NAAT Batt Symposium

HATCH

Hatch Technology Solutions:
Agile, Smart, Sustainable

James Ansen
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Accelerating Innovation

Combining innovative process engineering with well-defined engineering milestones has been the basis of Hatch's approach to projects.

Dr. Gerald G. Hatch, founder and former president of Hatch

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Agenda

1. Forces shaping Hatch technologies
2. Hatch Solutions
3. Conclusion
4.

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Forces shaping Hatch technologies

ESG

A holistic and circular approach to cover all stages of the EV batteries´ life cycle.

Speed to Market

Reducing the time-to-market to gain a competitive edge

Digitalization

Digital technologies to improve safety, increase efficiency and quality, and reduce costs

Increase in Metals Demand

Global battery and minerals supply chains need to expand drastically to meet projected critical minerals demand

Feed Variability

Constant innovation in the batteries' chemistry challenges adaptability for process flowsheets tuned for specific feed composition

Product Quality

High purity materials are crucial as even very small amounts of contaminants can have catastrophic consequences in the final battery performance.

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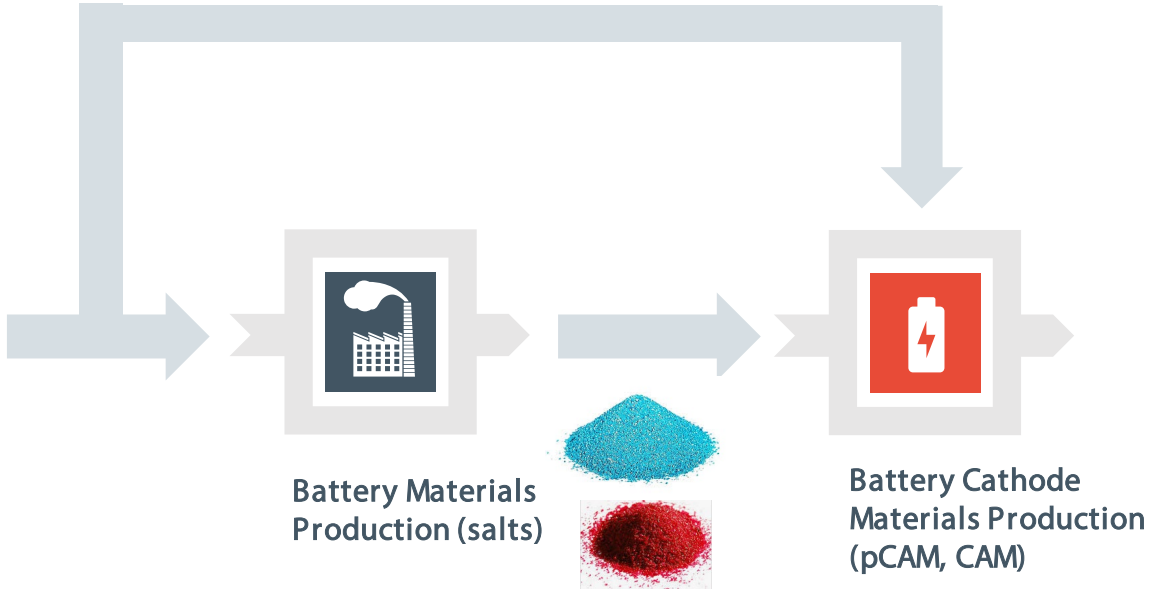
Novel Processes/Flowsheets

Primary Sources
Ore, Brine, Concentrate

Intermediate Sources
MHP, MSP, Matte, FeNi, Cathode Metals, etc.

Secondary Sources
Waste, Tailings

Direct Recycling
Scraps, Black Mass



Hatch has established different pathways (novel flowsheets) to produce battery materials from various sources, reducing cost (capex and opex) and environmental footprints in comparison to some of the conventional pathways

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Increasing performance while reducing the cost – some examples

- Reducing acid and base consumption using novel flowsheets (e.g., Removing need for Nickel Solvent Extraction step)
- Using alternate reagents (e.g., replacing caustic with potassium hydroxide)
- Using Regenerative lixiviants (e.g., use of hydrochloric acid or nitric acid instead of sulfuric acid)
- Efficient fluorides removal
- Taking advantage of electro-processing (e.g., electrolysis , electrodialysis)
- Keeping emissions in mind!

