Development of continuous feeding approach for solid-state Additive Manufacturing (FSEAM) - MSc

Additive Manufacturing (AM) of high strength aluminium alloys by fusion based approaches is often limited by the occurrence of solidification related defects. Solid-based approaches form an attractive alternative where the temperature during deposition remains below the melting point. The in-house developed Friction Screw Extrusion Additive Manufacturing (FSEAM) process is a very promising approach to fabricate aluminium and magnesium parts with much higher resolution and part complexity than state-of-art solid-state approaches. First results have been very interesting (Fig. 1), but are limited by a batch-based approach to supply feedstock material. It results in relatively temperatures and poor dimensional control at the ends of the build, leading to reduced mechanical properties and overly thick end sections (see Fig. 1).

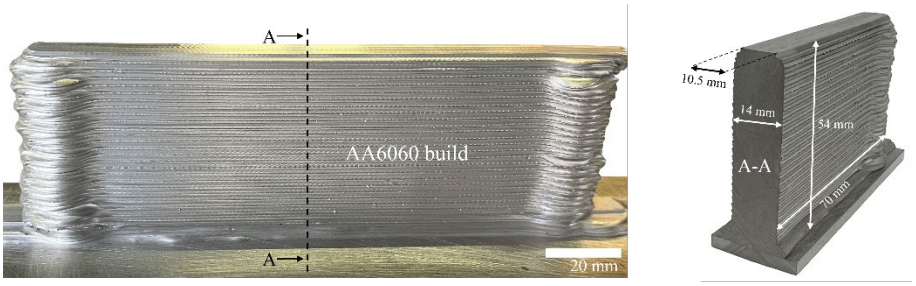

Fig. 1. Example of a FSEAM build fabricated from AA6060 (Al-Mg-Si alloy) at 500 mm/min.

Currently, feedstock material is supplied through a hydraulic feeding system (see Fig. 2, left) where small pieces of material are pushed in one after another. However, when a new piece of material is placed, the temperature in the printhead drops, which causes poor printability upon restart of the printing process. Therefore, a continuous system is highly desired, for example, based on a pair of profiled rolling wheels (see Fig. 2, right). Preliminary work has indicated that such a system is feasible, but literature shows that also other approaches are possible.

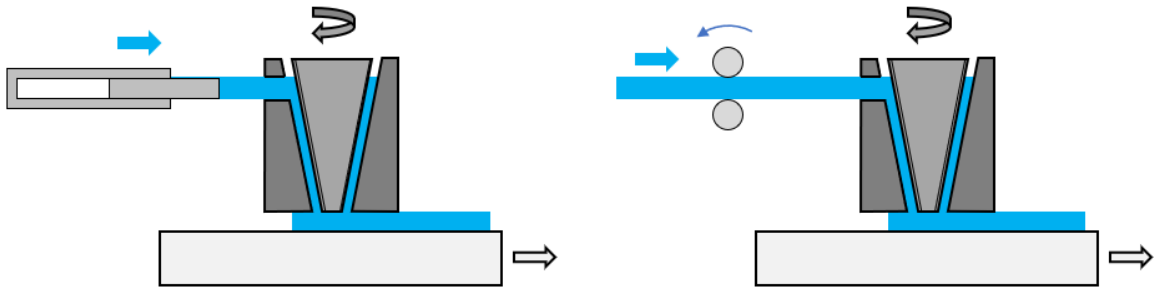

Fig. 2. Schematic pictures of batch-based feeding (left) and continuous feeding (right).

The MSc assignment comprises:

- Literature review on relevant continuous feeding approaches for high-strength aluminium and magnesium alloys; selection of feasible approach.
- Development of proof-of-concept of selected approach supported by experimental and (basic) modeling work.
- Fabrication and testing of feeding approach on FSEAM setup. Manufacturing and testing of relevant builds with developed feeding approach.

Would you like more information on this fascinating assignment? Please contact:

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