CS-D

ArcelorMittal Dofasco: A Steel-Sector Pilot

A phased thermoelectric waste-heat-recovery pilot at a major North American integrated steel plant.

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This case study documents MicroPower's phased waste-heat-recovery pilot with ArcelorMittal Dofasco at its Hamilton, Ontario integrated steel works. It runs from the August 2021 pilot design through to an initial test unit installed on site, returning data that confirmed it was functioning as expected and was reviewed with the Dofasco engineering team as a successful initial phase.

At a glance

Parameter	Value
Partner	ArcelorMittal Dofasco
Site	Hamilton, Ontario, Canada
Programme stage	Phased pilot: design 2021, initial test unit installed 2022, staged commercial plan 2023
Status	Initial test unit and supporting infrastructure installed on site; initial data confirmed expected function and was reviewed with ArcelorMittal Dofasco R&D as a successful initial phase
Proposed architecture	Phased pilot: thermal profiling → partial population → optimal population → replication
Pilot install location	Maintenance-access hatch on water-cooled EAF ductwork
Cooling-water requirement (Phase 1)	Modelled flow chosen to limit cold-side temperature rise to ≤5 °C
Environmental design constraints	Ontario winter climate, mechanical stress, corrosive chemistry

About this case study

ArcelorMittal Dofasco is a long-standing MicroPower partner in the steel sector. The August 2021 documents set out a phased pilot design for thermoelectric waste-heat recovery on the plant's electric-arc-furnace ductwork. The engagement then progressed into execution: an initial test unit and its supporting infrastructure were installed on site, and the initial data set received confirmed the unit was functioning as expected. That data was reviewed with the Dofasco R&D team, who assessed the initial phase as successful, and the engagement moved on toward conceptual design and, in 2023, a staged commercial plan. This case study records both that engagement and the standardised engineering framework MicroPower uses to scope any integrated-steel pilot.

1 · The partner and the site

ArcelorMittal Dofasco is a major integrated steel producer located in Hamilton, Ontario. Dofasco is among the largest steel plants in North America by annual capacity and has a long history of engineering dialogue with waste-heat-recovery technology vendors. The Hamilton site presents two environmental constraints that are material to any pilot design: extremely low winter temperatures (Ontario climate), and the corrosive chemistry typical of integrated-mill waste gas.

At the time of the August 2021 pilot design, MicroPower had an active pilot running at Gerdau Manitoba (see CS-A) and a parallel engineering conversation running with CMC Steel Texas (see CS-B). The Dofasco pilot was designed to share engineering framework with both, while adapting the integration specifics for Dofasco's Hamilton operating conditions.

2 · The four-phase pilot methodology

The pilot followed a standardised four-phase progression that MicroPower uses as its default template for a steel-industry deployment.

Phase 1 — Thermal profiling, no electrical output. Install a small test unit in the maintenance-access hatch on the relevant water-cooled ductwork. Fit two Onset HOBO temperature loggers (approximately 5 × 3 × 3 inches each, mounted on the hatch). No external power is required. The focus at Phase 1 is to characterise the operating conditions — temperature range, duty cycle, moisture exposure, mechanical vibration — before committing module hardware.

Phase 2 — Partial population, power measurement. Based on Phase 1 data, design a small (50–100 W target output) unit with a partial complement of PowerBlock modules. Install in the same access hatch geometry. Measurement hardware at this phase is a box of electronic devices approximately 8 × 8 × 4 inches, again mounted on the hatch. Demonstrate electrical output and confirm module-performance behaviour against Phase 1 thermal expectations.

Phase 3 — Optimal population, validation. Scale up with additional small modular installations to increase system size toward the local waste-heat limit. Optimise PowerBlock population density against the observed hot-side temperature profile. Validate performance and longevity across multiple months of operation.

Phase 4 — Repeat at other locations. Take the validated design and methodology to additional Dofasco plant locations, or to other ArcelorMittal sites within the programme. The per-site effort after the first validated deployment is a fraction of the Phase 1 engineering lift.

3 · Cooling and power-conditioning engineering

The Phase 1 pilot cooling loop is sized against a specified inlet-water flow and pressure (60 psi gauge inlet). The study determines the cooling-water volume flow rate required to maintain a temperature rise of no more than 5 °C across the cold-side heat exchanger. The pilot design includes pre-installation measurements of outlet pressure to size the cold-side loop correctly.

