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ReMAT

- State-of-the-Art
- Project P2025-03611
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- Presenter Swathi Manchili, Researcher

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High-Strength Steels in Modern Industry

- Enable critical applications across energy, transport, and heavy industry
- Designed for high strength, durability, and reliability
- Increasing demand for high-performance components
- Central to modern industrial infrastructure

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Increasing Pressure on Material Use

- Reduce environmental impact and emissions
- Improve resource efficiency
- Manage material supply risks
- Control production costs

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Additive Manufacturing in Context

- Additive manufacturing enables high-performance, complex components
- Well-developed processes with stable and reliable operation
- Powder-based feedstocks with controlled characteristics
- Supported by established material processing and recycling routes

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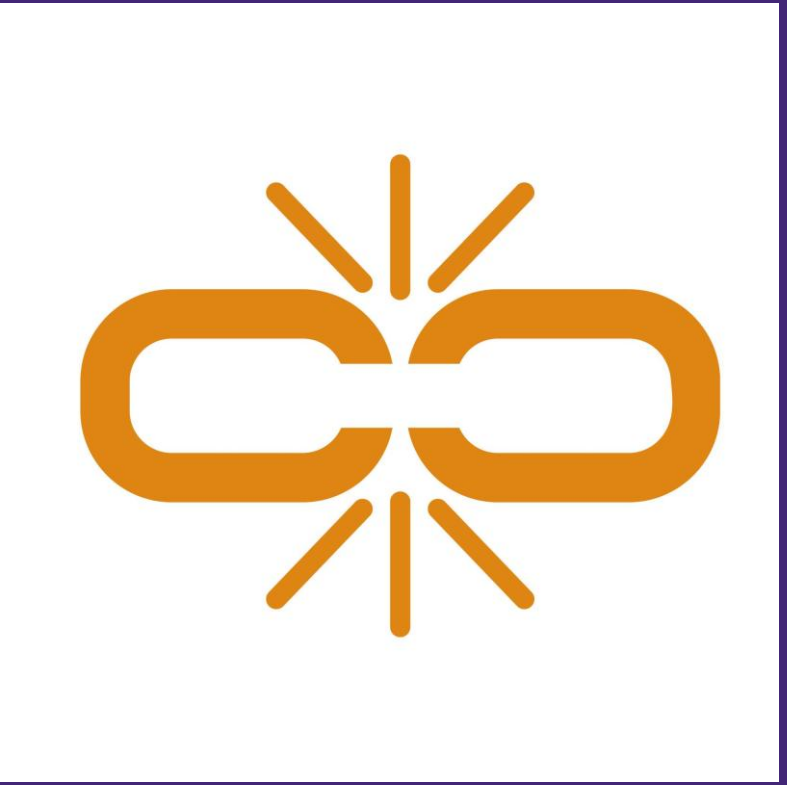
The Missing Link

- Additive manufacturing is well established.
- Powder production technologies are available.
- Recycling routes exist at industrial scale.



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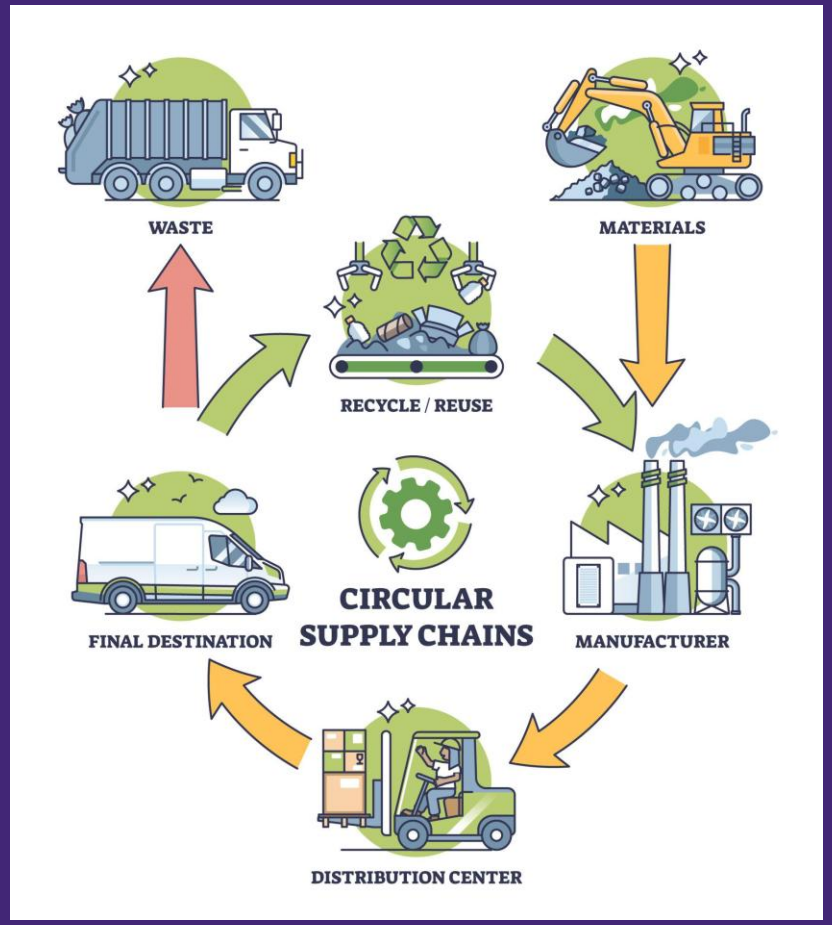
Unlocking the Opportunity

