

How to Implement Sustainable Manufacturing in Footwear - new occupational profile and training opportunities
Project 539823-LLP-1-2013-1-PT-LEONARDO-LMP

Piloting Report



Lifelong
Learning
Programme

This project has been funded with support from the European Commission.
This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CONTENTS

- 1- Introduction to the document
- 2- Presentation of the integrated course: e-learning and practical workshops in companies situs
- 3- Piloting Numbers
- 4- Evaluation of the piloting of the E-learning component
- 5- Presentation of the practical workshops in company situs
- 6- Conclusions
- 7- Annexes

1. Introduction

This deliverable consists in the feed-back report on piloting activities, with information gathered during the piloting phase in e-learning component and work based training activities

2. Presentation of the integrated course: e-learning and practical workshops in company's situs

This course consists in a B-learning course on “Sustainable Footwear Manufacturing” aiming at developing skills and competences on the field of action, targeted to the new occupational profile of Expert on “Sustainable manufacturing in Footwear”. The b-learning course comprehends a package of learning strategies (units, assessments, workshops orientation guides, etc.) that altogether address the training needs of the new profile and contribute for its certification. The e-learning platform that was used is a tailor made platform, with sections addressed to all actors of the e-learning process: secretary area, trainee area (with the functionality to accede the course), trainer/coach area (to accede to backstage, controlling course delivery, assessment, control apprenticeships progress, follow up all activities related to trainees, administrator area.

The training units are individualized within the b-learning course and the trainee can select all the course or just the units that are more interesting for his/her. It's possible to be done during registering or afterwards.

TRAINING UNITS
Standardization and Certification Systems
Sustainable Materials and Components for Footwear
Eco Design and Product Engineering
Sustainable Manufacturing Technologies and Processes
Environment Regulations and Standards
Health and Safety at Work (HSW) in Footwear Industry
REACH and consumer safety-Product legislation for footwear industry
Contractual, Social and Trade Legislation
Sustainable Packaging for Footwear
Supply Chain and Logistics Management in Footwear Companies
Green Marketing
Social Corporate Responsibility Practices

In addition, and according to the research and learning programme, some units of the course can be addressed to key-people in SMEs that lacks the correspondent skills and competences and whose domain will improve the work of the new occupation profile in indoor in a way that support the implementation of the action fostering the successful implementation of sustainable manufacturing.

If it occurs, the e-learning platform will allow trainee to make AN “invitation” to other participants inside the company to make some specific training unit, contributing for the enhancement of knowledge on the field in Footwear, and promoting the success of the strategy.

Each Unit has a main Objective and, the Learning Outcomes were established by transforming the Knowledge, Skills and Competences (KSC) from the Occupational Profile according with the principles and rules for designing training curricula.

Each unit is independent of other units, so that it may be a course in itself for further customized training to be provided to footwear companies on their request.

For each Unit is provided the following information before to stat the learning activities:

The main objective of the unit accordingly with the activities and tasks described in the Occupational Profile

Statements of what a learner knows, understands and is able to do on completion of a learning process, and which are defined in terms of knowledge, skills and competence

Description of the unit in terms of its content.

A detailed structure of the units and subunits

Learning strategies: contact hours (in class) for theory and practical sessions/ exercises, self-study, individual projects, assessment) – the trainee may find a wide range of multi support learning activities, such as: presentations, videos, support for discussions, suggestions for hands-on activities, work project guidance, role-plays, tutorials, exercises and self-assessments.

Apart from the e-learning components, the b-learning course also includes practical activities/workshops in the companies/spot or eventually in the training provider that can deliver the course.

3. Piloting Numbers

In the lines below, some figures of the piloting can be encountered, at the time of the final report delivery:

- Number of prototypes manufactured by the trainees during the practical workshops / piloting: 14
- Number of trainees registered in the course: 108 register
- Number of trainees per country: 35 Portugal, 21 Spain, 14 Germany, 3 Czech Republic, 3 Poland, 2 France, 1 Netherlands, 1 Belgium, 3 USA, 4 Italy, 3 India and a small group from Greece, Canada, Hong Kong, Hungary, Bolivia, Turkey, Switzerland.
- Number of trainees that reach the end of training units and filled out the feed-back questionnaire: 48
- Number of companies involved: 97, including 64 different companies + 7 institutes/centres/VET school and other independents

4. Evaluation of the piloting of the E-learning component

At the time of the final report, 48 trainees filled out the feed-back form, giving the opportunity to the partnership to evaluate the level of satisfaction on competing the training units selected.

