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Integrating Companies in a Sustainable Apprenticeship System

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OUTPUT 1

Learning Station Analysis

Germany

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CONTENT

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1. LEARNING STATION ANALYSIS MANUAL

-an instrument to connect occupational Activity Fields (AF) and Work-Based Learning (WBL)

1.1. Introduction

Learning within work processes differs in three important aspects from formal learning in schools or apprentices' workshops:

- *What can or should be learnt does not only depend on decisions of teachers or trainers, but is strongly determined by work processes;*
- *the absence of pedagogically specialised staff;*
- *the number of mentors (skilled workers accompanying the apprentices, supporting the development of their vocational competences).*

This manual 'Learning Station Analysis – an instrument to connect occupational Activity Fields (AF) and Work-Based Learning (WBL)' is an adapted version of a collaborative product of ITB (Universität Bremen) and trainers from Airbus which was developed for two pilot projects in the aeronautic sector 'Move Pro Europe' and 'AERONET'. This method has already been approved in other sectors and other European projects such as 'APPRENTSOD' or DUAL TRAIN. In particular, the form of documentation of the analytical results has been adapted with respect to the specific aims of the 'ICSAS' project. The methods proposed here are supposed to be applied to exemplary work places in shoe production, where 'activity fields' (AF) or units have been identified and selected for their suitability for the implementation of dual structures.

The 'LSA' (Learning Station Analysis) method was developed to support the training organisation at the learning places in an effective way, taking into regard business needs as well as processes requirements. Essentially, it helps users to identify the work places that are important both in terms of the significance of their operating processes and for the learning opportunities they provide. This approach emphasises the value of trainings taking place at work stations where the most significant operations are being carried out: the quality of training to prepare apprentices for the requirements of modern skilled work is considerably increased if the training takes place at the most relevant operational processes.

LSAs should not only enable the development of training processes which focus on the work process, they should also provide support for the positive development of the trainees.

The LSA method serves to examine the quality of individual work stations within a training process, and, moreover, can highlight the value of these being attended in a certain order. A simple example would be the comparison of a single-task operational work place in a workshop and a more complex operational work place in the final assembly line that offers insight into and experience of a

technology and a quality procedure that are characteristic for a professional occupation. However, prior to entering into such a more complex workplace, young people need to possess an understanding of certain production procedures. Without such preceding experience (for example if a trainee arrives at a relatively early apprenticeship stage at a challenging learning station and remains there for only for a short period of time), it is quite impossible to fully impart the actual functioning at that work station. In consequence, learning opportunities are missed. This example illustrates that the overall training organisation and the order of flow through different learning stations has an impact on the learning results and the training quality. An additional important aspect of the LSA method is that skilled work is being regarded from a beginner's perspective: elements that seem self-evident and too trivial for experienced workers to explicitly explain can pose considerable, if not insuperable problems for a trainee and need to be communicated explicitly. LSAs reveal the communication needs and the learning potential of specific workstations within the entire apprenticeship programme, and they can contribute to analyse other work stations so as to provide information on the optimal sequencing of movement through the work stations, which can be depicted in form of a flow chart. The LSA method is also suitable to assess the potential of workstations that have not yet been used for training purposes – not only the learning potential at work stations already being used in trainings.

- *The LSA method was jointly developed by researchers and trainers.*
- *Its primary objective is to evaluate learning potentials of work processes.*
- *It helps to set up training plans according to work processes, and fosters the acquisition of skills and competences by the learners.*

1.2. Procedure - Milestones

The term 'Learning Station Analysis' itself clarifies the aim of the LSA method as a tool. 'Learning stations' are places where learning to acquire skills and competences to perform work central to the occupation takes place. LSAs analyse workplaces, which cover activity fields (AF). AFs describe skilled work tasks in terms of characteristic operations and work contexts that are needed in order to make sense of learning and allow the trainee to "grow" into an occupation. They are typical for the profession and, in total, comprise a complete specification of the learning required in order to become fully skilled. With this definition vocational activity fields can be specified as follows:

No individual activities or performances are analysed, for example closing a backseam or activating an upper. Instead tasks, in the sense of complete actions, following a holistic process structure, are analysed, such as cutting or lasting. The aim is to obtain a general process structure of activity fields; containing specifications of concrete tasks, including their planning and accomplishment as well as quality inspection and assessment of work outcomes. The LSA method is based on the following criteria:

- it has to reflect the super-ordinate coherence of the occupational work process and refer to a distinct vocational profile;
- it always describes a work context and a complete work action, highlighting planning, performing and evaluating the work;
- the formulation of the documentation also emphasises the content and types of skilled work;
- it reflects function and meaning of a work-process in the context of super-ordinate operational business processes;
- particular attention is paid to the creative potential in skilled work.

LSAs assigned to activity fields are divided into the following three phases:

- *preparation of the analysis,*
- *accomplishment of the analysis,*
- *evaluation and documentation of the analysis (the results serve for developing a training schedule respecting a logical sequence of progression through learning stations).*

1.3. Learning Station Analysis – Approach

1.3.1. Preparation of a LSA

Investigation team

The selection of the LSA team is part of the preparatory phase. It is recommended to choose a group of two people, including an expert skilled worker and a researcher or teacher.

Selection of workstations

Although each LSA corresponds to a previously identified activity field, the following procedure is recommended: It is necessary to distinguish an activity field from sub-tasks. It has to be checked whether a workplace fulfils the precondition of being relevant both in terms of competence development and syllabus. The ICSAS project intents to plan a complete apprenticeship: it requires numerous individual analyses in the technical and production departments in order to achieve the desired training results – but the LSA method also reveals what ***cannot*** be learnt within the company and thus should be taught in VET-school or training workshops.

It is necessary to select operational work places as (possible) learning stations in the company and/or a department, where qualified specialists master the tasks, which are representative for the activity field. The operational representative in the LSA team is responsible for the selection of the workstations, since he/she has detailed insight into the business and work processes and can ensure LSA performance on site.

In practice, activity fields are often not completely isolated from each other. At many work places (and therefore at learning stations or in work fields), several closely linked activity fields are mastered together. *For the analysis it is advisable to select work places with the 'core characteristics' of an activity field. Although, only one individual activity field is analysed at a time, the interfaces with other activity fields have to be observed.* Simultaneous analysis of several fields could cloud the view on the most relevant processes in different fields. When – due to work organisation – several AFs are involved in a work process, it might be necessary to perform several LSAs from different angles (for example in the case of function checks, disassembling and malfunction analysis).

An immensely influential factor in LSAs is the cooperation with the skilled workers at the respective work places. It is important to make particularly clear to them that the analysis is not conducted to prepare rationalisation measures, personnel restructuring or an assessment of their performance. The participation of specialists with substantial professional experience is crucial for devising vocational education and training programmes in practice. This central request should be clarified with the production manager who has given agreement for the planned analyses to take place.

The following four steps have to be performed to complete a LSA:

- Discussion schedule (interview);
- Preparation of a record (references);
- Preparation of photos and sketches;
- Materials and samples for visualisation (design sketches, semi-finished products, components).

- *Ideally, a LSA is conducted by a skilled worker and an external colleague.*
- *The manual for analysis should be used as a toolbox, not as a rigid rule.*
- *A LSA takes several (few) hours.*

1.3.2. Manual for the Analysis

Not only (experienced) researchers, but also the skilled staff selected for a LSA should read the LSA manual beforehand and focus on the following questions:

- In which business and working processes is the activity field integrated?
- At which workplace is the task of the activity field executed?
- Which items are being worked on during the actual performance of a task?
- Which tools, methods and organisation forms are used?
- Which requirements in terms of skilled work have to be met?
- Which interfaces to other activity fields exist?
- What are the experiences in regards to training at this workplace?

Based on these preliminary questions, the analysis categories are developed, which can then be complemented in detail by a catalogue of central questions.

Analysis category: business process

The analysis of skilled work cannot refer to the workplace without considering the context. Without consideration of the integration in business and working processes, skilled work in its full complexity cannot be appropriatelycaptured. For this analysis category, material and information flow charts as well as schematic diagrams of the order flow are very useful. This material can be examined by the LSA team in the preparatory phase, i.e. before the 'on-site-analysis' starts.

Analysis category: workplace

When describing a chosen work place, it is of special interest to identify – besides the location (department, production area and section) – the working conditions under which the specialists perform their everyday work. Relevant details are lighting conditions, noise exposure, ambient temperatures but also aspects of ergonomics at the workplace (e.g. sitting positions, work benches).

Analysis category: subject of skilled work

In order to describe the subject of skilled work, the work context and the work process need to be considered. For example, the technical realisation of a machine is very often done in such a way that the machine operator requires only few skills and knowledge. However, the work routine of the machine operator differs substantially from that of the maintenance technician, although both work processes refer to the same machine. The machine operator adjusts the necessary machine settings (e.g. model- and size-dependent), feeds parts to the machine and accomplishes simple maintenance tasks. The operator relies on the trouble-free functioning of the machine, and in general does not know much about the internal design and the technical details. In case of machine breakdown, the maintenance technician has to determine the cause for the defect and therefore, on the contrary, needs detailed knowledge of how the machine is constructed in order to identify all possible causes for malfunction.

Skilled work can contain a surprising degree of creative potential. For example: Even if two maintenance technicians proceed in a completely different way when trying to repair a machine default, their goal is the same: identification of the defect and rapid repair. LSAs identify the methodical approach of skilled workers in performing such professional tasks. Differences can be found not only in the actual work execution but also in planning the work. In many cases, different strategies are viable.

Analysis category: tools and equipment for the skilled work

Concerning the description of the tools and equipment used in the skilled work, the context of the work process is crucial. Beside the tools used, the workshop facilities that are used in the work process at the work place are also of interest.

Analysis category: organisation of the skilled work

The form of work organisation of work is a key feature of skilled work that cannot be neglected. In this respect, the operational structure and sequence organisation are at the centre of attention (e.g. group organisation, division of labour, hierarchy levels, co-operation with other professions). Co-operation with other professions (e.g. in skilled maintenance work; decentralized versus central maintenance) is an important aspect of the analysis. Varying organisational forms can lead to substantial differences in terms of occupational responsibility, task connection and co-operation and communication requirements relating to the work process. Also work time models (e.g. shift work, break times, part-time jobs) may affect the nature of skilled work considerably.

Analysis category: requirements for skilled work and its components

In this phase the demands towards the work process and the work components, made by different stake holders, are identified. For example, the company sets specific quality standards, which are necessary to stay competitive and have to be respected when performing skilled work. This may require, among others, the adherence to time and cost targets. In addition, legal requirements and standards, e.g. technical standards or the health and safety at work regulations, must be respected. The possibilities and requirements of organising and aligning technology and skilled work only become clear when these varying and partially contradictory demands are compiled in the format of a list.

Analytical category	Central questions
Business and work process	**- Which business processes is the learning station part of?** **- Which products are manufactured?** **- Where do pre-products come from?** **- How are orders accepted?** **- Where in the further process are the products used?** **- How are processed orders handed over?** **- Who is client / customer of the service?**
Workplace	**- Where is the analysed workplace located?** **- What are the prevailing lighting conditions?** **- Prevailing climatic conditions (heat, cold, radiation, ventilation, gas, vapours, fog, dust)?** **- What are the postures of the workers when performing their tasks?**
Subjects and methods of skilled work	**- What exactly is being worked on at the respective learning station (e.g. technical products and processes, services, documentations, control programs)?** **- What is the role of the object produced within the working process?** **- What procedures are applied when working on the task (e.g. manufacturing / assembly operation, error tracing, quality assurance procedure)?**

Tools / equipment of skilled work	- **Which tools and equipment are used to perform the task (machines, tools, devices, software)?** - **How is the tool/equipment handled?**
Organisation of skilled work	- **Organisation of the skilled work (e.g. individual work or group work, division of labour)?** - **Which hierarchies affect the skilled work?** - **Which co-operations and boundaries with other occupations or departments exist?** - **Which qualifications come together in multi-skilled workers / teams at the respective learning station?**
Requirements of skilled work	- **Which operational requirements have to be met when performing the task?** - **Which demands are placed by the customer?** - **Which social requirements do play a role?** - **Which standards, laws and quality specifications need to be considered?** - **Which rules and standards does the community of practice require?**
Interfaces	- **What are the links and interfaces with other activity fields?** - **Which comparisons can be made with other analyses in this activity field that have already been accomplished?** - **What are the similarities / differences to other workplaces in the company or in other companies which refer to the same field of activity (perform the same tasks)?** - **How are theory (vocational school) and practical work interlinked, what are the 'vocational basics' and/or 'core competencies'?**
Training experiences	- **Is the analysed workplace actually being used in training programmes?** - **If not, why?** - **In which year of apprenticeship are the trainees at this learning station (or should they be)?** - **How long are (should be) they at the learning station and where were they before / where do they go afterwards (should have been / should go)?** - **Which preliminary conditions should the trainees meet?** - **What should a trainee learn in the opinion of the skilled workers at this respective learning station?** - **What are the experiences of the skilled workers with trainees/young skilled workers at the respective learning station?** - **How are the trainees coached / supported?** - **Do the trainees work on "normal" work orders do they work on separate orders (e. g. simulated work processes)?** - **What level of autonomy expected from a trainee at the end of his internship at this station? (support/under instruction/under surveillance/independently)**

Table 1: guiding questions for the Learning Station Analysis

Analysis category: interfaces

Furthermore, the analysis must be put in a broader context. Especially interfaces and overlaps with other activity fields deserve special attention. As previously mentioned, activity fields occur rarely completely isolated; they are often closely linked to others and cannot be clearly demarcated. In consequence, results of analyses concerning the chosen activity fields, which derive from other workplaces, can also be subject of critical reflection.

Analysis category: experience with training

As already mentioned, LSAs focus on the development of recommendations as to the sequential order, duration and type of training a learner can receive at work stations. The experiences of skilled workers with trainees are therefore of particular importance.

For the purposes of the ICSAS project, entries in the fields “experiences with new colleagues”, “preliminary conditions” and “level of autonomy” are of particular relevance:

Experiences with new colleagues: The answers to this question might reveal relevant weaknesses of the training system, which most likely cannot be solved at the level of single activity fields.

Preliminary conditions: It strongly increases the acceptance of internships if basic skills and knowledge (i. e. health and safety regulations, working under workshop conditions) are trained in advance.

Level of autonomy: This indicates the learning outcomes that can be expected. Sometimes the highest level (autonomy) cannot be attained (legal preconditions, necessity to have of a lot of experience, etc.) – but this does not lower the potential benefit of WBL; it only indicates the possible realistic outcome. In addition, the autonomy level scale is very useful to document the achievements of trainees (cp. Tab in section 1.5): The mentor responsible for the learning station can indicate on a personal assessment sheet which performance level a trainee has attained.

The classification scheme with guiding questions for the LSA is merged in table 1 and designed as a master template to guide the analysis. The guiding questions offer suggestions for the analysis. They do not need to be strictly followed in each analysis and are not to be considered as a checklist. Their purpose is rather to provide suggestions in order to be able to produce meaningful LSA results.

1.3.3. Execution of Analysis and Documentation

At the beginning of each LSA, the specialists, i.e. the personnel working at the selected workplaces whose work will be analysed, must imperatively be informed of the aims of the LSA. They should follow their work routine as usual: the analysis does not focus on performance, but on how a skilled worker organises and carries out his/her tasks. It can happen that no ‘highlights’ occur on the day of the LSA, just unspectacular ‘standard work’. This is not a problem for the analysis; it just reflects normality. The workplaces are visited and analysed according to the guiding questions which were conceived to get answers making the «invisible» visible. All LSA interviews must be audio-taped in order to handle the information abundance. Of course the recordings must be previously

authorised. The amount of time required for the LSA interviews depends on the complexity of the tasks at each workplace. Experience shows that a LSA usually takes a couple of hours.

- The core of a LSA is to analyse daily work of a skilled worker from the perspective of an apprentice.
- LSAs are not an attempt to evaluate the individual performance of skilled workers.
- The skilled workers involved in the interviews should proofread and give their ok for publication of the documentation of a LSA before further circulation.

