The Powell Continuous Sodium Hypochlorite Process System is designed to manufacture sodium hypochlorite with greater efficiency and higher quality than previously obtainable with batch or continuous methods. The process, which uses liquid or vapor chlorine and caustic, is versatile and has a design capability of making any concentration from 3% by weight to 16.5% by weight sodium hypochlorite.

The Powell Continuous Sodium Hypochlorite Process System is constructed of high quality components to insure long service life with a minimum of maintenance. The unit is small and compact, housed by a sturdy steel frame. Due to its size, the plant can be fabricated in our factory and easily shipped as a complete unit to your site.

Several advantages and benefits are inherent with the use of the Powell Continuous Sodium Hypochlorite Process System. For example: the continuous system eliminates the need for mechanical refrigeration, which is typically required when high strength bleach is produced by other methods.

Since the continuous system cools the bleach by using water from a water cooling tower and not a refrigeration system, a considerable savings in energy, equipment and maintenance costs is realized.

Depending on the strength of product made and the ambient weather conditions, the final product may need to be cooled in storage using either an air conditioned storage room or chilled water with heat exchangers. For example, bleach produced at 16% by weight and stored at 35°C should be cooled during storage. Additional savings and advantages are listed in the chart at the right.

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**Advantages of the Powell Continuous Sodium Hypochlorite Process System**

- The continuous system can use liquid chlorine, so equipment and energy requirements of a chlorine vaporization system are eliminated.
- Due to better mixing and control of the reaction, excess caustic can be lowered from typical levels of 1% by weight sodium hydroxide to typical levels of 0.2 - 0.3% by weight.
- Due to better mixing and control of the reaction, lower levels of chlorate are typically achieved resulting in large savings in raw material costs.
- The system is automatic, eliminating the need for highly skilled operators. New operators can be quickly trained to produce a quality product.
- Since this continuous plant is completely automatic, considerable person-hours are saved compared to other bleach operations. For example, with our largest system, one person, including all materials, handling, and testing, can operate a typical plant producing 70,000 gallons of 16% by weight sodium hypochlorite per 8-hour shift.
- The system can be easily and inexpensively upgraded for higher production rates so production of the sodium hypochlorite never limits the sales of the product.
- The system can use vapor chlorine, either wet chlorine directly off chlorine cells or dry vapor chlorine under pressure off chlorine compressors. The system can also utilize gas streams containing chlorine with other gases, reacting the chlorine to produce the sodium hypochlorite and acting as a chlorine gas scrubber for the other gases. A typical application would be chlorine tank car or ISO container evacuation for removal of the chlorine.
- The system utilizes 32% or 50% caustic, eliminating the need for costly dilution tanks and production space. Existing diluted caustic can be chlorinated, which eliminates the caustic dilution system and reduces the initial cost.
- When the system is installed into a large industrial complex with an existing distributed control system, the Powell Bleach Plant controls can be integrated into the existing system quickly and easily.
Carbocloro Oxypar, Cubatao, Brazil
A batch operation used for both chlorine scrubbing and bleach production was replaced in the fall of 2000. A Powell Continuous Bleach Plant and Powell Bleach Filter System were installed to allow continuous operation of the chlorine scrubbers and to automate bleach production using 50% diaphragm cell caustic, gas chlorine off the compressors, and cooling tower water. The process was integrated into the Carbocloro DCS system using Allen Bradley PLC process control. The system produces high purity bleach with low heavy metals, low suspended solids, lower excess caustic and low chlorate. Automation of the chlorine scrubbing and bleach production process also reduces labor.

Odyssey Manufacturing Co., Tampa, Florida
A Powell Continuous Bleach Plant and Chlorine Scrubber were installed downstream of a membrane cell plant to produce high strength, high purity, low excess caustic, and low chlorate sodium hypochlorite. The 32% caustic and wet chlorine from the cell room is utilized for the bleach production. The Powell equipment is integrated into the plant DCS system and is completely automated and continuous. A caustic dilution system with density control in a feed forward configuration automatically adjusts for the variation of the 32% caustic during start-ups. Cooling tower water is used for all production of chlorine, caustic and sodium hypochlorite. A bleach dilution system was installed downstream of the bleach reactor system to provide weaker strengths of bleach. This additional flexibility allows Odyssey to sell many strengths of sodium hypochlorite to customers.