The blank form used for the feed-back is in the annex 1.

The form pretended to evaluate 6 dimensions of the learning process through the e-platform:

General expectations regarding the training unit(s)

Contribution of the contents to my personal development on Sustainability issues

Contribution of the contents to my company's development strategy regarding Sustainability

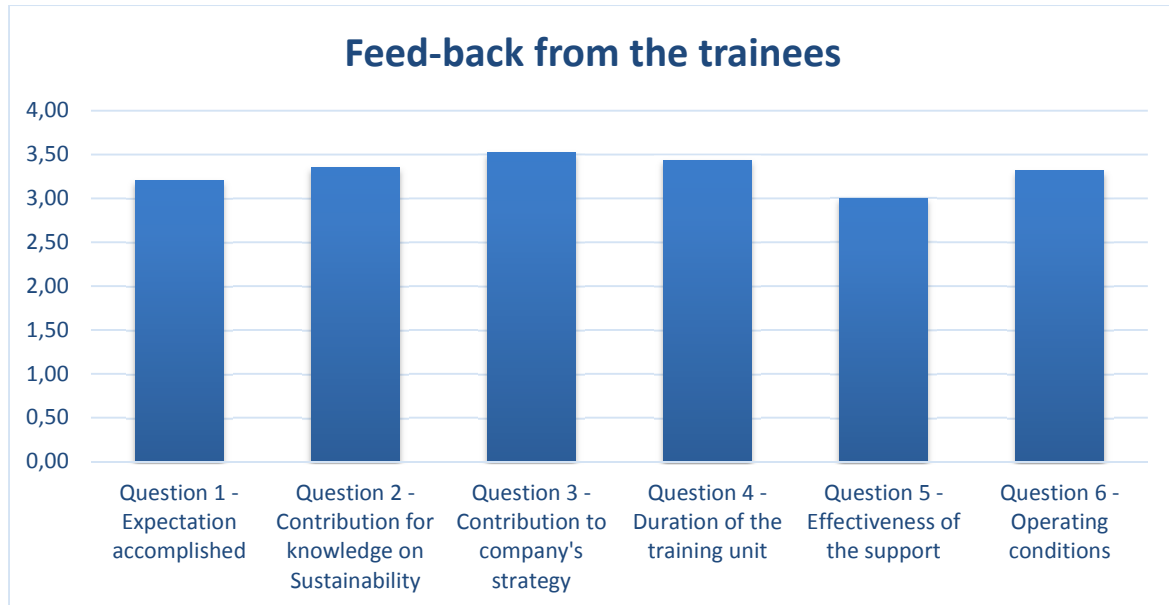
Duration of the training unit(s)

Effectiveness of the trainer(s) support

Operating conditions of the e-learning platform (accessibility, user friendly, language used, helpdesk support,...)

The trainee was invited to evaluate each criteria from 1 to 4.

The following graphic give a quite accurate vision of the level of satisfaction of the trainees:



5. Presentation of the practical workshops in company situs

5.1. Selection of the companies.

Our training materials were tested inside of the member's team. The decisions how and where to test them were done in February 2016 when the practical training units were finished in drafts.

The majority of the EU companies have winter season as the main production season and from March they finalize preparation and start full production latest in April. That is why was hard to find responsible technicians which could have a chance to give qualified opinion.

That is why the piloting was done by responsible technicians from companies:

- Klaveness, trainers from CTCP, production company FERN, training technicians from company ISC and designers from ARS Sutoria.

Beside many of co-working technicians the main participant were:

Klaveness:

Mr. Mario Moreira

Mr. Helder Pinho

Mr. Rui Maia

CTCP:

Mrs. Maria Jose Fereira

ISC:

Mr. Joachim Horzela

Mrs. Sabina Krebs

Mr. Michal Špaček

FERN:

Mr. Josef Macho

Mr. Petr Fajkus

ARS. Sutoria:

Mr. Paolo Merenghi

Mrs. Beatrice Zocchi

Mrs. Michela Colaiacovo

5.2. Piloting activities.

The first piloting activity was done on the meeting at company Klavness. Technical teams from companies Klavness, CTCP and ISC went through the first drafts of modules focused to materials, designs and production. This meeting created idea that our activities must be focused on activities which can do any company and the activities which will require huge investment in money and research capacity will be only mentioned in training documents as possibility.

