Propane Education & Research Council
Final Grant Report
Docket 10565

Background

Source: http://www.northernpower.com/case-studies/gmcr.html

Customer Need

Waterbury, Vermont-based Green Mountain Coffee Roasters (GMCR) needed a reliable, on-site back-up power system for its roasting and packaging operations. The company had been experiencing monthly power disturbances, ranging in duration from less than a second to hours, causing costly downtime in its manufacturing processes and resulting in significant product loss. Since their process control devices could be disrupted by as little as a 20 cycle dropout, GMCR needed a system that would deliver truly continuous power. Safety was also a priority, because the roasting process has an exothermic stage and can be a fire hazard if the machinery shuts down.

Northern Solution

Working in conjunction with Niagara Mohawk Energy, Northern's solution was to custom engineer and install a grid-connected, on-site power system that would address GMCR's criticial needs for continuous, highly reliable power.

The combined heat and power system consists of a 95kW propane-fueled Waukesha Enginator® that operates full time during coffee production, providing 208 Volt 3 Phase power to a critical load panel. In the event of an outage or anomaly as short as two cycles, the utility-side circuit breaker opens and the critical electrical load is seamlessly sustained by the generator. Waste heat from the Enginator water jacket is sent to super-insulated tanks that preheat wash water for processing and other building uses. Northern installed and programmed the digital engine control and microprocessor-based utility-grade relay to provide system control and safety functions. The intelligence of the GMCR system is provided by Northern's Engine Control System, while a Local Operator Interface provides control of equipment and a display of electrical parameters, equipment status, and system alarms.

Performance Results

Northern's on-site system reduces utility power costs during peak use periods (peak-shaving), provides highly reliable back up power and incorporates cost-saving heat recovery for potable hot water and space heating.

Objective:

- Provide the Company with Distributed Power in an environmentally acceptable format.
- Guarantee high quality power for the roasting process.
- Reduce the amount of fuel used in operations and facilities.
- Reduce the thermal footprint of the equipment.

Benefits:

- Steady clean dependable power for roasting no matter what the weather.
- Hot process water, at reduced costs.
- Building heat, at reduced costs.

- Telecommunication Systems Emergency Power.
- Management Information Systems Emergency Power.
- The ability to manually switch the system from the roasters to the distribution lighting and conveyors for shipping purposes.

Options Reviewed:

- We reviewed the reliability of our existing system.
- Our path was clear based on the positive experience of the system installed on 1999 we wanted the same level of security.
- We opted to add a second 280 KW 480 Volt system.

Environmental Aspects:

- The new Co-gen system would be a turbo charged engine, staying with the same brand manufacture.
- This would allow us to get Air Quality permits from the Agency of Natural Resources.
- We would be permitted for unlimited operation parameters.

Hardware Selection:

- We kept the same brand switchgear.
- We added a much bigger user interface and provided a trending screen for diagnosis of power failures.
- We incorporated the engine monitoring system in the touch screen instead of having it be a stand-alone system. This sets the stage for remote monitoring of the entire system.
- We provided space in the enclosures for a second unit of equal or larger size.

A New Partnership Emerges.

- We contacted the Propane Education & Research Council and applied for grant money to help fund the heat reclaim part of the project. The heat exchanger on the exhaust system had worked well.
- We kept the same brand air to water heat exchanger. We just got a larger one. Cain RESW 179 Sq Ft of heat exchanger surface.
- We liked the water-to-water heat exchanger on the cooling system but we had a space constraint.
- We installed an on demand unit vs. large storage tanks of the 90 KW system manufactured by P-K Compact by Patherson Kelly Co

Logistics:

- We already had the building, but we needed to bring in 480 service from the grid. The power company agreed to install the service but:
  - We had to purchase the transformer to set in the pad, and then give it to them.
  - We had to agree not to increase the 240-volt service and to transform from 480 volt down to 240 volt someday
- We reviewed air handling in the co-gen building and our gut feeling was right.
- We had to install a new ventilation system to remove the excess heat.

Project Costs:

Generator, Electrical Switch Gear & Commissioning
$331,000
Heat Exchangers, Installation & Plumbing
$105,500
Grant monies from the propane Council
$(50,000)
Total Cost
$387,500

90 KW System Modifications:

- The 90 KW system is now our stand-by emergency power for the telecommunications, MIS and expanded plant lighting needs.
- We run this system during bad weather to avoid the slightest disruption in service.
- We are debating upgrading the engine with a catalytic converter and putting it back on line full time. We first are studying the heat recovery from the new roasters to determine what will give us our greatest payback in recovered energy.

