



# Bentonite Processing Facility Benefits from New Automation System

To meet rising customer demand, Black Hills Bentonite, a bentonite processing plant, installed a new, state-of-the-art automation system, complete with RSVIEW32 and RSLogix. They now enjoy increased productivity and reduced maintenance costs.

During the Cretaceous period, chains of volcanoes triggered by shifting tectonic plates sprayed forth enormous clouds of ash and lava. As the ash fall subsided, sediment accumulated over the ash, compacting it slowly over millions of years to form distinct clay bed layers. In 1890, an American geologist discovered a clay bed near Fort Benton, Wyoming, and named it bentonite after the location of his find. Quite a legacy for the base component of most of today's cat litter.

Black Hills Bentonite of Mills, Wyoming has been processing bentonite since 1947. In 1990, they started processing specifically for use in cat litter. To meet rising demand, the company upgraded its operations with state-of-the-art automation software and hardware. The company's experience is a good example of how, by evaluating specific application needs, any company can develop a cost-effective automated system to help meet customer demands.

### Bentonite by the Pound

Black Hills receives loads of bentonite trucked in from local mines. The bentonite is stock-piled in the facility yard or mixed with other minerals



to achieve different consistencies. Unprocessed bentonite has a moisture content of about 25 to 35 percent, but cat litter production requires moisture content of only 9 percent. The bentonite enters the plant via a feed belt and is run through a slicer to break up any chunks. From here it transfers to a rotary kiln dryer system to remove the excess moisture.



The dryer system can run independently of any other system in the facility, and dries an average 35 tons of bentonite an hour. It has a heating system, called a fire box, that generates heat to remove moisture from the bentonite as it passes through the dryer. The fire box heats the bentonite to about 450 degrees and outputs it at approximately 135 degrees, effectively removing most of the moisture. The bentonite is then transferred out of the dryer system through a screen and into a feed tank. During transfer, large chunks of bentonite are removed from the process and smaller chunks are sent to the feed tank. From the feed tank, the bentonite transfers to a screen system that separate the bentonite into different size clumps. The clumps are fed over to load-out tanks – the final holding tanks before the bentonite is loaded into rail cars. The tanks are equipped with scales to determine the correct tonnage of processed bentonite for each rail car.

### Starting from the Ground Up

Black Hills initially upgraded an existing facility to meet the demand for bentonite, but found that the company needed to double the bentonite processing capacity. Because the existing facility could not be upgraded any further, the company decided to invest in an brand new facility to process the additional bentonite needed.



Because Black Hills was building a new facility from the ground up, the company was able to carefully plan its requirements without having to worry about protecting investments. As a mostly motor-generated facility, Black Hills was especially interested in protecting equipment and motors. The company also wanted a way to view the entire process graphically from a PC on the plant floor for better maintenance diagnostics and operator feedback.

Black Hills started developing its new system by choosing a factory network that would help protect the company's extensive motor system. With the amperage level and the amount of use the Black Hills motors get, Black Hills wanted to cut down the overall cost of motor maintenance. The company discovered that



one network, DeviceNet™, would offer Black Hills the ability to set the amperage level in the controls so motor use could not exceed the amperage set. DeviceNet is an open network standard that provides improved communication between devices and critical device-level diagnostics. The network's built-in diagnostic capabilities allowed operators to configure the network to send diagnostic information to an operator if the pre-set motor amperage levels are exceeded. In Black Hills' case, the company configured DeviceNet to send a message that would shut any motor off if it exceeded the set amperage.

With more than 80 motors, the ability to receive as much diagnostic information from the motors as it could was another feature Black Hills wanted. To achieve this, the company installed an Allen-Bradley SMP-3 Solid State Overload Relay on each motor. The SMP is DeviceNet-compatible and provides protection from overcurrents, ground faults and damage caused by phase loss conditions. It also provides operators with diagnostic information on amperage, start/stop and phase imbalance, allowing the operators to monitor and troubleshoot the motors for any problems.

One other reason Black Hills decided on DeviceNet was the ease

of installation. Because Black Hills installs and configures most of their factory without outside help, installation had to be easy. Black Hills estimates that the company saved more than \$5,000 in labor costs just from not having to hardwire each device back to the processor.

### The Hard and the Soft of It

Black Hills evaluated Rockwell Software and Allen-Bradley products to control the processing operation – choosing to install the Allen-Bradley SLC 500™ controller and Allen-Bradley Flex I/O system along with Rockwell Software RSVIEW32™ human-machine interface (HMI) software for the core of the control system and Rockwell Software RSLogix 500™ logic programming software. According to Jeff Danielson, lead electrician for Black Hills, the company was familiar with Rockwell Automation and confident that the equipment would work well with the DeviceNet network.