The main topics were:

- biodegradable materials
- recycled materials
- natural materials without any heavy metals or other harmful particles
- save sources
- save energy, tools and consumption of materials
- avoid solvents
- show some way how to eliminate rework and reject

All that should be done in the way which doesn't need huge money and time investment. The way like robotic, printing, knitted uppers, special injection machines, laser treatments are described as inspiration but they are realistic because of money or time investment may be for only 1-5% of all shoemakers. We decided that this approach practically presented will influent much more. Also practically prepared samples which were in 1 case shown how to calculate the saving showed high savings.

This decision leads to the concrete decisions what to do and what to show. The final proposals:

- prepare the new designs using as much as possible biodegradable materials
- prepare the new design using as much as possible either biodegradable or natural materials

- change some existing designs and show material savings, prepare technical design in the way to avoid rework and avoid solvents
- use affordable technology which could be cheaper to the most widely used Cemented way of assembly
- use natural upper materials cheaper than leather but with good properties
- prepare upper sawing special tools and using lower grade of upper
- prepare exact samples and calculation how much material could be sawed in case that

Cemented way of construction is changed to Strobel construction in case that the wall side sole is used.

The search for materials was done by partners of S2S – CTCP, ARS Sutoria and ISC.

Tests, trials and final sample production ant companies – Klaveness, Fern and ISC.

This mixture of production companies and research partners was fruitful because not only practical production was proved but also partners in research teams train their ability to come to production, propose practical affordable changes leading to more sustainable production and participate on practical preparation.



Picture 1 - Photo from the team working at Klavenes. Technicians from Klaveness, CTCP and ISC.

5.3 Individual prototypes or processes

- Samples prepared at company Klaveness



Picture 2 Boot design ARS Sutoria Klaveness

The first shoe was developed as a new design.

The material used:

- Upper leather – biodegradable, producer Carvalhos Portugal
- Upper textile – organic textile Limontha
- Lining – biodegradable leather, producer Carvalhos Portugal
- Sole – recycled EVA, producer Finnproject, Italy



Picture 3 Casual shoe design ARS Sutoria Klaveness

Material used:

- Upper leather – biodegradable, producer Carvalhos Portugal
- Lining – biodegradable leader, producer Carvalhos Portugal
- Sole – recycled EVA, producer Finnproject, Italy

Above mentioned designs were new development. They are only examples. The fully biodegradable shoes express still today big investment. The biodegradable sole are existing but at the very beginning of their development very expensive and in addition very often require high energy to show biodegradability. In that case the environmental load is just moved from shoe material to another place. But was mentioned and in our manuals.

The next activity was focused on changes of existing models. Sawing material, no solvent and reduce rework. All glues were replaced by Fuller water-based glues. The shoes were done in 2 variants:

1st – leathers lasting margin was reduced 12mm with exception of front part. To keep leather in front part is better for fashionable front shapes. Front part lasting and heat setting will be needed in this case. Missing 12 mm of leather is replaced, for example by felt which is stitched vy zig-zag to the upper leather edge.

2nd – leather lasting margin was reduced 12mm all around. Missing 12 mm of leather is replaced, for example by felt which is stitched by zig-zag to the upper leather edge. Rounded wide front shape could be easily processed in that way. This process can save 8-12% of the leather material.



Picture 4 Vamp of existing model



Picture 5 „V“ notches will help folding of the material in front area



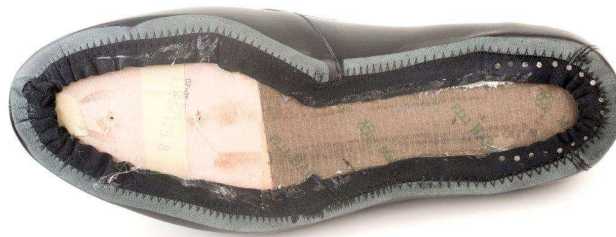
Picture 6 Example of good design of „V“ notches and leader grain skiving

„V“ notches and grain skiving (about 10-15% of the leather thickness) will help with bending and flat lasting. It is recommended to skive grain side of the leather before zig-zag stitching.

