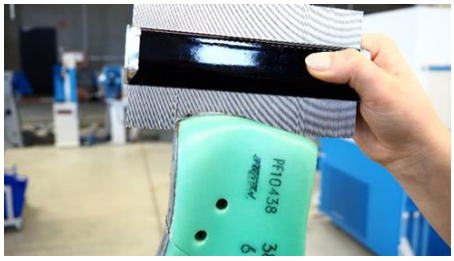

Fig. 7: Shape of last back part © PFI

Fig. 8: Shape of mould must be identical with last shape © PFI

The final price pre-calculation which considers the previous decisions could be done at this moment. Some companies use SW for material nesting. The consumption of the upper materials which will include the first waste could be done and final price could be estimated with maximum 10% mistake.

Marketing team can see the product in virtual reality, see the price and can decide if it is ok for sample making or propose some changes or cancel the idea already at the stage when no investment to samples is done.

2.5 Production planning

The company is at the stage where customers order the shoes. The quantity and delivery dates are set, and production planning is completed. It is best to divide the production into small units. The shorter the time between the start of cutting and the packaging of the finished shoes, the fewer problems there are with rework or waste. The goal of having finished shoes up to 48 hours after the uppers are cut, or even faster, can be achieved.

The condition of how to complete shoes from cutting to packing in 48 hours maximum is to divide the total order into sub-orders for delivery if the order is very large and the sub-orders into small units of 100, 200 or 144 pairs. Small orders (one delivery) can be immediately divided into small units.

Next important factor how to speed up the production flow is the size of the unit which travels from operation to operation. The best is a 1-pair unit together with an agreed system for positioning the parts in the box. The system of parts positioning saves preparation time and a higher percentage of time is used for the value-added process.

Fig. 9: Random position of part increase searching time © PFI

Fig. 10: example of 1 pair properly placed in box © PFI

In an ideal production flow 1 pair units would move between the different operations and departments. In reality, while cutting and stitching system with 1 pair unit workflow exists there is usually a buffer between the stitching and making departments. The problem is balancing the complete production as one line for each design. Designs often mean big changes in the stitching and cutting departments, but very small changes in the making department.

Very often two stitching lines supply one making line. The high quality systems prefer a cutting „island" as a part of stitching line.

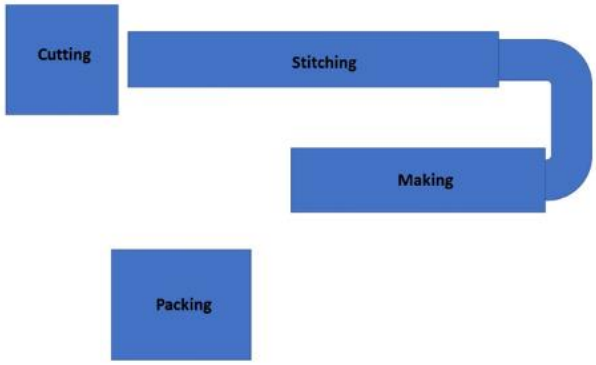

Fig. 11: Example of the production flow © PFI

How do you calculate the assortment of units that move quickly through production? A common solution is to divide a large order into smaller delivery orders and then into units of 100, 200 or 144 pairs according to the assortments of packaging sizes. The calculation is influenced by the number and size range of last or in case of direct injection by the number of moulds and time needed for their change.

Example:

Order - 1450 pairs, size range 36-42.

Quantities for each size:

- 36 – 100
- 37 - 200
- 38 - 250
- 39 - 300
- 40 - 300
- 41 - 200
- 42 - 100

Calculation for sub-units of 100 pairs

36	37	38	39	40	41	42	Sizes
100	200	250	300	300	200	100	1450
14,5	14,5	14,5	14,5	14,5	14,5	14,5	Unit 100 pair
-	-	-	-	-	-	-	
7	14	17	21	20	14	7	Must use 14,5 x 100
98	196	238	294	280	196	98	Pairs
+2	+4	+12	+6	+20	+4	+2	Start of Balancing plan (50 pairs only)

Don´t forget to start production with balancing unit. In this case all other 100 pairs plans could be packed according ordered assortment.

Fig. 12: Example how to calculate according packing assortment. © PFI

Minimizing work-in-process automatically reduces the percentage of rework and scrap, since the final work result can be checked within 24 or 48 hours and corrective action can be taken quickly and in a very effective manner.

2.6 Material ordering

Large inventories are a common type of mistake. Companies tend to look for the cheapest sources and order large quantities. The sustainable solution is to order quality material from suppliers who are able to deliver on time.

The advantage of just-in-time deliveries according to production needs starts with large orders that are in production for several weeks or with small orders that are repeated.

The company should create a system of suppliers comparing price, quality and ability to deliver. This system should focus on soles and uppers, which account for 65-80% of the total cost of materials, depending on the type of shoe.