1.4. Evaluation

The LSA tool pursues two targets: Firstly to compare the organisation of work at the learning stations with activity fields (AF) respectively units of the curriculum, and secondly to document the learning potential of learning stations. The interviews should cover all necessary aspects to unveil the learning potential of each workplace and to describe it with the necessary clarity. However, the LSA team should give the question of what learning potential can be realistically expected at each specific learning station some initial thoughts, taking into regard the individual progress of each trainee and the requirements of vocational training.

For sure 'potential' is not a guarantee of 'learning'. The term 'potential' rather highlights that a situation or context offers (good) possibilities for substantive learning. In qualification research and professional education 'learning potential' not only has connotations of positive influences at a personal level, it also means the increase of competences in the special subject or task – in the sense that someone is enabled through the learning process to do something that he or she was not able to do before. This also means that someone who is not capable of doing something which he will be required to do later in her/his career is not behaving wrongly. He/she is just not yet able to perform the required tasks. The trainee is expected to reach the required performance level not through threats or exhortation, but by learning to do something thanks to appropriate learning opportunities. The learner has to take advantage of these opportunities in order to gain experience and expertise. Vocational training helps trainees to achieve these goals, but in order to enable them to do so, the responsible staff for organising work-based learning in companies have to be knowledgeable about where within the work process the relevant learning possibilities are located.

The goal of work-based learning is that trainees reach the level of skilled workers in the chosen activity fields. A precondition is that the AF are correctly described and learning stations are selected correspondingly. However, the skilled work observed during LSAs is actually based on long-term experience. Hence, even under ideal conditions at a learning station, it is practically impossible for a trainee to reach the level of an experienced skilled worker within the scope of a limited training period.

Another pedagogical argument has to be considered: it is virtually impossible for an apprentice to catch up with the routine and experience that a skilled worker has acquired during 5 to 15 years of

career – even if the training is organised with utmost efficiency. But this is exactly why job beginners should get in contact with skilled workers, with 'masters of their profession', and should be coached by them during the entire practical training. Even if it is not possible to become even nearly as professional as the experts within a training of several weeks at the learning station, the contents that are important for the profession can be most effectively learned from the experts in the field. A knowledge and skill gap between an expert skilled worker and even the most talented beginner will, of course, always persist. It will only diminish over time.

It is not the primary objective of a process-orientated training to turn beginners as quickly as possible into 'experts'. As we have seen, LSAs aim to identify the core features of skilled work that are present at the relevant learning stations according to the AF. A further aim of LSAs is to bring the learning stations into an appropriate order for learning purposes. Hence it is necessary to be aware of the learning potential of all learning stations. For example, consider the core work associated with cutting of upper parts from leather hides. It can be analysed how the necessary skills and competences can be acquired in an effective way. It can also be identified what prior skills, knowledge and attitudes the trainee should have for effective learning in that workplace. Having a cooperative attitude may greatly aid the learning process in cutting, as well as having theoretical knowledge about leather and being able to create a cutting layout or hold a hand cutting knife. A trainee can learn all the practical skills from involvement in the work process. In order to organise an effective progression through the different learning stations, LSAs can also serve to create a reliable assessment tool, led by two key questions:

- What skills can be acquired at the particular learning station and which elements of this skill spectrum will be required for which subsequent learning station?

- What skills and competences must the trainee already possess in order to increase the chances to achieve a substantial learning gain?

These two questions have to be answered for each LSA. It is key to identify the initial entry level requirements for each learning station a trainee must meet, as well as to identify the expected learning outcome (skills and knowledge the trainee should have acquired after the training at a particular learning station). The learning outcome of one learning station is the pre-requisite to enter into the subsequent learning station.

A comprehensively accomplished LSA in a plant will result in a logical organisation of the necessary learning steps that can be achieved by a particular progression through different organisational work processes. The evaluation should therefore take "the internal linkage of all working processes" into account. The development steps of trainees have to be aligned with how trainees can move through the organisational work processes.

The training quality will also depend on the time a trainee can spend at each learning station. Evidently, short trainings (few days/weeks) can only quickly touch on each process step will impart very little about the process itself. Short-time trainees will be able to report what he/she has heard and seen but cannot develop a deep understanding or know-how because of the lack of substantial experience. A rapid progression through work processes can only produce superficial knowledge.

The flow through learning stations is guided by a pedagogic rationale. We should be aware that the core competences may require hierarchical structuring because of increasing levels of difficulty and

increasing amounts of time to learn. Therefore it makes sense if less complex component elements of a major task are learned at an earlier stage. LSAs investigate the potential of concrete work processes to provide support for competence development of apprentices.

LSAs answer the following questions:

- What can be learnt at a specific learning station?
- Which skills and knowledge should a trainee already have acquired before entering a new learning station in order to achieve optimal learning outcomes?
- Findings are recommendations; concrete implementation might be affected by frame conditions (e. g. number of placements at a time).

Abbreviations:
AF: Activity Field
LSA: Learning Station Analysis
WBL: Work-Based Learning

1.5. Template

The template below is based on table 1. It is half open, meaning that it offers at any time the possibility to make additional entries.

Description	Learning station Date	
Location / site	**Vocational profile**	
Allocation	**To curriculum**	
Process environment	Type of product/service	
	Internal supplier	
	Order- / material acceptance	
	Direct user of product/service	
	Client of product/service	
	Production steps already performed	
	Interfaces with other process steps	
	Specifics of work process related to the duration of execution, work process organisation, quality assurance etc.	
Process steps (detailed description)		
Workplace	Shop floor	
	Lighting conditions / environment	

	Posture			
	Specifics			
Organisation	Employees at workplace per shift			
	Employees in department			
	Hierarchy			
	Cycle time			
	Shifts			
	Similar work stations			
	Cooperation			
	Specifics			
Interfaces	… to other activity fields?			
	… to other learning places?			
	Separate trainee workshops / theoretical knowledge?			
	Miscellaneous			
Vocational training	Vocational year / duration			
	Preconditions / previous stations			
	What should they learn?			
	Specifics of training (individualisation, duration, timing)			
	Experience with trainees & young skilled workers			
	Assistance / working tasks			
	Is the existing potential used?			
	Possibilities for improvement			
	Number of trainees per learning station			
Highest level of autonomy reachable	Support	With instruction and guidance	Under surveillance	Independently

2. LEARNING STATION ANALYSIS

2.1. Core spheres

2.1.1. Gabor Cutting

Description	Learning Station Date	Cutting / Prototype production January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (vocational position n°)**	A 2. Cutting and clicking of materials for upper manufacturing (§ 4 paragraph 2 number 2), 18 weeks A 1. Assessment and use of materials and auxiliary materials for upper manufacturing (§ 4, paragraph 2 number 1), 14 weeks A 3. Preparation of upper parts (§ 4, paragraph 2, number 3), 10 weeks
Process environment	Products	Cut upper parts (outer upper, interlining, lining)
	Type of product / service	Semi-finished products
	(Internal) supplier	Leather/materials warehouse
	Order- / material acceptance	Batch box with work order and cardboard patterns
	Direct user of product / service	Stitching (at Gabor Rosenheim this is also where quality control of the upper parts prepared to be stitched takes place)
	“End” user of product / service	Final inspection/shipment to customer
	Production steps already performed	Design, pattern making (including digital object data for automated cutting tables), cardboard patterns (from the grading room), production planning (creating work orders for production including all production steps/stating all materials and components), preparation of materials to be cut (for serial production, the material is being prepared for the cutters, but for prototype production

		the cutters fetch the material they need from the warehouse themselves)
	Interfaces with other process steps	-
		At the Rosenheim site, Gabor produces exclusively prototypes. In consequence, there is no piecework wage. The reason for this is that the workers do not only need to concentrate on the correct execution of all work steps for the new patterns (no routine work), but they also need to verify that all information in the work order is coherent and complete. This could not be done under time pressure. Sometimes the workers need to take own decisions. As concerns prototype production, the cutters are responsible to choose the needed materials (upper, interlining, lining) in the warehouse (whereas for serial production, the cutters will receive the prepared batch boxes with all materials at their work place).
Process steps Detailed description	The cutter receives the first draft for a new prototype from the designer. The work sheet contains information on: • who created the design (name) • date • article name • pair or piece • upper material, lining, seam colour, elastics • sometimes only the outer upper material is defined and interlining and lining are determined only later • patterns If **cutting** is done by hand, the cutter cuts interlining and lining, whereas the upper leather is cut on the automated cutting table (oscillating knife). All pattern stencils carry designations: O or OB = outer upper leather, V = interlining, F = lining. The marking pattern stencils are of particular importance for the stitching department (to provide guidance to the stitchers on how to join the upper pieces).	

	Sometimes prototypes are produced without a final decision on interlining and lining. The final decision is taken when design and marketing will discuss the article. Only after this meeting all materials are defined. Cutting of upper leather is done on the cutting table: All upper leather parts are cut from leather hides or skins (no need for pattern stencils as the CAD system communicates the geometry data to the cutting table). The work starts on the nesting table to define the cutting layout. First, the barcode on the work order is scanned to identify the shoe model and call up the geometry data from the CAD system. Then the cutter places the leather hide/skin on the layout table and decides on the nesting of the parts (which are projected on the leather). Next, the hide/skin is put on the cutting table (which is positioned in a right angle next to the layout table) and the cutting process starts. A positioning cross serves as reference to make sure that the position of the hide/skin for both layout and cutting will match. On the cutting table, the leather is kept it in the exact position by vacuum suction. To improve the suction effect, a plastic sheet is placed on the hide/skin (leather is air permeable which reduces the suction effect if no plastic sheet is used). **Stamping:** All cut parts are stamped on their back with gold foil (article number, size, pictogram etc.). The stamping specifications must be respected (notice next to stamping machine). The stamping machine must be set up correctly and the appropriate stamping foil must be chosen. **Splitting:** Thickness homogenisation of cut parts (e.g. leather heel cover must be split down to 0.45 mm). **Clicking of sock liners:** At clicking press with bi-manual release. The cutter needs to go fetch clicking dies (the reference number of the die is given on the work sheet, e.g. 9602) from a shelf, where the cutting dies are stored according to size in dedicated compartments, and the material to be cut (for example pigskin colour caramel). The cutter needs to adjust the clicking press (i.e. clicking stroke height, clicking force). With a second die, the cutter will cut a sheet foam material (the exact type is also defined on the work sheet). The foam sock liner paddings are slightly smaller than the leather sock liners. The leather sock liners and the foam parts are bonded (with glue). The effect when the foot enters into the shoe is a sensation of comfort and cushioning. Insoles are not cut in the cutting department; they are purchased as ready-made components.	
Workplace	Shop floor	Prototype production
	Lighting conditions / environment	-
	Posture	-
	Specifics	-

Organisation	Group work?	No
	Employees at workplace per shift	1
	Employees in department	6
	Hierarchy	Fore(wo)man, workers, apprentice(s)
	Work places in department	5 hand cutting work places, 2 tables which make up the computer optical system (COS) = 1 for nesting, 1 for cutting, 2 swing beam clicking presses, 1 stamping machine, 1 splitting machine
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other vocational positions?	B 6 handling of tools, machineries, and devices (8)
	… to other learning places?	Stitching Work preparation
	Separate trainee workshops / theoretical knowledge?	LF 2 Cutting leather LF 3 Cutting textile LF 4 Preparing upper parts
	Other	
Vocational training	Vocational year / duration	2 x 3 months within the first half of the apprenticeship
	Preconditions / previous stations	Theoretical knowledge about leather and materials as well as about footwear parts and components (vocation school and also in-company tutoring; the basics of work safety (pictograms) are imparted at vocational school and are being recalled in each department at each new machine.
	What should they learn?	All specific work steps in the cutting department

	Specifics of training (individualisation, duration, timing)		-	
	Experience with trainees & young skilled workers		Very positive	
	Assistance / working tasks		All tasks in the department	
	Number of trainers		2	
	Maximum number of apprentices		1-2	
	Other		Specifics at Gabor: About 1/3 of all skilled workers are officially qualified to train apprentices	
	Is the existing learning potential used?		Yes	
	Possibilities for improvement		Nope	
Highest level of autonomy that can be attained	Support	With instruction and guidance x	Under surveillance	Independently (cutting table) x

Fig. 1 Batch box with work order

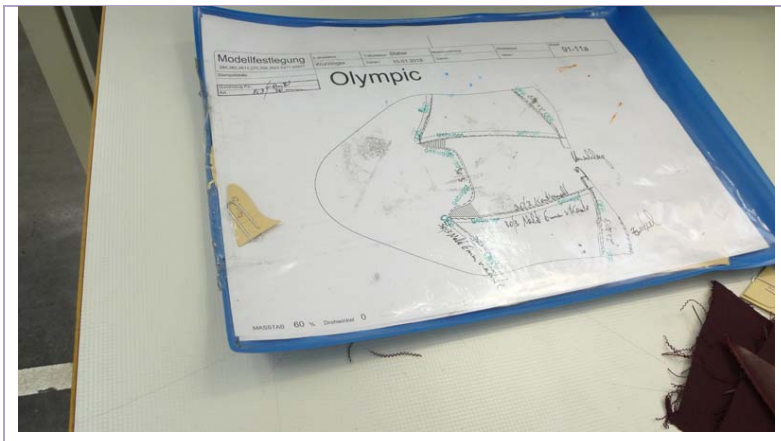


Fig. 2 Envelope containing work order and pattern stencils

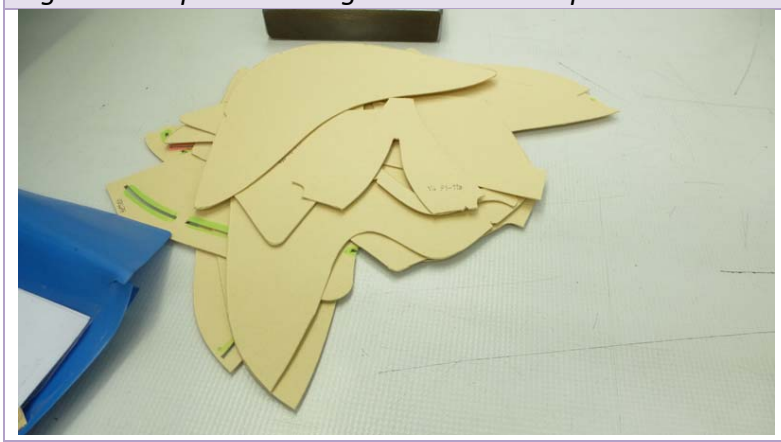


Fig. 3 Pattern stencils

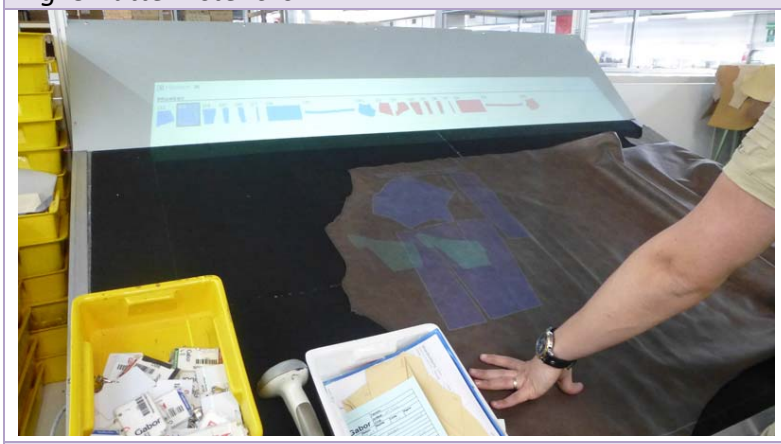


Fig. 4 Nesting of parts on computer optical cutting system

Fig. 5 Cutting of parts on computer optical cutting system

Fig. 6 Batch box with cut parts

Fig. 7 Stamping machine

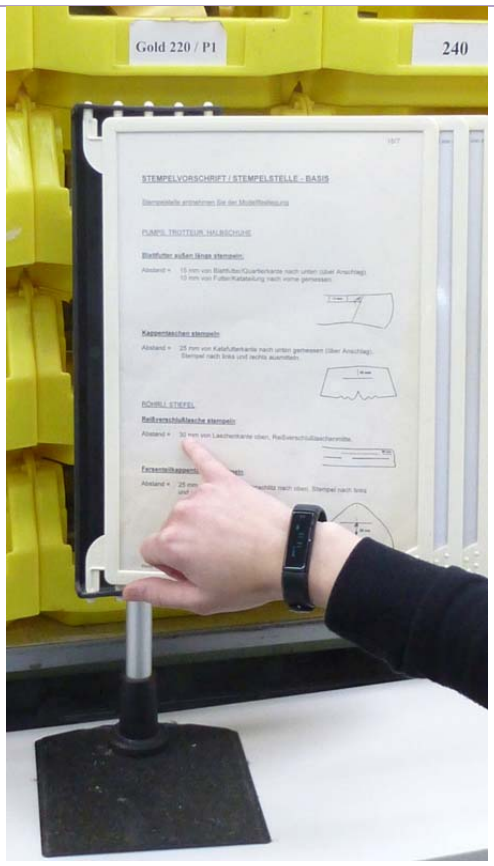


Fig. 8 Stamping instructions

Fig. 9 Setting up stamping machine

Fig. 10 Stamping result

Fig. 11 Cutting of sock liners

2.1.2. Gabor Stitching

Description	**Learning Station** **Date**	Stitching and apprentice workshop stitching / Prototype production January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (vocational position n°)**	A 3. Preparation of upper parts (§ 4 paragraph 2 number 3), 10 weeks A 4. Upper manufacturing (§ 4 paragraph 2 number 4), 24 weeks
Process environment	Products	Shoe uppers
	Type of product / service	Semi-finished products
	(Internal) supplier	Cutting department
	Order- / material acceptance	Stitching: Batch box with work order, cut upper parts and cardboard patterns for marking
	Direct user of product / service	Lasting department
	"End" user of product / service	Final inspection / shipment to client
	Production steps already performed	In terms of stitching department within prototype production: Cutting including all process steps previous to cutting. In terms of apprentice workshop in the stitching department: No matter whether an apprentice – depending on his/her individual apprenticeship plan – has already been through the cutting department or not: Each apprentice entering the stitching department is taught to cut the upper parts of a shoe model with a difficulty degree that is similar to the one that will be subject of the final examination. This way the apprentices are autonomous when they need new material to practise because they can perform all cutting process steps independently.

