

OIT Projects
Application or Relevance to Aluminum Industry

Title	Supporting IOF program	Project Description	Project Lead - Contact	Application or Relevance to Aluminum Industry	Current Status
Combustion System and Process Heating					
Low-Dross Combustion System	Aluminum	Oxygen enriched combustion system contains burners capable of flame control.	David Rue - GTI	Applicable to aluminum melting furnaces to supply heat at proper locations within the melting furnace during the melting cycle.	R&D - commercial application 2006
High-Efficiency, Ultra Low Emission Integrated Process Heater System	Combustion	This project will developed an advanced combustion system for petroleum refinery process heaters. The system will generate NOx emissions below 5 ppm and incorporate advanced controls and a high-efficiency, integrated heat recovery system.	Charles Benson (ADL)	Potential burner design application for aluminum melting furnaces for NOx reduction.	Combustion system has been commercialized. Sold more than 200 units for retrofit applications. 5 to 25 MM Btu/hr) range different versions. Burner available for applications in aluminum industry.
Very Low Emissions: Forced Internal Recirculation (FIR) Burner (Combustion)	Combustion	A very low NOx emission burner is to be developed and commercialized, without compromising performance.	Harry Kurek - GTI	Application in natural gas fired melting and heating furnaces	Has been demonstrated, being commercialized during 2002 by three burner companies for boilers. Possible application for RT demo in progress.
Rotary Burner Demonstration (Combustion)	Petroleum, Combustion	This project aims to demonstrate an ultra-low emissions burner for petroleum refinery fired heaters.	Calcpos Engineering	Application in natural gas fired melting and heating furnaces	Under development. To be completed by the year 2003 fro testing and demonstration.
High-Luminosity, Low-NOx Burner	Glass	Develop and demonstrate a high-luminosity burner for combusting natural gas in oxy-fuel fired glass furnaces.	GTI (David Rue)	Potential application for melting furnaces heating system.	Demonstration on a fiberglass furnace (OCF) - NICE3 program, commercial application 2003

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Dilute Oxygen Combustion System (Combustion)	Steel/Combustion	This furnace design injects oxygen through a separate lance (from fuel) so it is dilute before mixing with the fuel and combusting. A reduction of NOx is the goal.	Dr. Kobayashi of Praxair	Application in fuel (natural gas or other) fired melting and heating furnaces	Demonstrated at Auburn Steel - Commercially available for specific applications
NOx Emission Reduction by Oscillating Combustion (Combustion)	Combustion	Oscillating fuel flow to a burner creates lean/rich flame zones, which lowers NOx emissions.	GTI (Harry Kurek).	Application in natural gas fired melting and heating furnaces	Commercialization progress. Technology licensed to Air Liquid and Synergistic Partners.
Development of O2 enriched furnace system for reduced CO2 and NOx emission	Steel	An O2- enriched furnaces system improves energy efficiency and reduces the emissions of CO2 and NOx	Center for Advanced Gas Combustion Technology, Ontario, Canada	Application in natural gas fired melting and heating furnaces	Under development. To be completed by the year 2002 for testing and demonstration.
Demonstration of a High-temperature Corrosion Resistant Coating for Recuperators	NICE3, Aluminum	A new coating process creates a corrosion-resistant recuperator that improves plant efficiency through recovery of waste heat	Robert DeSaro - ERCo	Application in fuel (natural gas or other) fired melting and heating furnaces	Field tests conducted at ALCOA in Indiana, Commercially available technology from ERCo

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Innovative Energy-efficient High-temperature Gas-fired Furnace	Inventions and Innovation	A new porous wall radiation barrier (PWRB) heating mantle represents a breakthrough in heating mantles that significantly increases heat-transfer rates.	Vijay C. Shroff - Procedyne Corp.	This technology has immediate application in the metal-processing industry.	Conducting demonstration testing of the salt probes and filter media at commercial sites.
Innovative Vertical Floatation Melter (VFM) and Scrap Dryer	Aluminum	The vertical floatation melter is an innovative design which decoats, preheats and melts in one operation.	Robert De Saro - Energy Research Company	The VFM can decoat aluminum, melt aluminum that has been previously decoated, or simultaneously decoat and melt scrap aluminum.	VFM is being field tested at a commercial host site.
Isothermal Melting Process (ITM)	Aluminum	The ITM process saves half the energy and emissions associated with conventional melting.	C. Edward Eckert - Apogee Technology, Inc.	ITM can be applied throughout the aluminum industry and covers all aspects of aluminum melting.	Demonstrate ITM on a technically and commercially viable scale.
Energy Efficiency in Aluminum Melting	Aluminum	Experimental reverberatory furnace will be used to study advancements in oxygen-air-fuel burners in conjunction with improved insulation, refractories, and sensors and control systems.	Subodh Das - Secat, Inc.	Aluminum processing requires melting large quantities of aluminum for subsequent production of semi-fabricated products.	Design, build, and operate an experimental reverberatory furnace to conduct trials.