For the full-scale system, power-output conditioning follows a pattern analogous to solar PV power conditioning — optimal-load matching and power-output configuration defined by the customer's electrical engineering team. The thermoelectric DC output is treated as a PV-class input to the plant electrical bus, with appropriate isolation, control, and metering. No special safety measures are required in the areas surrounding the modules; maintenance and inspection schedules are synchronised with the plant's normal cycles.

4 · Module-level engineering for the Dofasco environment

Each MicroPower module contains semiconductor chips sandwiched between two aluminium-nitride plates, sealed with high-temperature ceramic. Modules are encased between two steel blocks, also sealed with high-temperature ceramic. The hot side can be directly exposed to the heat source without additional insulation. For the Dofasco Hamilton environment specifically, the module encapsulation and cold-side heat-exchange design are engineered to handle humidity, Ontario winter cold, vibration, and the corrosive chemistry typical of integrated-mill ductwork — the same encapsulation family validated on the Gerdau Manitoba cooling-duct pilot.

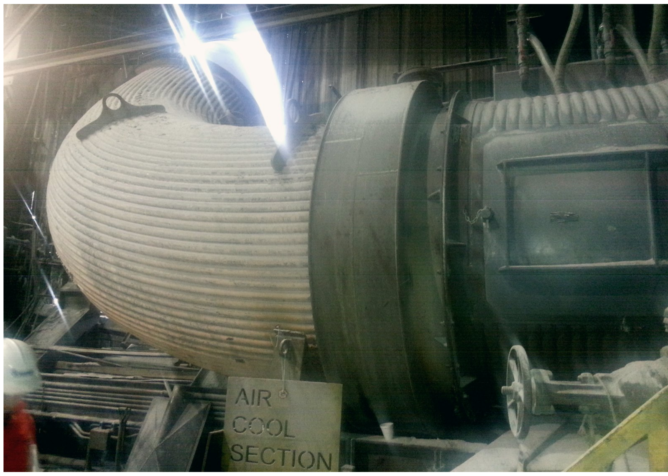
5 · Where the engagement stands

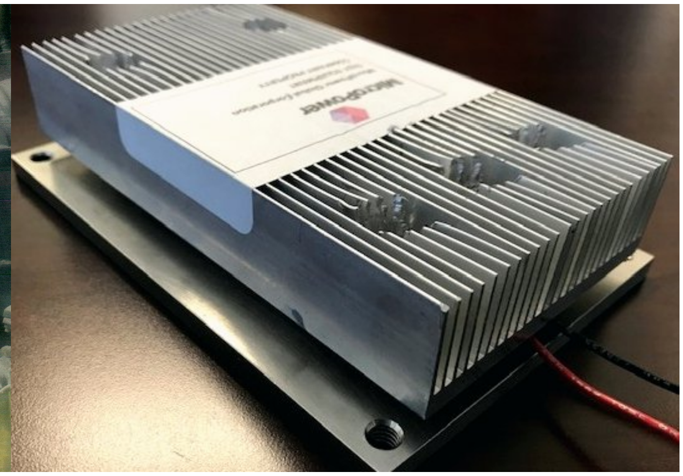
The Dofasco engagement moved from design into execution: an initial test unit and its supporting infrastructure were installed on site, returned data confirming expected function, and the initial phase was reviewed with ArcelorMittal Dofasco R&D as successful. The engagement then progressed toward conceptual design and, in 2023, a staged commercial plan. This case study serves three purposes:

- Reference template for the MicroPower four-phase steel-industry pilot methodology. Any future Dofasco, CMC, or comparable integrated-mill engagement will proceed through this same Phase 1–4 sequence, calibrated to the specific site.
- Live record of design constraints MicroPower has already scoped for this partner — Ontario winter, Hamilton humidity, integrated-mill corrosive chemistry.
- Live engagement – the Dofasco relationship is an active partnership, and the next phase of the programme builds directly on the installed-pilot results.

Closing

This case study documents a steel-sector pilot that progressed from engineering design to an installed, functioning test unit, reviewed favourably by the partner's R&D team as a successful initial phase. It records both MicroPower's standardised four-phase methodology for integrated steel producers and the specific Hamilton-site design constraints, and it is the foundation the next phase of the Dofasco programme builds from.





Sources & notice

Sources: Thermoelectric waste-heat recovery pilot design, August 2021, and project-status records through 2022–2023, MicroPower Global. Archived in the MicroPower customer records.