	Interfaces with other process steps	-
	Specifics of work process related to the duration of execution, work process organisation, quality assurance etc.	Stitching department: At the Rosenheim site, Gabor produces exclusively prototypes. In consequence, there is no piecework wage. The reason is that the workers do not only need to concentrate on the correct execution of all work steps for the new patterns but also they need to make sure that all information contained in the work order is coherent and complete. This cannot be done under time pressure. Sometimes the workers need to take own decisions. Apprentice workshop stitching: in fact this is a separate production line mirroring all machines of the stitching department but entirely dedicated to training). Also, the apprentice workshop has a dedicated trainer (50% part time employee who instructs the apprentices and monitors their work, gives advice for reading the work sheet in terms of assembly of the upper parts, machine settings, handling of the parts etc.). When the workload in prototype production is high, she switches to the stitching line.
Process steps Detailed description	The process steps in the stitching room are model-dependent. The stitching room receives the batch boxes with the cut upper parts from the cutting room. Here is an example of work instructions for a footwear model as it could potentially be chosen for the final examination: • Splitting straps • Cutting elastics and pressing straps • Marking • Skiving of upper leather and lining parts • Placing tape • Ironing-in of interlining • Ironing-in of “banana“ and “Pyroflex“ (material terms)	

	• Stitching and rubbing down of lateral closing seam • Ironing-in of lateral “Pyroflex“ material • Stitching, rubbing down and pressing of back seam • Marking the straps on their back • Fancy stitching 30/3 on upper • Preparing elastics for straps, manual edge folding • Preparing and pressing upper • Stay seam 30/3 • Joining vamp lining parts with a looping (zig-zag) seam • Vamp: glue lining strip 14 KK • Stitch and press counter lining • Joining vamp lining and counter lining with adhesive; then stitch with 60/3 thread • Ironing of non-woven and toe puff • Applying spray adhesive to lining and glue • Gluing strap lining onto strap • Top stitching upper and strap 30/3 • Gluing strap to upper, bar 60/3 to recess • Barring strap curve 60/3 from star to star right next to 303 top stitching • Stitching of the lasting allowance The introductory exercise for newcoming apprentices to the stitching room is treadle training to get a feeling for pace and needle movement. The next step are exercises on paper (still without thread) where they are supposed to place needle holes on straight and curved lines and finally produce all types of geometries. Then they practise threading of upper and looper thread, and finally they can practise to stitch traced patterns or even writing on (scrap) leather parts. When they start feeling comfortable with all these preparatory exercises, they start real stitching on shoe parts such as stitching the counter lining etc. (but still always in the apprentice workshop). From time to time the apprentices in the workshop get to stitch uppers of articles which have already been passed on to serial production. This enables them to train the interpretation of approved production instructions. Workstations on the stitching line (prototype production): • Initial control of all batches coming from the cutting room • Marking (colour code on the work order: green = silver marker pen or cray, which can be removed after the parts have been joined /stitched together, or red = permanent marking on the back of a part after the interlining has been ironed-on)

	• Skiving (progressive thinning-out of the material thickness at the edges). There are different skiving cuts: for folding, bound edges, underlay, open edges … • Edge inking (the edges of non-dyed-through leathers are dyed manually with a small wooden stick with a colour tint matching the colour of the outer leather surface). Many colour tints are available in stock, some need to be mixed. Sometimes apprentices are placed at the edge inking workstation because they need to read the production instructions and identify open edges. • Ironing-in of interlining (featuring sintered hotmelt adhesives which appear as small dots that feel dry at room temperature) and reinforcement materials at the ironing machine (settings: pressure ~1 bar, ϑ ~ 100-120 °C for ordinary leather, less for sensitive leathers). • Prepare upper parts and pre-fix them with adhesive before they get definitively joined by stitching • Stitch lateral and back closing seam (robust Union machine) • Flatbed stitching machine for counter linings • Zig-zag stitching machine for vamp lining (butt-joint seam) • Different stitching machines (grouped) with one operator, e.g. for stay seams (thread 60/3) and decorative stitching from 30/3 to 10/3 and 5/30 depending on work instructions • Gluing-on interlining and applying tape • Decorative stitching • Top stitching (post-bed top stitching machine with nibbler knife that trims off excess material) • Insert zippers (post-bed stitching machine) • Folding machine (for visible edges) with hotmelt adhesive and folding tape • Riveting machine (for buttons, snaps or decorative rivets), holes are pre-punched with a punching tool. Even perforations or hole patterns are done with punching tools. At the prototyping stage it is too costly to order matrices. • Final inspection, cleaning (remove marking pen traces, visible thread ends etc.)	
Workplace	Shop floor	Prototype production / Stitching room
	Lighting conditions / environment	Daylight and very good lighting (ceiling and at machine)
	Posture	Ergonomic chairs at each work station which can be individually adapted

	Specifics	At each machine, the apprentice is reminded of the specific functioning and the respective safety instructions. The trainer holds a seminar on stitching machines. This seminar is part of a series of in-house trainings, each of which featuring a different focus: work preparation, production organisation, machines in different production rooms, materials etc ...
Organisation	Group work?	No
	Employees at workplace per shift	Single- or multiple-machine workstations for each operator
	Employees in department	20
	Hierarchy	Forewoman, workers, apprentices
	Work places in department	Stitching room: 2 x marking, 3 x skiving, 1 x edge inking, 4 x preparation of upper parts, 1 x flat-bed stitching machine, 1 x machine for closing seams, 1 x zig-zag machine, 4 machines for stay seams and decorative stitching, top stitching machine, folding machine.
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other vocational positions?	B6 handling of tools, machineries, and devices (8)
	… to other learning places?	VET school for theoretical training / experience in serial production in the Slovak Gabor factory (Banovce) Lasting/Cutting
	Separate trainee workshops / theoretical knowledge?	LF 5 Producing upper shafts LF 10 Performing different production versions
	Other	

Vocational training	Vocational year / duration	1 x 3 months within the first half of the apprenticeship, and again 3 months in the second half of the apprenticeship to get prepared the final exam.
	Preconditions / previous stations	Theoretical knowledge on leather and materials as well as shoe parts and components as well as basic knowledge about safety at work (pictograms) is imparted at VET school and deepened specifically at each workstation in the apprentice stitching workshop.
	What should they learn?	All operations in the stitching room with focus on a shoe model of a type similar to the one that will be subject of the final exam (practical part).
	Specifics of training (individualisation, duration, timing)	The apprentice stitching workshop does not represent a typical production environment. Gabor apprentices spend 4 weeks in the Banovce factory to familiarise with the conditions of serial production.
	Experience with trainees & young skilled workers	Very positive. Besides the regular apprentices, the stitching workshop also receives interns (normally, an internship at Gabor has a duration of one to 5 days) who will follow through the making of a pair of shoes (in order to attract them to start an apprenticeship at Gabor). But also new operators are being trained for specific tasks.
	Assistance / Working tasks	All tasks in the department
	Number of trainers	1
	Maximum number of apprentices	1-2
	Other	One trainer for one or two apprentices = ideal training conditions
	Is the existing learning potential used?	Absolutely

	Possibilities for improvement		More variety of footwear models, at least when the apprentice masters all operations to produce the upper of the model similar to the one that will be subject of the final exam.	
Highest level of autonomy that can be attained	Support	With instruction	Under surveillance	Independently X

Fig. 12 Stitching room: Control of incoming batches

Fig. 13 Skiving

Fig. 14 Edge inking

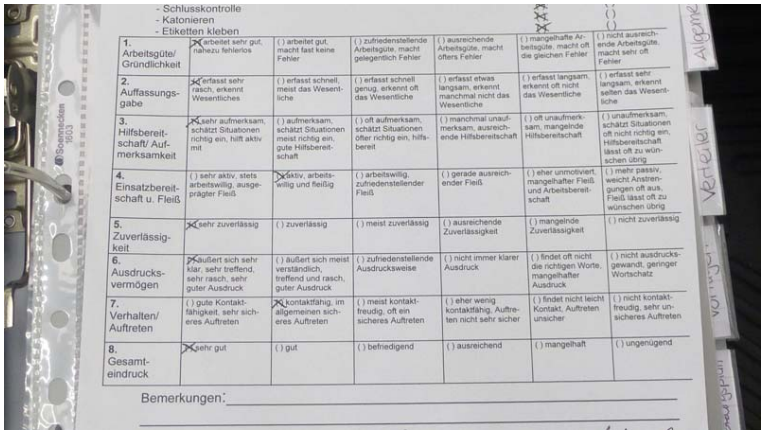
Fig. 15 Ironing in of reinforcements

Fig. 16 Stitching on a flat bed machine

Fig. 17 Stitching on a post bed machine

Fig. 18 Folding edges

Fig. 19 Reporting book (cover)



- Schlusskontrolle
- Katonieren
- Etiketten kleben

1. Arbeitsgüte/ Gründlichkeit	X arbeitet sehr gut, nahezu fehlerlos	( ) arbeitet gut, macht fast keine Fehler	( ) zufriedenstellende Arbeitsgüte, macht gelegentlich Fehler	( ) ausreichende Arbeitsgüte, macht öfters Fehler	( ) mangelhafte Arbeitsgüte, macht oft die gleichen Fehler	( ) nicht ausreichende Arbeitsgüte, macht sehr oft Fehler
2. Auffassungsgabe	X erfasst sehr rasch, erkennt Wesentliches	( ) erfasst schnell, meist das Wesentliche	( ) erfasst schnell genug, erkennt oft das Wesentliche	( ) erfasst etwas langsam, erkennt manchmal nicht das Wesentliche	( ) erfasst langsam, erkennt oft nicht das Wesentliche	( ) erfasst sehr langsam, erkennt selten das Wesentliche
3. Hilfsbereitschaft/ Aufmerksamkeit	X sehr aufmerksam, schätzt Situationen richtig ein, hilft aktiv mit	( ) aufmerksam, schätzt Situationen meist richtig ein, gute Hilfsbereitschaft	( ) oft aufmerksam, schätzt Situationen öfter richtig ein, hilfsbereit	( ) manchmal unaufmerksam, ausreichende Hilfsbereitschaft	( ) oft unaufmerksam, mangelnde Hilfsbereitschaft	( ) unaufmerksam, schätzt Situationen oft nicht richtig ein, Hilfsbereitschaft lässt oft zu wünschen übrig
4. Einsatzbereitschaft u. Fleiß	( ) sehr aktiv, stets arbeitswillig, ausgeprägter Fleiß	X aktiv, arbeitswillig und fleißig	( ) arbeitswillig, zufriedenstellender Fleiß	( ) gerade ausreichender Fleiß	( ) eher unmotiviert, mangelhafter Fleiß und Arbeitsbereitschaft	( ) mehr passiv, weicht Anstrengungen oft aus, Fleiß lässt oft zu wünschen übrig
5. Zuverlässigkeit	X sehr zuverlässig	( ) zuverlässig	( ) meist zuverlässig	( ) ausreichende Zuverlässigkeit	( ) mangelnde Zuverlässigkeit	( ) nicht zuverlässig
6. Ausdrucksvermögen	X äußert sich sehr klar, sehr treffend, sehr rasch, sehr guter Ausdruck	( ) äußert sich meist verständlich, treffend und rasch, guter Ausdruck	( ) zufriedenstellende Ausdrucksweise	( ) nicht immer klarer Ausdruck	( ) findet oft nicht die richtigen Worte, mangelhafter Ausdruck	( ) nicht ausdrucksgewandt, geringer Wortschatz
7. Verhalten/ Auftreten	( ) gute Kontaktfähigkeit, sehr sicheres Auftreten	X kontaktfähig, im allgemeinen sicheres Auftreten	( ) meist kontaktfreudig, oft ein sicheres Auftreten	( ) eher wenig kontaktfähig, Auftreten nicht sehr sicher	( ) findet nicht leicht Kontakt, Auftreten unsicher	( ) nicht kontaktfreudig, sehr unsicheres Auftreten
8. Gesamteindruck	X sehr gut	( ) gut	( ) befriedigend	( ) ausreichend	( ) mangelhaft	( ) ungenügend

Bemerkungen: _____

Fig. 20 Reporting book (evaluation of apprentice)

2.1.3. Gabor Lasting

Description	Learning Station Date	Lasting room / Prototype production January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (vocational position n°)**	A 6. Assembly preparation and assembly of shoe uppers and bottom parts (§ 4, paragraph 2, number 6), 20 weeks
Process environment	Products	Heel counters are inserted into finished uppers, then the uppers are lasted and the insole is stapled to the last bottom
	Type of product / service	Semi-finished products
	(Internal) supplier	Stitching room; lasts, heel counters and insoles are being supplied by external suppliers (and are being stored in the internal warehouse)
	Order- / material acceptance	Batch box with work order and finished uppers
	Direct user of product / service	Production trolleys with lasted shoes and production instructions (yellow paper) are being transferred to the bottom assembly room
	“End” user of product / service	Final inspection and shipping to client
	Production steps already performed	Stitching room including all previous production steps
	Interfaces with other process steps	Some customers send inspectors to perform quality checks of the finished uppers before lasting. There eventually is an interface with the assembly room (e.g. when insoles with bound edges are used or when the heels are covered with leather).

	Specific characteristics	The Gabor Rosenheim site manufactures only prototypes. There is no piecework wage. In the lasting room, the frequently changing footwear styles require a frequent re-setting of the lasting machines. In serial production, the lasting capacity is the bottleneck because it determines the number of pairs that a factory can produce per day.
Process steps Detailed description	The lasting room receives the batch boxes from the stitching room: • Uppers (pairs or single shoes) • If the model includes ornaments / decorative elements / jewellery, this just stays in the batch box • Work order: defines last, heel counter, insole type and sole (soles stay in the batch box as well for the subsequent department) • Commonly, Gabor uses heel counters made from leather fibre board. The exact type which is chosen depends on the heel height (Gabor produces shoes with heel heights between 10 and 60 mm) • As a preparative step, the heel counters were dipped into hotmelt adhesive (this is not done in the lasting room but beforehand) • In the lasting room, the heel counter is inserted into the heel counter pocket (important: no creases) and held in place with a small staple • The next work step is the back part moulding machine. To start with, pressure and temperature need to be set. Then the machine needs to be equipped with tools that correspond to the last shape: Padded heatable moulds (positive and negative last shape) which exactly match the shape of the rear part of the last, and wipers (their shape corresponds to the shape of the last bottom) which will press the lasting edge onto the insole. Upper (with the heel counter in place) are inserted into the machine. The machine is triggered by a dual safety switch (the operator has to use both hands to trigger the machine). The heel counter is pressed into shape by means of pressure and heat. The temperature re-activates the hotmelt adhesive, that will bond together heel counter, lining and upper material. The wipers will press the lasting allowance to the last bottom. When the shoe is released, the operator checks for creases.	