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Sensors and Control System					
Amperometric Oxygen Sensor	NICE3, **	This project will produce a small, inexpensive, amperometric oxygen sensor to be commercialized for combustion control.	CeramPhysics, Inc.	Application in fuel (natural gas or other) fired melting and heating furnaces	
Tunable Diode Laser Sensor for Combustion Control (Steel)	Sensors and Controls	A tunable diode laser sensor is used to detect temperature, NOx, and CO levels. This data will help control combustion, reducing emissions and increasing efficiency	William Von Drasek - American Air Liquide	Application in fuel (natural gas or other) fired melting and heating furnaces	Under development, to be completed by the year 2003 for testing and demonstration.
Fiber-Optic Sensor for Industrial Process Measurement and Control (Glass)	SBIR - Sensors and Controls	Temperature and gas chemistry levels are monitored to control combustion, while reducing emissions and saving energy.	Peter DeBarber - MetroLaser	Application in fuel (natural gas or other) fired melting and heating furnaces	SBIR - Phase 2 , Testing prototype for temperature and H2O, in-situ measurement, temp. limit 3000 K (2000F)
Real-Time Gas Composition Analyzers for On-Line Process Control (Aluminum, Ceramic, Forest Products, Glass, Metal Casting, Steel)	SBIR - Sensors and Controls	Gas composition analyzer measures air to fuel ratio to optimize and control combustion. It would reduce emissions, reduce fuel use, and save energy.	Nenomaterials Research Corporation	Application in fuel (natural gas or other) fired melting and heating furnaces	SBIR - Phase 1 completed.
Thermal Imaging Control of High-Temperature Furnaces (Steel)	Sensors and Controls	Near IR thermal imaging controls combustion in furnaces, reducing fuel use and emissions.	GTI - Dave Rue	Application in fuel (natural gas or other) fired melting and heating furnaces	R&D, commercialization in 2004
In-Situ, Real-Time Measurement of Melt Constituents	Sensors and Controls, Aluminum	Measure aluminum melt constituents in situ and in real time.	Bob DeSaro - Energy Research Company	Measure aluminum melt constituents in situ and in real time.	Laboratory tests completed with success, looking for a commercial demonstration site for aluminum application

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On-Line Measurement Using Laser-Based Ultrasonic System	Steel, Sensors and Controls	Develop Laser-Ultrasonic system to provide on-line measurement of wall thickness and eccentricity of steel tubing for manufacturing control.	Robert Lolarik - The Timken Company	Potential application for measurement and control of aluminum tubes manufacturing plants	Under development
Ultrahigh-Speed Measurement of Internal Die Cavity Temperature Profiles	Metal Casting	Measurement and monitoring of internal die cavity temperature during all phases of the fill sequence in a die casting die.	ORNL and NADCA	Applicable to aluminum die casting machines used by parts manufacturers.	Under development, to be completed by the year 2003 for testing and demonstration.
Intelligent Potroom Operation: Improved Control of the Aluminum Refining Process	Aluminum	Predictive tool to anticipate the instability or degraded operations of the cell (pot).	Jan Berkow - Applied Industrial Solutions	Prediction of the instability or degraded operations of the cell (pot).	In development stage
Diagnosis and Control of Natural Gas Fired Furnaces via Flame Image Analysis	Sensors and Controls	Use of video images and artificial intelligent techniques to obtain information for optimal control of natural gas fired furnaces	University of Missouri-Rolla	Application in fuel (natural gas or other) fired melting and heating furnaces	Under development
Wireless Sensors for IOF	Sensors and Controls	Development of wireless telemetry architecture to provide building blocks for intelligent industrial process control system	Wayne Manges - ORNL	Potential application in aluminum plant wide control system.	Under development, prototype demo during 2002.
Temperature measurement of Galvanized Steel	Steel	On-line, emissivity independent temperature measurement system for irregular or moving surfaces for temperatures upto 1500 C.	Joseph Vehec - AISI	Potential application in annealing of aluminum strips, coils or other parts.	Field demonstration completed for steel - galvanizing strips.

Note:

Fact Sheets are available for all projects, except those with **, at the OIT website under the respective Industries of the Future (IOF) tab

OIT web site is www.oit.doe.gov