

NUMERICAL INVESTIGATIONS OF WIRE-ARC ADDITIVE MANUFACTURING.

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ABSTRACT

Wire-arc Additive Manufacturing (WAM) is an emerging technology with potential widespread application across a range of manufacturing industries. Additive manufacturing is ideally suited for high-cost low-volume metal components. WAM, in particular, is an appropriate choice where large scale structures are considered. WAM could help to reduce inventory and facilitate rapid prototyping for complex, so called ‘thin walled’, structural parts. It can therefore be considered a key green technology in metal manufacturing. Due to similarities with its antecedent technology, welding, some insights from the more mature welding field are transferrable [Karayel, et al. 2020]. Despite the similarities, key aspects of the material specific processing windows need to be tailored for WAM applications. To reduce costly and wasteful experimental process optimisation, numerical simulation can be applied [Sampaio, et al. 2023]. Several factors must be considered in determining the success of a WAM build. The control of the thermal field is paramount to obtain a consistent wall thickness and meet expected design tolerances. A coupling of thermal and mechanical simulations can help to predict residual stresses and distortions. The incorporation of microstructural effects including void formation can help to improve the build quality and minimize the incidence of deleterious defects in the final part.

The aim of the Invited Session is therefore to highlight the newest cutting edge modelling techniques for Wire-arc Additive Manufacturing (WAM).

Welcome are presentations covering the numerical modelling of wire additive manufacturing. Both thermal-only and thermo-mechanical simulations facilitating any simulation technique at any scale are covered in this invited session.

REFERENCES (Not mandatory, maximum 2 references)

- [1] Karayel, E. a. (2020, 9). Additive manufacturing method and different welding applications. *Journal of Materials Research and Technology*, 9(5). doi:10.1016/j.jmrt.2020.08.039.
- [2] Sampaio R., et al. (2023, 2). Modelling of wire-arc additive manufacturing – A review. *Advances in Industrial and Manufacturing Engineering*, 6, 100121. doi:10.1016/j.aime.2023.100121

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Organizers of Invited Session (IS) proposals are requested to send an abstract of approximately 300 words (1 page) no later than **December 4, 2024**, following the format of this template.

The abstract should briefly illustrate the contents and objectives of the session as well as the IS Topics. The list of prospective speakers is not required.

For practical reasons, each IS shall have a Corresponding Organizer, who will submit the IS proposal and keep in contact with the Conference Secretariat, and one or more Co-organizers if this is the case.

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