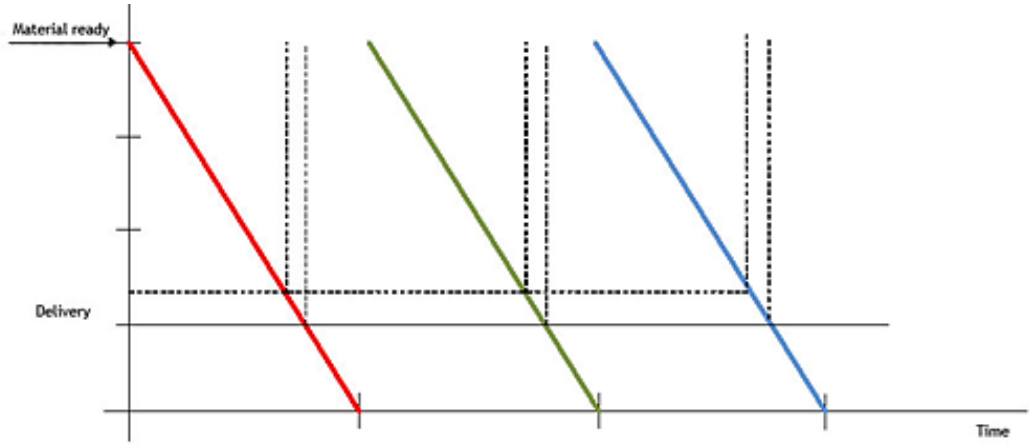

Fig. 13: Graphic demonstration of delivery system © PFI

The example shows the approach to material ordering. The weeks are shown on a horizontal line. The colored lines show that on Monday all the material will be ready and consumed day by day. The goal is to place the confirmed order a few days in advance to be sure that the material will be ready a day or two before production starts. The dotted horizontal and vertical lines indicate the time when the new order must be placed. The second horizontal line crossing the colored line is the day when the material will be delivered, to have a reserve for unexpected situations a few days before all the material will be used.

2.7 Decision about production system

The machinery and the system of transport between departments and within the department between operations is usually fixed. The technology and system of production flow is often based on a conveyor system. This system is not very flexible and could be problematic. The goal is to balance the line so that each "operator-machine unit" is used as close as possible to optimal productivity. Using sources at 100% of their capacity is part of the basic sustainable approach.

The simplest system for balancing and decision making is the zig-zag system with one pair in a transport box. This system offers a variety of solutions. Some possibilities for balancing are shown in the next drawings.

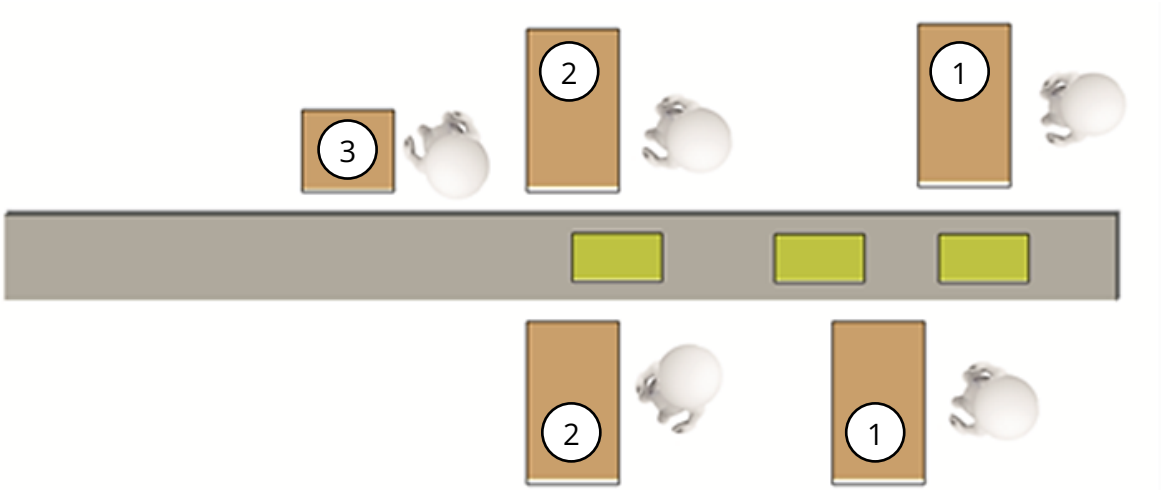

Fig. 14: possible situations on zig-zag line © PFI

(1) Line without big time reserve

(2) For operations that need almost double of the takt time, each operator finalizes only half a pair.

