ICAM26

International Conference on Advanced Manufacturing

Research to Application through Standardization

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Value Chain: In-Situ Monitoring and Process Control

As Additive Manufacturing (AM) continues to evolve and gain widespread industrial adoption, in-situ monitoring and process control have emerged as essential enablers of high-quality, reliable, and cost-effective production. These technologies can underpin improvements in build yield, part quality, and process repeatability, while also reducing reliance on traditional non-destructive evaluation (NDE) and accelerating qualification and certification pathways.

There is broad recognition across the AM community that coordinated, cross-value-chain efforts are needed to advance sensing capabilities, data interpretation, intelligent control, and the standardization of monitoring methodologies. This symposium invites contributions that advance the science, engineering, and implementation of in-situ monitoring and process control for any AM process.

Topics of interest include but are not limited to:

1. Landscape and state of the art
- Landscape assessments of in-situ monitoring and process control in AM
- Challenges and advances in in-situ monitoring, process control, and predictive (feed-forward) process strategies

2. Sensing technologies and system architecture
- New sensing solutions, system designs, and architectures for in-situ data capture
- Multi-sensor data fusion and hybrid sensing strategies

3. Data, signal interpretation, and process physics
- Use of in-situ data to elucidate process physics
- Development and validation of signal–flaw–property relationships
- Case studies correlating sensing modalities with failure modes, material quality, performance, or dimensional conformance

4. Data processing, software, and data management
- Novel data processing techniques for in-situ monitoring data
- Software tools related to the collection, analysis, or visualization of in-situ monitoring data
- Verification, validation, and management of in-situ monitoring datasets

5. Modelling, digital twins, and machine integration
- Integration of monitoring, control, and physics-based or data-driven modelling directly within machine platforms
- In-situ datasets to support AM digital twins

6. Process optimization and manufacturing outcomes
- Use of in-situ monitoring for process optimization, part personalization, and first-time-right production
- In-situ monitoring to accelerate process development or augment post-process NDE

7. Qualification, certification, and standardization
- Qualification and certification approaches enabled by in-situ monitoring
- Standardization of in-situ monitoring and process control workflows

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