

# METALCASTING

## Project Fact Sheet



## A PROCESS TO RECOVER AND REUSE SULFUR DIOXIDE IN METALCASTING OPERATIONS

### BENEFITS

- Projected energy savings of 75% for a medium sized foundry to recover and reuse SO<sub>2</sub> and the carrier gas
- Captures and reuses efficiency of over 95% for SO<sub>2</sub> and the carrier gas without further purification
- Rapid, one year payback
- Eliminates scrubber chemicals for waste treatment

### APPLICATIONS

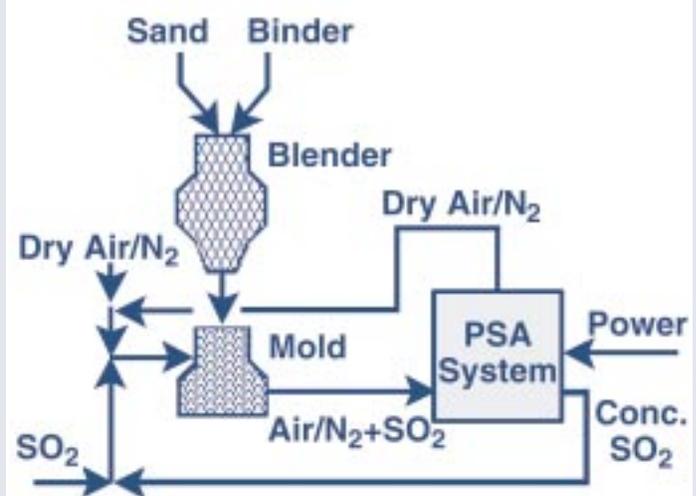
Pressure swing adsorption to recover and reuse SO<sub>2</sub> can replace the current operation of using SO<sub>2</sub> once and then discarding it by purging the mold with dry air or nitrogen that must be scrubbed with a caustic solution. The process might be applied to other operations that use or produce SO<sub>2</sub> such as lead and copper smelting, food preservation, and flue gases from power plants.

## PRESSURE SWING ADSORPTION WILL RECOVER 99.5% OF THE SULFUR DIOXIDE USED IN FORMING COLD BOX MOLDS FOR METALCASTING

Sulfur Dioxide (SO<sub>2</sub>) is used as a catalyst in forming cold box molds and cores. The present, wasteful mode of operation uses the SO<sub>2</sub> once, then discards it by purging the mold with dry air or nitrogen. That effluent is then scrubbed (at about 98% efficiency) with a caustic solution, which is then flushed into a sewer or delivered to a waste treatment facility.

The new process is based on pressure swing adsorption, and requires no regnerant; hence, it produces no waste streams. Preliminary testing showed recovery rates of 99.5% for SO<sub>2</sub> and 99.8% for the carrier gas that allow for reuse without further purification. The principal operating cost is for power consumed in evacuating the adsorbent vessels during blowdown, and maintaining low pressure during purge. Employing this process will reduce energy consumption, eliminate the need for caustic effluent, and pay back in less than one year.

### NEW PSA-BASED SYSTEM



New sandcasting SO<sub>2</sub> recycling technology using a pressure swing adsorption system for gas recovery instead of a wasteful scrubber system.



## Project Description

**Goal:** The goals of this project are to design and construct a prototype SO<sub>2</sub> recovery and reuse system that will be installed and tested in a variety of foundries.

The pressure swing adsorption system consists of one or two stages, depending on the application. The pressure swing cycle ensures continuous processing of the foundry off-gases and complete recovery of the excess SO<sub>2</sub>. The proposed project will include the design and construction of a pilot-scale prototype using the new pressure swing process to be tested at two or more foundries currently using scrubbers for their waste SO<sub>2</sub>. This will demonstrate the new technology without disrupting normal operations. In addition, new features to reduce energy losses due to pressure drop will be demonstrated.

## Progress and Milestones

- Final tests on adsorbents are ongoing. Once the adsorbents are selected, design and construction of the prototype equipment will begin.
- Once the unit is constructed, it will be installed at two or more foundries for on-site testing under industry conditions.
- Evaluation of unit performance and integrity will follow with necessary unit modifications to optimize the system.
- An operation manual will be developed along with a marketing campaign to promote the system while on-site testing continues.

## INDUSTRY OF THE FUTURE—METALCASTING

*The metalcasting industry – represented by the American Foundrymen's Society (AFS), North American Die Casting Association (NADCA), and the Steel Founder's Society of America (SFSA), has prepared a document, "Beyond 2000," to define the industry's vision for the year 2020. OIT's Metalcasting Vision Team partners with metalcasters, national laboratories, universities, and trade/environmental/technical organizations to develop and implement energy efficiency technologies that benefit both the industry and the United States. Recently, the Metalcasting Team facilitated the development of the Metalcasting Technology Roadmap, which outlines industry's near-, mid-, and long-term R&D goals.*

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NICE<sup>3</sup>—National Industrial Competitive-ness through Energy, Environment and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Total project cost for a single award must be cost-shared at a minimum of 50% by a combination of state and industrial partner dollars. The DOE share for each award shall not exceed \$400,000 to the industrial partner and up to \$25,000 to the sponsoring state agency for a maximum of \$425,000. Each award may cover a project period of up to three years.

### PROJECT PARTNERS

NICE<sup>3</sup> Program  
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