



PumpLines

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Maintenance Headaches at CoGen Plant Cured With PumpSmart®

Jim O'Connor

Regional Sales Manager

Brian Verdehem

Sales Engineer

At a major cogeneration facility in a coke-making plant, Goulds' PumpSmart equipped pumps have eliminated maintenance problems associated with cavitation as well as constant wastewater spills by providing on-demand variable speed pumping for the facility's wastewater service.

PumpSmart is an advanced technology system that works with any centrifugal pump utilizing a smart VFD controller and proprietary control software to provide significantly reduced energy costs, enhanced reliability through failure prevention, and advanced process control.

With disruptions in price and supply across the United States, access to a constant and low cost supply of electricity by large industrial consumers is more important than ever. In many industrial processes, large amounts of waste or latent heat are generated. These sources of heat provide the perfect



opportunity for on-site generation of electricity, using a process known as co-generation.

Cogeneration, a form of distributed generation, has been the key driver in industrial demand growth for energy. Much of the energy demand in the industrial sector is based on the need for heat and electricity. Both electricity and usable heat can be produced in a single process called cogeneration. Because cogeneration equipment captures and uses heat that would otherwise be wasted, it is far more efficient and clean than conventional separate processes. Cogenerators currently produce about 10 percent of the electricity consumed in the United States

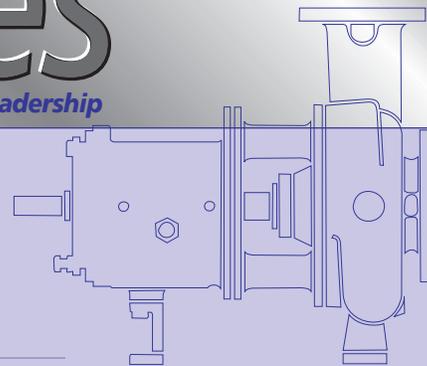
The Primary Energy Corporation is one of a new breed of energy producers taking advantage of the opportunities of co-generation. Their new Cokenergy plant is a 95 mega-watt electrical generating facility located on site at Ispat Inland's East Chicago Steel Works on the shores of Lake Michigan in Indiana. The plant provides power to Ispat's #7 Blast Furnace, which is one of the biggest blast furnaces in the Western Hemisphere. Cokenergy uses the waste heat and byproducts from a new set of coke ovens installed in 1998. This plant is the first of its kind for non-recovery coke battery to power.

Coke is one of the basic components of steel production and is produced by heating coal to high temperatures for a long period of time. The coke making process produces immense quantities of latent waste heat - a natural opportunity for a co-generation plant. Previously considered waste heat is now being directed to a series of boiler-generator combinations to produce electricity for the steel mill. According to Dale Bell, manager of facilities and maintenance at Primary Energy, "what our facility does is capture that heat, make steam, which we use to generate electricity and send process steam to our host - Ispat Inland Steel. All of the energy we produce helps to provide for their needs."

Business and Environmental Benefits of Co-Generation

The country's large integrated mills share some important operating characteristics for co-generation.

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Maintenance Headaches...

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For starters, steel making facilities typically exhibit a large thermal and large electric demand with a high load factor - and they operate twenty-four hours a day, seven days a week, 365 days a year. Other key conditions include the availability of waste or by-product energy, an energy consumption profile marked by low natural gas and high electric costs, and the presence of energy facilities in need of replacement or upgrading.

The co-generation plant provides many advantages for the industrial customer. Besides allowing the customer to focus on its core business, the "inside the fence" power project significantly reduces operating costs and provides a reliable, low-cost source of electric power for the consuming company. It also reduces vulnerability to purchased power price spikes and improves overall environmental performance by converting waste heat into clean, useable electricity. In the case of Ispat Inland Steel, there are a few additional environmental twists: The coke facility is the first to incorporate full-scale heat recovery for flue gas scrubbing of SO₂ and particulate matter as well as power generation. The co-generation plant also replaced a 134-megawatt coal burning power plant at Cokenergy at Ispat Inland in East Chicago, Indiana, without the need to burn any additional fuels.

Dale Bell of Primary energy notes that, "We look at three factors. Is there some kind of waste energy available? Is there some old and efficient equipment being used - which allows for efficiency gains, and is the company in need of someone to come into do this for them because their core focus is not on generating electricity?"

Plant Maintenance is Crucial for Profits

Bell goes on to say that, "what we produce is what we get paid for. So our reliability and production numbers are very important to us because if we don't have those, we don't get paid."

This "pay for play" scheme recently ran into some trouble when centrifugal pumps in the wastewater system were creating maintenance havoc. Jim O'Connor of Goulds pumps notes that, "the price Primary Energy can charge its customers is fixed for the life of the contract. The key to being profitable is to keep the support staff lean and to keep the plant running. Dale Bell had advised me that he needed to replace some problematic split case pumps which were being used in a

wastewater application and that he needed the new pumps to be a split case design with a variable speed drive."

According to Bell, when co-generation plants are built, they often times have to tie into the existing infrastructure of a plant. In the case of this coke plant, there were many limitations, including having to tie into a wastewater piping system that was outdated and causing a major bottleneck. In making high quality water for the boilers (in order to heat the plant), there is a lot of waste water generated because of the high particulate matter in the water drawn from Lake Michigan. All of this wastewater was required to go through a single pipe to get to the plant's waste treatment facility. This pipe also served a number of other wastewater applications and during peak use periods, the existing pumps could not push enough water through the pipes, causing water spills and overflowing tanks and environmental problems.

Bell recalls that, "the old wastewater pumps that we had installed were very high maintenance. The original pumps were a constant speed centrifugal-type and the pumps cavitated all the time and broke down constantly. We had to spend significant amounts of repair money - actually rebuilding the pumps twice over a three year period - and we were not able to keep up with the volume of water."

O'Connor remembers that he talked to Dale about Goulds' PumpSmart technology and its advantages over traditional VFD's, including, dry run protection, protection against cavitation, and the fact that the pumps will be able to react to system changes. The problems they had with the current installation also

made PumpSmart a good product for Cokenergy. The existing pumps are fixed speed with no built-in protection for cavitation or dry running. With PumpSmart the cost of the damage from dry running could be eliminated.

According to O'Connor, "I also stressed that PumpSmart would only need wires run between the instrumentation and the controller and the controller and the DCS system. Then the pumps would be ready to go — no field programming needed, making for a much quicker startup and a better level of integration."

Bell agreed and four PumpSmart units from Goulds were installed. In the case of the Cokenergy plant, the PumpSmart system tied into an existing piping system and according to Bell, "it allows us to have a system that is able to automatically adjust the volume of water according to the needs of the plant. And, we don't have to tear up a lot of existing piping systems to improve our situation. These PumpSmart units just ramp up or down depending on system requirements, and get rid of the wastewater." An additional benefit is the power savings of PumpSmart controlled pump.

The four PumpSmart units have been in operation since November 2000 and since then there have been no problems. Bell notes that, "It is a good thing we put PumpSmart on these new pumps because if we hadn't, we'd have been tearing them out just like the old pumps."

In addition to steel makers, other target markets for co-generation include the oil refining, chemical, food products and pulp and paper industries in North America. ■