	• Gabor also processes thermoplastic heel counters, which – in contrast to leather fibre heel counters – require a second pressing cycle on chilled moulds to retain the desired shape. • The next process step is to choose the correct last (reference number given on work order). The most important differences in last shapes concern toe shape and heel height. • Gabor processes insoles with and without foam padding depending on the model. The insole is the central element of the cemented make because it allows joining upper and sole. • The insole is stapled to the last bottom with two tacks. • In the next step, a vamp activating /pressing device is used to avoid creases • Depending on the model, sometimes insoles with bound edges are used. “Bound” means that a small leather strip is glued around the outer edge. The leather strip will be visible in the finished shoe even after insertion of the sock liner. This gives the shoe interior a more elaborated aspect. • The next process step is toe lasting, i.e. pulling over and lasting of the upper on the toe lasting machine. To start with, the machine needs to be equipped with the appropriate tools = toe bands and bottom wipers; pulling force and distance of the pincers need to be defined according to the last shape and the material used (the elongation of the upper material is indispensable but can be critical and cause tear). The pincers will clamp the upper first at the tip and then on the sides. The material is pulled downwards. From beneath, nozzles will apply hotmelt adhesive onto the insole. From above, the stamp presses onto the vamp area and the toe bands move towards the last – while simultaneously the pincers continue to pull the upper material down and two wipers press the upper material against the last bottom with the attached insole and the hotmelt adhesive. Pressure and pressing time depend on style and material. The machine cycle is triggered by means of a dual safety switch. Result: Upper and insole are joined and the lasting edge is smooth and even. One of the challenges in lasting is symmetry: The last cone carries a scale enabling the lasting machine operator to last both vamps symmetrically. The machine operator also needs to make sure that a left shoe, for example, is lasted on a left last. A functional zipper always needs to be placed on the medial side. On the contrary, decorative zippers can be placed laterally so the lasting operator needs to make sure that he/she will not place them – by habit – on the medial side.

	• The next steps are side lasting and finally heel seat lasting. • Side lasting is done manually at Gabor Rosenheim. The lasting operator uses a pair of pincers to pull the upper material over the insole and attaches it on the insole with 8 tacks that are hammered in laterally and medially at an even distance. The wearer will not feel the tacks because their tips will fold when hitting the metal plate on the last bottom. The upper material on the sides is pounded to the last by means of a pressurised air hammer. In serial production, Gabor does not use glue for side lasting. The upper material is held in place by the pincers and is then attached to the insole with small nails (tacks), which is faster but a little more strenuous for the operator. After side lasting, the two tacks are removed which were used to staple the insole to – later in the process it would be too difficult to remove them. • Heel seat lasting: to start with, the machine settings must be adapted according to the requirements of the respective footwear style (the settings are different for pumps, loafers, booties and boots and differ as well depending on the heel height). The correct programme and the correct top piece need to be chosen (the top parts of pump and boot lasts are different), toe rest and the last holder height on the machine need to be set. The machine features a dual safety switch. The lasting allowance in the heel seat area is attached to the insole with ~ 20 tacks. Symmetry is important here – left and right shoe of a pair must have the same backpart height (a scale on the last heel indicates the backpart height, and the desired backpart height is given in the work order). There are programmable lasting machines on the market able to perform side and heel seat lasting in one process step. • Pounding machine: This machine removes creases and straightens out the feather edge. It features a wheel with small metal beads which – when the wheel is turning – are centrifugally accelerated outwards and pound on the upper material, shaping it to the last. During this process, the shoe is manually held in place between support and wheel. • Heel pressing is the next step: To offer an ideal backpart appearance, the heel is pressed (by means of a pad which is pressed onto the backpart of the shoe with a pressure of 5 bar). After this operation, a visual final inspection ensures that the shoes are free of creases and symmetrical. • Heatsetter: This is kind of oven (90-105°), usually with relatively high humidity to re-active adhesives and to shape

	the upper to the last (shape stabilisation) Heat setting has a duration of 2-3 minutes according to the shoe model.	
Workplace	Shop floor	Prototype production
	Lighting conditions / environment	Normal
	Posture	Mostly standing
	Specifics	Occupational safety: dual safety switches; hearing protection at pounding
Organisation	Group work?	No
	Employees at workplace per shift	1
	Employees in department	5
	Hierarchy	1 fore(wo)man – 4 skilled workers
	Work places in department	9
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other vocational positions?	A 5 Assessment and preparation of bottom parts for production and further processing B3 Safety and health protection at work B6 handling of tools, machineries, and devices
	… to other learning places?	From time to time the designer pass to check how the shoes turn out Stitching Assembly
	Separate trainee workshops / theoretical knowledge?	LF 5 Producing uppers LF 6 Using glue LF 10 Performing different production versions
	Other	-
Vocational training	Vocational year / duration	All apprentices spend 2-3 months in the lasting room during the 1st year of apprenticeship, some come back in the 3rd year for another 3 months

	Preconditions / previous stations		-	
	What should they learn?		All work steps but only few apprentices will really be able to perform the settings on the toe lasting machine independently	
	Specifics of training (individualisation, duration, timing)		-	
	Experience with trainees & young skilled workers		Very positive	
	Assistance / Working tasks		No extra tasks for apprentices	
	Number of trainers		1	
	Maximum number of apprentices		1-2	
	Other		-	
	Is the existing learning potential used?		Yes	
	Possibilities for improvement			
Highest level of autonomy that can be attained	Support	With instruction	Under surveillance x (toe and heel lasting)	Independently X (all other work steps)

Fig. 21 Insoles

Fig. 22 Heel counter

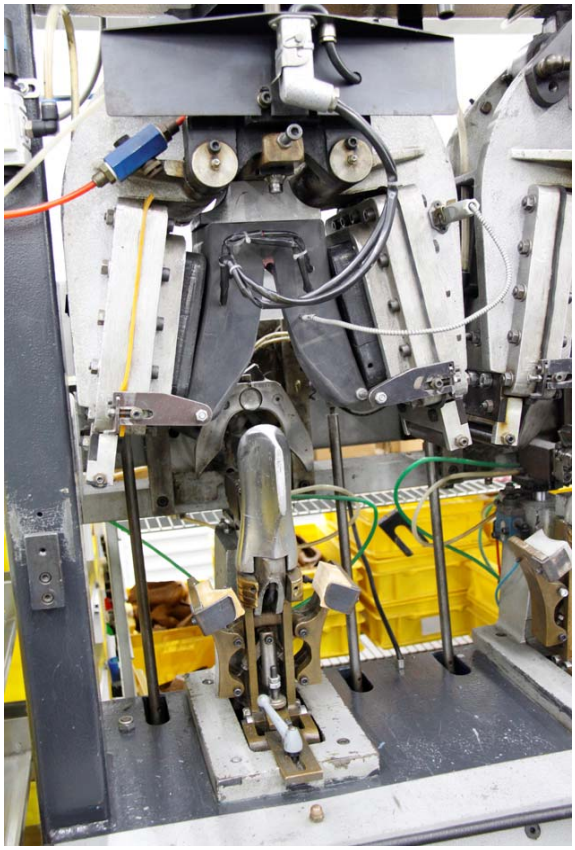


Fig. 23 Back part moulding machine

Fig. 24 Trolley with batch in lasting room

Fig. 25 Tool for toe lasting machine

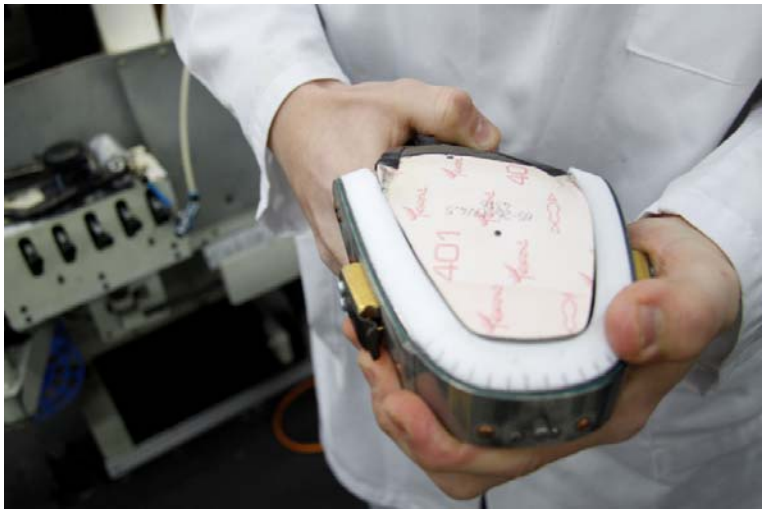


Fig. 26 The tool matches exactly the forepart of the shoe for a perfect toe lasting result

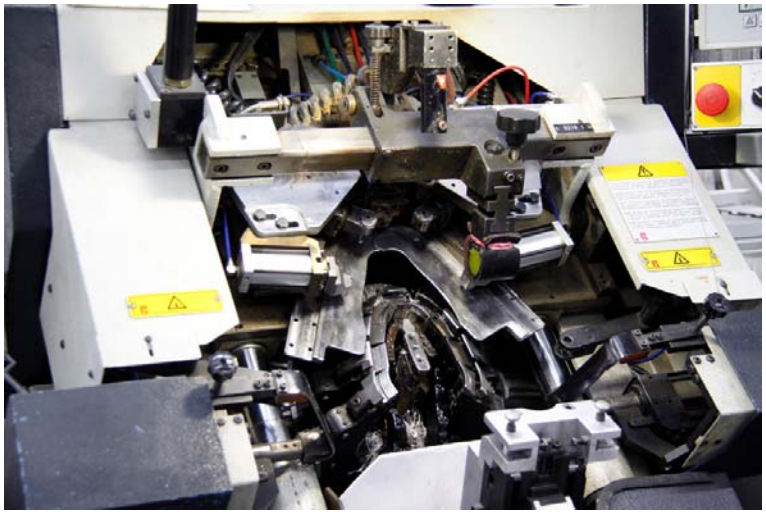


Fig. 27 Toe lasting machine

Fig. 28 This is how the last (normally with upper but for demonstration without) is inserted into the toe lasting machine

Fig. 29 Toe lasting

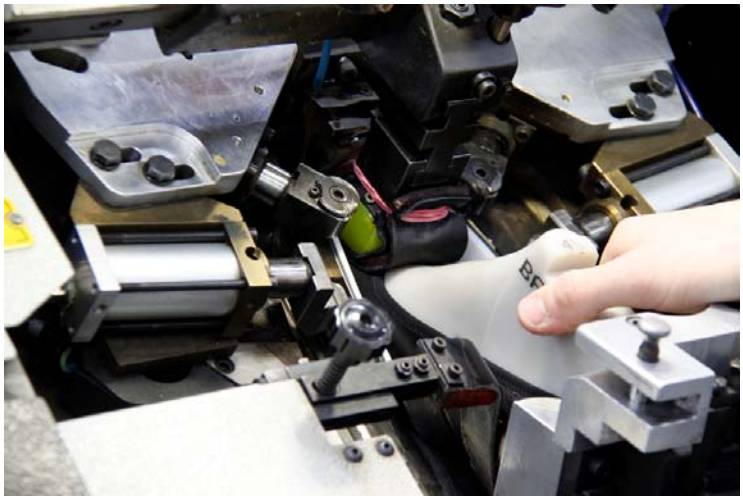


Fig. 30 Toe lasting

Fig. 31 Result of toe lasting

2.1.4. Gabor Assembly

Description	Learning Station Date	Assembly January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (vocational position n°)**	A 6. Preparation and assembly of uppers and bottom parts (§ 4 paragraph 2 number 6), 20 weeks
Process environment	Products	De-lasted shoe with assembled bottom parts
	Type of product / service	Nearly finished shoes (the next and final department will be the finishing room)
	(Internal) supplier	Lasting room (pulled-over and lasted uppers still on the last); outsoles, heel and heel top pieces supplied by internal warehouse, cut heel covers supplied by cutting room
	Order- / material acceptance	Trolleys with semi-finished shoes and their bottom components; work order
	Direct user of product / service	Finishing room
	"End" user of product / service	Final inspection and shipment to client
	Production steps already performed	Lasting including all previously performed process steps
	Interfaces with other process steps	-
	Specifics of work process related to the duration of execution, work process organisation, quality assurance etc.	Prototype production, no piecework wage
Process steps Detailed description	• The first work step in the assembly room is (manual) roughing of the lasted shoe bottom. In serial production, this task is performed by automated roughing machines but because of the frequent tool change in prototype production, manual roughing is the method of choice here. Roughing smoothens potential creases on the lasting edge and removes the grain layer of the leather (which contains a high percentage of	

	grease – which would inhibit adhesion and lower the bond quality with the sole). For the shoe used in this LSA example, a thermally activated adhesive was used, mixed with a curing agent to reinforce the bonding strength. To start with, the lasting edge is scoured with coarse sand paper and then roughened with a finer roughing disk. Roughing causes a surface increase. Therefore, the adhesive can adhere better to the material and the bonding strength is increased. The shoe in the LSA example has a ¾ sole (meaning that the heel seat area does not have to be roughened). For full-length soles the complete bottom is roughened. For shell soles, not only the bottom but also the sides need to be roughened. • Cementing means that the adhesive film (in our example a PU adhesive) is applied. Actually, this is done in two steps: primer and main application. Important: too much adhesive does not mean better bonding! Drying time: 10 minutes. • The outsoles need to be chosen from the storage according to the reference number given in the work order. • Covering plastic heels with leather or covering insole edges with leather strips are preparative operations which are part of the “bottom parts preparation room”. In order to be covered with a cut leather part, the heel is clamped into a holding device. The leather part is supplied by the cutting room. The plastic heel is dipped into adhesive. Spray adhesive is applied to the back of the leather cover. The leather cover is wrapped around and pressed against the heel. Excess material is trimmed. At the heel seat edge as well as towards the tread surface the leather is folded over the edge. • For this LSA, Gabor showed how an insole with bound edges is produced (again, this is normally done in the “bottom parts preparation room”). The storage for insoles to be covered is part of the assembly room. Neoprene adhesive is applied both to the insole and to the leather cover strip with a brush. The leather strip is folded under strain around the insole edge. Both ends are rubbed down in order to guarantee a smooth transition. • As mentioned above, the primer coat must be allowed to dry (drying time in this example: 10 min) before further processing the roughened upper: A bottom filler is inserted to compensate the height difference between last bottom and

	lasting edge. Then the main adhesive coat is applied to the roughened lasting edge (not to the bottom filler, though) and the sole. This operation is performed at a workplace with an exhaust system to protect the worker from inhaling harmful volatile substances contained in the adhesive. Depending on the type o soling material, there are different methods of pre-treatment to prepare the sole bond. In this example, a TPU sole is used, which requires washing to remove grease and other contaminations prior to adhesive application. A PU sole, for example, would require a chemical roughing process. Very important: drying times. • Pre-pressing of the shoe bottom • Sole attachment: Soles and uppers are heat-activated. Then the soles are attached to the lasted uppers on two sole presses (for left and right shoe). The softer the soling material the less pressure needs to be applied. Pneumatic sole presses are commonly used for attaching soft soling materials. For hard soles, hydraulic sole presses are preferable because they can apply a higher pressure. Important: Even pressure distribution. • The next operation is last pulling (take out the last). • The heel is screwed on and the operator checks whether the shoe stands straight (with a rubber pad compensating the still missing heel tip). • The last operation is to press the heel tip onto the heel (it will simply snap into place). The heel tip has a pin with linear grooves to avoid excess pressure when attaching the heel tip. The heel then is held in place by four tacks to prevent rotation around the screw. Important: Do not nail into the steel shank of the insole.	
Workplace	Shop floor	Prototype production
	Lighting conditions / environment	Normal
	Posture	Mostly standing
	Specifics	-
Organisation	Group work?	-
	Employees at workplace per shift	-
	Employees in department	Fore(wo)man, two workers