(3) operation id is done manually directly in the box, or it could be done in line quality check

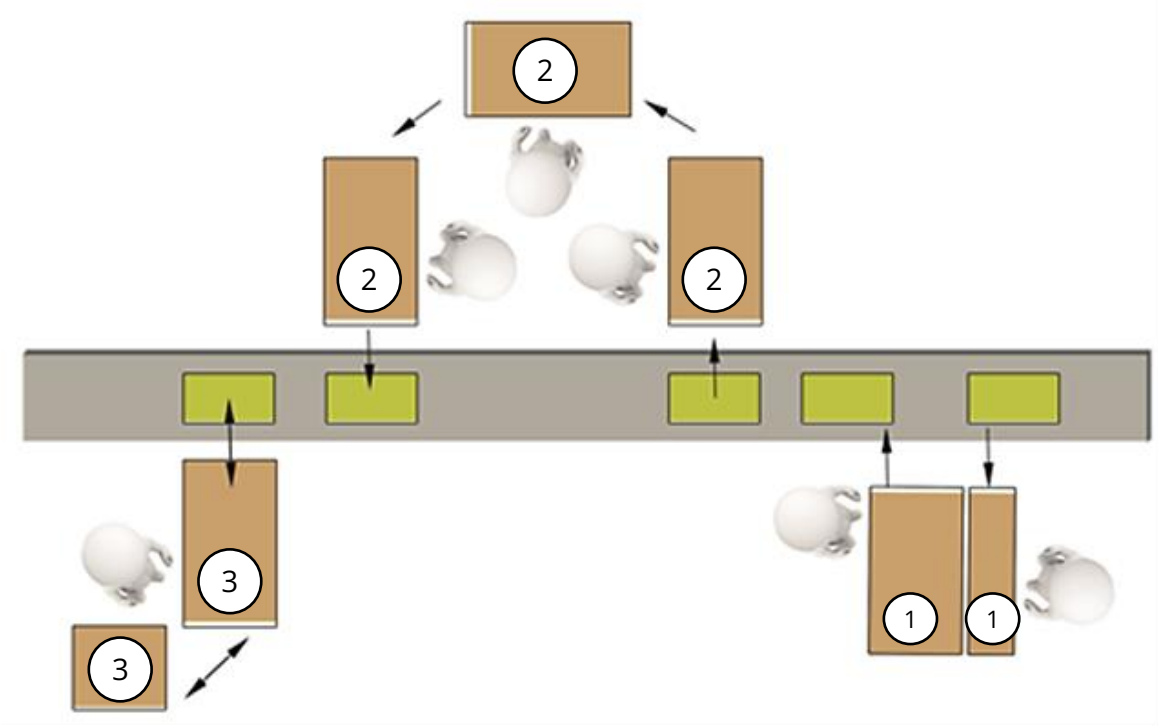

Fig. 15: possible Situation on zig-zag Line © PFI

(1) Solution of complicated stitching operation which needs 1,5 times more time than takt time. Helper, low qualification, just prepare the parts which will be stitched in the correct position with the support of fast glue and give them over to the stitcher. He or she can also correct the position of the part in the box, check the result, clean etc. He/she is at narrow working table to give support of stitcher easily.

(2) For time consuming operations like hand stitching, manual folding etc. an island of 3 workers is created to manage the operations in takt time.

(3) For operations which need only 50-60% of takt time, a small table or simple machine is added to help partly or fully with some of the next operations.

The conveyor systems have not so many possibilities to balance the differences among very different duration of operations. Some possibilities offer multi-layer conveyors with 2,3 and sometimes 4 layers.

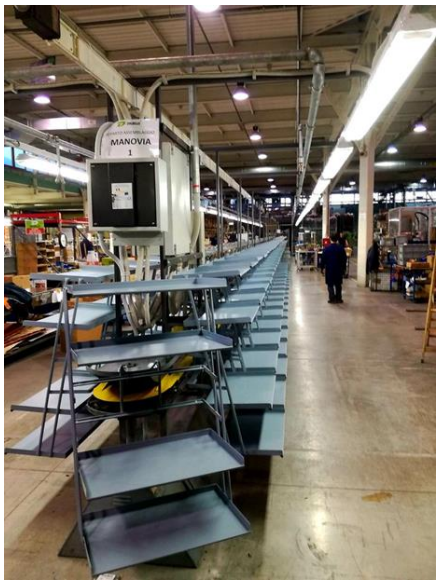

Fig. 16: 4 layer conveyor © PFI

Possibility for balancing multi-layer stitching conveyor. Select takt time and calculate if some fast operations can manage 2,3 or even more pairs. Some operators do all pairs in takt time. Each shelf has prepared materials for single pair from pre-stitching operations. In case of time-consuming operations, the same operation is done by 2 or 3 operators. Each operator carries out his shelf in that case. This is one of the possibilities how to balance the stitching line placed at conveyor.

There are also many different software helping with balancing of production. The output can be in form of graphic or figures.

Data collection should be done by technician who understand the machine operation, preparation of materials, can estimate skill of the worker etc. The technician must not be the only person who can work with the software but must be able to decide if the operation is done correctly.

2.8 Sustainable investment for the new technology

Every company needs to replace old, unreliable or energy expensive machines with new ones from time to time. The sustainable approach means to consider not only, price and space requirements, but also energy efficiency and recyclability.

