

Innovative Aluminum Melting Technology

Isothermal Melting Process



Isothermal Melting (ITM) from Apogee Technology, Inc. transforms aluminum melting with a new, durable electrical heating process. In ITM, groups of direct-immersion heaters transfer energy from their metallic cores through protective outer sheaths to the melt pool. At idle, the heated refractory baffle and side pocket panel system provides efficient holding heat. ITM completely eliminates on-site emissions by replacing gas-fired combustion melters.



If adopted industry-wide, ITM could save 63 trillion Btu each year.

ITM Profile

Applications: Melting of primary ingots and scrap metal, in new or retrofit applications

Industries: Aluminum, copper, glass, magnesium, and other molten metal industries

Heat Transfer: Internal heat transfer by conduction and melt heat transfer by convection

Energy Input: About 30% of the energy input required by conventional gas-fired melters

Energy Savings: 63 trillion Btu/year in potential energy savings industry-wide

Size: One-third of the floor space required, as compared to conventional melters

Melting Throughput: Up to 7,000 lbs./hr.

Melt Loss: Improved from 2–4%, to less than 1%

Costs: Lowered capital and operating costs

In-Plant Emissions: None

Apogee Technology, Inc.
P.O. Box 101
Verona, PA 15147
Phone: 412.795.8782
Fax: 412.795.1004
www.apogeetechinc.com

Features subject to change without notice

Partner Profiles

Apogee Technology, Inc.

Headquartered in Verona, Pennsylvania, Apogee Technology, Inc. was established in 1993. An aluminum process heating and metals treatment solutions provider, Apogee Technology has obtained more than 100 patents for its products.

Among Apogee's first innovations were master alloy rod feeders and the REVROT™ Process, a rotary degassing technology, which was shown to reduce metal treatment times by more than half. In 2001, Apogee was awarded a three-year U.S. Department of Energy (DOE) cost-sharing grant to develop an energy-efficient melting process. The result of this effort was the Isothermal Melting (ITM) Process, which has been deployed at Aleris International, a cost-sharing industrial partner to Apogee (see below).

At present, Apogee is engaged in a new DOE award intended to further ITM and its component technologies by demonstrating new strategies for in-plant molten metal management. Some of the new approaches include over-the-road transportation of molten inventory via self-heated ladles, and direct introduction of molten inventory to the casting process without the need for holding furnaces.

Aleris International, Inc.

Aleris International, Inc. is a leading North American manufacturer of rolled aluminum products and is a global leader in aluminum recycling and the production of specification alloy. The company is also a leading recycler of zinc and a manufacturer of value-added zinc products that include zinc oxide, zinc dust, and zinc metal.

Aleris' global headquarters are located in Beachwood, Ohio, a suburb of Cleveland. The company operates 42 production facilities in the United States, Germany, Brazil, Mexico, and Wales, and employs approximately 4,200 employees. The plants are strategically located to serve a diverse range of customers, which include many of the world's largest companies in the building and construction, transportation, containers and packaging, consumer durables, and metal distribution industries.

Aleris operates in four segments, including the Rolled Products segment, the Aluminum Recycling segment, the International segment, and the Zinc segment. Steven J. Demetriou is the Chairman and Chief Executive Officer. Michael D. Friday is the Chief Financial Officer and Executive Vice President.



DOE Office of Energy Efficiency and Renewable Energy, Industrial Technologies Program

The mission of DOE's Office of Energy Efficiency and Renewable Energy (EERE) is to strengthen America's energy security, environmental quality, and economic vitality in public-private partnerships. EERE works to enhance energy efficiency and productivity; bring clean, reliable, and affordable energy technologies to the marketplace; and to make a difference by enhancing energy choices. Douglas Faulkner is Principal Deputy Assistant Secretary.

EERE's Regional Offices catalyze the implementation of energy-efficient and renewable energy strategies at the state and local level by working with states and communities, by identifying and engaging community and state partners, and by integrating EERE programs with public- and private-sector activities.

The Industrial Technologies Program (ITP) is an EERE program that leads national efforts to improve industrial energy efficiency and environmental performance. Specifically, ITP's mission is to improve the energy intensity of the U.S. industrial sector through a coordinated program of research and development, validation, and dissemination of energy efficiency technologies and operating practices. ITP partners with industry and its stakeholders to reduce the nation's reliance on foreign energy sources, reduce environmental impacts, increase energy efficiency and the use of renewable energy, improve industrial competitiveness, and improve the quality of life for Americans.

GMPT Saginaw Metal Casting Operations

With global headquarters in Detroit, Michigan, General Motors (GM) manufactures cars and trucks in 33 different countries and employs about 327,000 people. In 2005, 9.17 million GM cars and trucks were sold globally under the brands of Buick, Cadillac, Chevrolet, GMC, GM Daewoo, Holden, Hummer, Opel, Pontiac, Saab, Saturn, and Vauxhall.

Saginaw Metal Casting Operations (SMCO), a division of GM Powertrain (GMPT), is a manufacturer of aluminum blocks and heads for GM. Open since 1919 in Saginaw, Michigan, the plant has a rich history of iron casting. Throughout the course of its 85 years of iron casting, the plant poured 45 million tons of iron. In 2004, the plant poured 46,900 tons of iron and 45,460 tons of aluminum. In 2005, the operation converted to an all-aluminum foundry. SMCO currently manufactures heads and blocks for the Vortec 4200 in-line 6-cylinder engine; heads for the Vortec 4800, 5300, and 6000 V8 family of engines; and blocks for the Vortec 5300 and 6000 V8 engines.

SMCO is active in environmental issues and education for employees and the public. The plant recycles 2 billion gallons of water and 15,000 tons of sand each year. It also manages paper, wood, and print-cartridge recycle programs. In 2005, SMCO achieved zero nonconformance (perfect audits) in environmental (ISO 14001), quality (TS 16949), and UAW-GM health and safety audits. SMCO's 1,854 square foot facility employs 1,400 hourly and salaried employees. Rex Blackwell is the Plant Manager.

ITM Sample Photos



For electronic versions of these photos, please contact info@apogeetechinc.com.

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A melting heat array cluster is installed in a 5,000 lb./hr. ITM.



Direct immersion heaters work in a 5,000 lb./hr. ITM. The heaters have a maximum output of 30 kW each.



A 5,000 lb./hr. ITM sits next to an existing gas reverberatory furnace.



A chute feeds aluminum scrap to the 5,000 lb./hr. ITM. The flue for the existing gas-fired furnace is visible behind the ITM.



The group surveys a 5,000 lb./hr. ITM touch screen control panel.



The 5,000 lb./hr. ITM measures 10 x 15 x 5 feet.