	Hierarchy	
	Work places in department	
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other vocational positions?	A 5. Assessment and preparation of bottom parts for production and further processing (§ 4 paragraph 2 number 5), 8 weeks B 4 Environmental protection
	… to other learning places?	Stitching Finish
	Separate trainee workshops / theoretical knowledge?	LF 6 Using glue LF 9 Using bottom materials LF 10 Performing different production versions
	Other	-
Vocational training	Vocational year / duration	Flexible, can be in year 1, 2 or 3; duration: three months
	Preconditions / previous stations	Lasting room
	What should they learn?	Assembly of shoe bottoms on lasted uppers
	Specifics of training (individualisation, duration, timing)	-
	Experience with trainees & young skilled workers	
	Assistance / working tasks	
	Number of trainers	1
	Maximum number of apprentices	1-2
	Other	-
	Is the existing learning potential used?	Yes
	Possibilities for improvement	

Highest level of autonomy that can be attained	Support	With instruction	Under surveillance	Independently X

Fig. 32 Assembly: Roughing

Fig. 33 Applying adhesive to the lasted upper

Fig. 34 Placing the filler

Fig. 35 Applying adhesive to the sole

Fig. 36 Covering heels with leather

2.1.5. Gabor Finishing

Description	Learning Station Date	Finishing room / Prototype production January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (vocational position n°)**	A 7. Finishing of footwear and preparation for shipping and sale (§ 4 paragraph 2 number7), 12 weeks
Process environment	Products	Shoes with inserted sock liners and attached accessories, cleaned, treated with finishing products (cremes, sprays, wax, brushing, polishing) and boxed.
	Type of product / service	Finished products
	(Internal) supplier	Assembly, sock liners from cutting room. The production sites in Slovakia and Portugal have dedicated sock liner departments.
	Order- / material acceptance	Trolley with assembled shoes, accessories and work order
	Direct user of product / service	Shipping department
	"End" user of product / service	Production sites in Slovakia, Portugal, design department, sales staff, customers
	Production steps already performed	Assembly including all prior process steps Sock liners from cutting room
	Interfaces with other process steps	Eventually with stitching room when sock liners need to be reworked.
	Specifics	Prototype production, no piecework wage.
Process steps Detailed description	Work batches coming in from assembly room on a trolley: • Shoes (pairs) • Eventually accessories (bows, ribbons. etc. come in a box on the trolley) **Stamping of sock liners:** Stamping machine with diverse stamps (for different product lines and designs) and stamping equipment (fixtures	

	for different sock liner shapes, always 2 for left and right). Stamping machine and stamp are selected and set up according to the specifications in the work order. Certain pump styles require inlets in the sock liner (e.g. gold foil leaves) which are fit into small grooves. Stamp and stamping machine are adjusted and pre-heated (~ 100 °C) and then the sock liners are stamped. **Ironing press:** The sock liners of Gabor pump models are fitted with foam pads under the metatarsal area; some footwear models require sock liners with full-length foam paddings. After adhesive and foam pad application, the sock liners are pressed for several seconds at ~100 °C. **Embossing machine:** The sock liners of certain models are embossed. The operator needs to set the embossing machine (pressure, temperature, pressing time), insert the sock liners into the embossing machine, start the embossing process, and finally remove the embossed sock liners from the machine. At the production sites in Slovakia and Portugal stamping, ironing and embossing of sock liners are performed in dedicated sock liner rooms. **Inserting sock liners into the shoes (with adhesive):** Perfect fit is key. For pump models, the foam pad under the metatarsal area requires insertion from heel to toe. **Heel seat ironing:** The heel seat area of pump models needs to be ironed, meaning that the heel area is pressed on hot (to give the desired shape) and cold (to fix and retain the desired shape) moulds. If the cold mould is not being used, it must be switched off to prevent ice from forming. **Boot and bootie legs** are ironed on hot moulds to remove undesired creases or to fix desired creases. **Lacing:** The work order specifies how laces or ribbons need to be inserted **Attach accessories (e.g. bows):** Bows are usually stapled to the upper and then tied according to the work order (e.g. 8 cm large) and fixed with superglue to keep them from untying. The ends are secured and excess material is trimmed off. Flowers or other decorative elements are fixed with superglue. Some decorative elements have already been attached in the stitching room. They are additionally fixed with superglue in the finishing room. Of course, superglue needs to be handled with the utmost care (in order not to leave stains) **Final control:** Check correct number of shoes (Gabor usually produces 2 pairs of manufacturing samples; one shoe stays in the Rosenheim

	design centre, the other 3 go to the sites in Slovakia and Portugal). The technical specifications on the docket need to be checked (colour, material, correct outsole, correct performance of all operations, etc.) and the shoes are cleaned. Cleaning methods and tools are chosen according to the upper material. In our LSA example, the shoe is checked for leather damage. Small damages can eventually be camouflaged, especially on sample shoes; important damage leads to rejection meaning that a new shoe must be produced). Also, the shoes are checked for straight back seams and good stand on a vertical surface. Adhesive stains are removed using a hot iron (important: not to damage the soling material). Stains on the leather are removed with an eraser. Thread ends that stick out are trimmed or burnt. Finally the shoe is creamed and polished. . The docket for the finishing room is archived. **Creaming:** The shoes are creamed by hand with shoe cream in the matching colour shade. **Suede and nubuck** shoes cannot be creamed; impregnation and colour protection agents are applied with a spray gun in a finishing boot (with exhaust). Certain effects such as shadows, colour transitions, changing colours) can also be sprayed on with a spray gun. **Polishing:** Removes excess cream and makes the shoes shine. Attention: There is the risk that the rotating cylinders of the polishing machine pull in hair, cords or scarfs. The machine has two polishing cylinders: one that is hard and coarse and one that is fine and soft. When polishing, the operator must pay attention to hold the shoe in the right angle (so the machine cannot pull in the shoe) and the right pressure against the polishing cylinder (in order not to damage the shoe). **Intended creases** can be heated with a hot air blower to drape them into shape. **Packing / boxing:** Gabor uses shoe boxes made from recycled cardboard. There are standards to be followed in terms of which and how much filling material to use, where to place stickers, labels and hang tags, which buckle protection to use, etc. Shoes from past ranges are also boxed and stored.	
Workplace	Shop floor	Prototype production
	Lighting conditions / environment	Normal
	Posture	Partly standing, partly sitting
	Specifics	-

Organisation	Group work?	-
	Employees at workplace per shift	
	Employees in department	3
	Hierarchy	-
	Work places in department	-
	Shifts	1
	Similar work stations	-
	Specifics	The spray gun can only be used in the finishing booth (health protection).
Interfaces	… to other vocational positions?	A 4 Upper manufacturing
	… to other learning places?	If necessary, shoes need to be reworked (stitching and assembly room)
	Separate trainee workshops / theoretical knowledge?	LF 1 Presenting shoes LF 7 Finishing uppers LF 11 Finishing and controlling shoes
	Other	-
Vocational training	Vocational year / duration	Can be done at any stage of the apprenticeship / 3 months
	Preconditions / previous stations	none
	What should they learn?	All finishing operations
	Specifics of training (individualisation, duration, timing)	-
	Experience with trainees & young skilled workers	Positive
	Assistance / working tasks	No extra tasks for apprentices; sometimes apprentices are called in to help when large volumes need to be packed for shipping.
	Number of trainers	1
	Maximum number of apprentices	1-2
	Other	-

	Is the existing learning potential used?		Yes	
	Possibilities for improvement		-	
Highest level of autonomy that can be attained	Support	With instruction and guidance	Under surveillance	Independently x

Fig. 37 Preparing sock liners

Fig. 38 Inserting sock liners

Fig. 39 Inserted sock liners

Fig. 40 Heel seat moulding

Fig. 41 Heel seat moulding

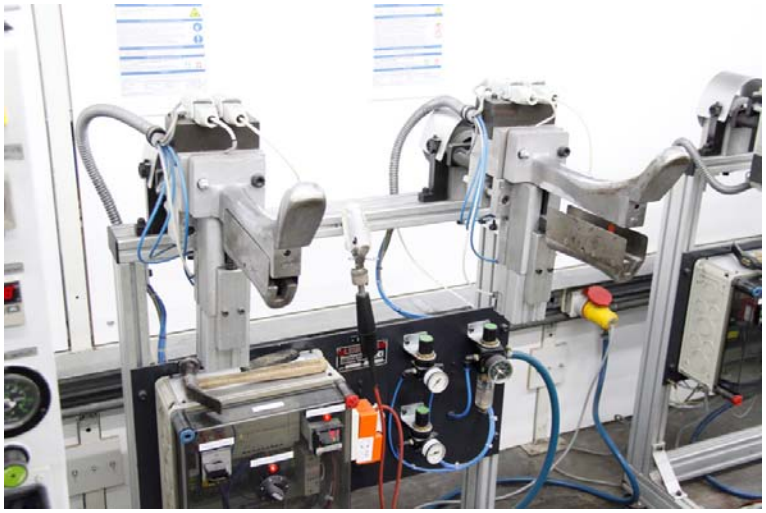


Fig. 42 Device for boot leg moulding

2.1.6. ISC Pre-stitching

Description	Learning Station Date	Pre-stitching department / ISC training factory / prototype production February 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (position n°)**	A 3. Preparation of upper parts (§ 4, paragraph 2, number 3), 10 weeks in the first half of the apprenticeship
Process environment	Products	Upper parts prepared for further processing in the stitching room (outer upper, interlining, lining)
	Type of product / service	Semi-finished products
	(Internal) supplier	Cutting room
	Order- / material acceptance	Batch boxes with cut parts (already marked) and work order for the pre-stitching operations (extent of work is model-dependent)
	Direct user of product / service	Stitching room
	“End” user of product / service	Customer
	Production steps already performed	(Design, pattern making), production planning (work flow / operations), material selection, cutting, marking, cutting quality control
	Interfaces with other process steps	Some parts are further processed in the stitching room, others in the finishing department (adhesive pictograms; parts backed with paddings, sock liners) Suppliers: Leather paint for edge inking (according to leather sample)
	Specifics	ISC production line is used for prototype production and training purposes. Operators often have to make independent decisions.

Process steps Detailed description	Batch boxes with cut materials (upper leather, lining, interlining, eyelet reinforcements, sock liners, sock liner paddings) come in. The work order contains the following information: • date • model name • pair or piece • upper material, lining, seam colour **The cut parts are checked in terms of**: Pair matching, colour differences, material defect/damage, stretch direction, size **Stamping:** The cut upper parts (regardless of the material) are stamped immediately (size, batch number, serial number within the batch, colour number, pictogram, logo). Then the batch numbers are attributed to the boxes. One box contains 10 pairs = one batch. Pictograms are either stamped on o rare applied as adhesive pictograms in the finishing department → depending on the customer's specifications. **Edge inking** for non dyed-through leathers: This is done using a paint tint especially mixed by the supplier (matching the colour of the leather surface). The paint is applied with a spray gun in a booth with exhaust. The cut parts are treated in stacks. Drying time ~ 30 min. Edges to be inked for the men's Derby in our LSA example: Derby line, cuff, quarter edge, tongue. **Skiving of upper leather parts (or other materials)**: This is done on a skiving machine (equipped with a thickness gauge to measure the leather thickness). • Part 1 (upper leather toe cap): edges are skived for folding (50% edge thickness) • Other parts, such as the vamp, are skived for lap seam (10mm bevel cut down to 50% of the leather thickness) to avoid double material layers at the seams which could cause pressure points • Another variant of skiving is the cut for open edge (3mm large, bevel cut), for example for parts which are intended to be joined by a back seam First all folding edges are skived, then all lap seam edges, then all open edges and finally the bound edges. Each time the settings of the skiving

	machine need to be adjusted. The cut upper parts carry markings to indicate the skiving cuts (marking is done in the cutting room). Other skiving cuts executed on the shoe model used in this LSA example: • Grain skiving for shell sole (smooth grain leather: take off about 1/10 of leather thickness) • Skive toe puff and heel counter (thermoplastic material) **Eyelet stay reinforcement**: Self-adhesive reinforcement material (cut on the cutting table) is applied to the back of the upper leather parts where the eyelets will be placed. The reinforcement therefore is invisible because it is placed between upper leather and interlining. **Ironing-in of interlining:** An ironing press is to apply the interlining material. At each ironing cycle, one pair is treated (left and right shoe upper). The interlining material is placed on the back of the upper leather parts, with the sintered adhesive facing downwards. The ironing press features two trays (like drawers). While one pair of uppers is being pressed, the next pair can already be prepared. After ironing, the upper parts are put back in pairs into the batch box. Machine settings 135°C, ~10-15 seconds pressing time (depending on material). Cooling time can be neglected. **Backing sock liners with padding**: Cut paddings and sock liners in a separate box. In order to back the sock liners with padding, either self-adhesive paddings are used or the sock liners are treated with spray latex and the paddings are applied by hand. Drying time ~10 seconds After backing, the sock liners are directly transferred to the finishing department. **Fold leather toe cap with tape:** Align folding tape at the skived toe cap edge with the interlining material. Apply adhesive to the folding edge (folding adhesive is a special adhesive with relatively long open time). Fold the toe cap edge over the tape (at ISC this is done manually; could be done on a folding machine as well).	
Workplace	Shop floor	Training factory

	Lighting conditions / environment	Daylight and artificial light
	Posture	Mostly sitting
	Specifics	Exhaust for spray booth (edge inking), gloves for edge inking, exhaust and apron for sock liner backing (latex spray gun)
Organisation	Group work?	No
	Employees at workplace per shift	1
	Employees in department	2-3
	Hierarchy	Fore(wo)man, staff, apprentice
	Work places in department	1 stamping machine 1 edge inking 2 skiving machines 2 ironing machines 2 eyelet reinforcing 1 latex spray gun 1 folding
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other activity fields?	
	… to other learning places?	
	Separate trainee workshops / theoretical knowledge?	
	Other	
Vocational training	Vocational year / duration	
	Preconditions / previous stations	
	What should they learn?	All pre-stitching operations
	Specifics of training (individualisation, duration, timing)	-
	Experience with trainees & young skilled workers	Very positive
	Assistance / working tasks	All operations in the department

	Number of trainers		1	
	Maximum number of apprentices		2	
	Other			
	Yes		ja	
	Possibilities for improvement			
Highest level of autonomy that can be attained	Support	With instruction and guidance	Under surveillance	Independently x

