Integrating Companies in a Sustainable Apprenticeship System

Project 2017-1-DE02-KA202-004174

Intellectual Output 3

Train-the-Trainer Manual

Assembly

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Erasmus+

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Contents

1. Introduction

1.1. Aims of the ICSAS Project

The aims of the Erasmus+ project «Integrating Companies in a Sustainable Apprenticeship System» are to

- show ways how the existing Vocational Education and Training (VET) systems to train skilled workers for footwear manufacturing in Romania and Portugal can evolve towards work-based learning (WBL), and improve the sector-specific tutor training in Spain and Germany
- develop a sector qualification framework and the referencing of national qualifications for Germany, Portugal, Romania and Spain.

1.2. Eleven Manuals to Guide In-Company Tutors

In dual training schemes, the work-place specific know-how is imparted by skilled workers from the respective departments. As outlined in the ICSAS project application, the project consortium has committed to issuing eleven manuals, the purpose of which is to prepare designated in-company tutors in WBL for their role and provide support for the work-based learning phases of the apprenticeship. The tasks of a tutor are to

- demonstrate the operations which the apprentices are expected to learn to perform
- introduce the apprentices to each new task and supervise them during their first approaches
- accompany them as their skills are becoming more and more advanced
- guide them towards an independent performance of the task

Furthermore, each company enrolled in work-based learning shall appoint a Head of Training who is responsible for

- drawing up an individual training schedule for each apprentice (how long each apprentice will be trained at each learning station and in which order an apprentice will run through the departments – not all apprentices can start, for example, in cutting)
- assessing and documenting the learning progress of each student at each learning station

The manuals are not meant to replace a textbook. They are meant to provide support to the trainers to plan the work-based learning activities with the trainees. The workplace trainers are invited to gather more information from other sources.

1.3. Take Your Apprentices on a Guided Tour

Before you start the hands-on training in a specific department, please make sure that the apprentices have been given a tour of the entire company including all departments.

For example, the apprentices should be introduced to the types of products the company manufactures and their intended use, the different customer segments, the distribution

channels etc. They should be allowed insight into the product creation and manufacturing processes, i.e. product design, pattern making, purchasing department, production planning, and all production departments to warehouse and logistics.

Point out the details of a typical shoe model which the company produces (see Fig. 1). Your trainees will better understand the complexity of the product “shoe”.

Fig. 1: Views of shoe parts like on this photo can be very helpful for the trainee to understand the complexity of a shoe

2. Assembly in Footwear Manufacturing

Shoe assembly is one of the final stages of footwear manufacturing (only followed by finishing and boxing for shipment).

In the assembly room, the shoe bottoms (i.e. soles respectively soling components) are mounted to the lasted uppers. During the assembly process, the shoes are still on the last (see manuals on the preceding operations, Pre-lasting and Lasting) to give the shoes their final shape and inner dimensions to provide optimum fit.

