



**MIDWEST
CHP
APPLICATION
CENTER**

In Partnership with
the US DOE

combined heat & power in industry

Broshco Fabricated Products

4.55 MW CHP Application

Project Profile

Quick Facts

Location:

Mansfield, Ohio

Type of Industry:

Automobile Seat Frame Manufacturer

Maximum / Average Electric Demand:

4,000 kW / 3,000 kW

CHP Electric Capacity:

4,550 kilowatts

CHP Thermal Capacity:

8 MMBtu/hr hot water heat recovery

- ▶ Engine jacket water
- ▶ Engine exhaust

Prime Movers:

- ▶ (3) 1,150 kW Waukesha 7100 GSI 1200 rpm Engines - *installed 2000*
- ▶ (1) 1,100 kW Waukesha APG 1800 rpm ARES Test Engine - *installed 2005*

Heat Recovery Applications:

- ▶ Process tanks
- ▶ Boiler heat
- ▶ Make-up heat for plant operations

Fuel Type:

Natural Gas

Operating Schedule:

Operated when utility power price signals are above the cost of on-site generation

Reasons to Install CHP:

- ▶ Energy Savings
- ▶ Backup Standby Power

Project Overview

Broshco Fabricating Products, a fabricator of ferrous metal involving modern stamping, metal tube fabrication, and welding production equipment, is located in Mansfield, Ohio, 80 miles southwest of Cleveland, Ohio. The Broshco Fabricating Products plant operates a 4.55 MW CHP system that generates electricity and 8 MMBtu per hour of hot water to supplement building and process heat loads. The system is driven by three 1,150 kW Waukesha 7100 GSI natural gas-fired engine generator units (installed in 2000) and a fourth engine generator unit added in 2005 as a test unit for the ARES DOE program – a 1,100 kW Waukesha APG natural gas-fired engine generator. Today, the CHP system's schedule of operation is determined by local utility rates and to some extent hourly pricing signals when the price of purchased electricity from the utility is greater than the cost of on-site generation. The CHP system operates between 2,000 and 3,000 hours of per year.



Broshco Fabricated Products' CHP Building

Background

Broshco Fabricated Products, a division of Jay Industries, Inc, is one of two facilities located in Mansfield, Ohio that is owned by Jay Industries and operates a combined heat and power system. A third system sited at the Mansfield Area YMCA was donated by the owner of Jay Industries. All three CHP systems were designed and installed by Ballard Engineering Co., a design / build firm located in Rockford, Illinois.

- ▶ 4,550 kW CHP system – Broshco Fabricated Products – installed 2000, upgraded 2005
- ▶ 150 kW CHP system – Mansfield Area YMCA – installed 2000 (donated by Jay Industries, Inc.)
- ▶ 1,900 kW CHP system – Jay Plastics – installed 1997

In 1997, Jay Industries, Inc. installed a 1,900 kW CHP system at the Jay Plastics facility seeking to expand corporate energy savings and provide backup power. Building upon this success, Jay Industries decided to construct another CHP system at their Broshco plant. Although intentions were at hand, Jay Industries would exercise patience as the existing natural gas line to the Broshco plant would experience a fuel capacity upgrade to meet the required fuel quantity of an integrated CHP system. In 2000, following negotiations with the local electric utility and the installation of the upgraded natural gas line, three Waukesha engines with heat recovery were installed. Today, Broshco Fabricated Products' and Jay Plastics' engineering personnel are trained to operate, maintain, and repair the CHP system and equipment.

Jurisdiction over the Interconnection Process

The jurisdiction of distributed generation systems that interconnect to the grid at the transmission service level of 69 kV and above, fall under the responsibility of an Independent System Operator (ISO). Whereas, distributed generation systems that interconnect at the distribution service level below 69 kV, fall under the jurisdiction of the local utility. The interconnect rules and regulations of an ISO are standardized throughout their service territory; meanwhile, the rules and regulations of interconnection can vary significantly from one utility to the next.

The primary concerns when interconnecting to the grid regularly include safety, power reliability, and power factor, which can lead to a variety of engineering studies performed to ensure adequate measures are taken to interconnect properly to the grid. Since these steps and procedures can vary considerably, it is often recommended to contact the electric utility early in the planning and design phase of each project. An engineering firm that is knowledgeable in the technologies, concepts, and installation practices of distributed generation systems is indispensable when implementing and installing these types of projects.

ARES DOE Program

The Advanced Reciprocating Engine Systems (ARES) program is a competitively funded, multiple participant arrangement involving the U.S. Department of Energy (DOE), Caterpillar, Cummins and Waukesha Engine. The engine output range targeted by ARES is approximately 500 – 6,500 kW for power generation applications. Special attention has been given to technologies that compare to current and future competing distributed generation technologies.

The manufacturers and supplier teams, along with considerable involvement from several universities and national laboratories, are researching advanced materials, unique fuel and air handling systems, advanced ignition and combustion systems, catalysts, lubricants, and technologies that are compatible with existing transmission and distribution systems.

Launched in September 2001, the ARES program consists of three phases, each with specific targets to reach the program's overall goals by 2010:

- ▶ 50% electrical efficiency
- ▶ 80+% CHP efficiency
- ▶ 0.1 g/bhp-hr NO_x (0.3 lb NO_x/MWh)
- ▶ 10% reduction in cost of power
- ▶ Improved reliability, availability, maintainability

The packaged Waukesha APG generator set is a 16-cylinder, turbocharged, inter-cooled, lean combustion power generation unit capable of producing 1,100 kW at 60 Hz (1,800 rpm) with an electrical efficiency of 40.5%. The APG engine features a 428 L lube oil capacity, a single ABB turbocharger design and a two-stage inter-cooler for improved heat recovery characteristics.

Source: Diesel & Gas Turbine Worldwide, October 2005



Waukesha 7100 GSI Engine Units



Control Room Switchgear



Waukesha APG 1800 rpm ARES Test Engine

For further information contact:

*Midwest CHP Application Center
851 S. Morgan Street
Chicago, IL 60607-7054*

*Phone: (312) 413-3835
Fax: (312) 996-5620*

www.CHPCenterMW.org

**40.5%
electric
efficiency**

**ARES
Waukesha
APG Unit**

**100%
backup /
stand alone
power
capability**

**1 of 3
CHP systems
owned by Jay
Industries, Inc.**