Fig. 43 Skiving

Fig. 44 Checking thickness of skived edge

Fig. 45 Skived parts

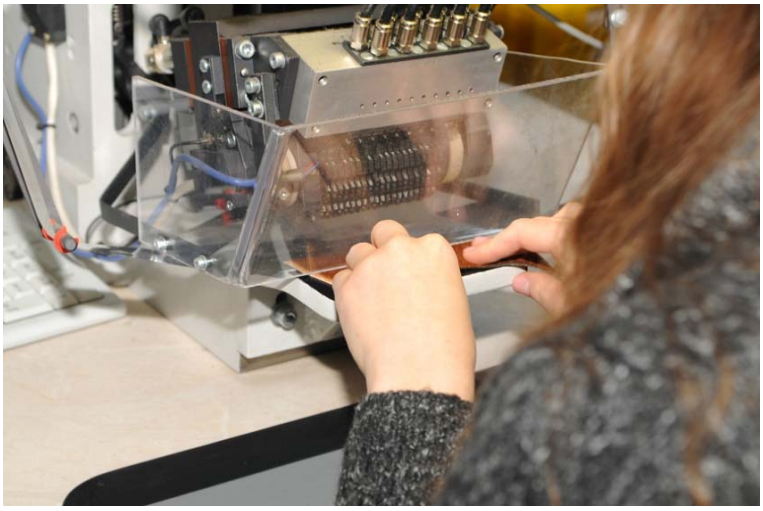


Fig. 46 Stamping

Fig. 47 Stamped parts

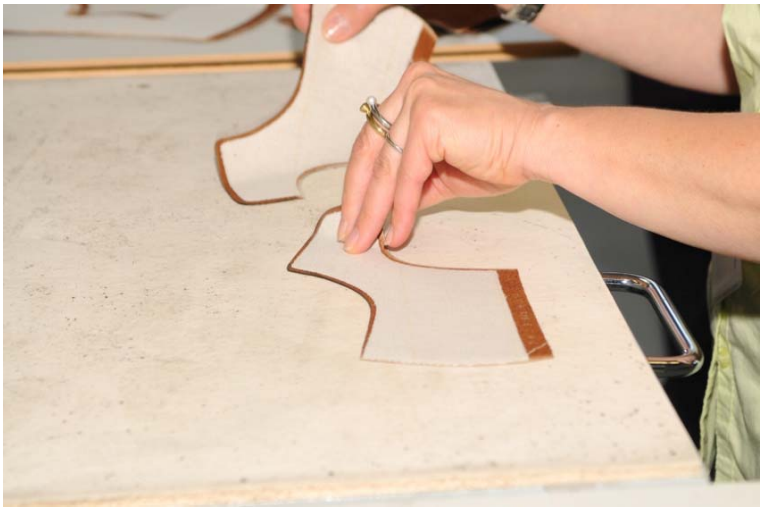


Fig. 48 Ironing-in of interlining

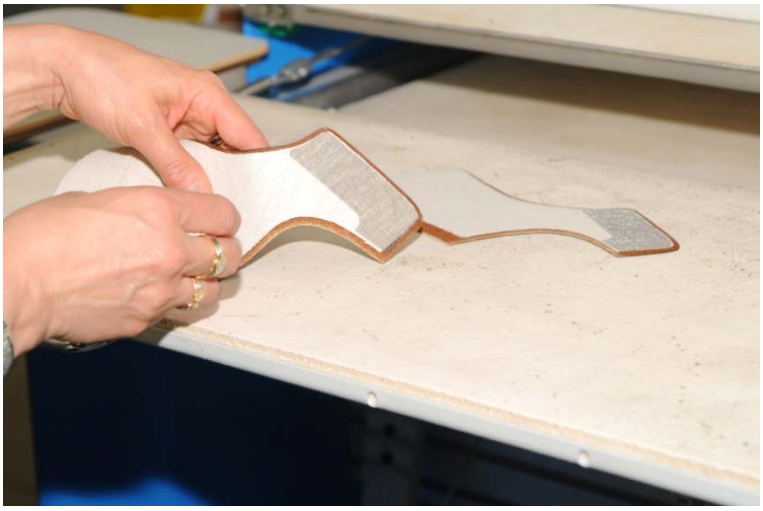


Fig. 49 Self-adhesive eyelet reinforcements

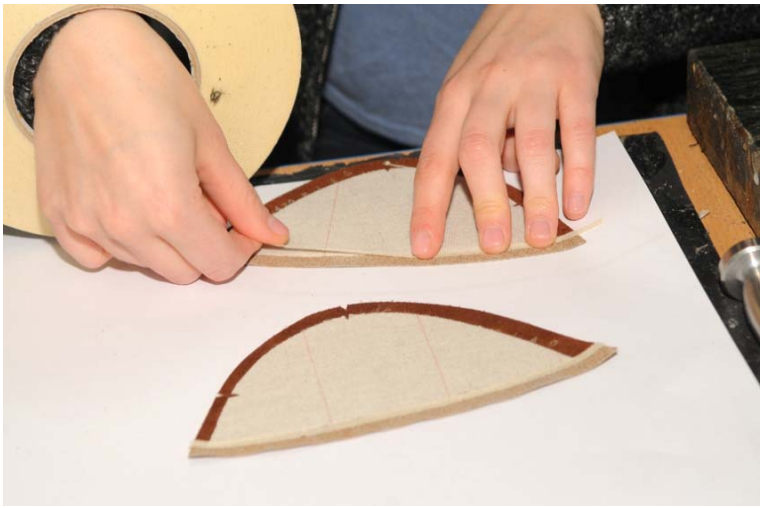


Fig. 50 Applying folding tape prior to toe cap folding

Fig. 51 Manual toe cap folding

2.1.7. ISC Stitching

Description	Learning Station Date	Stitching / Prototype production / training factory February 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (position n°)**	A 4. Upper manufacturing (§ 4 paragraph 2 number 4), 24 weeks in the first apprenticeship half
Process environment	Products	Finished uppers
	Type of product / service	Semi-finished products
	(Internal) supplier	Pre-stitching
	Order- / material acceptance	Pre-stitching: Batch boxes with work order and prepared upper parts
	Direct user of product / service	Pre-lasting
	"End" user of product / service	
	Production steps already performed	All process steps in cutting and pre-stitching
	Interfaces with other process steps	-
	Specifics	ISC production line is used for prototype production and training purposes. Operators often have to make independent decisions.
Process steps Detailed description	The process steps depend on the model. For the LSA the example of a men's derby shoe was chosen. Work batches and work order come in boxes from the pre-stitching department. Apprentices in the stitching room start with treadle (pedal of the sewing machine) exercises to get a feeling for speed and needle movement. Then they do sewing exercises on paper (just with the needle, still without thread) with increasing difficulty: straight lines, curves, circles. Then they practise threading of upper and looper thread, and finally they draw patterns or write on scrap leather pieces with a marker pen in order to stitch these lines with needle and thread.	

Process steps in the stitching room:

Stitch toe cap to vamp / stitch tongue on vamp (40/3):

This operation is performed for all pairs in the batch. Joining the pieces is done freehand (without clamping or holding device) on a flat-bed machine with a lap seam. The thread used is a 40/3 ply needle and bobbin thread in the matching colour.

Stitch quarters to vamp (40/3):

The quarter is stitched onto the vamp. Machine, thread and stitching as in previous step.

Stitch quarters together with closing seam (40/3):

Both quarters are stitched together on a flat-bed machine (same thread) with a so-called closing seam. This seam forms the central vertical heel seam.

Rub down closing seam and apply tape:

Rubbing down the back seam is done on a machine which is equipped with rollers (to rub down the seam) and a sensor (which automatically recognises the back seam length and controls application of the backing tape). The tape is a self-adhesive Nylon tape.

Joint lining parts (60/3):

This is done again on a flat-bed machine using a lighter thread (60/3). The thread colour is given in the work order. To start with, the quarters are joined to the heel lining (open-edge plain seam). The stitcher follows the marks for the reduction defining the lap seam width. Then the quarters are stitched to the vamp.

Top stitch outer upper and lining (40/3) and trim excess lining material:

- Close top stitch seam (upper top edge) on a post bed machine. Excess lining material is automatically trimmed by knife.

Apply toe puff:

A thermoplastic toe puff is applied to the interlining on a toe puff ironing press (130 °C; 7-8 s; 5,5 bar). A convexly curved heatable mould irons and pre-shapes the material.

	<u>Apply latex adhesive to outer upper and lining upper (toe to waist):</u> Latex adhesive is applied to the back side of the outer upper (toe to waist) in a spray booth with exhaust. The lining upper is manually pressed against the outer upper. The vamp area is moulded into shape on the upper performing machine. The spray gun head allows to control the quantity of adhesive applied. It is recommended to make a trial prior to treating the upper. <u>Eyelet setting (180/60/R):</u> During the cutting process, the automated cutting table marks the eyelet positions. Eyelets are set using an eyelet setting machine. In our LSA example, roll eyelets (R) in size 60 are used. The machine punches the eyelet holes and sets the eyelets in one single operation. <u>Stitching Derby bar (40/3):</u> The Derby bars are stitched onto the quarters. Important: The roller presser foot of the stitching machine needs to stay in its down position on the material. <u>Lacing the upper for lasting:</u> Before the lasting process, at ISC the upper is manually laced with a string (in serial production, the operation is performed by machines). <u>Final control / stitching room:</u> Before the finished uppers leave the stitching room, they are checked according to the following criteria: • Leather defects • Straight seams? Correct distances? • Correct leather colour? • Eyelets correctly set? • Correct lap seams? • Derby bars symmetric? • Correct closing seam (Fehlstiche)? • Lateral / medial correct? • Lining correct and without creases? If a defect is detected, the batch is separated until it has been decided on the further proceedings (usually the defective part is either repared or replaced).

Workplace	Shop floor	Training factory
	Lighting conditions / environment	Daylight and artificial light
	Posture	Mainly sitting
	Specifics	Safety precautions at ironing press: Dual safety switch
Organisation	Group work?	No
	Employees at workplace per shift	1
	Employees in department	2-3
	Hierarchy	Fore(wo)man, staff, apprentice
	Work places in department	15 post-bed machines 4 post-bed machines with edge trimmer; 12 flat-bed machines
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other activity fields?	
	… to other learning places?	
	Separate trainee workshops / theoretical knowledge?	
	Other	
Vocational training	Vocational year / duration	
	Preconditions / previous stations	
	What should they learn?	All operations in the stitching room
	Specifics of training (individualisation, duration, timing)	Workshop, not an ordinary production environment
	Experience with trainees & young skilled workers	
	Assistance / working tasks	All tasks in the department
	Number of trainers	1
	Maximum number of apprentices	2
	Other	

	Is the existing learning potential used?			
	Possibilities for improvement			
Highest level of autonomy that can be attained	Support	With instruction and guidance	Under surveillance	Independently x

Fig. 52 Sewing toe cap onto vamp

Fig. 53 Stitching lining upper parts together

Fig. 54 Outer upper and lining upper

Fig. 55 Top stitch outer upper and lining

Fig. 56 Rubbing down back seam and applying tape

Fig. 57 Rubbed-down back seam (inside)

Fig. 58 Rubbed down back seam (outside)

Fig. 59 Ironing-in of toe puff

2.1.8. ISC Finishing

Description	Learning Station Date	Finishing room / training factory / prototype production February 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (position n°)**	A 7. Finishing and preparing shoes for sale (§4 paragraph 2 number 7), 12 weeks, second half of apprenticeship
Process environment	Products	Finished shoes
	Type of product / service	Finished products
	(Internal) supplier	Assembly room
	Order- / material acceptance	Batches coming in on trolleys from assembly room
	Direct user of product / service	Warehouse, customer
	"End" user of product / service	Customers (B2B)
	Production steps already performed	All process steps in cutting, pre-stitching, stitching, pre-lasting and lasting
	Interfaces with other process steps	-
	Specifics	Prototype production and training factory, staff needs to be able to make own decisions
Process steps Detailed description	<u>Clean upper (for suede or nubuck with a sponge), remove adhesive residues</u> Depending on the material, brushes (manual or machine), cloth, rubber etc are used to remove dust or adhesive residues. Leather soles are polished. <u>Apply finishing agents / polishing</u> Depending on the upper material, shoe cremes (mainly for grain leather), waxes, greases, polishes or spray finish agents (wax spray crèmes, impregnations, paints) are applied. Spraying is always done with a spray gun in finishing booths. Spray finishing agents can be water-based or solvent-based. The spray gun head allows to control the quantity of finishing agent applied. The spray gun can be cleaned with water or acetone.	

	<u>Insert sock liner</u> Sock liners are inserted by hand. <u>Attach pictograms</u> If pictograms have not been stamped on sock liners or quarter linings in pre-stitching, adhesive pictograms are attached in the finishing department. <u>Lacing</u> Laces are inserted manually. <u>Final control</u> The finished shoes are checked in relation to: • Polishing • Stains • Irregular shades • Correct lacing <u>Boxing</u> Put up boxes, attach labels (article and colour number, size, logo, line drawing of the shoe), silk paper, filler (paper, card board, foam …). When the whole batch is boxed, it is stored in the warehouse.	
Workplace	Shop floor	Training factory
	Lighting conditions / environment	Daylight and artificial light
	Posture	Mostly standing
	Specifics	Safety precautions at the spray booth: exhaust Other: Gloves, apron
Organisation	Group work?	No
	Employees at workplace per shift	1
	Employees in department	2-3
	Hierarchy	Fore(wo)man, staff, apprentice
	Work places in department	1 finishing desk 2 finishing spray booths 1 polishing machine (rotating brush)
	Shifts	1

	Similar work stations		-	
	Specifics		-	
Interfaces	… to other activity fields?			
	… to other learning places?			
	Separate trainee workshops / theoretical knowledge?			
	Other			
Vocational training	Vocational year / duration			
	Preconditions / previous stations			
	What should they learn?		All operations in the finishing department	
	Specifics of training (individualisation, duration, timing)		Finishing workshop is a training entity (not a typical production environment)	
	Experience with trainees & young skilled workers			
	Assistance / working tasks		All working tasks of the department	
	Number of trainers		1	
	Maximum number of apprentices		2	
	Other			
	Is the existing learning potential used?			
	Possibilities for improvement			
Highest level of autonomy that can be attained	Support	With instruction and guidance	Under surveillance	Independently x

Fig. 60 Polishing brush (1)

Fig. 61 Polishing brush (2)

2.2. Peripheral spheres

2.2.1. Gabor Work scheduling and production planning and control

Description	Learning Station Date	Work scheduling and production planning and control (AVO / PPS, work planning and production planning) January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (vocational position n°)**	B 5. Planning and preparation of work processes (§ 4 paragraph 3 number 5), 4 weeks; section B of the in-company training curriculum B 7. Operational and technical communication (§ 4 paragraph 3 number 7), 4 weeks; section B of the in-company training curriculum A 1 Assessment and use of materials and auxiliary materials for upper manufacturing (§ 4, paragraph 2 number 1), 14 weeks; section A of the in-company training curriculum
Process environment	Products	Documents; working documents for materials and time management
	Type of product / service	**Material calculation** in order to quantify material consumption as well as material cost for each article **Calculation of labour cost** in order to calculate the time needed for each operation as well as the cost of wages for each article **Work and time schedules** to be able to plan staff demand and production volumes as well as for production scheduling and monitoring at each production site and for deadline monitoring at contract manufacturers or external suppliers. Work and time schedules also serve as a base for capacity optimisation of the different sites.

	(Internal) supplier	Design, CAD, Product managers (PMs), upper production planning department, materials purchasing department
	Order- / material acceptance	PMs, upper range planning
	Direct user of product / service	Materials purchasing department, PMs, production managers, production planning departments at each production site (Rosenheim / DE, Banovce / SVK, Silveiros / PT)
	Production steps already performed	Design sketch has already been processed by CAD department, upper production planning has created the manufacturing specifications
	Interfaces with other process steps	Potentially F&E
	Specifics	Office desk jobs (no production department), mainly IT-based due to the necessity to work with data bases bringing together work documents from different departments such as CAD files, bills of materials or production planning schedules. A significant feature for the work in AVO/PPS is the alphanumerical coding of articles and operations, materials, auxiliary materials etc, which newcomers to the department need time to get used to.
Process steps Detailed description	The AVO / PPS department is the interface between sales and production. Here decisions are taken where / at which site which groups of articles, models and variants will be manufactured. On top of this, the department monitors closely the adherence to schedules of all production sites with the main goal not to let production backlogs accumulate. AVO/PPS schedules the date up to which the sites will be busy producing the existing orders and is responsible for a smooth transition between S/S and A/W ranges. For example, if the stitching department will be through with all S/S articles in February, assembly and finish departments will only be done at the end of March. This means that the different manufacturing departments start working on the new A/W collection with a considerable time lag.	

