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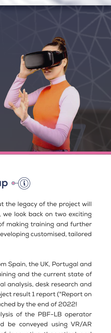
AR/VR for Aerospace PFB - LB Operators

AR/VR: Augmented Reality/Virtual Reality
PBF LB: Powder Bed Fusion, Laser Beam

Project Number: 2021-1-PT01-KA220-VET-000034876



AREOLA Project: Achievements Recap

The AREOLA project comes to an end in February 2024 - but the legacy of the project will continue and will be available to you and all of us! Together, we look back on two exciting years in which the AREOLA consortium worked on the task of making training and further education for PBF-LB operators more interactive as well as developing customised, tailored training material.

The project started back in February 2022 and 7 partners from Spain, the UK, Portugal and Germany started their journey by identifying the need for training and the current state of training in industrial companies and VET providers. An internal analysis, desk research and the results from the interviews were incorporated into the Project result 1 report ("Report on Validation Needs Analysis") - the first milestone had been reached by the end of 2022!
The partners continued directly with a comprehensive analysis of the PBF-LB operator guideline with the aim of determining which content could be conveyed using VR/AR technologies and the conceptualisation and development of innovative theoretical and practical content (Project result 2: Materials for PBF-LB Theoretical) and Project result 3 (VR/AR tools Practical). Milestones 2 to 4 were successfully achieved. Energised by an internal exchange and the joint internal testing of the developed material as part of a train-the-trainer workshop in the UK in March 2023 hosted by MTC, the consortium set a plan for project piloting. As part of the AREOLA pilot project, the theoretical and practical training material was tested both virtually and in-person in the UK, Spain, Portugal and Germany with participants external to the project (milestone 5).

Figure 3: AR/VR as training supporter

The events were evaluated through feedback questionnaires, in which the participants provided valuable feedback on what they had experienced. Overall, the consortium received a lot of positive feedback (78% of participants that agreed or agreed strongly found the training course to be educational and it met their expectations. 73% stated they would recommend the course to others) and also very useful constructive suggestions for improvement, on the basis of which the material could be revised and adapted. The feedback was also used to update the Blended Learning Guideline for PBF-LB operators in Project Result 5 (in line with milestones 7+8).

The material developed, the feedback received, and the results of the pilot project were presented at national virtual roundtables, national in-person seminars in all partners' countries between November and February 2024. The project was also presented to the international stakeholders at the European conference on 20 November 2023. The project results were shared with a wider audience and some participants had the chance to try out the AR/VR tool at this event. Through the **multiplier events (MEs)**, the project reached around 200 organic audiences. This included milestones 6, 9 and 10 of the AREOLA project.

AREOLA Project: Feedback and Improvements

One of the most important activities of the AREOLA project has been the testing of the materials and training applications developed during its course, in pilot training activities involving personnel not directly involved in the project's development, and participants from several external organizations.

The pilots were **structured in 2 stages**.

AREOLA Theoretical Pilots:

These pilots aimed to test the training materials developed for in-person or distance learning modes, covering topics such as PBF-LB machine maintenance, powder management, and specific content for the aerospace industry. They involved conducting courses of approximately 8 hours in duration, with one pilot activity per participating country (Portugal, Spain, the United Kingdom, and Germany). In total, 104 individuals participated, encompassing both active workers and trainees from various industry segments, including aerospace, defence, automotive, and more.

Some of the testimonies from the participants are:

- The course provided valuable and comprehensive information, making it accessible to individuals who are new to the subject matter. The incorporation of videos and photos throughout the course added an engaging element.
- Very informative overview of all metal AM processes. PBF process explained in detail covering all aspects.

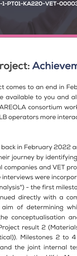
AREOLA Practical Pilots:

Three use cases aimed to test the software applications developed for practical training, using extended reality technologies, and comparing them with traditional hands-on training methods. The topics for which virtual software applications were developed are: laser power of a PBF-LB machine measurement, recoater blade change, and a health and safety walk-around. The virtual software applications developed (by MTC and IDONIAL) were deployed onto a VR (Virtual reality) Meta Quest 2 headset to provide a fully immersive training experience. The participants were trained on these selected use cases using both traditional hands-on methods and XR tools. They then completed a assessment on the topics covered and reflected on their user experience through a feedback survey.

A total of 58 participants (mostly engineers, designers, and technicians) took part in the practical pilot activities. Once again, these were carried out through the collaboration of all the organizations involved in the project, so participants form Portugal, Spain, the United Kingdom and Germany were enrolled. Notably, for just over 40% of the participants, this pilot marked their first exposure to extended reality technologies.

Some testimonials from practical pilots are as follows:

- Structured; you get a good impression and feel prepared to go to the machine.
- You can do the training anywhere, & you don't have to have the machine to learn about.



Despite their individual significance, both activities hold immeasurable combined value as they have allowed for the testing of blended training methods applied to the additive manufacturing environment.

Although the scale of the results is somewhat limited at the moment, and there are several areas that require dedicated effort to enhance the applicability and business sustainability of these training solutions (such as creating more dynamic and interactive theoretical training materials, increasing digital competence in extended reality technologies, generating low-cost integrable assets for virtual environments, establishing structures and methods for developing highly replicable and adaptable digital contents, etc.).

However, these same results undeniably indicate the path toward successive steps, enabling the further development of digital content with sufficient scope to cover complete professional profiles in the fields of additive manufacturing.

>> Innovation >> Implementation

AREOLA Project: Call to Action

We are thrilled to share exciting updates from the AREOLA project, where innovation meets aerospace excellence. AREOLA team has been hard at work developing customised training materials tailored for Metal AM Operator for PBF-LB in the aerospace sector. But that's not all – we've taken the training experience to new heights by creating virtual reality (VR) training scenarios.

Embark on a Virtual Journey:

Step into the world of AREOLA VR scenarios, meticulously crafted to enhance the skills of Metal AM Operator for PBF. Experience firsthand the dynamic challenges and scenarios. Our virtual reality training scenarios are designed to provide a unique learning experience, pushing the boundaries of what's possible in practical training for additive manufacturing.

Call to Action: Test, Share, and Inspire!

We invite you to be a part of this groundbreaking initiative by testing AREOLA VR scenarios. Share your experiences, insights, and testimonials with us! Your feedback is invaluable in refining and perfecting our training materials for the benefit of the entire AM community.

Stay Connected with AREOLA:

To access the project materials, stay updated on the latest developments, and participate in shaping the future of Metal AM PBF-LB operations, visit our project website. There, you'll find a set of resources, including (virtual) training materials, guidance documents, and more.

Join us on this transformative journey as we redefine the training for Metal AM Operator for PBF. Your engagement and feedback play a crucial role in the success of the AREOLA project.

Thank you for being a part of the future of additive manufacturing training!

>> Results >> Materials

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