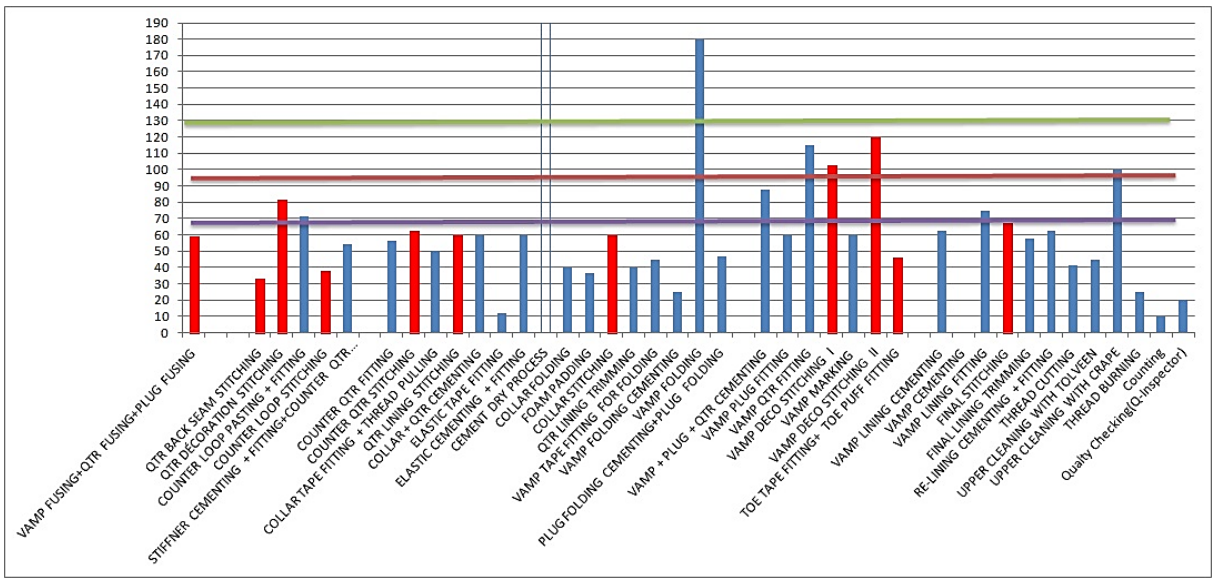

Fig. 17: Example of the time analysis © PFI

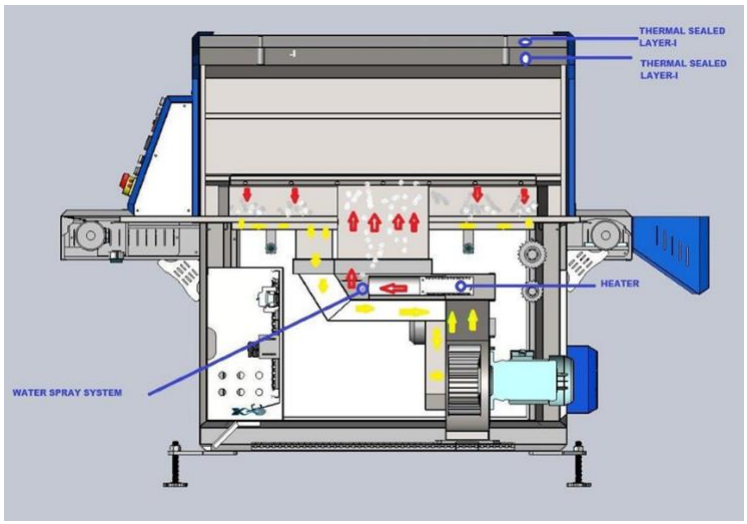

Fig. 18: Heating system reusing energy at heat setter
© PR Engineering Ltd

Fig. 19: Energy saving
© PR Engineering Ltd

Any purchase should be made with a thorough study of performance, tool selection, consumable selection, tooling decisions, basic replacement parts, and available technical support and training. Pay attention to the instructions for preventive maintenance.

Today, there are more and more technical and material solutions. New machines should be able to increase the value of the product. There are still installations with robots that only move the work in progress from "A to B" without adding value. Such solutions are not sustainable.

The best sustainable approach means that the newly selected machine adds important value to the product or avoids some kind of waste.

2.9 Managing methods supporting sustainable approach

In the previous part, a sustainable approach to product preparation, technology adaptation and the production process was described. In the next steps, we will select some management methods to maintain and improve the process. Let's start with the workplace.

5S – system focused on creation of individual working places.

Each workstation should be large enough to allow high-quality execution of the work. All tools and materials are in the optimal place and sorted so that they can not be mixed.

Fig. 20: Counters sorted according sizes © PFI

Fig. 21: Clearly separated cutting dies and cut outs ©PFI

Fig. 22: Nicely sorted patterns © PFI

Fig. 23: Working place for labeling ©PFI

Fig. 24: Placing of tools needed for actual operation © PFI

Fig. 25: Office has also organized working places ©PFI

Fig. 26: Parts and tools which are not used must be stored © PFI

5S principles

SORT – On each working place are ONLY the tools, part, materials which are needed for performing actual operations today

STORE – there are created visible places for materials and tools which are not temporarily used

SHINE – Create the rules how the working place should look like

STANDARDIZE – rules how to use machine, tools, and consumable materials in the safety way and in maximum effectiveness

SUSTAIN – process of checking and maintaining the working place

Total Quality maintenance (TQM)

Total Quality Maintenance is a strategy focused on continuous improvement of operations. General quality parameters according to customers are:

→ Design

→ Comfort

→ Durability

→ Health.

