Hall 4A

сниста



Boiler 2.0 Air-sourced Steam Generating Heat Pump

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Outline

- Motivation
- Air-sourced vs Waste Heat Integration
- AtmosZero Boiler 2.0
- Prototype test results
- Pilot
- Conclusion

Motivation – Industrial Process Heat



Adapted from: Industrial heat demand, IEA report



*: Adapted from: https://www.renewablethermal.org/vision/

US process heat 100 – 200 °C : >1200 TWh/yr * EU28+3 process heat 100 – 200 °C : >500 TWh / yr **

**: Rehfeld et al, "A bottom-up estimation of heating and cooling demand in the European industry"

Heat Pump System Configurations



Pump

System and Integration Costs



* Revenue lost assumes €100M per annum company and 5 days of lost revenue for the installation period

Payback period of waste heat integration



* Revenue lost (upper bound) assumes \$100M per annum facility and 5 days of lost revenue for the installation period. Lower bound assumes no facility downtime.

Air sourced vs Waste Heat

Consistent waste heat at >60 °C needed for a positive business case for waste heat integration

For all other scenarios a **modular, scalable, air-sourced solution** offer the lowest cost of steam

Due to the **high temperature lift** Boiler 2.0 can provide **process cooling** in addition to steam

Boiler 2.0: How does it work?



650 kW Prototype



Prototype Test Results

- **Stable** 150°C steady-state operation
- Push button "cold" and "hot" start achieved
- Pinches tight in main heat exchangers





First Consecutive Automatic Hot Starts

First customer

BELGIUM

Meet 1/3 of steam demand

- Replace one natural gas boiler in Fort Collins facility
- 165°C, 1 ton per hour saturated steam
- In-field, in-revenue service. Q1'25.

Conclusion

- US pilot 2025
- EU pilot early 2026



AtmosZero is ready to take orders for initial production starting 2026

Come see the future of decarbonized steam in the START:HUB area, Hall 9



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Thank You!

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