- Enable higher value from existing materials
- Reduce reliance on primary raw materials
- Improve overall material utilisation
- Create new opportunities for advanced manufacturing



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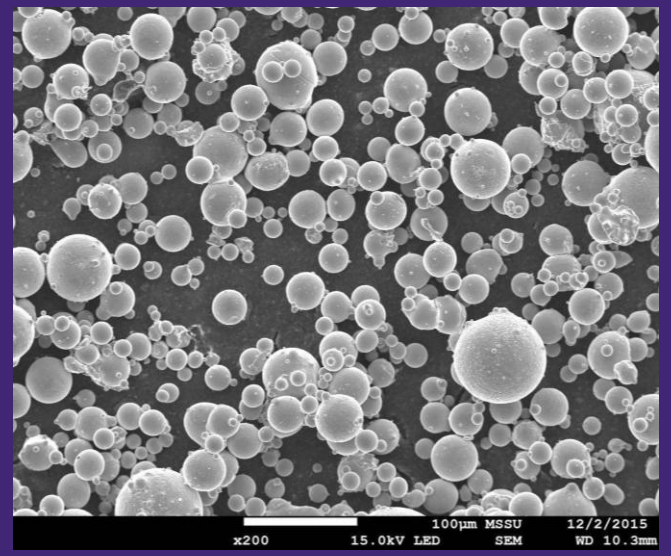
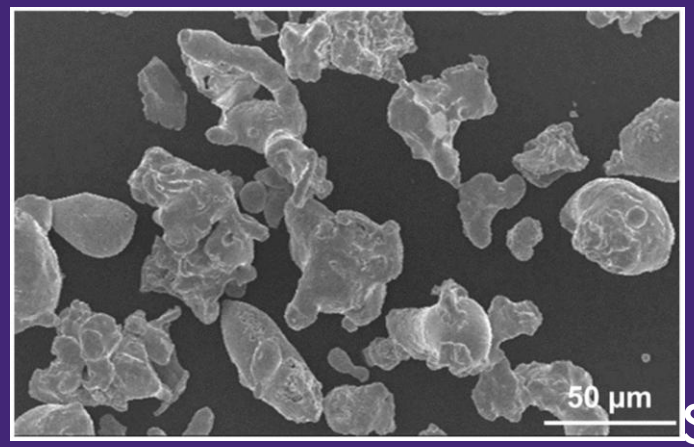
Powder Production and Feedstock Options

- Gas atomisation produces high-quality, spherical powders
- Water atomisation offers a cost-effective route for recycled materials
- Scrap-based powder production is technically feasible at scale
- Feedstock quality and consistency remain critical for AM