Each customer may have their own expectation or expectations are the same but orders differ.

Quality starts with:

Proven design, well selected components, trained technicians and workers, tools selected exactly according to design and materials, properly maintained and adjusted machines, well prepared workplaces, instructions, hand samples, manager support and much more.

Basic Quality measures

Each design has a technical description created as part of product development. The technical requirements need to be met under all circumstances with the help of the following means:

- a properly prepared working place
- a description of actions required to prevent mistakes
- properly adjusted machines
- examples of good (or bad) results in form of hand samples
- devices for automatic inspections of the operations results

Standard operation procedures (SOPs) that provide instructions about what to do before the start of the process, during the work activities and after the work is completed.

For important tasks the correct tools, instructions and hand samples must be available at the working place.

Fig. 27: Hand samples for each operation © PFI

Fig. 28: Fast checking of skiving width © PFI

Fig. 29: Example of gluing instructions © PFI

Fig. 30: Simple photo instructions © PFI

Quality-Assurance-System

Production instructions-**BACK PART MOULDING**

Check the shape of the mould.

Insert the counter up to stitching line

Open the temporary glue if necessary

Adjustnments:

Pressure: 4 bar
Activation temperature of ALU moulds : 135°C
Activation temperature of silicon moulds : 125°C
Activation time: 15s
Cooling temperature: - 8°C
Cooling time: 25°C

Random check the strenght of gluing.

Create date:	10/29/2014	Serial number:	03.001
Responsible:	M. Spacek	Change date:	

Confidential

Fig. 31: Instruction for machine operation © PFI

A variety of quality tools can be used:

- Instruction how to set up the machine,
- Instruction that describes the part of the process
- Examples of correct and incorrect use of the machine
- Hand samples showing the correct outcome of operation
- Tools to check operation results

Total Productive Maintenance (TPM)

Activities to Total Productive Maintenance:

- create rules for preventive maintenance.
- continuously update machines.
- create a maintenance, preventive maintenance and monitoring system.
- maximize effectiveness of machines (speed, usage, quality).

There should be a list of prescribed measures for each machine. There should also be a division of what should be done by the operator and what should be done by the maintenance technicians. Each measure should be confirmed and signed by the person who carried it out and when. The next chart is showing core part of the chart prepared for a bridge cutting machine with a travelling head.

Cutting machine Nr. 125- ISC quality checking list				
Activity	**Time/ day**	**Daily**	**Weekly**	**Comments**
Head and base parallel			X	
All screws on ALU plate tighten		X		
Safety photocell properly working	2x			
Depth of cutting into cutting block OK or not OK?	3x			
Flipping and rotating cutting block	4x			
Moving speed of cutting head		x		
Cutting speed of cutting head		x		
Sensitive starting buttons (not only slightly touch or opposite big pushing force)			x	
Noise of hydraulic pump		x		
Others:				

Fig. 32: Maintenance chart for bridge cutting machine © PFI

It is recommended to have:

- a "book" for each machine where all performed adjustments and maintenance to be written.
- a check list for the cleaning procedure and its time schedule.
- detailed specification of checking points.
- a list of marks leading to problems.

Key information regarding machineries maintenance and adjustments:

- Type and motive of failure.
- Failure date and time.
- How long was needed to solve the problem = to repair or adjust the machine.
- The quantity of products done since the last problem occurred = document the frequency if the same or similar problems happened before.
- Who repaired/adjusted the machine.
- What could be the core reason for the failure.
- What was used for repair (material, spare parts…)?

Each machine should have a kit of spare and consumption parts. Consumption parts and tools should be available for all range of materials involved in the manufacturing process.

Why is Total Preventive Maintenance sustainable?

- improves quality of products.
- improves durability of machines.
- decreases idle times.
- decreases maintenance costs.
- increases machinery lifetime.

The most important in machinery operations, quality and preventive maintenance is having a program to train multi-skilled workers. Here is example which could be valid for the making room.

Groups of operations in the making department:

1. counter inserting, back part moulding, connecting upper with lining, back pre-moulding, insole attaching.
2. toe activation, toe lasting, seat lasting, side lasting.
3. sole halogenation, sole roughing, marking, lasting margin roughing, glue application, glue activation, sole placing, sole pressing.

Worker in the team should be consequently trained for each operation in the group.

Visual control

There are many levels of visual controls

- the smallest unit is represented by the individual workstation
- the manager or a subordinate technician should be able to easily see whether all tools and components used at a workstation are available and functioning properly
- the entire production should be clean and organised in such a way that any bottlenecks can be seen at a glance
- each technician should have actual information about work in progress in his department but also in the departments before and after theirs.