Miami Products & Chemical Co., Dayton, Ohio
Miami Products is an existing bleach producer who was using liquid chlorine, 50% caustic and refrigeration. They needed to increase production and to relocate from an existing facility to a new location to better service customers. Powell supplied a new 150 GPM system producing 16.5% by weight NaOCl with liquid chlorine from railcars, 50% caustic and cooling tower water. Powell supplied all major equipment including the Powell Chlorine Tank Car Unloading Systems with chlorine detectors, Powell Chlorine Scrubber, Powell Chlorine Tank Car Padding System, Powell Continuous Bleach Plant, Powell Bleach Filter System, Powell Bleach Dilution System and all automatic process controls including tank level control systems. The entire system is automated with Allen Bradley PLC controllers, and 14” color monitors for operator interface. The Miami system, including all raw material handling, is operated with one person per shift.

Olin Chlor Alkali Corporation, Charleston, Tennessee & Augusta, Georgia
Olin Corporation purchased two Powell Continuous Bleach Plants for the Charleston and Augusta chlorine plants. These Powell units use the emergency scrubbing tower solution with liquid chlorine on a continuous basis to produce high strength bleach with low excess caustic and low chlorates so bleach can be produced even if the cell rooms are not in operation. In each, plant Powell ORP control systems are used to feed forward high excess caustic scrubbing solution to the Powell unit. The Powell system will complete the chlorination of the solution to the final end point. All though the Powell process is normally operated at 10-15% capacity, the equipment is designed to handle process upsets that trigger high demand to the chlorine production and scrubber systems. Installation of these systems improves safety due to continuous and automatic operation. Caustic and chlorine savings from reduced excess caustic and lower chlorates created a payback of each project of less than one year.

Borden-Remington, Fall River, Massachusetts
Borden-Remington is a specialty chemicals supplier breaking into the bleach market. Powell supplied an entire process for converting chlorine to bleach including a Powell Chlorine Tank Car Unloading System, Powell Continuous Bleach Plant, Powell Bleach Filter System, and Powell Bleach Dilution System. The entire system was automated using Allen Bradley ControlLogix controllers so operations can be controlled from a single plant location. The sophisticated automation includes a DeviceNet communication network and an IntelliCenter motor control center. Dial-in access to all screens and processors is also available with this state-of-the-art system. This 80 GPM system provides Borden-Remington an efficient operation with low labor costs. The Powell Bleach Dilution System allows them to provide the customer with customized bleach strengths quickly, making their operation extremely flexible and customer focused.

Pennwalt S.A. de C.V., El Salto, Mexico
A Powell Continuous Bleach Plant was installed in this chlor-alkali plant facility near Guadalajara. This system is designed to manufacture bleach and supply diluted caustic to the chlorine scrubber system. The caustic is fed to the emergency scrubber, then forward to the chlorine scrubber, and finally back to the bleach plant for final chlorination. Finished bleach is then supplied to storage. Caustic may be sent directly through the plant during shutdown periods to allow bleach production to continue using liquid chlorine from storage. The Powell unit is capable of producing various bleach strengths and can use either liquid or vapor chlorine for the final chlorination. The system also added the ability to automatically manage waste chlorinated water. The separate chlorinated water flow, sent to the chlorine scrubber, is added to the soft water flow used for dilution. The total water flow is then used to calculate the amount of strong caustic required for the diluted caustic. This provides an easy way to handle the waste stream of chlorinated water. By completing the chlorination process in the bleach plant instead of the chlorine scrubber, Pennwalt has realized significant raw material savings, due primarily to lower chlorated. The safety of the system is increased by continuously replenishing fresh caustic in the scrubber.

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