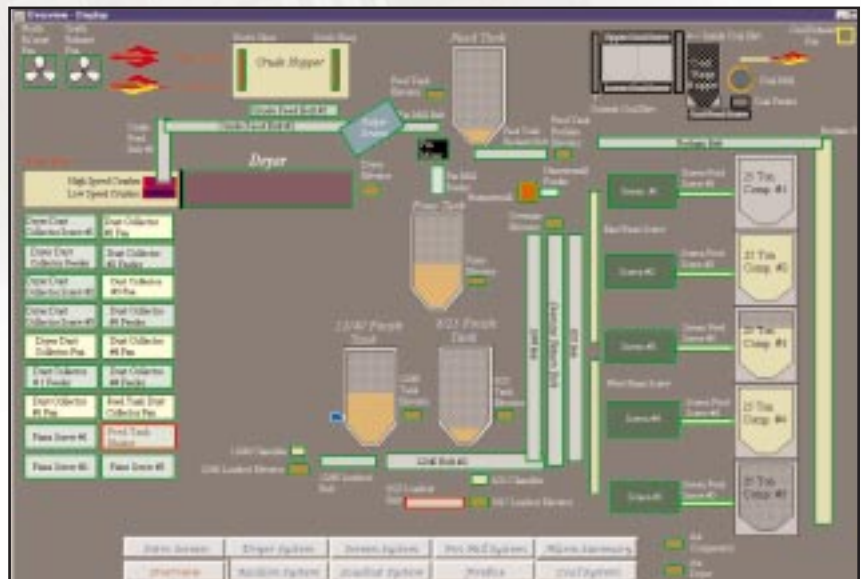
“They’ve already done the research and the development,” said Danielson, “so why should I spend time and effort getting products to talk to each other, when I know that the vendor has already tested their hardware and software for compatibility.”

Black Hills has three PCs running RSVIEW32 on Microsoft® Windows NT®, connected over Ethernet®. Danielson has access to one PC for controlling and changing the process, and two others sit on the plant floor for operators to use for monitoring the process. Black Hills also uses a Rockwell Software RSLinx™ communication driver and RSLogix 500 to program the SLC 500 controller. Because Black Hills was running all the software on Microsoft Windows NT, they were able to share tags from RSLogix™ and bring them into the RSVIEW32 HMI, saving time during the development stages. RSVIEW32 offers direct driver support via RSLinx on Windows NT, allowing Black Hills to use RSVIEW32 concurrently with other Rockwell Software products

that require RSLinx. Black Hills also can add tags from the RSVIEW32 Tag Browser, which allows users to access points from the RSLogix 500 databases.

Using only a mouse, operators can effectively run and monitor the entire process with RSVIEW32. Because the remote Wyoming location limits access to training facilities, ease of use in the software was critical. The company didn’t want to have to send operators away for software training, so being able to train internally was also a big advantage in choosing an HMI that was Windows®-compatible and had an interface that was easy for operators to learn.

“With the familiar Windows-based interface that RSVIEW32 has, I can train somebody to run the plant in 2 to 3 hours,” said Danielson. “All a new operator needs is the basic knowledge of what piece of equipment goes where, and they can coordinate that with the custom screens,” he added.



### Screening Your Process

Black Hills developed 10 custom screens in RSVIEW32 that represent each stage of the bentonite processing. After accessing the system through a log-in screen, an overview screen allows operators to monitor the entire plant process. This screen can show operators if the motors are all running or if there are any problems at any point in the process. Operators also can

check rotation of the motors, jog the motors or receive amperage information on the motors. Because of the RSView32 security functionality, operators can easily be restricted from specific screens. Black Hills uses two levels of security for their screens. One level allows operators to log in and view processes, and the second level allows Danielson to access the screens for control options.

There is one screen each for the drier, reclaim, screen, load out, coal and fire box systems. The fire box system screen provides all the temperatures on the fire box, including information on the flame and amperage. Finally, an alarm summary screen logs all the alarms so operators can track any problems in the system. The alarm summaries are then routed to a printer so operators can have a record of recent alarms.

### Shippin' It Out

The Mills facility has been up and running for approximately eight months. It processes an average of 115 to 120 rail cars per month, each holding 100 tons. Because the company spent the time to evaluate exactly what it needed for their bentonite processing application, it was able to install a state-of-the-art system in a short amount of time. The additional capacity has helped the company meet the production requirements of the partner facility, but the Rockwell Software programs and Allen-Bradley hardware now allow Black Hills to maintain and monitor equipment from one location, reduce motor maintenance and cut

hardwire installation costs. Black Hills saved money by using a network that eliminated a lot of hardwiring and offered the company additional diagnostic capabilities to extend the life of the company's motors.

"The new system will help us extend the life of our equipment. The operators have more control of what's going on, and they can troubleshoot any problems a lot quicker and simpler. This all contributes to more productivity and less maintenance," said Danielson.



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