Fig. 33: Easy to see how the stitching lines run © PFI

Fig. 34: Making line easy look from top © PFI

Continuous flow

Continuous flow:

- describes how the productions is organized
- focused on minimizing buffers
- focused on working with smallest possible unit in production
- A footwear manufacturing process often has hundreds of different steps/operations.
- Some production steps can be grouped together and performed by one operator at one or more working places.
- It is important that the final products can be checked as soon as possible.
- Using natural materials there is a higher probability of existing hidden problems.
- More reworks or rejects = waste of time, energy, labour, and materials.
- A footwear manufacturing process often has hundreds of different steps/operations.
- Some production steps can be grouped together and performed by one operator at one or more working places.
- It is important that the final products can be checked as soon as possible.
- Using natural materials there is a higher probability of existing hidden problems.
- More reworks or rejects = waste of time, energy, labour, and materials.

Fig. 35: Not used tools must be stored in its space © PFI

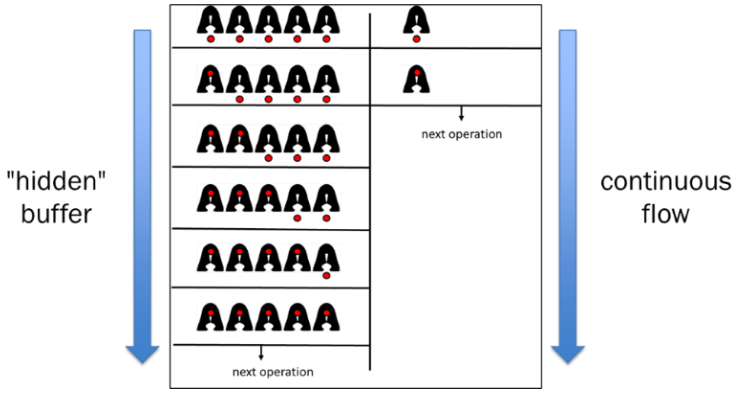

Fig. 36: Hiden buffer © PFI

Fig. 37: Everybody see the actual situation in production © PFI

Gemba

- refers to the working area – the place where the adding of value is done.
- the production managers should be familiar with the manufacturing process.
- It is necessary to know the real root of any deviation from quality.

Usual action manager should do in case that some problem is recognized:

- ask the worker why the problem happened.
- confirm it and decide what should be done for improvement.
- support the improvement of process and confirm that the solution is OK.

Best actions that should be taken by managers:

- Do the operation by themselves.
- Instruct the operators what to do.
- Call maintenance ask responsible technicians to make improvements.
- Support the improvement process.
- Make a notice.
- Describe the improvement.
- Share this situation with other technicians.
- Decide what to do to prevent the problem from happening again.

Gemba walk - the activity of leaders visiting the place where the adding value process is done.

- The visit should be done with the production management team.
- The visit could be a planned one, with an exact scope, or just a random one.
- The general production manager should know how to operate the machines.
- It is good to motivate technicians to learn some machine operations or to train skilled operators in decision making.
- Gemba walk and Gemba troubleshooting should be properly documented and widely shared with company technicians.
- Gemba activity also has a psychological aspect.
- It is better that the higher manager doesn't decide immediately when he sees a problem.
- Any type of improvement should be confirmed after some time with another Gemba walk.

Kaizen

The main focus of Kaizen methods:

- "Improve by changes" or "Change for better "
- main aim is to reduce "wastes".

It is important to recognize all kinds of waste in a company:

- Large inventory.
- Not necessary waiting.
- More shoes are planned than are ordered.
- Long transport time.
- Defects and rejects.
- Processing motion which is not adding any value.
- And other mentioned already in our lesson

Managers decide where the Kaizen activity will be focused:

- Describe the selected activity situation.
- Select the places having wastes and quantify them in time and money.
- Select solutions to be used for improvement.
- Improve - managers of the departments where improvements were done are responsible to continue in that direction.
- Check if improvements are still implemented after some time.

Decision types:

- Easy to do immediately without investment.
- Needs time and longer preparation.
- Need longer time and investment.
- Not possible to do it soon.

Daily meetings in small teams are part of the Kaizen method.

The manager should have a clear idea about the daily aim.

Improve production today

A company can be successful if its managing team is motivated to do daily improvements.

All efforts should be generally focused on anything connecting with:

→ quality

→ productivity

→ working conditions

The actions are focused on recognising the "wins" of the day or "losses" of the day and on the efforts to maintain the “wins” and solve the “losses”.

The final activity should also look like:

- Do we meet our shift target?
- What could be improved?
- Which action can be taken immediately?
- Which action should be taken later?
- Which action should be taken to achieve permanent improvement?

Improve Production Today

- In the majority of cases, this method must be well prepared by the top or higher managers.
- Starting this activity will need personal support from high managers.
- Occasionally, the actions will support only machine failures, replacing missing operators etc.
- The method could be used also for describing problems with certain designs.