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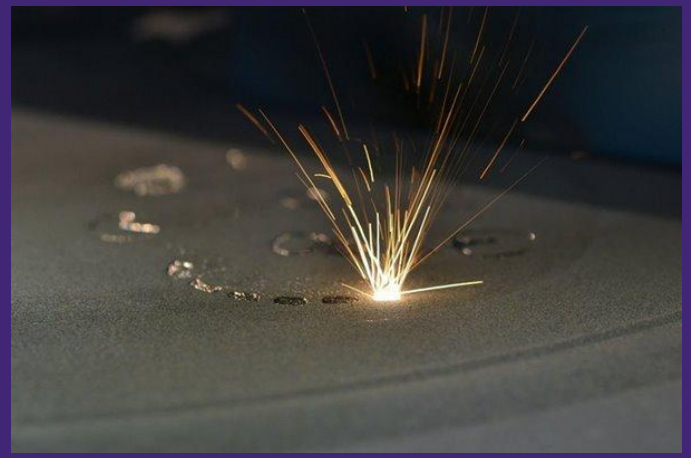
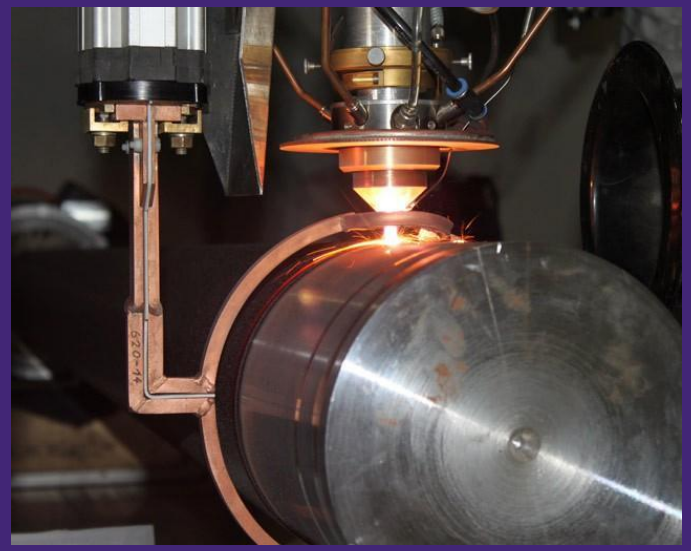
Additive Manufacturing Technologies

- PBF-LB → high precision, strict powder requirements
- MBJ → higher throughput, post-sintering required
- DED → flexible feedstock, suited for repair and larger features
- Different processes enable use of different powder fractions





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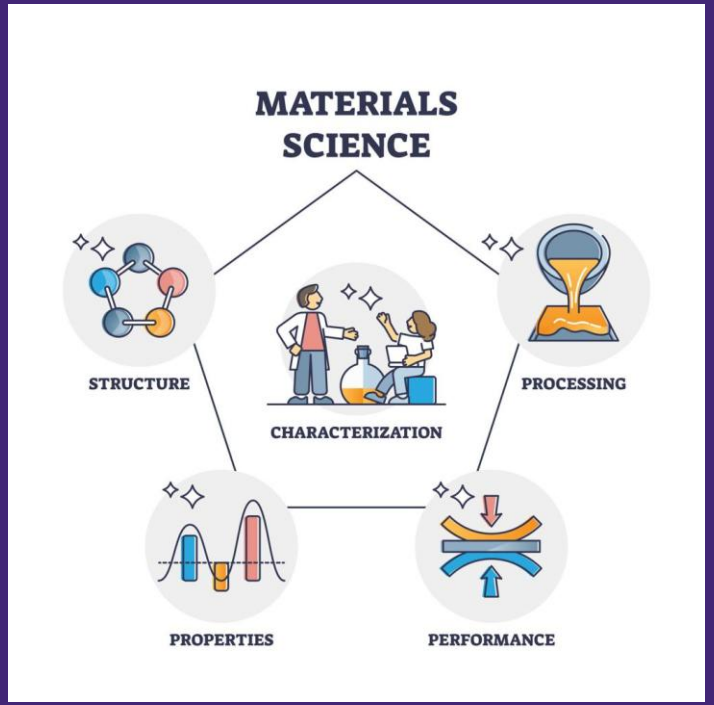
Material–Process–Component Relationship

- Powder characteristics influence process stability
- Process parameters control microstructure and defects
- Component performance depends on resulting material properties
- Variability across this chain affects reliability



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Implementation Status

- Additive manufacturing is increasingly used in industrial applications
- Strong ecosystems exist in Europe, North America, and Asia
- Sweden has advanced capabilities across the value chain
- Implementation of circular approaches remains limited

