AREOLA | e-Newsletter #3
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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

Development of VR/AR tools to deliver PBF-LB Operator Training

Development of Virtual and Augmented Reality (VR/AR or xR) training tools is central to the AREOLA project. The aim of the project is to explore how digital technologies can be used to provide more effective and flexible training for PBF-LB operators to meet the needs of the aerospace sector.

This new, innovative approach will help to overcome the challenges of conventional face-to-face training, experienced during covid 19 pandemic.

Practical AM machine operations, highly applicable to the aerospace industry, were identified by the partners to form the basis of AR/VR training scenarios to be progressed in the project. The xR tools were then selected to provide the most effective approach for each of the selected scenarios.

Training scenario selection for the xR applications

To select Additive Manufacturing use cases for xR tool development, the practical operations which form part of the training undertaken within the PBF-LB qualification have been reviewed. The ten most suitable were selected using an evaluation matrix based on industry need, compatibility with xR training tools and the greatest value for VET centers and students.

The down selection process also involved a detailed review of how these practical operations are currently taught, including the associated training material for each of the Competence Units which comprise the PBF-LB operator qualification within the International Additive Manufacturing Qualification System (IAMQS).

Downselected Practical scenarios

Operation	CU
Clean protective lens	21
Exchange nozzle (ie EOS aerospike)	21
O2 Sensor check	21
Recoater blades replacement and alignment	21
Particle capture bin change over PCBCO	21
Wet separator	21
Health and safety (walk around)	21
PBF-LB system, including components and their functions	15
Pre buid check list (walk around)	18
Laser checking	18

In addition, the availability of both the AM and xR hardware required to perform the piloting later in the project were taken into consideration, which led to the selection of the 'Recoater blade replacement and alignment' and 'Laser checking' scenarios for xR tool development.

>> AREOLA Project   >> Project Impact

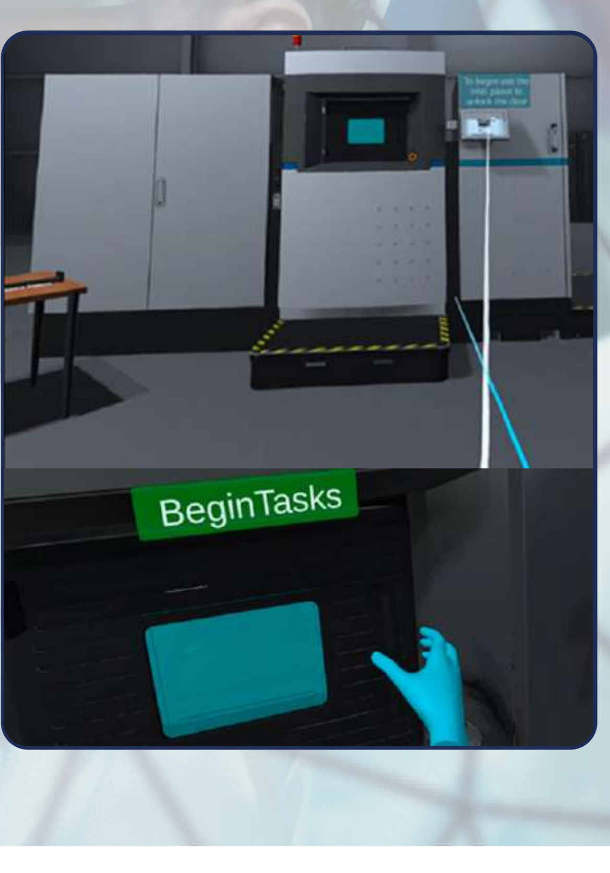
VR/AR tool selection and development for practical training

Following the down selection of the practical scenarios, available xR tools were evaluated and Unity 3D was chosen as the software tool to develop the practical use cases in Virtual Reality (VR). Unity is widely used for immersive application development as the software is capable of local application development and deployment, both of which are essential to meet the secure nature of data handling in the Aerospace sector.

Virtual Reality enables a fully immersive safe and standardised way in which a practical training scenario can be taught, which can enable a good comparison to hands-on practical training.

The 'Recoater blade replacement and alignment' scenario is the first use case to be developed for the piloting, to assess xR tools for the PBF-LB Operator Training.

>> Innovation   >> Implementation



AREOLA Train the Trainers

From 28th to 31st March, an exciting 4-day internal learning activity, known as Train the Trainers, took place hosted by MTC in Ansty Park, Coventry. This program aimed to equip trainers with the necessary skills to utilize xR (Extended Reality) tools effectively and prepare them to pilot the AREOLA training materials.

During the four days, participants were introduced to xR background knowledge and practical skills. A comprehensive discussion took place, exploring the history, benefits, and integration of xR technologies into training programs. This provided trainers with a solid foundation to understand the potential and value of xR tools in enhancing the learning experience.