It will replace roughing effect and protect the threads at final roughing. This is not any extra cost and will save rework and in addition increase bond strength with sole or reduce sole bond claims.



Picture 7 Leather lasting machine sawing with leader replacement all around



Picture 8 Look of the lastex result



Picture 9 Look of the same type of shoes without the felt, without „V“ notches and without skiving.

Above picture 9 show the damaged material by roughing because material without notches and grinding is more rigid, there were wrinkles in front and back area which were reduced by roughing. Roughing went through leather thickness and damaged the leather structure strength.



Picture 10 Look of the original and new pattern for above mentioned method.

- **Samples prepared at company FERN.**

The company FERN was selected because they work with vulcanizing technology. This technology use strobeld uppers which are inserted on metal last. On last are placed pre-cut sheets of the raw rubber mixture, closed to the mould, pressed, taken pout to fill areas where material is missing and finally closed for about 5 minutes and temperature cca 170°C.

All making line is replaced by 1 simple machine. This means sawing space, labour, energy.

The energy costs for 1 pair is 0,20 – 0,40 EUR/pair. 0,20 EUR in case that production don't require many mould changes. 0,40 EUR in case of small series and frequent mould changes.

According required output the number of machines must be arranged.

Following pictures are describing process:



Picture 11 Metal last



Picture 12 Strobed upper



Picture 13 Upper on last with the first layer of rubber



Picture 14 Upper with 2 layers of rubber ready to be inserted for the first dressing



Picture 15 Look after 1st pressing



Picture 16 Correction of the places where material was missing



Picture 17 Shoe inserted in mould



Picture 18 Look of the complete machine



Picture 19 Look of the shoe coming out from the machine

Vulcanizing technology is another topic how to produce reliable shoes which can save energy, space, labour as well as the used soling material, based on SBR rubber is required for plenty of other applications mainly in civil engineering.

Our aim was to prove agility of natural or even biodegradable materials which can be used in this process and not damaged or lost properties at 5 minutes vulcanizing at up to 180°C.

Another topic for solution was selection of reinforcing materials, which material could be used for lining, if the upper could be functional without metal eyelets etc.

Finally was proved:

- **upper materials** from company Carvalhos from Portugal in version biodegradable as well as vegetable tanned.

-**upper materials** from company Wilhelm Germany - combination cotton and recycled viscose.

-**lining material** - natural cotton from company Wilhelm

-**reinforcing material** – material BIOTEC from company MOREL Italy. Material was used for counters and also reinforcing holes for laces.

-**water based** glues from company Fuller



Picture 20 Biodegradable upper leader



Picture 21 Vegetable tanned upper leader



Picture 22 Natural and recycled textile-low shoes



Picture 23 Natural and recycled textile – ankle shoes.

We proved that cheap vulcanized technology can use natural and biodegradable materials.

This technology and used soling material can offer possibility how to use liquidate the waste.

The upper part could be cut off and composted and bottom part milled and mixed to the materials for civil engineering or other application.

- **Prototypes prepared at ISC**

The aim for prototypes making was to prove that one technology could be replaced by another with the same machinery and wall side soles. We wanted to calculate exact the savings. The process should be done if possible in the way which eliminate plenty of different tooling and can use lower quality of leather on condition that the durability of the final shoes will be acceptable for customers.

The first focus was on process:



Picture 24 Automatic leader cutting-sawing production of cutting knives and high flexibility.



Picture 25 Automatic leader cutting and parking. 2 operations in 1.



