



**Materials
Processing
Institute**

Services Portfolio

Advanced Metals & Green Steelmaking



Advanced Metals & Green Steelmaking

Green Steel	Page
- Bio-carbon injection in EAF	4
- Decarbonised steelmaking pilot (scrap route)	4
- Iron ore reduction tests	4
- Melting mixed scrap and alloys in EAF	4
- Melting direct reduced iron (DRI) in EAF	4
- Melting hot briquetted iron (HBI) with scrap	4
Product Development	Page
- Continuous casting trial of new alloy	5
- Alloy addition trials in EAF	5
- Melting high-alloy or stainless steel in EAF	5
- Small batch alloy melting in induction furnace	5
- Melting specialty cast irons in induction furnace	5
- Small-scale metal casting demonstrations	5
- Continuous casting of test slabs	6
- Trial of new refractory materials in furnace	6
- Pilot production of steel for rolling trials	6
- Melting under inert atmosphere	6
- Small-scale metal casting demonstrations	6
- Melting exotic metal mixtures	7
- Prototype manufacturing via casting	7
- Help develop production routes for steel grades via EAF/LAF/TVD routes	7
- Casting of pilot ingots from EAF heats	7
- Production of master alloy in pilot furnace	7
Process Improvement	Page
- Instrumentation hot testing & development	8
- Optimising slag foaming for energy savings	8
- Continuous feeding trials in EAF	8
- Carbon injection foamy slag practice	8
- Vacuum degassing of molten steel	8
- Ladle refining with synthetic slag	8

Advanced Metals & Green Steelmaking

Process Improvement	Page
- Alloy cleanliness assessment during melting	9
- High-phosphorus or sulphur scrap melting trials	9
- Controlled cooling of steel after melting	9
- In-situ gas analysis during melting	9
- Calibration heats for sensor testing	9
- Training in EAF operation	9
- Demonstration of new furnace technologies	10
- Melting of slag for testing	10
- Use of susceptor in induction heating	10
- Remelting for homogeneity	10
- High-temperature hold tests	10
- Slag-metal equilibrium experiments	10
- Metallic coating melting/removal	11
- Benchmarking scrap quality impact	11
- Replicating industrial melt conditions for troubleshooting	11
- Help develop decarbonised routes to aid transition from Blast Furnace / BOF to EAF route	11
Extra	Page
- Melting mill scale or oxide wastes in EAF	12
- Melting galvanized steel scrap	12
- Alloy yield measurement experiments	12
- Disposal of weapons by melting	12
- Secure disposal of confidential data or prototypes	12



Green Steel

Bio-carbon injection in EAF

Trial injection of bio-char or other biomass-derived carbon in an EAF to replace fossil coal and assess effects on steel quality and emissions.

Decarbonised steelmaking pilot (scrap route)

Demonstrate steel production using 100% scrap in an EAF with green electricity and compare carbon footprint to traditional routes.

Iron ore reduction tests

Iron ore reduction tests to ISO standards to mimic blast furnace processes and determine ore / pellet reducability and quality.

Melting mixed scrap and alloys in EAF

Study how different scrap mixes affect steel composition and cleanliness.

Melting direct reduced iron (DRI) in EAF

Evaluate metal yield and energy use when using DRI as feed.

Melting hot briquetted iron (HBI) with scrap

Demonstrate recovery of iron from HBI mixed with scrap in furnace operations.



Product Development

Continuous casting trial of new alloy

Test the castability of a new alloy by casting it into a mini-slab or ingot to check for cracks or segregation.

Alloy addition trials in EAF

Optimize alloying element recovery and steel composition control during melting.

Melting high-alloy or stainless steel in EAF

Produce specialty steels in pilot scale to test refining practices for chromium / nickel alloys.

Small batch alloy melting in induction furnace

Produce a limited quantity of a specific alloy for testing or prototyping without needing a full-scale melt.

Melting specialty cast irons in induction furnace

Refine and produce cast iron or ductile iron samples for property evaluation.

Melting copper or aluminium alloys in induction furnace

Provide small-scale non-ferrous alloy melts for prototype casting or material analysis.



Product Development

Continuous casting of test slabs

Solidify steel from pilot melts into small slabs to examine castability and downstream processing.

Trial of new refractory materials in furnace

Evaluate performance of novel refractory linings or coatings by exposing them to real molten metal conditions.

Pilot production of steel for rolling trials

Make steel in pilot furnace to produce material for testing in rolling or forming processes.

Melting under inert atmosphere

Melt metals in a low-oxidation environment to prevent oxidation (for oxygen-sensitive alloys).

Small-scale metal casting demonstrations

Melt and cast metal to showcase foundry processes or to create demonstration pieces for clients.



Product Development

Melting exotic metal mixtures

Experiment with melting combinations of metals (e.g. iron with tungsten, or scrap with unusual elements) to see solubility and behaviour.

Prototype manufacturing via casting

Melt metal and pour into prototype moulds to create demonstration parts or sample products for clients.

Help develop production routes for steel grades via EAF/LAF/TVD routes

Reproduce a steel plant's melting process on a pilot scale to investigate quality or operational issues in a controlled setting.

Casting of pilot ingots from EAF heats

Produce ingots from pilot-scale melts for forging or rolling trials.

