



Department for  
Business, Energy  
& Industrial Strategy

# JJ Bioenergy Ltd Heat Recovery Project

Industrial Heat Recovery Support (IHRS)  
Programme - Case Study

August 2021

# Context

*JJ Bioenergy is a process engineering company dedicated to improving industrial energy efficiency. This Industrial Heat Recovery Support project – located at the Outokumpu stainless steel mill in Sheffield – sees the company recovering waste heat from off-gas in the electric arc furnace (EAF), storing it in the thermal energy storage (TES) unit, and reusing it for preheating the ladles.*

*Outokumpu partnered with JJ Bioenergy to provide the site's engineering conditions, enabling the project to pursue its aim of investigating feasibility and delivering the preliminary engineering design. This work represents a UK first for high-temperature TES application based on a phase-change material (PCM) with a melting temperature of 600 °C.*

## How IHRS supported the project

Our ambition was to develop a reference that could be widely applied in industrial heat recovery and foundation industries in the future. IHRS funding made that possible, providing a grant to support all aspects of the project.

### Benefits and added value

In the first phase of the programme, we validated the proposal's feasibility and delivered the preliminary engineering design, creating a strong foundation for future installation and detail engineering.

In addition to energy and carbon savings, the project directly consolidated jobs, allowing us to keep developing where others were struggling due to the implications of the Covid-19 pandemic.

Our cooperation with Outokumpu during the delivery phase led to another collaboration – we secured further funding from Innovate UK to conduct industrial research about supply chain management and excess heat sales.

### Lessons learned

The project's key technical challenge was how to transfer the heat from the off-gas to the clean air, which would charge the TES unit. Using a FLUENT-based simulation was critical to overcoming these engineering design challenges. As site partner, Outokumpu helped to organise and guide a number of comprehensive site visits, which were instrumental in ensuring the right conditions for the project.

The study showed a lower-than-estimated off-gas temperature during operation, which indicates other measures are necessary to reduce air leakage first. With those measures taken care of, we would predict temperatures to be closer to the initial estimates.

As we progress with this project, we anticipate the biggest barrier to overcome being the capital investment required.

*“It is great to validate the feasibility to recover waste heat, store and re-use it based on high temperature thermal storage. (Neil Schofield, Environment Manager)”*

A picture of the Outokumpu stainless steel mill in Sheffield – showing heat sinks used for preheating the ladles.



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