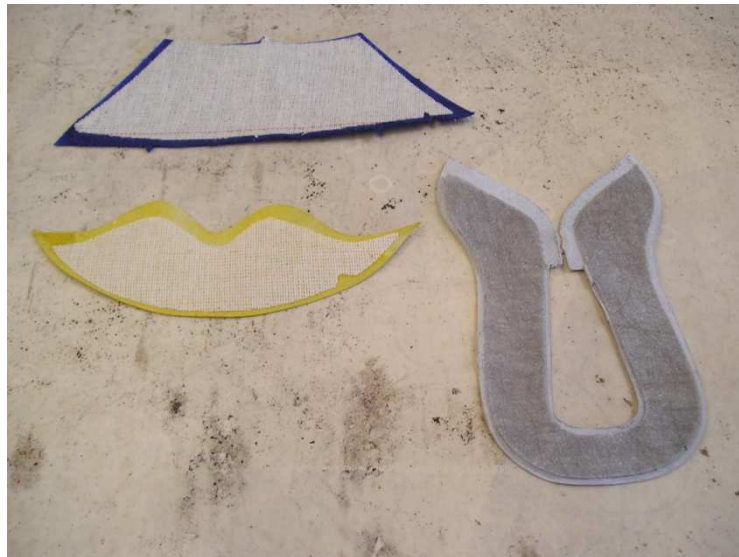
Picture 26 Perfect leader skiving



Picture 27 Zig –zag stitching save material-this is possible to use at some connections



Picture 28 Skived stitched and glued lining leather



Picture 29 Reinforcement of upper leader enables to use thinner or even Loir quality of materials