Once equipped with the basic knowledge of xR technologies, partners had the opportunity to fully immerse themselves in xR tools. They experienced firsthand how these tools work and actively practiced intervention strategies when faced with challenges during the actual pilot implementation. This hands-on approach allowed trainers to familiarize themselves with xR tools and gain confidence in utilizing them effectively.

Furthermore, both theoretical and practical existing materials were thoroughly tested by trainers throughout the week. This process ensured that the training materials were comprehensive, relevant, and aligned with the objectives of the AREOLA project.

The Train the Trainers program was a crucial step in preparing trainers to deliver high-quality and engaging training sessions using xR tools.

AREOLA First Round National Piloting - Theoretical Materials

AREOLA project pilot course was successfully completed, which focused on Power Bed Fusion-Laser Beam (PBF-LB) with metals. This course was developed based on the existing curriculum of the EWF guideline, "The International Metal AM Operator Powder Bed Fusion - Laser Beam (I MAM O PBF-LB)". Participants from industrial companies, AM machine manufacturers, training centers (in the IAMQS network), and Vocational Education and Training providers working in the PBF-LB field took part in this course. These pilot courses were implemented in project partners' countries: Portugal, Spain, Germany, and the UK.

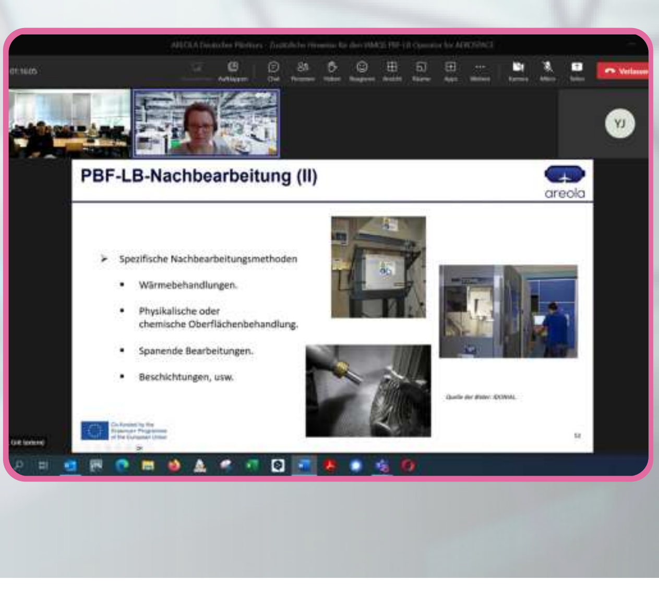
Throughout the course, participants had the opportunity to enhance their knowledge in various key areas:

1. Basis of PBF-LB Systems: Participants gained a comprehensive understanding of the fundamentals of Power Bed Fusion-Laser Beam systems.
2. Management and Maintenance of PBF-LB Machines: The course provided valuable insights into effectively managing and maintaining PBF-LB machines, ensuring safe and optimal operation.
3. Powder Handling: Participants were equipped with the necessary skills and knowledge to handle powders used in the PBF-LB process in aerospace sector, emphasizing safety protocols and best practices.
4. Aerospace Applications: The course delved into the specific applications of PBF-LB in the aerospace industry, exploring the potential and advancements in this sector.

To facilitate an engaging and interactive learning experience, the course materials consisted of presentations, case studies, and multiple-choice questions. The presentations offered visual experiences, bringing concepts to life, while the case studies fostered dynamic discussions among participants. Additionally, the inclusion of multiple-choice questions facilitated active participation and enabled participants to evaluate their understanding and progress.

Testimonies from participants highlighted the course's effectiveness:

- Content, experience, audiovisual material, and the trainer's knowledge of the material.
- The entire manufacturing and maintenance process was covered from start to end.
- Clear explanation, appropriate examples.



AREOLA Next Actions

AREOLA Practical Pilots:

In the AREOLA project theoretical and practical AM training material is being developed, and the theoretical material pilots are underway. The upcoming practical training material pilot would consist of running a hands-on and xR training scenarios side by side for comparison, starting with the Recoater blade replacement and alignment operation. Following the completion of the pilot, feedback would be gathered from trainees and trainers to better understand the applicability of xR technologies for AM training and the aerospace sector.

AREOLA TPM in Munich:

The Transnational Project Meetings (TPMs) are a great opportunity for all the project partners to share and disseminate findings from the project and align on the project progress. An upcoming TPM meeting, to take place in October in Munich, Germany, will be a chance for all the partners to share their experiences in piloting theoretical and practical AM training material as well as exciting outcomes of the AREOLA project.

AREOLA National Roundtables and Seminars:

With the large amount of information and findings on AM training for the aerospace gathered throughout the duration of the project, dissemination will be essential in enabling the training to become more efficient and adaptable in ever so changing digital era. The National Roundtables and Seminars will be scheduled towards the end of a project as a way to share exciting findings from the AREOLA project and to positively impact the AM training for the aerospace.

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