	At the Rosenheim site, AVO is responsible for the preliminary costing calculations for all prototypes manufactured in Rosenheim and for the batch costing for the Banovce and Silveiros sites. This means issuing the **bills of materials** including the calculated material consumption (direct material costs) as well as **calculation of standard time requirements** for each operation (direct labour costs), meaning that AVO defines all operations and identifies the necessary time requirements. Both calculations (direct materials and direct labour costs) provide the information needed to calculate ex-factory prices and finally the (recommended) retail prices. **Upper and lining leather** consumption is calculated according to the SLM method (SLM = Scientific Leather Measurement). For synthetics (reinforcing materials, synthetic upper and lining materials), the parallelogram method is used. **Yarn and tape length** is defined by length measurement. **Components** such as outsoles, heels, insoles, shoe boxes are counted in pairs or pieces. The consumption of auxiliary materials such as **adhesives etc.** is defined by weighing. For each article, a **bill of materials (BOM)** is created. BOMs list all materials which are necessary to manufacture a pair of shoes of a specific article. BOMs are used to base the pricing on. Software programmes are used to multiply the required material quantities from each BOM to identify the volumes to be ordered, and the dates when those materials are needed in production. This is key information for the purchasing departments responsible for placing the orders with the various suppliers (this is done in Slovakia respectively in Portugal). In order to define standard times for the manufacturing operations, the AVO department uses the following two methods: • REFA and • MTM (methods-time measurement) Based on the technical specifications (design drawing for stitching department, model specifications), all work sequences including all standard times for all production departments are defined. For the remuneration of the production workers (piece pay for the workers at the sites in serial production in Banovce/Slovakia and Silveiros/Portugal), coupons are printed for all operations in all departments. Those coupons will – just like the technical drawings for

	the stitching department and all other work orders and specifications) accompany each batch on its way through production. The tasks of the AVO / PPS department are highly diverse due to the variety of materials, the complexity of the articles and the division of work between the different sites. The department contributes to a high degree to the profitability of Gabor und therefore bears high responsibility, especially when it comes to trouble shooting, for example when suppliers cannot supply materials and components for the production of certain articles in time. This inevitably leads to production backlogs. In such situations, the AVO/PPS department must take immediate action (by switching to different articles) in order to guarantee optimum capacity utilisation at all sites and at all times. They also need to keep the logistics department (whose shipping schedule depends on the production schedule) as well as the customers (the ones concerned by postponements of articles) informed.	
Workplace	Shop floor	Desk jobs
	Lighting conditions / environment	Office environment
	Posture	Mainly sitting, PC workplaces
	Specifics	-
Organisation	Employees in department	AVO / PPS have 10 employees in Rosenheim; 10 in Slovakia and 10 in Portugal
	Hierarchy	Head of department, employees
	Work places / tasks	Material calculation, labour cost calculation, production planning
Interfaces	… to other vocational positions?	B 2 Structure and organisation of the training company (§ 4 paragraph 3 number 2); B 1 Vocational training, labour/employment and collective bargaining law
	… to other learning places?	Vocational school, Gabor production sites abroad
	Separate trainee workshops / theoretical knowledge?	LF 1 Present footwear LF 8 Choose last
	Other	-
Vocational training	Vocational year / duration	Apprentices «Industrial Shoe Maker and Finisher» are introduced to the

		tasks of the AVO / PPS department at vocational school as well as within the scope of theoretical in-company training class hours (independent from the year of apprenticeship) in the format of a presentation followed by a short knowledge evaluation. At Gabor, the AVO / PPS department apparently only exceptionally accepts apprentices.
	Preconditions / previous stations	-
	What can be learned?	Tasks and role of AVO / PPS department, i.e. planning (time schedules, optimum capacity utilisation), calculation of material consumption and material costs as well as calculation of standard times and labour costs.
	Specifics of training (individualisation, duration, timing)	-
	Experience with trainees & young skilled workers	Very positive
	Assistance / working tasks	-
	Number of trainers	-
	Maximum number of apprentices	-
	Other	-
	Is the existing learning potential used?	In the scope of the «Industrial Shoe Maker and Finisher» apprenticeship role and tasks of the AVO / PPS department are being theoretically imparted but the apprentices are not given the opportunity to spend time in this department (except for: how to calculate material consumption by parallelogram method as well as by SLM). The reason for this is that the tasks of this department are too vast and complex to be dealt with them in

		detail in the context of the training for a skilled worker. However, Gabor may consider giving top-flight apprentices the opportunity to gain closer insight (3-4 weeks).
	Possibilities for improvement	-
Highest level of autonomy that can be attained	Not at the core of the «Industrial Shoe Maker and Finisher» apprenticeship; still, the apprentices should understand the tasks and responsibilities of the AVO / PPS department in order to gain comprehensive insight into the activities and interdependencies of a footwear manufacturing company.	

Fig. 62 For some materials, the consumption is really difficult to calculate. Therefore, the AVO/PPS department makes nesting trials and documents them in the system.

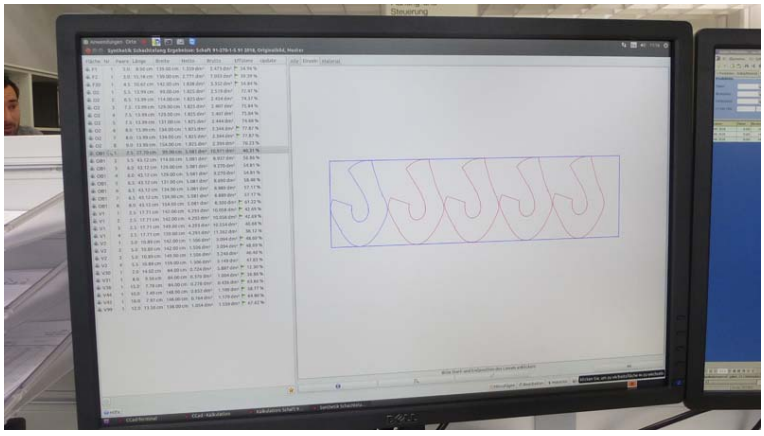


Fig. 63 Example of a ¾ pump vamp

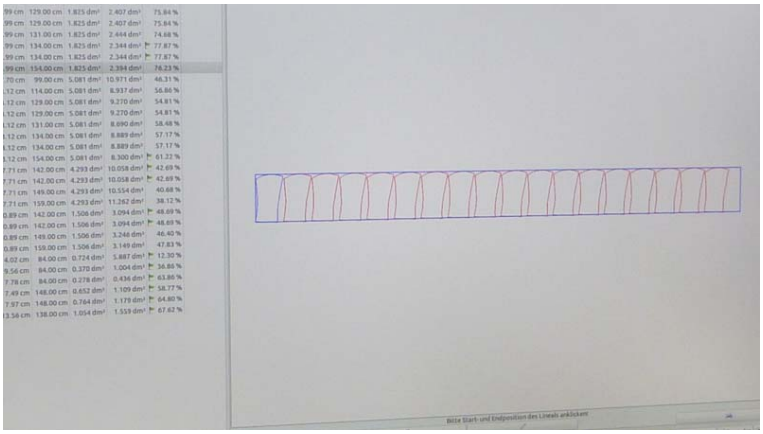


Fig. 64 Example of a ¾ pump quarter

2.2.2. Gabor Research & Development

Description	Learning Station Date	Research & Development January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (position n°)**	A 1 Assessment and utilisation of raw and auxiliary materials for upper production (§ 4 paragraph 2 number 1)
Process environment	Products	Test results for purchasing department / product management (test reports)
	Type of product / service	Completed test sheets
	(Internal) supplier	Purchasing department, technical pattern making rooms uppers / bottoms
	Direct user of product / service	Material to be tested comes from purchasing department with a test request
	"End" user of product / service	Purchasing department
	Production steps already performed	-
	Interfaces with other process steps	Shoe design and material selection (designers)
	Specifics	-
	Direct user of product / service	Gabor R&D is an internal quality control department conducting material tests according to international, European, German and internal standards.
Process steps Detailed description	The R&D department tests all new materials (leather, synthetics, laces, zippers, elastics, lining and reinforcement materials, soling materials, accessories etc.). All staff members new to the department are introduced to the safety instructions at all testing machines. The department tests about 60 material types, for example – among many other – insole materials (which is the central piece of the cemented construction but which is not visible on the finished shoe).	

	Gabor conducts only mechanical testing. Chemical testing is awarded to accredited test laboratories. Many tests are based on industry-wide applied legal standards and guidelines. In addition, Gabor is a member of the CADS initiative, which groups about 70 companies of the shoe and leather goods industry. CADS has the goal to assure stringent quality standards for footwear and leather goods. CADS members strive for products that are produced without and do not contain hazardous substances as well as for an environmentally compatible and socially responsible production. The CADS standards are – at least for the most part – more rigorous than statutory requirements. CADS revises its standards and limit values annually. **Internal mechanical tests include:** Leather testing at Gabor comprises 34 different testing procedures (respecting the stretch direction). Elastics, for example, undergo continuous stress tests in order to determine the decrease in force after 1000 stretch cycles. The test protocols can be printed in German or English language. For this LSA, R&D demonstrated how a testing request for a new upper leather (buffed goat leather with top-foil for colour effects) material is performed. The test duration (test machine run time) is one day. • The specimens are taken according to DIN/ISO standard requirements from the butt. The goat skin and the cutting dies to cut the specimens are taken to the cutting room (with the testing request from the purchasing department defining the leather colour and the tests to be performed). • The specimen are cut in the cutting room (according to DIN/ISO standard requirements for lastometer tests / grain crack resistance, tensile strength, stitch tear resistance etc.). For each test at least 3 specimens are cut to be able to calculate a mean value. Specimens are taken in longitudinal and cross direction. The position of the specimen to the dorsal midline is marked. Furthermore, Gabor takes specimens to determine fixation of colour dye pigments as well as for water repellence, light fastness and delamination testing and for

	Flexometer testing (especially important on the vamp where the leather creases at each step; for the Flexometer test, the leather is folded so form a crease, and undergoes 50,000 test cycles). Colourfastness testing is also very important (to avoid returns when, for example, a dark blue shoe stains a white pair of jeans). • **Tensile test:** The first test performed determines the tensile strength. The test programme is pre-installed on the machine. The following parameters need to be entered: Sampling in longitudinal or cross direction referring to the dorsal midline, specimen thickness, specimen width, distance of the pneumatic clamps (the latter two parameters are standardised). The specimen thickness is measured at three different points and the mean value is calculated. The specimen is clamped into the machine according to the specifications and the corresponding test programme is started. The screen displays the force distance diagram. All three specimen undergo the same test. Then the mean value of the breaking load is calculated and compared to the minimum requirements for use in footwear. The maximum elongation (in percent) is also recorded. This parameter is important because the leather is supposed to adapt to the foot of the wearer. To conclude, the test report is printed and the specimens are glued on the back. • **Tear resistance:** This second test is performed on the same testing machine but using a different test programme. The specimens are prepared with a defined cut. Two clamps grip the specimen in the middle of the cut. The aim of the test is to determine whether the material is resistant enough to be stitched or perforated. Again, two parameters need to be entered: specimen thickness as well as sampling in longitudinal or cross direction (referring to the dorsal midline). The aim is to record the breaking force (when the cut propagates). At least three specimen must be tested. The test report is done as for the first test. A material passes the test when it outperforms the defined minimum value. • **Lastometer test (to define the grain crack behaviour):** Performed using a hand-held lastometer. The specimen is clamped grain side up around its edge into the lastometer. A ball with defined diameter attached to a plunger is gradually

	forced to distend the specimen in its centre. At the first sign of surface cracking, the force on the plunger and the distension of the specimen is recorded (finish crack, grain crack). As the previously mentioned tests, this test is performed with at least three specimen. • **Flex test (flex cracking / resistance to creasing and cracking):** The specimen are clamped into the flexometer testing device with a defined in- and outward fold and undergo 50,000 flex cycles (the test reproduces the flexing patterns that occur during use / gait). On completion of the set number of flex cycles, the specimen are assessed for cracks. • **Fastness to rubbing:** Two specimen are clamped into the testing device and their grain (or outer) side is rubbed with defined pressure with against a white piece of felt. On completion of the test, the piece of felt is assessed or colour transfer and the specimen are assessed for surface change e.g. (marring, pilling). In an additional test, the material is tested by rubbing a dry piece of felt with defined pressure 50 times and 20 times with a wet felt. There are five shades of grey on the result scale (1= the darkest). The Gabor standard requires that to pass the test, a material must reach at least number three. The same test is performed on the flesh side with an artificial sweat solution (20 rub cycles). • **Fastness to light:** The specimen (partly covered) is exposed to Xenon light. At the end of the radiation test cycle, the colour fading is assessed. • **PFI water test (strip test):** Distilled water is filled into a lab dish (5 mm high). A filter paper strip is placed on the specimen, which is then pressed between two object carriers. The specimen is put into the dish for 8 hours. Poorly fixed dye pigments will “bleed“ due to the contact with water and diffuse into the filter paper strip. • **Water drop test:** Two water drops are placed on the specimen. Assessed is the time for them to soak in and eventual water stains.	
Workplace	Shop floor	Office space right next to prototype production hall
	Lighting conditions / environment	Normal

	Posture	Mostly sitting
	Specifics	-
Organisation	Group work?	-
	Employees at workplace per shift	-
	Employees in department	3
	Hierarchy	Department head, lab employees
	Work places in department	11 testing stations for new leathers
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other vocational positions?	A 5 Assessment and preparation of bottom parts for production and further processing (§ 4 paragraph 2 number 5) A 8. Detailing of shoe models (§ 4 paragraph 2 number 8), 8 weeks in the second apprenticeship half B 8 Quality assurance
	… to other learning places?	
	Separate trainee workshops / theoretical knowledge?	LF 2 Cutting of leather LF 3 Cutting of textiles LF 11 Finishing footwear / final inspection
	Other	Formally, the R&D department received only commercial apprentices to give them a change to better understand the product. For several years, F&E also introduces industrial shoe maker and finisher apprentices to the matter.
Vocational training	Vocational year / duration	2nd or 3rd year of apprenticeship, 1-3 months
	Preconditions / previous stations	The apprentices need to be familiar with the quality zones of a leather hide/skin.

			They need to be aware of the safety instructions at the testing machines (high temperatures, high forces). They need to know what the production requirements are, especially in the cutting room (including familiarisation with cutting machinery) as well as in the stitching and lasting room. They also need a consolidated theoretical knowledge of footwear materials.	
	What should they learn?		Opportunity to better understand the business process and the manyfold tests to assess material quality as well as the underlaying standards and how to document the test reports.	
	Specifics of training (individualisation, duration, timing)		Possibility to try out things	
	Experience with trainees & young skilled workers		„Simply awesome.“	
	Assistance / working tasks			
	Number of trainers		All R&D employees	
	Maximum number of apprentices		1	
	Other		-	
	Is the existing learning potential used?		Yes	
	Possibilities for improvement			
Highest level of autonomy that can be attained	Support	With instruction and guidance	Under surveillance x	Independently

Fig. 65 Tensile tester

Fig. 66 Fastness to light

Fig. 67 Flexometer test

2.2.3. Gabor Technical Bottoming Department

Description	Learning Station Date	Technical Bottoming Department January 2018
Location / Site	Vocation	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (vocational position n°)**	A 5. Assessment and preparation of bottom parts for production and further processing (§ 4 paragraph 2 number 5)
Process environment	Products	Development and procurement of all bottoming components
	Type of product / service	Construction specifications for bottom components (insoles, sock liners, inlay soles, outsoles, heels, heel covers, heel top pieces, wedges), order placements, check orders, release materials
	(Internal) supplier	Designer (sketches for outsoles and heels)
	Order- / material acceptance	3D prototypes
	Direct user of product / service	Designers (for release); Gabor production sites
	"End" user of product / service	Gabor production sites
	Production steps already performed	Design sketches for bottom parts (last-specific)
	Interfaces with other process steps	-
	Specifics	Gabor develops – unlike many other shoe manufacturers – outsoles and heels internally
Process steps Detailed description	The technical bottoming department is part of the Industrial Shoe Maker and Finisher apprenticeship at Gabor. The apprentices spend about 12 weeks in the department. Ideally, they are already familiar with all tasks and operations in the cutting, lasting and assembly rooms and have a sound knowledge about bottoming materials. What the apprentices learn in this department is: • Introduction to health protection (escape routes, assembly points) and work safety at all production machines and devices which are used for production or further processing of bottom	

components (splitting machine, swing beam clicking machine, hand cutting, stamping and embossing machines, ironing machine, heel covering machines, occupational safety in general)

- Introduction to the software systems used in the department:

  1) Construction in CCAD
  2) Technical drawings and specifications in AutoCAD
  3) Preparing and placing orders with AutoCAD and Outlook

- Making a pattern of the last bottom (last bottom copy): The last bottom is covered with tape strips. Then the tape copy is cut out along the feather edge. The tape copy is transferred onto card board. The card board copy is scanned into the CCAD system.

- Insoles: The apprentices learn what the role of insoles in shoe construction and production is. They learn to distinguish different insole materials and insole variants. The learn how to construct insoles in the CCAD system and how to edit the production specifications in AutoCAD. Under guidance of the trainer, they will place orders at insole suppliers. On delivery of the ordered items, the trainees learn how to check the incoming goods and how to release insoles for prototype and/or serial production.