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Digitalization

- Use of intelligent instruments and analyzers (adopting or developing new sensors)
- Advanced process controls powered by machine learning (ML) and Artificial Intelligence (AI)
- Digital Twins for prediction and training

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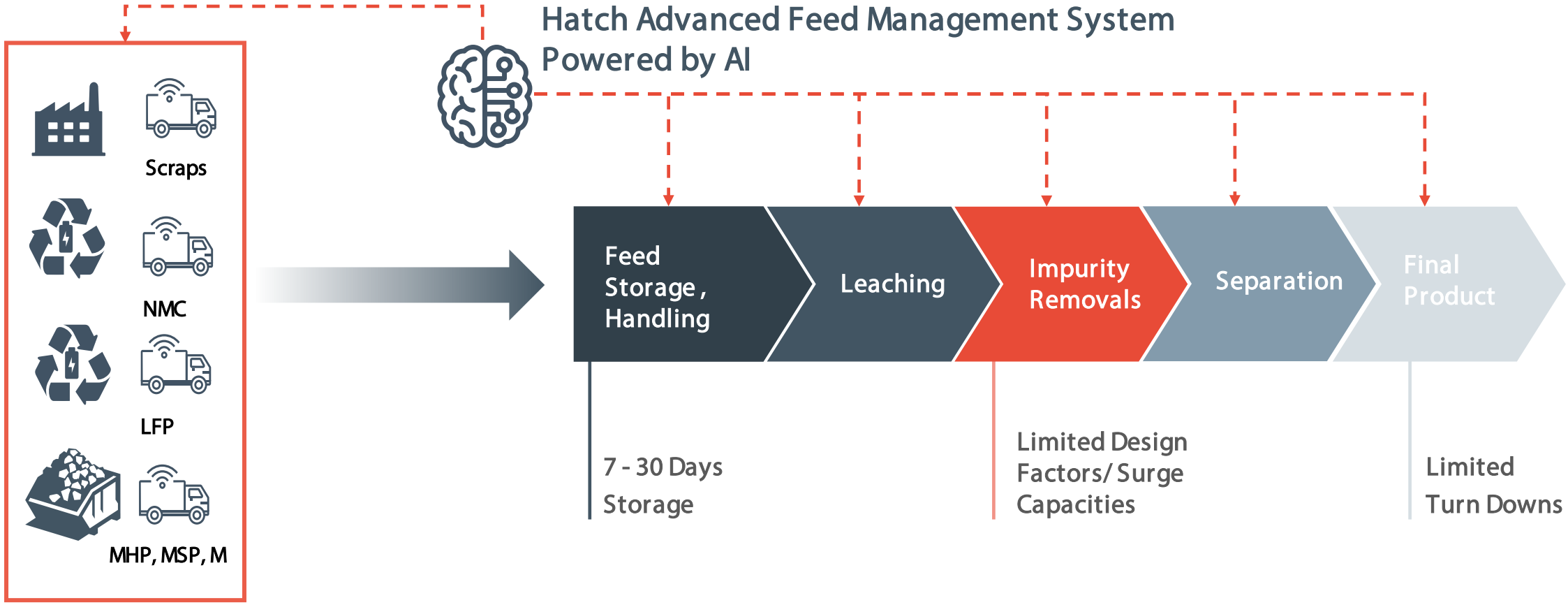
Hatch Advanced Feed Management System
Feed variability



