Heat Wave Metal Radar™ Inline

Technical brief · Oct 17, 2026 · @Frederick Schaefer

Summary

Heat Wave Metal Radar™ Inline measures DRI metallization in about a minute, on the product stream, instead of hours later in the lab. In a shaft-furnace DRI plant it sits on the cold DRI discharge conveyor, at the point where the auto-sampler already pulls product samples.

The reading goes to the plant control system, so operators can trim reducing gas and cooling-zone carbon while the material is still in the furnace, not after off-spec product has reached the silos.

The measurement gap

Metallization defines DRI quality, yet most plants still measure it by wet chemistry on composite samples. A sample is pulled every hour or shift, prepared and titrated, so the result arrives hours after the material was made.

By then the furnace has produced many more tons under the same conditions. A reliable reading within minutes lets the plant correct drift while the burden is still in the shaft, and gives a quality record for every shipment rather than a composite.

How Metal Radar works

Metal Radar reads metallization from how the material interacts with microwaves. Metallic iron is a conductor, while iron oxides and gangue are lossy dielectrics, so the microwave response of a DRI sample changes with its metallic iron fraction.

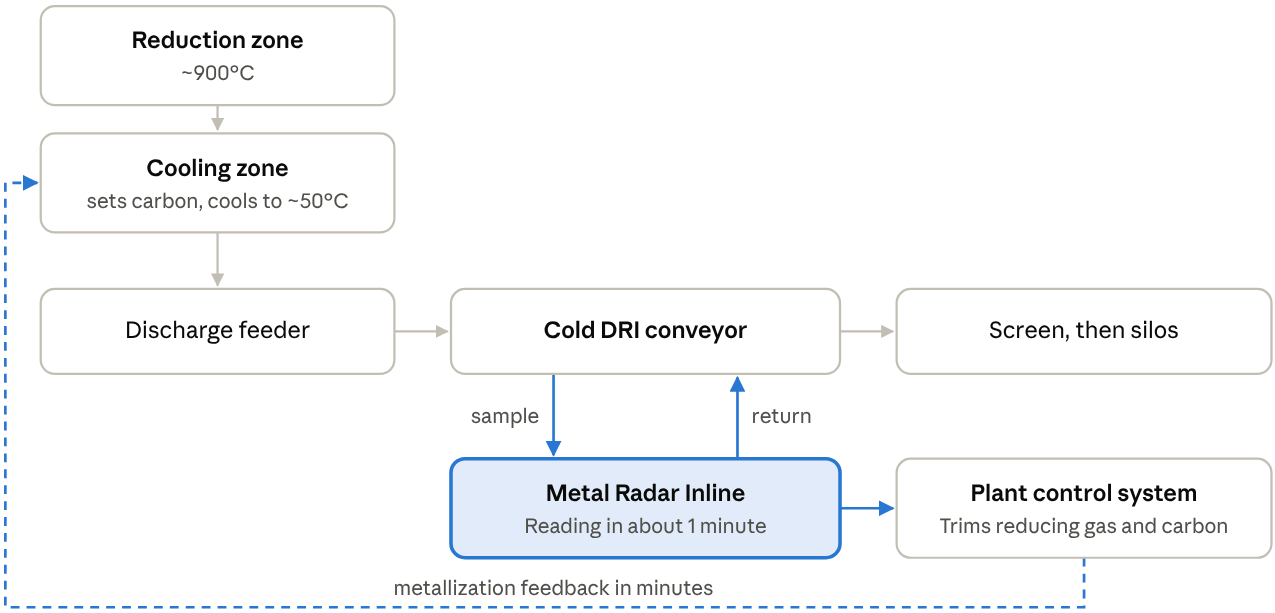
- **Stays sensitive at high metallization.** Many microwave sensors lose resolution as metal content rises. Metal Radar is designed to keep resolving differences in the 90–96% range.
- **Separates metallic iron from carbon.** The measurement yields several independent features, which helps separate metallic iron from carbon and iron carbide.
- **Built for a flowing stream.** A slipstream of pellets passes the sensor, is measured while stationary, and returns to the belt.

Metal Radar comes in three models: **Lab** (bench-top), **Inline** (plant bypass unit) and **Field** (handheld). Patent pending.

Placement in a shaft-furnace DRI plant

The lead application is the cold DRI discharge conveyor, after the cooling zone and before the product screen. The product there is cool, in air and free-flowing, and the plant already samples it at that point.

Metal Radar reads the product where the auto-sampler already samples it



Metal Radar Inline on a shaft-furnace cold DRI conveyor · schematic

An auto-sampler diverts a slipstream through the Metal Radar sensor and returns it to the belt; the reading goes to the control system, which trims reducing gas and cooling-zone carbon.

See it in motion: [animated view at metalradarlab.com]

Location	Product state	Fit	Main value
Cold DRI discharge conveyor	Cold (~50°C), in air	Lead application	Process control and off-spec prevention

Location	Product state	Fit	Main value
HBI, after briquetting and cooling	Cooled briquettes	Second step	Shipment certificate for traded HBI
Hot DRI transport to the EAF	Hot (~600–700°C), inerted	Later; needs cooled, inerted sampler	Real-time EAF charge control
EAF receiving	Cold DRI or HBI	Adjacent market	Incoming quality check

Value to operators

- **Fewer off-spec tons.** Drift is seen in minutes, so less product is made under the wrong conditions.
- **Tighter carbon and metallization.** Gas and cooling-zone adjustments are made against a live product reading.
- **Room to run closer to target.** Better feedback lets plants carry less safety margin, with potential savings in reducing gas per ton.
- **A quality record per shipment.** Useful for DRI and HBI sold to third parties.
- **Less lab work.** Routine titrations can be reduced to calibration checks.

Technical considerations

Topic	Consideration	Approach
Carbon	Shaft-furnace DRI typically carries roughly 1–4.5% C, much of it as Fe_3C	Calibrate metallization and carbon together
Temperature	Microwave response shifts with temperature	Measure cold DRI first; hot product only with a cooled, inerted sampler
Sampling	The reading is only as good as the slipstream	Use the plant's existing sampler point where possible
Product form	Pellets, briquettes and fines pack differently	Calibrate per product form
Calibration	Must match the plant's reference method	Run side by side with the plant's lab during the pilot

Availability and pilot program

Metal Radar Lab is available January 2027. The Metal Radar pilot program starts the same month, with live video-call demonstrations.

Pilot sites are DRI plants willing to run Metal Radar side by side with their lab method:

1. **Sample testing.** The plant sends DRI or HBI samples with lab metallization and carbon; Heat Wave measures them on Metal Radar Lab and reports the correlation.
2. **Plant pilot.** Metal Radar Inline installed on the cold DRI discharge conveyor, run against the plant's lab method.
3. **Rollout.** Permanent installation once the pilot results meet the plant's needs.

About Heat Wave

Heat Wave, based in Colorado Springs, develops industrial microwave technology for ironmaking and metal recovery. Its president, Frederick A. (Fritz) Schaefer, has 25 years in the industrial microwave business:

- At Varian, as VP of the Industrial Microwave Products Group, his team delivered the first microwave-powered chemical manufacturing process in industry: two microwave-heated chlorination reactors at Dow Chemical, Freeport, Texas.

- At Industrial Microwave Technologies, he developed a microwave dielectric probe that measures percent water in oily emulsions, still in daily use at a used-oil recycling plant in Mobile, Alabama.
- He spent 15 years as General Manager Europe for a steel mill services company.

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Metal Radar is a trademark of Heat Wave. Patent pending.