Fig. 38: Small solution how to keep the new given shape © PFI

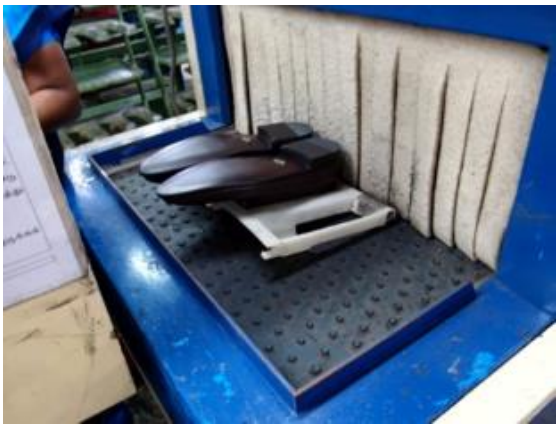

Fig. 39: Solution how to increase the stream of cold on sole © PFI

Fig. 40: Solution how to keep the back height © PFI

Fig. 41: Improved manual folding © PFI

Layered Process Audits – LPA

Layered Process Audit is an internal audit method comparing workers performance with quality and safety requirements. LPA focuses on observing and validating how products are made, rather than just inspecting finished products.

There might be different audit levels depending on management positions. The bigger the company the more levels. Level from "working island" or production line up to the department level, all production level up to the whole company level.

Procedure:

- Create the list of all checking points (use work instructions and rules for machine settings at the beginning).
- The list should be amended based on the LPA results and can be modified according to new proposals
- Randomly pick up the prescribed quantity at the first checking point
- Check the number of wrong pieces and number of deviations from the required quality
- Continue through all suggested check points or select some of them
- Try to find the root cause for the deviations
- Create a report

Higher managers select one or more basic level, rechecked them and compare results with already completed basic audits. They ask higher-level questions like:

- Check if the root cause was found in case of deviations from quality
- Check if the corrective action was done and followed up
- Do we have any customer complaints?
- Do the employee understand the working instructions?
- Are all safety rules followed?
- Do we need additional safety rules?
- What should be done that the detected deviation never happens again?

Plant manager or general manager collect the audits results and make decision in cases that the needed corrective actions are above the responsibilities of the technician or production manager.

Findings from daily audits are often small deviations that do not require any rework.

The key point is that the company corrects daily small deviations, technicians are active searching for them, and corrections are implemented before the deviations grow to levels that require rework or scrap.

This type of internal audit reduces loss in productivity and money.

Managers and Leaders

Difference between manager and leader: “Managers have subordinates, leaders have followers”.

Managers focus on the creation or compliance with rules necessary for the day-to-day run of the company like rules for organization, responsibilities, production and financial planning, hiring and firing the employees, control etc. Rules and responsibilities depend on company size and how many managers they have for purchase, production, maintenance and other departments.

Leaders work under the conditions maintained by the managers and he/she is given a specific goal to achieve. He or she should put the team together and motivate the team members to achieve this specific goal (vision). He/she must not have a manager position. This leading position ends when the goal is achieved.

Selection of some key differences between Manager and Leader

- The leader influences his subordinate to achieve a specified goal, whereas a manager is a person who manages the entire organization or department.
- The leader sets directions and provides solutions, but a manager plans provides the condition to achieve the aim, delegates rights, responsibilities and provides funding
- The manager makes decisions and sets goals while a leader supports with suggestions about the best way to achieve them.
- The leader has followers while the manager has employees.
- The manager avoids direct conflicts. On the contrary, a leader uses conflicts as an asset.
- Leaders promote change, but Managers react to the change.
- The leader aligns people, while a manager organizes people.
- The leader fights for doing the things right. The manager strives for doing the right things.
- The leader focuses on people while a manager focuses on the procedure.
- Some companies are unable to progress because the company does not have a clear system to distinguish roles and responsibilities of technicians or because temporary success is not fixed to permanent success. A clear distinction in the responsibilities of managers and leaders is helping in the process of permanent improvements.

2.10 Eco Shoes

We hear frequently about the manufacturing of eco friendly shoes.

Criteria that should be considered for the eco friendly shoe:

- Energy consumption.
- Water consumption.
- Limitation of water pollution.
- Reduction of air pollution
- Performance and durability.
- Limitation of toxic and other residues in the shoes
- Materials (e.g. leather, textiles) with the use of minimum amount of chemicals on their production process.
- Natural rubber resin for the sole.
- Water based solvents and glues.
- Textiles without polyester and polyurethane.
- Use of recycled and recyclable materials.
- Use of biodegradable materials.
- Use of renewable energy.
- Simplifying the shoe models and manufacturing production processes.

There are several different aspects under ECO materials, SUSTAINABLE materials, ECO FRIENDLY materials or MORE ENVIRONMENTALLY FRIENDLY materials can be evaluated.