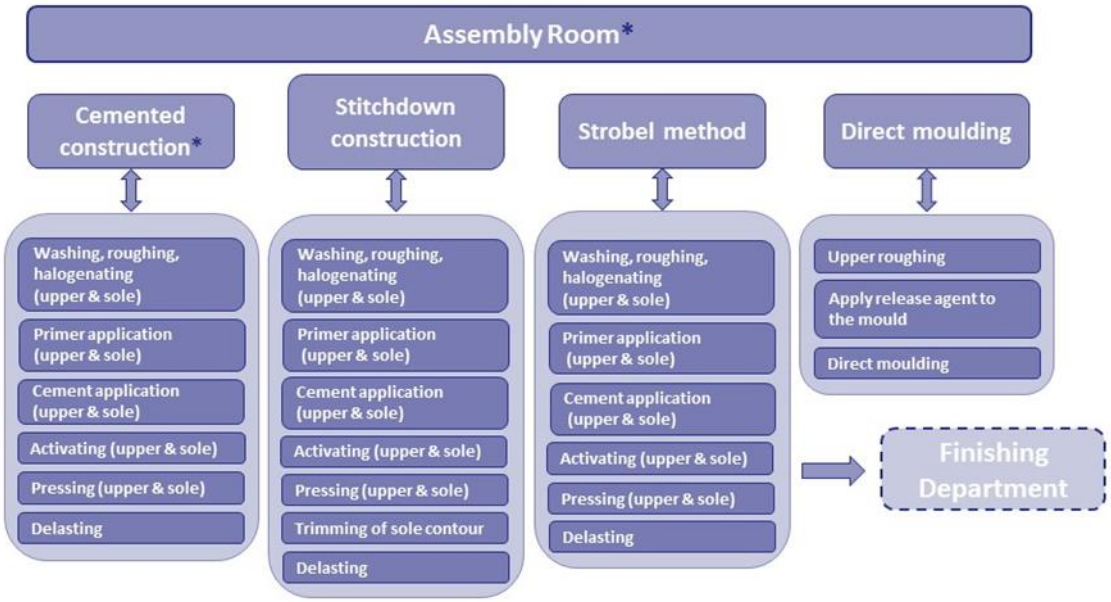

Fig. 2: Sequence of operations in assembly for the most common footwear construction methods (Credit: ISC)

The operational sequence in footwear assembly largely depends on the shoe construction method. In the scope of the ICSAS project, all companies involved produce leather footwear manufactured using the cement-lasting method, meaning that upper and shoe bottom are bonded with adhesives.

The shoes are delasted once the sole is attached respectively before the heels are attached.

3. Assembly Room (Cemented Construction)

The lasted uppers (semi-finished shoes) enter the assembly room on trolleys, together with the bottom components and the work ticket. The bottom components are / can be: Outsoles, heel and heel top pieces supplied by the internal warehouse and leather heel covers supplied by the cutting room.

3.1. Roughing (Manual)

The first operation in the assembly room is (manual) roughing of the lasted shoe bottom, i.e. of the lasting allowance.

In the case of Gabor, the serial production sites are located in Slovakia or Portugal. There, roughing is performed by automated roughing machines. The Gabor Rosenheim site is dedicated to prototype production, which implies frequent tool changes. Therefore, 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 can contain a relatively high percentage of grease; grease is an adhesion inhibitor, meaning that the presence of grease can considerably deteriorate the bond quality between upper and sole).

In the LSA example, a heat-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 with a finer sand paper quality on a roughing disk. Manual roughing requires a lot of precision and the appropriate pressure of the lasted upper against the roughing disk.

The result of the roughing process is a surface increase for bonding. The adhesive can “wet” a roughened material better, which leads to enhanced bond strength.

Fig. 3: Manual roughing (coarse sand paper). Credit: ISC

Fig. 4: Manual roughing (finer sand paper). Credit: Gabor

Fig. 5: Perfect roughing result: Only the grain layer has been removed. The structural strength of the upper leather is maintained and the contact area for the adhesive bond has been enlarged. Credit: ISC

Fig. 6: Example of an over-roughed upper: the white interlining is showing through. The strength of the sole bond will now completely depend on the structural strength of lining and interlining. Credit: ISC

Fig. 7: If roughing dust remains on the roughed surface, it will be covered with glue in the next step, which will ultimately weaken the bonding strength. Credit: ISC

The shoe in the LSA example at Gabor features 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. In order to mark the roughing height, the sole is placed onto the lasted upper and the sole edge is marked with a marker pen. The lasting edge is roughened as well as the lateral upper areas which will later be covered by the shell sole.

The roughened surfaces are cleaned to remove remaining roughing dust particles (e.g. with a compressed air pistol).

Roughing / Effects	Checkpoints
• Expands contact area for bonding • Anchoring effect (mechanical interlocking) • Removes the eventually weak and / or greasy surface layer (grain layer of the leather), release agents, blooming chemicals, plasticisers etc.	• Is the surface evenly roughed and not over-roughed? • Leather: Has only the grain layer been removed? • If roughing effects diminishes (which can happen i.e. with PUR soles): re-rough • Clean off roughing dust

Fig. 8: The effects of roughing and important checkpoints. Credit: ISC

3.2. Cementing (Manual)

In the LSA example at Gabor, a heat-activated adhesive mixed with a curing agent to reinforce the bonding strength was used for upper cementing.

Fig. 9: Primer application. Credit: Gabor

Cementing means to apply an adhesive coat (in the example a PU adhesive). This is done in two steps: primer and main application. At Gabor Rosenheim, this is done manually with a brush. In serial production, automated cementing machines are used.

Fig. 10: The bottom filler's function is to level out the difference in height between the lasting edge and the insole. Credit: Gabor

Important: too much adhesive does not mean better bonding! If the adhesive layer is too thick, it cannot dry properly within the given drying time, which will weaken the bonding quality. Drying time in this example: 10 minutes. The primer coat must be allowed to dry completely before further processing.