Verified Energy Savings:

- Totalizing fuel meters were not installed on the two gen-sets at time of installation.
- We are in the process of installing meters on both gen-sets at the present time.
- Cost savings cannot be documented without the data from these meters.
- The system has run in excess of 10,000 hours to date.

**Source: "Reducing Your Environmental Thermal Footprint" SCAA Seattle 2005 Power Point Presentation By: Paul Comey*

Figure 1 90 KW Generator

Figure 2 Control Panel

Figure 3 Heat Exchanger

Figure 4 Water Jacket Heat Exchanger

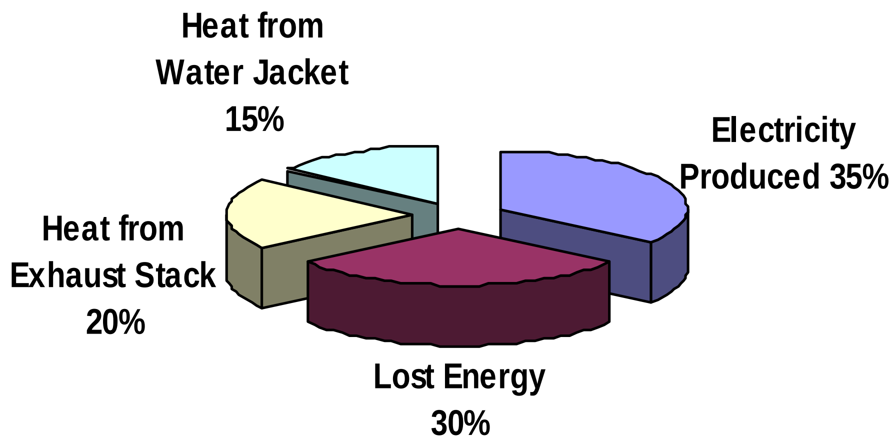

Figure 5 Typical Energy Output of System

Figure 6 280 KW Generator

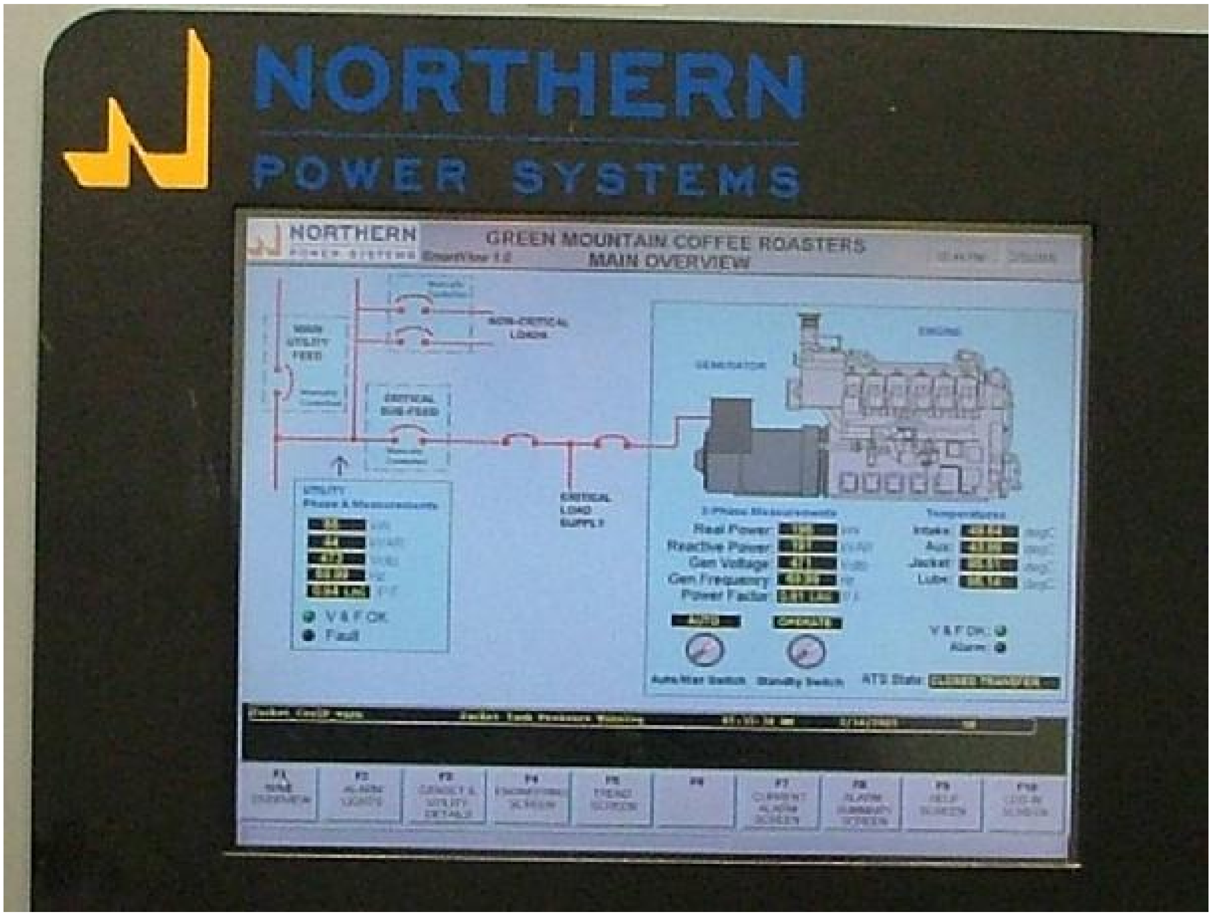

Figure 7 Control Panel Overview Screen

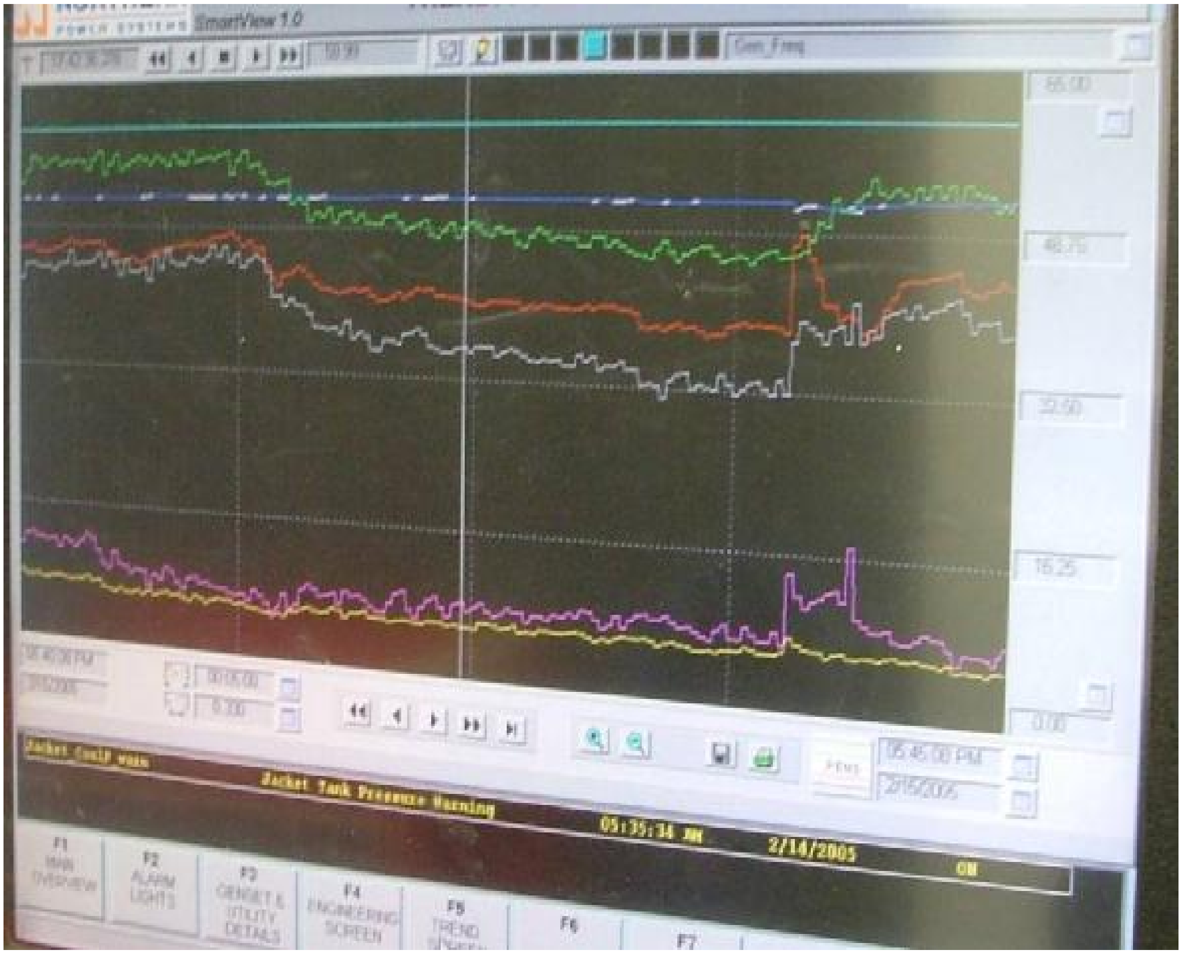

Figure 8 Trend Power Screen

Figure 9 280 KW Heat Exchanger