1. The best materials from the ECO point of view could be the materials which could be composted and their life cycle is finished by creating soil. (Example are some leathers and soles)
2. The second type of materials are materials which could re-enter production process and create the same type of product or should be part of different type of product. This process could be called recycling. (Example could be vegetably tanned leathers in crust form, plastic soling materials even like rubber, PU)
3. The third type of materials could be some known traditional materials but their production process use less or zero harmful chemicals, less energy is used, less water. (Example could be new ways of colouring textile materials, glues with low activation temperature, water-based glues)
4. The fort group of materials could be materials from standard materials but they are produced without waste, application need less operation, less energy etc. (Example could be printed soles, some technologies producing toe puffs and counters in final shape without cutting and skiving)

The types of materials listed above also represent the order of priority in terms of sustainability.

To distinguish the “more environmentally friendly” or “sustainable” materials there are some simple definitions available (source CTCP, step2sustainability project)

NATURAL MATERIALS are all products or physical matter from plants, animals or soil. The minerals and metals which can be extracted from them (without any modification) are also placed in this category.

RENEWABLE MATERIALS are substances derived from trees, plants, animals or ecosystems that have the ability to regenerate. A renewable material may be produced over and over again. For example, when wood is used to make paper reforestation can be planted more trees to replace. The renewable materials can be produced indefinitely with benefits to the environment.

RECYCLED MATERIALS are obtained by reusing materials benefited as raw material and transformed into a new product. The concept of recycled material is directed only to materials that can return to the original state and be transformed again into a product equal in all its features.

REUSED MATERIALS are obtained by reusing materials benefit as raw materials and processed into a new product, however, the new material does not return all the properties of the initial material. It is obtained a new product with different characteristics.

DEGRADABLE MATERIALS are materials that undergo significant changes in its chemical structure under certain environmental conditions, resulting in a loss of some properties that can be measured using standard methods suitable and applied in a determined period of time, determining its classification.

BIODEGRADABLE MATERIALS are materials in which the degradation is a result of the action of microorganisms of natural origin as bacteria, fungi and algae.

COMPOSTABLE MATERIALS are materials capable to undergoing biological decomposition when integrated in a composting place, the material should not be distinguished visually and its decomposition produces carbon dioxide, water, inorganic compounds and biomass, with a degradation rate consistent with known compostable materials.

2.11 Energy efficiency and CO2 Emissions

Carbon footprint and Green Energy are other important general topics tightly connected with sustainability.

A carbon footprint is the total greenhouse gas (GHG) emissions caused by an individual, event, organization, service, place or product, expressed as carbon dioxide equivalent (CO2e). Greenhouse gases, including the carbon-containing gases carbon dioxide and methane, can be emitted through the burning of fossil fuels, land clearance and the production and consumption of food, manufactured goods, materials, wood, roads, buildings, transportation and other services (Source: Carbon footprint, 2022/01/18. In Wikipedia, https://en.wikipedia.org/wiki/Carbon_footprint).

Studies concluded that hydroelectric, wind, and nuclear power produced the least CO2 per kilowatt-hour of any other electricity sources. These figures do not include emissions due to accidents or terrorism. Wind power and solar power emit no carbon from their operation, but do leave a footprint during construction and maintenance. Hydropower from reservoirs also has large footprints from initial removal of vegetation and ongoing methane.

Due to the globalization trend, many production sites have been centralized and the final products have to be transported to the customers. Light industry, textiles and footwear are examples with a very high carbon footprint. The footwear has one of the highest transportation impacts. Companies should act responsibly and consider producing products closer to the point of consumption.

Example of the passengers' footprints if cases of travel (Source: Harris, Noel (2019). Green Chemistry, Scientific e-Resources)

1. by plane: Some representative figures for CO2 emissions of airliners expressed as CO2 and CO2 equivalent per passenger kilometre:
    - Domestic, short distance, less than 463 km: 257 g/km CO2
    - Long-distance flights: 113 g/km CO2
2. by road: The average values for CO2 emissions per kilometer in road traffic for 2013 in Europe, normalized to the NEDC test cycle, are published by the International Council on Clean Transportation:
    - Newly registered passenger cars: 127 g/km CO2
    - Hybrid-electric vehicles: 92 g/km CO2
    - Light commercial vehicles (LCV): 175 g/km CO2

3 Conclusion

There are many different management methods that lead to and maintain sustainability. Which methods are best suited for a particular company depends on the specific conditions of that particular footwear company.

It is not possible to work out the best methods for one company and copy and apply them to all companies. The good management process existing in one company could be an inspiration, but not a copy, without taking into account the individuality of the machines, products, workers and technicians.

Depending on whether it is a very simple machine that needs to be evaluated manually or a computerized machine with the ability to automatically record performance, different monitoring methods will be used.

Different methods are used depending on whether the company does most of the work manually or uses robots, cobots, and a high level of automation.

However, the methods presented to reduce waste in production are general and can be used as a basic pattern in a variety of footwear companies. Companies can then adapt them to their specific conditions.

4 List of Figures