Once the primer coat has dried, a bottom filler is inserted. Its purpose is to compensate the height difference between insole and lasting allowance which could be perceptible for the wearer of the shoe.

Then the main adhesive coat is applied to the roughened lasting allowance (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 solvent-based adhesives.

Depending on the 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: Respect the drying times.

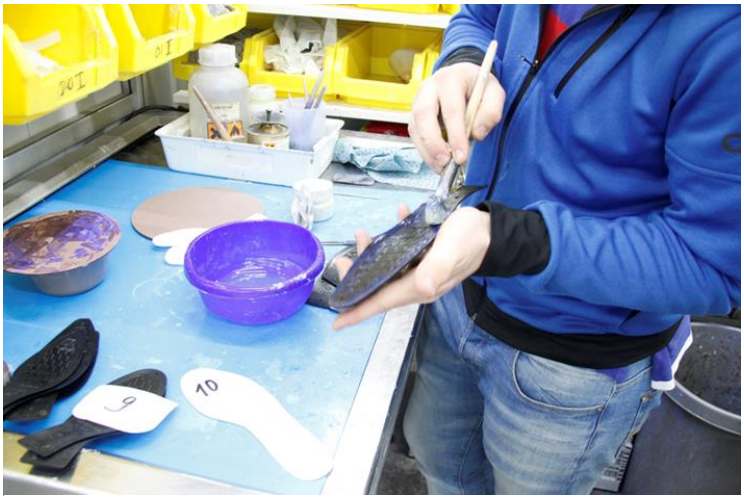

Fig. 11: Cement is applied to the sole. Credit: Gabor

Pre-treatment of Soles

Before the actual gluing process, most soling materials require a pretreatment:

PU – cleaning or roughing, primer

TR (TPR) – halogenating or UV curing

PVC – cleaning

Rubber – roughing, cleaning, halogenating

EVA – roughing/brushing, primer

TPU – cleaning, primer

Leather – roughing, primer

Note on Cleaning / Washing:

Cleaning is usually done with solvents. Primers are special – in general – solvent-based adhesives which must be selected according to the soling material. Please read the paragraphs on harmful substances in the material data sheets carefully before you decide which cleaning agent to use and how to protect the health of workers.

Fig. 12: Common pretreatment methods for different soling materials prior to adhesive application. Credit: ISC

3.3. Preparing a Covered Heel

Covering plastic heels with leather or covering insole edges with leather strips are preparative operations which are done in the “bottom parts preparation room” (aka “stock fitting”).

Fig. 13: Clamping device used for covering heels with leather. Credit: Gabor

In order to be covered with a leather piece of corresponding dimensions, the heel is first dipped into adhesive and then clamped into a holding device.

The leather part is supplied (cut and split) by the cutting room.

Spray adhesive is applied to the back of the leather cover. The leather cover is wrapped around and pressed against the heel. The edges meet at the heel front. Excess material is trimmed. At the heel seat edge as well as towards the tread surface the leather is folded over the edge.

Fig. 14: This is what the covered heel will look like on the shoe. Credit: Gabor

3.4. Preparing a Piped Insole

For the LSA, Gabor showed how a piped insole is produced (again, this is normally done in the "bottom parts preparation room"). The storage for insoles which will be piped is part of the assembly room.

Fig. 15: Insole and piping strip to be glued around the edge. Credit: Gabor

Neoprene adhesive is applied both to the insole and to the leather strip with a brush. The piping strip is folded under strain around the insole edge. Both ends are rubbed down in order to ensure that the overlapping strip ends do not cause a pressure point.

Fig. 16: Finishing the piped insole. Credit: Gabor

3.5. Attaching the Sole

Soles and uppers are heat-activated. Then the soles are attached to the lasted uppers on a two-station sole press (for left and right shoes).

Fig. 17: Sole activating device

The softer the soling material, the less pressure is 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 generate higher pressure.

Important: Even pressure distribution.

Fig. 18: Hydraulic sole press. Credit: ISC

Fig. 19: Double membrane pneumatic sole press. Credit: ISC

3.6. Delasting

The next operation is delasting (taking out the last).

3.7. Attaching the Heel

The heel is screwed on and the operator checks whether the shoe stands straight (with a rubber pad compensating the still missing heel tip).

