



KENTUCKY ALUMINUM INDUSTRY



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Identify the Numbers

Kentucky is home to over 120 aluminum companies, employing 15,000 workers, and producing 16% of the U.S. total of primary aluminum. Two of the operating 14 primary aluminum facilities are located in Kentucky producing 2,931,058 tons of aluminum in 2008.

Why is this market sector a good fit for CHP?

Aluminum is an extremely energy intensive industry and in fact nearly one third of the cost to produce aluminum is the energy required to produce it. Primary facilities operate 24/7 and CHP technology can be used to capture waste heat at aluminum facilities.

What is the market potential for this sector?

The reduction of energy costs is the principle reason for CHP implementation. Primary aluminum facilities must vent gas from the manufacturing process as part of the pollution control devices. This venting carries heat away from the process and is expelled into the atmosphere. By recovering this heat, energy costs could be reduced.

Secondary aluminum facilities which produce aluminum from scrap sources have gas furnaces that must vent combustion gases at very high temperatures which could be a significant source of waste heat energy. Aluminum rolling facilities also have waste heat sources from pre-treat and heat treating furnaces.

What are the potential benefits and uses?

The amount of heat required by aluminum facilities cannot be provided by topping cycle heat engines and as such, a bottoming cycle CHP technology would be the most beneficial. Bottoming cycle heat engines would recover the heat from an existing process. The aluminum plants have pollution control exhaust and combustion exhaust where heat can be recovered.

Secondary aluminum facilities which take aluminum scraps and remelt them have flue losses that range from 35-50%. Some of these losses can be recouped by various bottoming cycle CHP technologies.

Possible implementations of CHP technology are:

- Steam Turbines recovering heat from stack exhaust
- Organic Rankine generators recovering heat from the stack stream
- Absorption Chillers using waste heat from the stack stream offsetting the electrical chillers

Several sites analyzed for electrical output showed that there is potential for 1.4 MW of electricity at a primary aluminum facility. Rolling facilities have potential of producing up to 1 MW and casting facilities could produce up to 500kW depending on exhaust temperatures.

Use/Examples/Obstacles

Some companies in Kentucky already use recuperators for building or process heating, others have not incorporated any type of heat recovery techniques. Those companies not already implementing these technologies should consider the benefits of using a CHP system.

Based on EPA stack data, a primary aluminum facility was analyzed for potential. This Kentucky facility must vent gas as part of factory air quality control. The vented gas exits the stack at 200 F and over 2 million CFM. If a bottoming cycle heat engine was used to recover heat and convert it into electricity, a 10% efficiency in recovery would yield a \$460,000 savings in energy each year.

Additional Benefits?

Aluminum facilities use an immense amount of energy. While CHP may provide a cost saving, those facilities considering CHP implementation should perform feasibility study. The study should provide engineering and economic analysis which will determine if a project using CHP technologies would be profitable to install. While initial costs associated with establishing CHP are viewed as relatively high, rising fuel costs may cast a more appealing light on such proposals and subsequently create a large market for CHP applications.

For interested parties, CHP technologies offer a potential opportunity to increase productivity and economic efficiency within the agricultural process. As such, there are numerous government, trade, and support organizations for the implementation of CHP equipment.

The Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) offers *Quick Plant Energy Profiler (Quick PEP)* software on its website to help determine how energy is currently being used and where opportunity exists to save cost and energy. The Department of Energy also sponsors *Industrial Assessment Centers (IACs)* which provide no-cost energy assessments for small and medium sized facilities.