- Development of sock liners: The trainees get familiarised with sock liner materials (samples to get an impression of look & feel) and with sock liner variants. Sock liners are developed in CCAD. The apprentices follow through the complete process from sock liner construction to placing the orders for sock liner cutting dies at the supplier. They are encouraged to place the order themselves (under guidance of the trainer). On delivery of the cutting dies, the trainees learn how to check and release them for production. Cutting and preparing sock liners for insertion into the shoe is also part of the training.

- Ready-made inlay soles: The apprentices get to know the whole range of inlay sole variants. The learn how to construct inlay soles in CCAD and how to edit the production specifications in AutoCAD. As for insoles and sock liner cutting

	dies, they learn how to place orders at the supplier and how to release inlay soles for production. • Outsole development: The apprentices deepen their theoretical knowledge about soling materials (recognition, specific requirements in terms of processing / bonding preparation / bonding). They learn to distinguish different outsole types and how to make inside and outside sole edge patterns. They are present when designer and bottoming technician review sole prototypes (produced on a 3D printer) and eventually make changes. After the review they can observe the process how outsole orders are placed, they learn how incoming soles are checked and how the bottoming technician releases new soles for production. • Heel development: The apprentices learn to distinguish the different heel types and how heel inside and outside edge, patterns are constructed. They learn how heel covers are produced and how to cover heels. They observe how the technician places heel orders, how the incoming heels are checked and how they are released for production. • In the last week of their stay in the department, the apprentices get the task to develop insole, sock liner and outsole for a shoe model. The goal is to assess whether they are able to execute all tasks on their own or whether there still are knowledge gaps to be filled. • During the entire stay in the department, the apprentices are asked to perform the following tasks: - Bring sample shoes and bottom parts to the assembly room - Stock up on packaging material - Take delivery to the warehouse in time	
Workplace	Shop floor	Office
	Lighting conditions / environment	Normal
	Posture	Mostly sitting
	Specifics	-

Organisation	Group work?	-
	Employees at workplace per shift	
	Employees in department	6
	Hierarchy	Department head, employees, apprentice
	Work places in department	
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other vocational positions?	A 6 Preparation and assembly of uppers and bottom parts (§ 4 paragraph 2 number 6), 20 weeks A 8 Development of models B 5 Planning and preparation of work processes B 7 Operational and technical communication
	… to other learning places?	3 weeks‘ stay at the production site in Banovce (SVK)
	Separate trainee workshops / theoretical knowledge?	Learning field 6 Working with adhesives Learning field 9 Working with bottoming materials Learning field 12 Development of shoe models
	Other	-
Vocational training	Vocational year / duration	Second half of the apprenticeship
	Preconditions / previous stations	Cutting room, lasting room, assembly; VET school: Make a shoe by hand
	What should they learn?	Technical development of bottom components
	Specifics of training (individualisation, duration, timing)	-
	Experience with trainees & young skilled workers	Positive, in general the apprentices are very motivated

	Assistance / working tasks		All tasks are accomplished under surveillance. Final project in the last week: should be done autonomously.	
	Number of trainers		3	
	Maximum number of apprentices		1	
	Other		-	
	Is the existing learning potential used?		Totally.	
	Possibilities for improvement			
Highest level of autonomy that can be attained	Support	With instruction and guidance	Under surveillance x	Independently x (final project during the last week of their stay)

Fig. 68 Last bottom copy and insoles

Fig. 69 Sole

Fig. 70 Heel

2.2.4. Gabor Technical Pattern Making

Description	Learning Station Date	Technical Pattern Making (Uppers) January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (vocational position n°)**	A 8. Detailing of models (§ 4 paragraph 2 number 8), 12 weeks in the second apprenticeship half
Process environment	Products	Technical patterns for upper manufacturing
	Type of product / service	CAD files, pattern stencils, product images and construction drawings (raw drawings)
	(Internal) supplier	Designer (draws on plastic shells and in plotted CAD images); last supplier
	Order- / material acceptance	Plots of the basic model
	Direct user of product / service	Designer, prototype production
	"End" user of product / service	Product manager / range review
	Production steps already performed	Design drawings (on plastic shells or in plots)
	Interfaces with other process steps	Designers, product managers, prototype and serial production
	Specifics	-
Process steps Detailed description	What the apprentices learn in this department: • **How to make a last copy**: Gabor copies lasts (in order to flatten the last surface from 3D to 2D) using the tape copy method. When the last is taped, the tape is cut along the last centre line. The tape copy is put flat on the desk and the shape is transferred on cardboard. The cardboard model is scanned and the necessary allowances and reductions are marked – depending on the construction method that will be used. The thus obtained outlines are the basis for further elaboration in the CAD system (CCAD). The outlines can be plotted on paper for the designers to further detail their ideas for a new shoe model. The designers often also draw on so-called plastic shells (3D copies of lasts	

	obtained by vacuum deep-drawing which can be produced in any desired number). • **Pattern making by hand**: As soon as the designers are done with their design sketches, the apprentices learn how to make patterns by hand. Although in the normal process in the department this is done in the CAD system, detailing by hand helps to understand what needs to be done, how and why. Therefore at the beginning, they learn how to produce the patterns for all upper leather, lining leather and interlining parts, to make the necessary allowances and reductions (lasting allowance, folding edge, open edge, butt seam, French binding, closing seam etc.), to place marking slots and run-in points (to mark the height of folded edges) and for centre and medial markings. The patterns must be labelled correctly (upper leather UL 1, 2, 3, interlining IL 1, 2, 3 or lining LI 1, 2, 3, etc.), checked and must be packed in envelopes for transfer to prototype production. The apprentices practice pattern making by hand on different models. However, the department has an unchanging repertoire of shoe models for the apprentices to practise (meaning that they do not get to work on the current collection – simply because that would be too time-consuming for the trainers to handle). • **Introduction to CAD:** The third important learning field in this department is the introduction to working with a CAD system (CCAD). The apprentices learn how to create a model in the system, how to create the and how to enter the model number. There is a scheme to be followed for encoding new model numbers: Season – line – group – model – version. Proficient users of the system can grasp the information contained directly from this code. Another learning objective in this department is that the apprentices can find last outlines in the CAD system and plot them for the designers to detail their ideas. When these plots come back from the designers, the need to be scanned again into the CCAD system. Cross-hair pointers, which need to be precisely aligned, ensure the exact same position of the newly scanned drawing. In the CCAD system then the scanned plot must be uploaded in order to digitise the base lines (which the designer drafted

	on the plot) by setting so-called “splines” (by mouse clicks). The base lines need to be complemented by the processing instructions, e.g. by defining seam types etc. The department created an own folder with internal pattern making specifications for to support all employees of the department in their daily work. Of course the apprentices, too, can consult this folder. In the CAD system, all patterns - for upper leather, lining and interlining parts – are created. The colour-code for base lines is white and green. Allowances (e.g. for folded or beaded edges) in cyan, lining parts in red and interlining parts in yellow. In the following, the areas are created. Medial side and centre are marked with notches, as well as bar points, the different seam types, folding edges, run-in points, partitions (e.g. on the tongue), marking slots (for stability reasons, the slots need to be disrupted depending on the overall length). Finally, lift-of points are defined at critical points (e.g. sharp angles, corners) where the leather could tear during the cutting process. These lift-off points are signals for the CAD cutting table to lift the oscillating knife and change direction. In the next step all pattern stencils are „nested“, i.e. cut on the Computer Optical Cutting System (Gabor has a separate COS cutting table for pattern making). The pattern stencils are checked again and labelled. With the help of an export function in CCAD, a rough sketch of the model is created and printed out. It serves as a „cover page“ for the envelope carrying all patterns of the model which is handed over to the designer. The model data are communicated to the AVO / PPS department to calculate material consumption and time requirements for production. If – during prototype production – questions occur (mostly from cutting or stitching room), the pattern making department clarifies the issues.	
Workplace	Shop floor	Office
	Lighting conditions / environment	Normal

	Posture	Sitting or standing
	Specifics	-
Organisation	Group work?	-
	Employees at workplace per shift	-
	Employees in department	10
	Hierarchy	Department head, upper unit manager, employees, apprentice
	Work places in department	-
	Shifts	-
	Similar work stations	-
	Specifics	-
Interfaces	… to other vocational positions?	A 1. Assessment and use of raw and auxiliary materials for upper manufacturing (§ 4 paragraph 2 number 1), 10 + 4 weeks (in 1st and 2nd half of apprenticeship) A 2. Cutting of materials for upper manufacturing (§ 4 paragraph 2 number 2), 18 weeks A 3. Preparation of upper parts (§ 4 paragraph 2 number 3), 10 weeks A 4. Upper manufacturing (§ 4 paragraph 2 number 4), 24 + 12 weeks (in 1st and 2nd half of apprenticeship) B 5 Planning and preparing work processes B7 Operational and technical communication
	… to other learning places?	VET school, three weeks at Slovakian site in Banovce (serial production)
	Separate trainee workshops / theoretical knowledge?	Learning Field 2 Cutting of leather LF 3 Cutting of textiles LF 8 Last selection LF 12 Development of shoe models
	Other	-
Vocational training	Vocational year / duration	12 weeks in the second apprenticeship half

	Preconditions / previous stations		Cutting room, stitching room, material science, construction methods	
	What should they learn?		Technical pattern making for uppers	
	Specifics of training (individualisation, duration, timing)		By hand and using CAD system	
	Experience with trainees & young skilled workers		Positive	
	Assistance / working tasks		To start with, all tasks are carried out under guidance and later on autonomously (model selection for apprentices)	
	Number of trainers		5	
	Maximum number of apprentices		1-2	
	Other		-	
	Is the existing learning potential used?		The apprentices spend only 8 weeks in the department. Imparting their knowledge using models of the current range would be rather complicated for the trainers. Therefore, a set of standard models was compiled for training purposes.	
	Possibilities for improvement		-	
Highest level of autonomy that can be attained	Support	With instruction and guidance	Under surveillance x (because time is short and the tasks complex)	Independently

Fig. 71 Tape copy of the last

Fig. 72 Standard apprentice model for manual pattern making

Fig. 73 Cutting of the pattern stencils

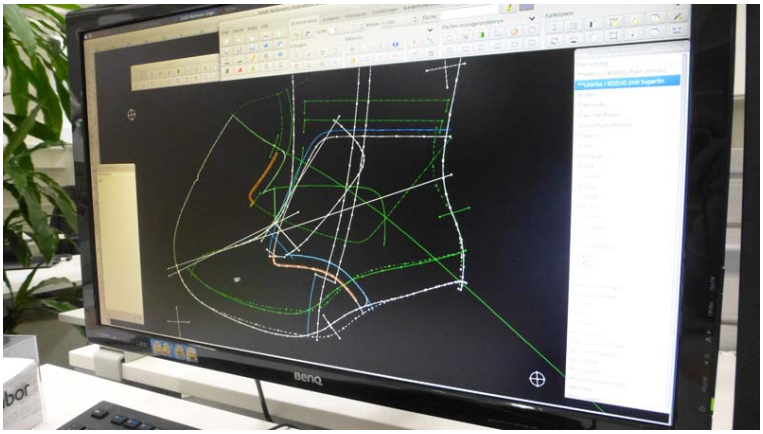


Fig. 74 Learning pattern making on the CAD system

2.2.5. Gabor Upper Coordination

Description	Learning Station Date	Upper Coordination January 2018
Location / Site	**Vocation**	Industrial Shoe Maker and Finisher
Allocation	**Time frame / Occupational profile (position n°)**	A 1 Assessment and use of raw and auxiliary materials for upper manufacturing (§ 4 paragraph 2 number 1), 14 weeks
Process environment	Products	Constructional drawings > AutoCAD drawings with specifications for material and production operations. Collaboration with design, prototype production, product management (PM)
	Type of product / service	Range review / specifications
	(Internal) supplier	Design, technical pattern making (upper)
	Order- / material acceptance	Raw drawing in AutoCAD, item lists (with all relevant specifications such as leather type and colour) and patterns (for cutting upper leather, lining and interlining)
	Direct user of product / service	Prototype production / calculation
	“End” user of product / service	Final inspection and shipping to the customer
	Production steps already performed	Design draft, technical pattern making (upper)
	Interfaces with other process steps	-
	Specifics	Gabor produces about 550 models per season > up to 3000 variants (e.g. September to February)
Process steps Detailed description	Upper Coordination: • Interface between design / technical pattern making and production. • AutoCAD drawings are further developed in order to specify all production details (e.g. seam sizes).	

	• There are two work stages: stage one is for prototype production (in Rosenheim), stage two is for serial production in Portugal and Slovakia. • When the design drafts with the most relevant specifications (e.g. upper material, colours, cutting dies) come in, Upper Coordination defines further details (e.g. reinforcements, type of toe puff) to complete the manufacturing specifications. • The department defines all elements of the shoe that are more or less invisible: lining, elastics, reinforcements, toe puffs, where to place markings (EU regulation: pictograms to define material types of upper, lining, sock liner and outsole). • The department works hand in hand with the Bottom Coordination department. Usually several upper styles share the same bottom group (e.g. heel + outsole). • Gabor has internal standards (e.g. in terms of seams: how many stitches per cm for which seam type etc.) which Upper Coordination applies. • An important decision taken in this department is the determination of the most appropriate interlining material. Its characteristics must match the characteristics of the upper leather (e.g. embossed or not). The department also decides to which thickness straps etc. will be split(= reduced in thickness), and how to skive materials, e.g. for lap seams (skiving = thinning out material edges to avoid double material layers which could lead to pressure points and therefore cause discomfort). • Sampling: In order to determine the most appropriate interlining material, samples are produced: upper leather and interlining material samples are ironed together. In some cases the upper leather needs to be split, and therefore the ideal thickness needs to be identified by making trials with different thicknesses. The trial samples are assessed in order to determine the interlining for the respective shoe model. • For applications such as studs, the ideal stud length must be defined (it has to match the material thickness of upper leather and reinforcing material together). • For all decisions, a variety of factors must be considered, such as the shoe type (casual / pump), specifics (e.g. heel height, how to attach decorative elements) as well as cost (material

	consumption, complexity and duration of each production operation). • Any potential difficulties in prototype production of the uppers or the shoe (e.g. how to attach decorative elements) are reported back to Upper Coordination; their task is then to develop alternatives. • AutoCAD drawings: The raw drawings come in as files (Technical Pattern Making – Uppers). Upper Coordination completes the files by adding applications (such as buckles, for which sub-files in the CAD programme are created), seams (seam type), geometric dimensioning (e.g. for colours) and manufacturing instructions. If, for example, a certain buckle does not exist as a CAD file, the CAD department is instructed to create a CAD drawing of the buckle. The seam types are added to the raw drawings in the CAD files of the upper parts with a distance of 1.5 cm inwards. If questions occur, the designer needs to be contacted. For upper parts that are not visible on the finished shoe, detailed drawings are created. All technical drawings will be added to the manufacturing instructions.	
Workplace	Shop floor	Office and prototype production
	Lighting conditions / environment	Normal
	Posture	Mostly sitting
	Specifics	-
Organisation	Group work?	-
	Employees at workplace per shift	-
	Employees in department	One department head and four employees
	Hierarchy	Department head and employees
	Work places in department	-
	Shifts	1
	Similar work stations	-
	Specifics	-
Interfaces	… to other vocational positions?	A 8. Detailing of patterns (§ 4 paragraph 2 number 8), 8 weeks in the second half of the apprenticeship

			A 3. Preparation of upper parts (§ 4 paragraph 2 number 3)	
	… to other learning places?			
	Separate trainee workshops / theoretical knowledge?			
	Other		-	
Vocational training	Vocational year / duration		2nd or 3rd year of apprenticeship, 2-3 months	
	Preconditions / previous stations		Good understanding of production process, in particular cutting and stitching; extensive material knowledge	
	What should they learn?		Introduction to the business process, working in Auto CAD (simple models; using the apprentice CAD styles catalogue), maintenance of item lists (update changes), organise and carry out trials to identify the most appropriate interlining material (as well as other material trials)	
	Specifics of training (individualisation, duration, timing)		Possibility to try out many different things	
	Experience with trainees & young skilled workers		Very good, apprentices are very eager to learn	
	Assistance / working tasks			
	Number of trainers		All employees in the department	
	Maximum number of apprentices		1	
	Other		-	
	Is the existing learning potential used?		Yes	
	Possibilities for improvement			
Highest level of autonomy that can be attained	Support	With instruction and guidance X (depending on the task)	Under surveillance X (depending on the task)	Independently

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