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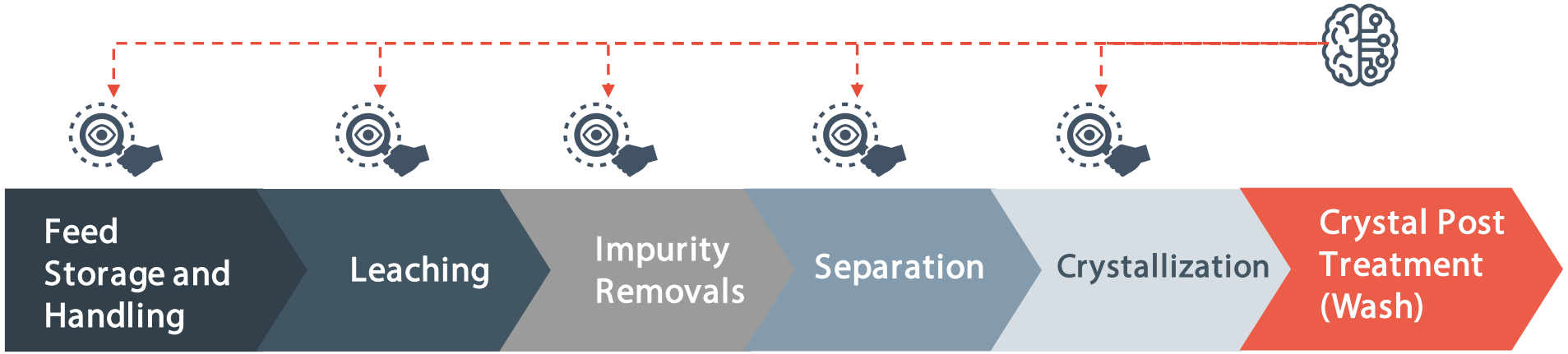
Hatch Advanced Product Quality Monitoring and Control



- Advanced monitoring and process control
- Hatch proprietary process to remove impurities from the crystals using rich solution

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Valorization Technologies

- **The sodium sulfate dilemma:** the unforeseen challenge of lithium battery production and recycling
- A large amount of sulfuric acid and NaOH is converted into low-value sodium sulfate.
- Hatch novel Ion Exchange (IX) process for converting sodium sulfate to potassium sulfate (fertilizer)

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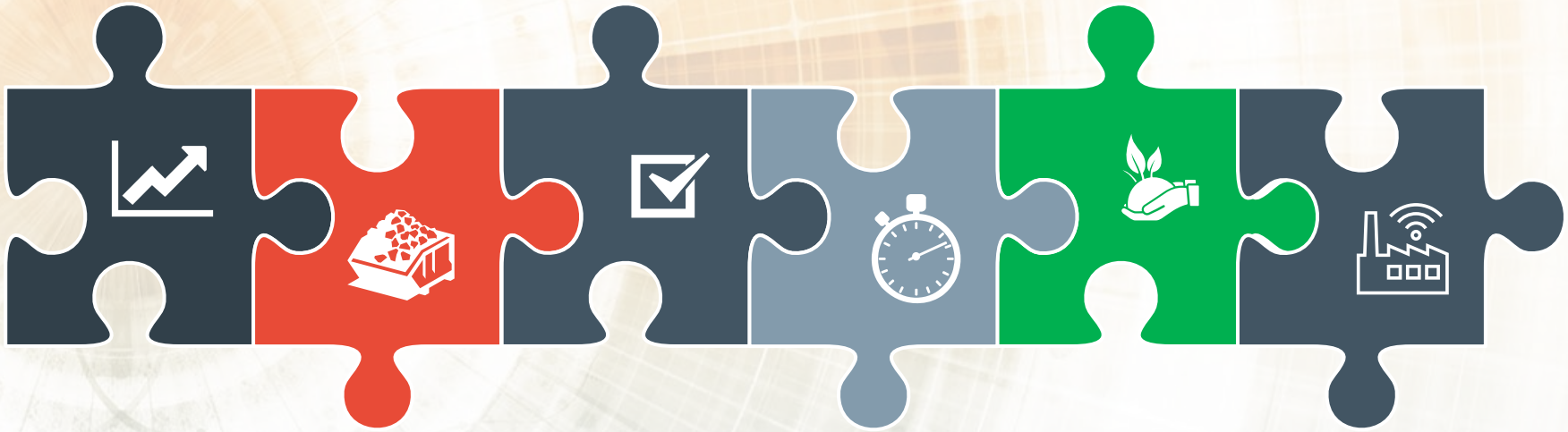
Hatch Techology Solutions

Novel flowsheets for alternative feedstocks

Proprietary processes to remove impurities

Reducing acid and base; Converting waste to by-products



Advanced monitoring and process control

Equipment design and supply

Smart and intelligent systems

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Thank you
YEARS
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Thank you.

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