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Key Challenges in Industrial Implementation

- Variability in material quality affects process stability
- High cost and dependence on virgin powders
- Limited integration across the value chain
- Lack of standardised qualification for recycled feedstocks

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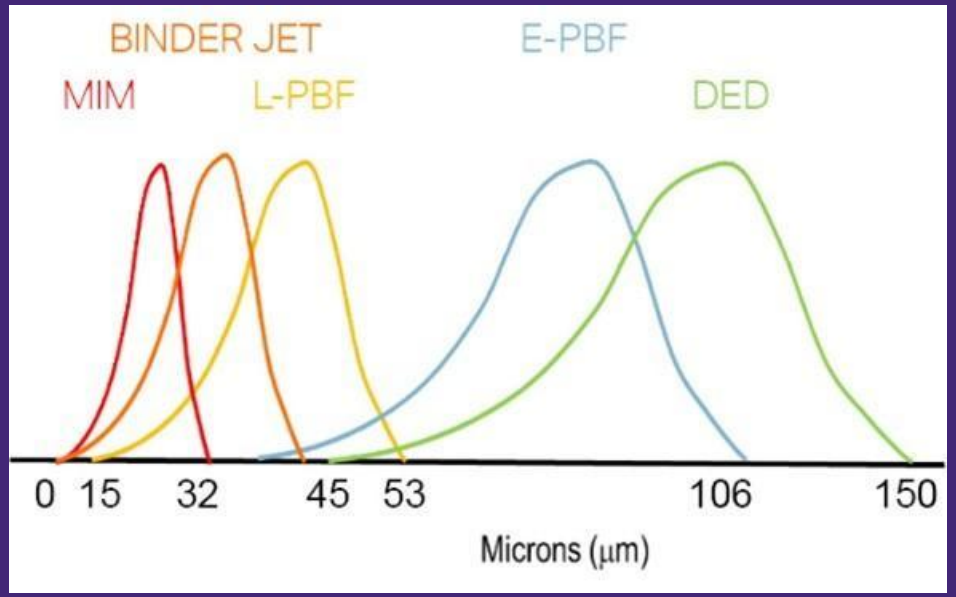
ReMAT: Integrated Approach

- End-to-end approach: scrap → powder → AM → component
- Integration of recycling and manufacturing
- Controlled reuse of powder feedstock
- Data-driven link between material and performance



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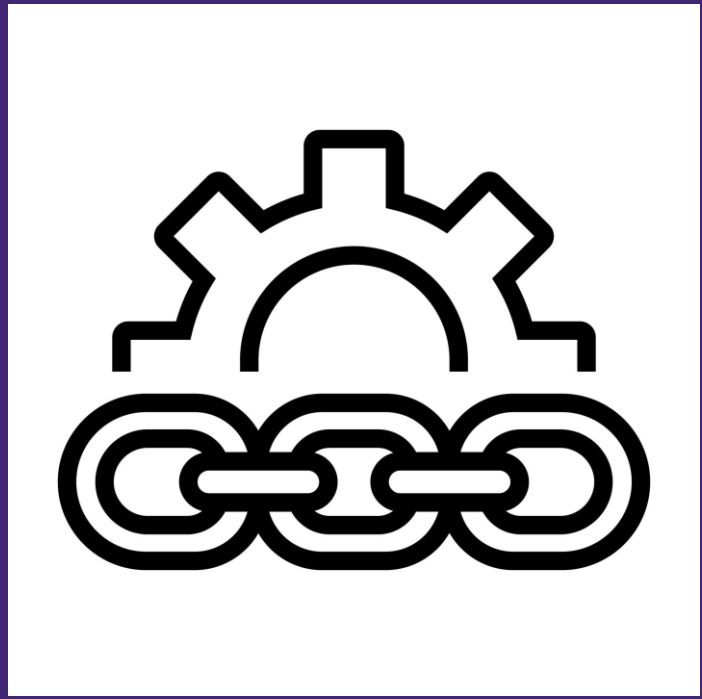
Expected Impact

- Higher value from existing material resources
- Reduced reliance on primary raw materials
- More resilient and secure material supply
- Enhanced competitiveness in advanced manufacturing



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