Fig. 20: Machine for screwing on heels. Credit: Gabor

3.8. Attaching the 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 is held in place by four tacks to prevent rotation around the screw.

Important: Do not nail into the steel shank of the insole.

4. Assessment / Feedback Template

4.1. Introduction to Feedback Sheet

from work-based learning (WBL) in a learning station (LS) depend strongly on the actual equipment of the production line and the models and makes, which a shoe factory manufactures. If the shoe models produced do not require certain work tasks of a whole sphere (in stitching or assembly, for example), then it is simply not possible to acquire skills in this production line related to this method.

A systematic and transparent communication on concrete LOs acquired via WBL by a learner/apprentice between tutors, supporting the learner in the various departments, and the head of training, being responsible for the entire training programme, is of great importance in WBL.

With the intend to provide a concise and handy communication tool, we recommend using the matrices as shown below: They allow tracking the achievements of each trainee in each department in a quick and easy way. The matrices do not refer to any formal assessment; they simply state the degree of autonomy each trainee was able to reach within the given timeframe in each Sphere of Activity.

The matrices list the main work tasks (in bold) and the performance that can be acquired in each department. The work tasks refer to the acquired skills; to indicate that they include key competencies and knowledge the underlying elements for some of the work task are listed.

How to use the matrices: In order to give feedback on the learning progress of each trainee, please tick off the level of autonomy the learner has reached for each work task (choosing between needs assistance / needs instruction / needs supervision / completely independent).

If the work task in the matrix was not part of the training, you can leave it out or erase the work task; if additional work tasks were trained, please feel free to continue the list of work tasks according to your training goals.

In the end, the matrices will document what each learner has been able to acquire and which level of autonomy she/he has reached. And again, although this has already been said: Please bear in mind that you may have to adapt the matrices according to the processes and to the operations in your department.

Sphere of Activity: Assembly

Work task:	Preparative tasks

Receiving incoming trolley with lasted uppers from lasting room, reading & understanding work ticket;

Preparing the correct outsoles and other bottom components according to the work ticket;

Asking for support if needed.

Evaluation

Needs assistance	Needs instruction	Needs supervision	Completely independent
☐	☐	☐	☐

Place, Date Signature

Work task:	Manual roughing

Reading & understanding work ticket;

Performing the manual roughing operation applying safety measures.

Controlling the work result and identifying possible defects;

Asking for help if needed.

Evaluation

Needs assistance	Needs instruction	Needs supervision	Completely independent
☐	☐	☐	☐

Place, Date Signature

Work task:	Cementing (manual)

Reading & understanding work ticket;
Performing manual primer application applying safety measures.
Applying main adhesive layer respecting safety measures.
Controlling the work result and identifying possible defects;
Asking for help if needed;
Knowledge about soling materials and adhesives.

Evaluation

Needs assistance	Needs instruction	Needs supervision	Completely independent
☐	☐	☐	☐

Place, Date Signature

Work task:	Attaching the outsole

[Please set up the criteria in this section in line with your evaluation needs according to the example given above]

Evaluation

Needs assistance	Needs instruction	Needs supervision	Completely independent
☐	☐	☐	☐

Place, Date Signature

Work task:	Attaching heel & heel tip

[Please set up the criteria in this section in line with your evaluation needs according to the example given above]

Evaluation

Needs assistance	Needs instruction	Needs supervision	Completely independent
☐	☐	☐	☐

Place, Date Signature

Work task:	Preparing covered heels

[Please set up the criteria in this section in line with your evaluation needs according to the example given above]

Evaluation

Needs assistance	Needs instruction	Needs supervision	Completely independent
☐	☐	☐	☐

Place, Date Signature

Work task:	Preparing insoles with bound edge

[Please set up the criteria in this section in line with your evaluation needs according to the example given above]

Evaluation

Needs assistance	Needs instruction	Needs supervision	Completely independent
☐	☐	☐	☐

Place, Date Signature

Work task:	Check quality of assembled shoe

[Please set up the criteria in this section in line with your evaluation needs according to the example given above]

Evaluation

Needs assistance	Needs instruction	Needs supervision	Completely independent
☐	☐	☐	☐

Place, Date Signature

Final evaluation (in this department)
Assembly, including all work tasks above
Evaluation

Needs further training	Can perform all work tasks (almost) independently
☐	☐
Place, Date Signature	

5. List of Figures