SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

D4.6 Pilot Activities Report

Executive Summary

1st Stage Pilots:

Qualification/Professional Profile:

Process Engineer PBF-LB

2 Competence Units /Units of learning outcomes:

Simulation Analysis and Simulation Execution

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Contents

1. Introduction

This document is an abstract of D4.6 1st stage pilot activity report - Students. It gives an overview of the conducted piloting activities within WP 4 Observatory in Additive Manufacturing. It includes the piloting of the guidelines/competence units (CUs)/units of learning outcomes (ULOs), the Quality Assurance System of the International Additive Manufacturing Qualification System (IAMQS), the related reporting activities and the achieved results of the 1st Stage of Real Case Scenarios of the SAM project.

2. Overview on 1st stage Real Case Scenarios' piloting activities

In line with the findings of D4.5 (1st Report on the Analysis and Validation of Skills Needs), the Process Engineer PBF-LB according to the "EWF Guideline for European/International Process Engineer Powder Bed Fusion Laser Beam" was selected as the full professional profile/ qualification for implementation in the 1st Stage of Real Case Scenarios. In the beginning, a revision process was done by a group of experts (D5.2 1st stage of real case scenarios Professional Profiles/Qualifications and Competence Units). In total, 15 CUs of the International Process Engineer PBF-LB Guideline were piloted. Furthermore, two CUs from another professional profile/ qualification were chosen, namely the competence units "Simulation Execution" (CU62) of the "International Metal AM Designer" and the competence unit "Simulation Analysis" (CU61). This was developed within the CLLAIM project (2017-3309/591838-EPP-1-2017-1-ES-EPPKA2-SSA, 2017 - 2020).

For preparation, implementation and debriefing their piloting activities, the pilot partners received a pilot implementation guide, a template for national reporting and a detailed description of their CUs/ULOs to conduct. Specifically, the piloting activities comprised virtual and in-person lectures, assessment of participants, the collection of feedback (2.7 Kit to collect feedback on the qualifications /training modules) and the provision of certificates to the participants.

The preparation of the piloting events started in June 2020 with the distribution of the CUs/ULOs amongst the partners. All piloting and reporting activities were conducted between November 2020 and February 2021. The period of implementation of 17 CUs/ULOs with training and reporting was encouraged and supported by various online alignment meetings and email support. 13 CUs were implemented virtually and 4 in-person training and face-to-face meeting according to the corona safety measures. In total, the implementation of the 1st Stage Real Case Scenarios had more than 500 participants in the lectures, given by about 40 trainers.

To ensure the independence of the assessments and the comparability in accordance with the IAMQS, exam questions were developed, verified and approved by the International AM Qualification Council prior to the exam. For each CU, the number of assessment questions corresponded to the allocated contact hours in the training to reflect the weighting of the teaching content in the examination. The exams were supervised by EWF, as part of the IAMQS Quality Assurance System or an authorised national body (ANB). Due to the situation caused by the coronavirus, a virtual assessment was conducted by the majority (76%) of the partners. In total 408 participants took part in the final assessment and 337 passed it during the implementation of the 1st Stage of Real Case Scenarios and were issued a certificate.

3. Feedback results and recommendations for the 2nd stage piloting

The results of the feedback survey indicate the opinion of participants regarding the AM qualifications and training modules on relevance, quality, attractiveness and usability. The Feedback analysis was done based on 420 answers to the feedback survey (22% female/78% male). Below, the main results are summarized:

- After attending the CU/ULO, the majority (92%) of participants stated that the course had met their expectations.
- 73 % agreed/strongly agreed with the statement "The training sessions were quite dynamic, in the sense that they were engaging and involved interactive activities, instead of being just expositive"
- Most of the participants (86%) rated the relevance of the course to their job activities as "satisfied enough" or better
- With a recommendation rate of 95%, the overall satisfaction of the participants is very high

In two debrief meetings with all partners the following recommendations and improvements for the next piloting stages were summarized:

Preparation of students and trainers:

- The participants will be informed at the beginning on the process of the piloting activity, so that they will be aware of all the steps/ actions included
- The piloting guide needs to be revised to better assist the trainers in preparing the piloting activity
- Every student that wishes to visit several CUs is invited to do so, therefore, the dates of all piloting events of the 2nd stage will be published on the same date
- A clear recommendation is to visit CU00 (Additive Manufacturing processes) prior to more advanced CUs, if the participants have no further basic knowledge on AM

Attendance:

- The assessment must be scheduled early enough, so that participants can book it in their calendars
- The feedback survey will be done directly after the assessment to avoid dropouts and to lower a possible hurdle for the survey
- Reaching gender balance will be a focus in the 2nd Stage of Real Case Scenarios
- Measures should be taken to reduce the large discrepancy between the number of participants in the lectures, the assessments and the feedback survey

Virtual / distance learning:

- It is recommended to follow a blended scheme (if possible, according to the COVID-19 situation), to combine online / distance learning implementation with in-person practical sessions in the laboratory

- If the lectures are implemented virtually, it is recommended to have shorter sessions per day (e.g. half day sessions or 2 hours per day), to use videos and to pay attention on an active link between teachers and trainers
- Online / distance training requires the active assistance of trainers during / after the lectures

Practical training:

- Virtual reality or more practical exercises can be used, break-out sessions during virtual lectures could be used
- The guidelines for each CU recommend the contact hours for the practical training, but every organisation can deliver more practical sessions or to have more active parts according to the demand
- some participants asked for more practical resources / practical training tools and examples – if possible, they should be included in the training

Assessment method:

- The wording from official standards will be used for the assessment (e.g., PBF-LB instead of SLM®)
- One harmonized multiple-choice question per recommended contact hour is the minimum requirement in terms of assessment for all participants, additional methods can be developed for the assessment by each AM ATB (authorized training body) or AM ANB (authorized national body) to test the required skills described in the guideline and to offer the possibility for participants to improve their result.
  - As multiple-choice questions are not applicable to test all skills, additional assessment methods, such as essay questions or case studies, will be implemented in the 2nd stage of Real Case Scenarios Pilots
  - The assessment duration is enhanced for the advanced level CUs - 1.5 minutes instead of 1 minute time to reply per multiple-choice question
  - To harmonize the practical assessment, a criteria matrix will be defined and prepared
  - The multiple-choice questions for CU15, CU26 and CU36 must be reviewed

Revision of guidelines:

- CU00, CU08, CU27, CU45, CU61 (in alignment with CU62) will be revised by the IAMQS (International Additive Manufacturing Qualification System), as
  - the content must be adjusted to the described learning outcomes
  - the state of the art has changed
  - the recommended contact hours did not match the content described