Picture 30 Upper stitching



Picture 31 Nylon thread pre-mould the front part



Picture 32 Nylon thread pre-mould the front part



Picture 33 Counter skiving



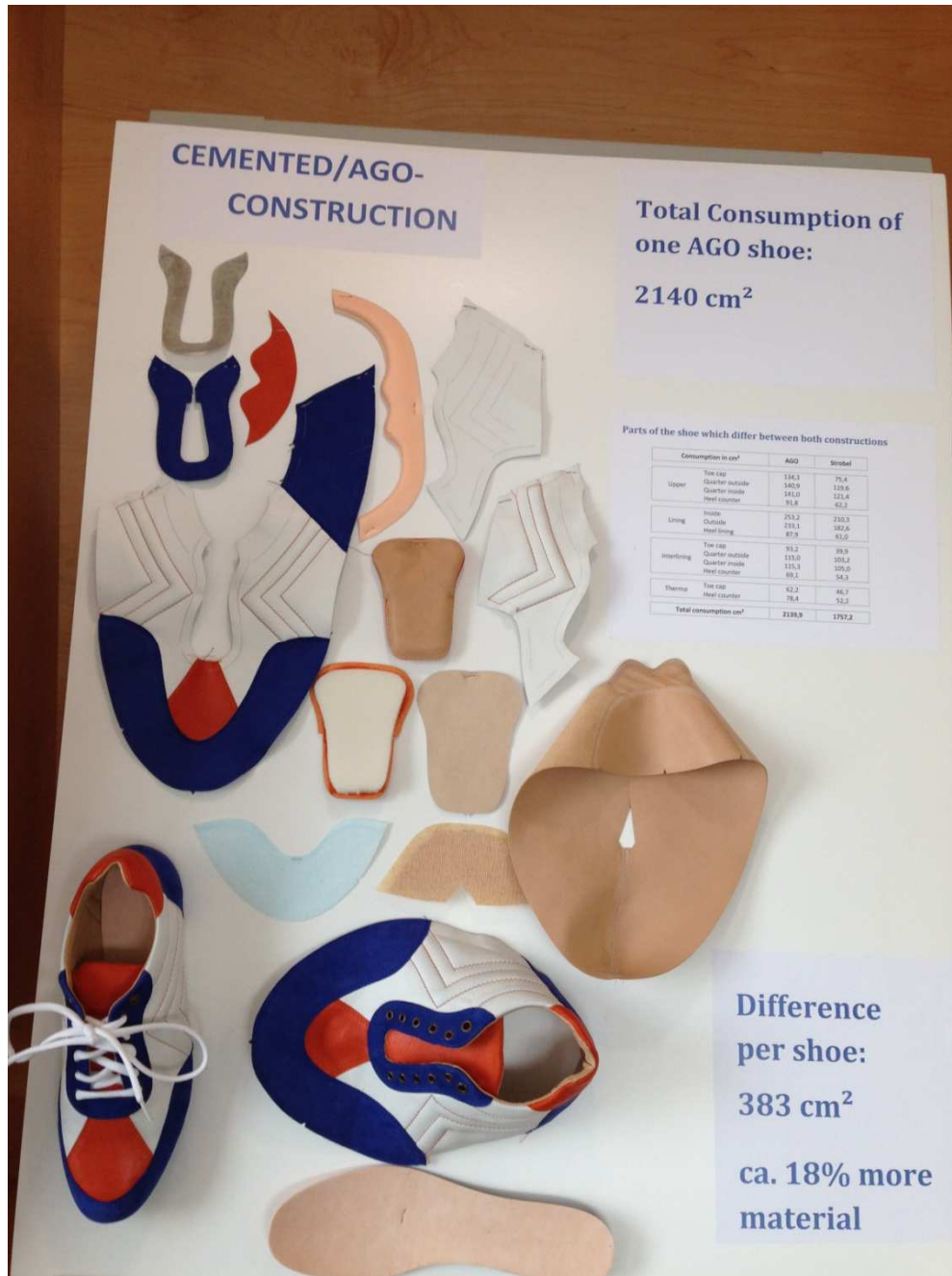
Picture 34 Back part moulding



Picture 35 Strobelling



Picture 36 Finished strobed upper



Picture 37 Hand samples and step by step operation practically displayed-the best way to maintain quality.



Picture 38 Some prototypes on „conference to sustainability at GDS 2016“.

Parts of the shoe which differ between both constructions

Consumption in cm ²		AGO	Strobel
Upper	Toe cap	134,3	75,4
	Quarter outside	140,9	119,6
	Quarter inside	141,0	121,4
	Heel counter	91,8	62,2
Lining	Inside	253,2	210,3
	Outside	233,1	182,6
	Heel lining	87,9	61,0
Interlining	Toe cap	93,2	39,9
	Quarter outside	115,0	103,2
	Quarter inside	115,3	105,0
	Heel counter	69,1	54,3
Thermo	Toe cap	62,2	46,7
	Heel counter	78,4	52,2
Total consumption cm²		2139,9	1757,2

Picture 39 Comparison of material consumption if the same shoe is produced in cemented way and second in strobel way.

The preparation team was very surprised with results. Just changing the technology saved 18% of the material consumption. The shoe stay the same. Not any look or quality difference.

6. Conclusion

Piloting proved many of simple ways how any shoe producer can direct its shoe production to the more green and sustainable without any big investments. The selected proposals were done in practice and it will be also part of practical education and evidence what is possible to do. We got additional result from piloting because the practice was done in cooperation between production companies and some technicians from the research team. Some more technicians from teams which can do practical training was trained and got practical skill for training in companies.

7. ANNEXES

A1 - Feed-back form blank used in the evaluation of the e-learning component of the course

A2 - Feed-back forms blank used in the evaluation of the practical workshops in the companies situs, directly participating in the piloting

E-learning course evaluation questionnaire

With this questionnaire we would like to get your opinion about the e-learning unit(s) you've just taken.

Your opinion will allow us to improve the whole course.

1. Evaluation grid

(Please select between 1 to 4 the value that better corresponds to your evaluation of the e-learning unit(s) you've just taken)

General expectations regarding the training unit(s)	Completely satisfied Quite satisfied Somewhat satisfied Not satisfied	4 3 2 1
Contribution of the contents to my personal development on Sustainability issues	Great contribution Good contribution Short contribution No contribution	4 3 2 1
Contribution of the contents to my company's development strategy regarding Sustainability	Great contribution Good contribution Short contribution No contribution	4 3 2 1
Duration of the training unit(s)	Adequate Quite adequate Medium adequate Inadequate	4 3 2 1
Effectiveness of the trainer(s) support	Very effective Quite effective Medium effective Not effective	4 3 2 1
Operating conditions of the e-learning platform (accessibility, user friendly, language used, helpdesk support,...)	Adequate Quite adequate Medium adequate Inadequate	4 3 2 1

2. Suggestions to improve

Thank you for your collaboration. Please return this questionnaire completed to
info@step2sustainability.eu

Practical activities evaluation questionnaire

With this questionnaire we would like to get your opinion about the practical activities that your company was involved in, in the frame of the STEP2SUSTAINABILITY project. Please provide information on the following aspects the most complete possible.

Duration of the practical activities (adequate/not adequate) :

Contribution of the activity to my company's development strategy regarding Sustainability:

Effectiveness of the trainer(s) support:

Operating conditions during the practical activities (materials available, support, involvement of the staff/workers, scheduling...):

Difficulties encountered and challenges:

Potentiality of commercialization of the footwear models developed:

General expectations:

Suggestions / remark for the future of the course:

Thank you for your collaboration. Please return this questionnaire completed to info@step2sustainability.eu