



INDUSTRY ENERGY RESEARCH AND DEVELOPMENT PROGRAM

CLEAN ENERGY TECHNOLOGIES

AN EFFICIENT SCRAP METAL PREHEATER FOR FOUNDRIES

With help from the Industry Energy Research and Development (IERD) program, an Ontario firm has developed an efficient gas-fired scrap metal preheater for use in small- and medium-sized foundries. Use of the new preheater yields a consistently dry, preheated charge that significantly improves worker safety and plant throughput, while cutting energy bills and atmospheric emissions.

The Project

Where there is a need there must be a way. So reasoned Randy Cyr, president of R.J. Cyr Co. Inc., a small engineering and manufacturing firm based in Windsor, Ontario. In 1993 Mr. Cyr applied to the IERD program for help in developing a more effective preheater specifically designed for small and medium size foundries.

The Opportunity

Moisture contacting molten metal can flash with sufficient force to damage equipment and injure workers. That's why iron and steel foundries sometimes use a preheater to dry the wet, oily scrap metal - their primary raw material - before charging it to their furnaces. Preheating the scrap cuts the time needed to melt it; and because preheaters use natural gas in place of the electricity used in the furnaces, they can help a foundry trim its energy costs while increasing production.

That's the theory. In reality, many commercially available preheaters are unsuitable for use in smaller installations. They can waste energy, take up space and slow down plant operations.



Preheated scrap being charged into the melting furnace.

"We'd never have come as far or as fast as we did without IERD support," says Mr. Cyr. "The money was vital, of course; but just as important was the fact that their people were there to ask the tough questions and formalize the process. For example, they suggested that we develop a mathematical model, something we wouldn't normally do. But now that we have it, designing custom systems for individual clients is a piece of cake.

"They also encouraged us, from the very beginning, to take a broader view. Had IERD not been involved, we'd probably have completed the installation in Windsor and that would have been the end of it. But thanks to IERD's support we're poised to enter an international market with a technology that, to my knowledge, is unmatched anywhere in the world."

"We had some reservations about getting involved with a government-run program," he admits, "but we are delighted at how quick and easy the application process really was."

The IERD program responded with guidance, technical advice and \$155,000 in financial support, about 25% of the project's costs. The program, which is administered by the CANMET Energy Technology Centre-Ottawa of Natural Resources Canada, helps Canadian firms develop and commercialize new, energy-saving technologies, products and processes.

The Team

Ken Miller, owner of Standard Induction Castings, recognized the potential when he saw the prototype bucket-style preheater originally developed by the Canadian Gas Research Institute (CGRI) in 1990.

Greg Lavallee and Ken Brown of Standard Induction together with Marvin Fields and Don Brechun of R.J. Cyr Co. Inc. were the team that designed and developed the prototype into reality.

Within 2 years of first seeing the prototype at CGRI, Standard Induction had its own fully functioning preheater. R.J. Cyr Co. Inc. designed, manufactured and fully integrated the process into the foundry's operations. Not only were ongoing casting operations never once disrupted, enhanced material handling helped optimize production.

The Process

In operation, the preheater's double-walled, insulated steel bucket is top-loaded with scrap metal from a vibrating conveyor. Pneumatic arms then lower a hood/burner assembly to the top of the bucket and an exhaust vent to its bottom, completely sealing the material inside. Flame from the gas burner - a design developed by CGRI - is drawn down through the scrap under negative pressure. Combustion gases



Scrap preheater showing scrap loading position (far left); preheating station (top); and scrap bucket pick-up station (right)

and particulates are sucked away by the exhaust fan and funneled to a high temperature afterburner.

The centerpiece of the materials handling system is an automated turntable that supports up to four buckets. The turntable positions the buckets, one at a time, under the loading conveyor, then rotates them to the next station. The arrangement makes good use of available space and keeps production moving: while one bucket is loaded, another is dried, a third is emptied into the furnace and a fourth is returned to the turntable. Operators use electric hoists and overhead monorails to move and tilt the buckets.

The Rewards

"The system has performed far beyond our expectations," says Greg Lavallee, President of Standard Induction


Castings Ltd., of Windsor, Ontario, whose foundry hosted the field trial. The preheater produces a consistently dry charge while warming it to 550°C in less than 8 minutes. Preheating the scrap shaves 17% off its melting time, which allows the plant to use electricity more efficiently while increasing production. The result is an 18% increase in productivity. "This technology has helped us increase productivity and profitability," says Lavallee.

By doing some of the work of the melting furnace with natural gas, the preheater cuts the foundry's energy bills substantially. Thanks to the afterburner, fugitive emissions of volatile organic compounds and related hydrocarbons have been reduced by 90%, allowing the plant to easily meet current and foreseeable government standards. The sealed, insulated bucket keeps heat loss to a minimum (the system boasts a thermal efficiency of 78%), while virtually eliminating smoke and fume on the melt deck.

R.J. Cyr has recently entered into a licensing agreement with CGRI to market the technology in Canada and abroad. The potential Canadian market has been estimated at \$30 million.

Your Invitation to Work with Us


We are interested in collaborating with you. Please contact the Business Office to discuss your particular needs.

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