Production of master alloy in pilot furnace

Create master alloy (high concentration alloying element mixture) that can be added to industrial heats.



Process Improvement

Instrumentation hot testing & development

Help industrial equipment manufacturers test & improve the durability of their instruments and assess the water / air rates required for cooling.

Optimising slag foaming for energy savings

Improve slag foaming in steelmaking to better insulate the melt and reduce electrical energy needed, thus saving energy.

Continuous feeding trials in EAF

Optimise continuous charging of materials (like pellets or briquettes) during melting.

Carbon injection foamy slag practice

Improve foamy slag formation to save energy and protect refractories.

Vacuum degassing of molten steel

Reduce hydrogen and other gases in steel for improved quality (e.g. for critical applications).

Ladle refining with synthetic slag

Use ladle furnace to adjust chemistry (deoxidation, desulfurization) and improve steel cleanliness after melting.



Process Improvement

Alloy cleanliness assessment during melting

Monitor inclusion content and cleanliness of steel under various melting and stirring practices.

High-phosphorus or sulphur scrap melting trials

Study how to remove or mitigate impurities (P, S) from low-grade scrap through flux and process adjustments.

Controlled cooling of steel after melting

Investigate how cooling rates from liquid steel affect microstructure (e.g., simulate ingot vs. slab cooling).

In-situ gas analysis during melting

Measure CO, CO₂, etc. in EAF off-gas in real time to optimise combustion and reduce emissions.

Calibration heats for sensor testing

Melt steel to create a stable molten bath for validating high-temperature sensors or probes under operating conditions.

Training in EAF operation

Provide practical training for engineers on electric arc furnace operation using a pilot-scale furnace.



Process Improvement

Demonstration of new furnace technologies

Host trials for new EAF technologies (e.g. advanced electrodes, sensors, or control systems) to prove performance.

Melting of slag for testing

Re-melt slag or simulate slag melting to study viscosity and chemistry for process improvement.

Use of susceptor in induction heating

Heat materials that are non-conductive (ceramics, glass) by coupling through a susceptor for melting or testing.

Remelting for homogeneity

Melt and solidify a material multiple times to achieve chemical homogeneity for a uniform test sample.

High-temperature hold tests

Keep steel molten for an extended time to observe changes (like hydrogen pickup, inclusion growth) for process insight.

Slag-metal equilibrium experiments

Equilibrate steel and slag in a controlled melt to study partitioning of elements (like sulphur, phosphorus) between them.



Process Improvement

Metallic coating melting/removal

Melt metal pieces with coatings (e.g. tinplate, galvanized steel) to determine how coatings behave (vaporise, go to slag) and how to capture them.

Benchmarking scrap quality impact

Run melts with scrap of varying purity levels to determine qualitative effects on energy, yield, and steel quality, helping clients select scrap grades.

Replicating industrial melt conditions for troubleshooting

Reproduce a steel plant's melting process on a pilot scale to investigate quality or operational issues in a controlled setting.

Help develop decarbonised routes to aid transition from Blast Furnace / BOF to EAF route

Reproduce melting process at pilot scale plus options for feeding of alternative iron and sustainable carbon inputs.



Extra

Melting mill scale or oxide wastes in EAF

Recover metallic iron from industrial iron oxide wastes by smelting with appropriate fluxes.

Melting galvanized steel scrap

Investigate zinc removal and recovery when melting zinc-coated scrap.

Alloy yield measurement experiments

Quantify how much of each alloying element is recovered in the steel vs lost to slag or gas.

Disposal of weapons by melting

Eliminate firearms/blades by melting them down, ensuring they cannot be reused.

Secure disposal of confidential data or prototypes

Eliminate hard drives, servers, physical models too sensitive for landfilling.

Full Services Portfolio

Advanced Metals & Green Steelmaking

- Green Steel
- Product Development
- Process Improvement
- Extra

Advanced Materials Development

- Custom Alloy Development
- New Steel
- Supporting R&D
- Additive Manufacturing & Powder Metallurgy
- Additional Services

Characterisation and Analysis

- Characterisation and Analysis

Critical Raw Materials

- By-product Valorisation
- End of Life Process Development
- Mine Tailing Valorisation
- Piloting /Testbed Hosting
- Process Scale-up
- Process Optimisation

Sustainable Cement and Concrete

- Product Development
- Process Improvement

Powder Analysis and Additive Manufacturing

- Powder Analysis
- Additive Manufacturing
- Powder Processing

Energy and Process Decarbonisation

- Feasibility Studies
- Energy and Emission Optimisation
- Process Optimisation
- Leveraging Facilities

Facilities and Equipment

Full Services Portfolio

Training

Processes

- Ironmaking
- Desulphurisation or Iron
- Steel Plant Raw Material
- Primary Steelmaking
- Secondary Steelmaking
- Ladles
- Practical Steelmaking
- Stainless Steelmaking
- Electric Arc Furnace (EAF) Steelmaking
- Continuous Casting
- General

Supplementary

- Engineering
- Metallurgy
- Environmental Protection
- Management
- Research

Applications

- Circular Economy
- Digital Technology
- Analytical Techniques

Products

- Finished Goods

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