

Capturing Waste Gas: Saves Energy, Lowers Costs

ArcelorMittal's Indiana Harbor plant in East Chicago, Indiana, is the largest steel mill in the Western Hemisphere. It operates five blast furnaces, including the largest in the United States, known as the No. 7 Blast Furnace. These furnaces transform iron ore, coke, limestone, and scrap into more than 9.5 million tons of high-quality steels each year, including hot-rolled, cold-rolled, and hot-dipped galvanized sheet products serving automotive, appliance, agricultural, and construction applications. Blast furnace gas (BFG) is a byproduct of this steelmaking process.

Flare Capture Boiler Creates Reliable, Useful Energy

BFG has a very low heating value—about 100 Btu/cubic foot, or one-tenth the heating value of natural gas. BFG from the No. 7 Blast Furnace had been used as the primary fuel for three boilers



Prior to the installation of the energy recovery boiler, 46 billion cubic feet of BFG was flared into the atmosphere each year. *Photo courtesy of ArcelorMittal*



ArcelorMittal's Indiana Harbor plant covers 3,100 acres crossing the Indiana Harbor canal on the southern shore of Lake Michigan in East Chicago, Indiana.

Photo courtesy of ArcelorMittal

at the No. 5 Boiler House. However, the existing boilers could not consume all the BFG—22% was wasted when it was flared into the atmosphere through an exhaust stack.

Committed to the efficient use and conservation of energy, ArcelorMittal's Energy Team at Indiana Harbor performed benchmark studies comparing the Indiana Harbor plant to the best practices for energy performance at other ArcelorMittal facilities. The BFG flare rate from the No. 7 Blast Furnace at Indiana Harbor was the highest of all ArcelorMittal's USA facilities. The Energy Team determined that capturing the waste BFG and converting it to electricity would be a cost effective way to improve the facility's energy efficiency.

In June 2009, ArcelorMittal learned about the potential to receive a 50% cost-matching grant from the American Recovery and Reinvestment Act administered by the U.S. Department of

Energy (DOE). ArcelorMittal applied for the competitive grant and, in November, received \$31.6 million as a DOE cost-sharing award. By matching the federal funding, ArcelorMittal was able to construct a new, high efficiency Energy Recovery & Reuse 504 Boiler and supporting infrastructure. The boiler, which weighs over one million pounds, was built in Buffalo, New York, and then transported to East Chicago, Indiana.



The boiler was shipped by truck and a lake freighter on the Buffalo River to the Indiana Harbor facility.

Photo courtesy of ArcelorMittal

To accommodate the boiler on site, a new 17,000-square-foot boiler house and 290-foot exhaust stack were constructed. Nearly 620 feet of new 66-inch pipe was installed to carry the BFG to the boiler. A feedwater economizer and combustion air preheater were installed to remove waste heat from exhaust gases and improve the boiler efficiency. Draft fans, feedwater pumps, and a deaerator were also constructed to support the operation.



The boiler weighs over 1 million pounds and is kept in a 17,000-square-foot boiler house along with supporting equipment.
Photo courtesy of ArcelorMittal

High Efficiency Boiler Uses BFG for Steam, Power

The boiler was connected to the high-pressure steam system at the No. 5 Boiler House in September 2012. The boiler’s 88% efficiency enables it to produce 350,000 pounds per hour of steam from about 490 MMBtu per hour of previously wasted BFG. The steam drives existing turbo-generators at the facility to generate electricity. The electricity is used on site and displaces power generated by the local electric utility from primarily coal-fired power plants. This reliable source of power reduces the plant’s exposure to energy price fluctuations. Internal power generation has increased, and purchased power costs have been reduced, thus

Estimated Annual Benefits

Energy Savings	4.6 trillion Btu
Cost Savings	Nearly \$20 million, effectively lowering steel production costs by \$5 per ton
Emissions Reductions	340,000 tons of carbon dioxide, equivalent to taking 62,000 cars off the road
Electricity Generation	38 megawatts of power, equivalent to 333,000 megawatt hours, which is enough to supply electricity to 30,000 homes

improving competitiveness of the facility. The project was awarded “Best Operational Improvement” for 2012 by American Metal Market.

Job Creation and Retention

Approximately 500 jobs (included 200 local trades) were created during the project’s construction, installation, and operation. Most of the jobs were created in the manufacturing and construction industries. More than 175 workers were on site daily at the peak of construction. The project also supported the retention of nearly 5,900 direct and 26,800 indirect jobs at the Indiana Harbor steel

mill. Wendell Carter, Vice President and General Manager at ArcelorMittal Indiana Harbor said, “Investments such as the DOE funding ensure the sustainability of steelmaking in Northwest Indiana, while supporting our commitments to energy efficiency and superior environmental performance.”

Recognition for Sustained Excellence

DOE and The U.S. Environmental Protection Agency (EPA) presented ArcelorMittal USA with an ENERGY STAR® Award in March 2013. ArcelorMittal USA received the highest award, ENERGY STAR® Partner of the Year – Sustained Excellence, “for its commitment to identifying and implementing innovative solutions to increase the sustainability of its operations, reduce greenhouse gas emissions, protect the environment and natural resources, while saving energy and costs.”¹ The new energy recovery boiler was one of the key accomplishments that earned ArcelorMittal USA the award.

“This is a good example of high efficiency manufacturing technology, thoughtfully executed, and is everything the Recovery Act was meant to be. Now instead of exhausting and flaring nearly 5 trillion Btu of BFG annually, we can harvest it and make electricity.”

– Dr. Robert W. Ivester,
Acting Program Director,
Advanced Manufacturing Office,
U.S. Department of Energy

¹ “ArcelorMittal USA,” ENERGY STAR® Awards, ENERGY STAR® website.

