



**TECHNICAL
ARTICLE
SERIES**

Pump Upgrading Improves Scrubber Performance and Reduces Down Time

ARTICLE # TL-120

INDUSTRY: Chemical

ENTITY: Gaylord Foundry Equipment, Inc.

SOLUTION(S) PUMPED: Caustic soda, Sodium hydroxide, Sulfuric acid

PUMP TYPE(S): FLEX-I-LINER Sealless Self-Priming Peristaltic Pumps,
SUMP-GARD Thermoplastic Vertical Pump

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Figure 1: Two non-metallic pumps assure dependable delivery of neutralizing chemicals in the Gaylord scrubber design. Controlled feeding of 50% sodium hydroxide is provided by a Vanton Flex-i-liner® rotary pump which supplies it on demand from the pH probe in the fiberglass sump. Continuous recirculation of the neutralizing fluid is accomplished with a Vanton polypropylene cantilevered shaft, sump pump.

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Reprinted from Pollution Equipment News

The management philosophy behind the quality reputation of packed tower recirculatory scrubbers manufactured by Gaylord Foundry Equipment, Inc. of Independence, Missouri combines the Truman "the buck stops here" doctrine with the Gaylord belief that "building it better isn't an option, it's the way we do it."

This explains why, despite the broad acceptance of their equipment, the engineering department recommended a major design change which involved upgrading the two pumps which are critical to continuous, safe, environmentally satisfactory and economical performance of their scrubbers.

An analysis of reported field problems indicated that the prime cause of downtime and maintenance could be traced to pump failures under the severe operating conditions they had to face. Depending on the specific service, the pumps had to be able to handle dilute, as well as concentrated sulfuric acid or sodium hydroxide. The use of these scrubbers in conjunction with resin bonded core/mold operations in the foundry, involves additional problems of abrasion from sand particles. Not only must all wetted parts of the pumps be inert to the corrosive chemicals, but they must be highly impact- and wear-resistant as well.

To better understand the scrubbing systems, let's examine a typical 13' 10" tall 4000 cfm SO₂ packed tower scrubber as shown in the accompanying sketch.

The SO₂ gas coming from the core machines enters through the air intake and flows upward through a deep bed of packing media consisting of polypropylene slotted ballast rings. Prior to the start of this upward flow of SO₂ gas, the packing rings have been, and continue to be, thoroughly wetted by a 5% by weight caustic solution supplied from the 190 gallon fiberglass sump tank.

In the original design, Gaylord used an externally mounted centrifugal plastic pump for the continuous circulation required. Due to repeated failure of the carbon seals, and the messy cleanup required, the design engineers replaced this pump with a Vanton polypropylene SGH vertical sump pump. This resulted in the elimination of the seal and cleanup problems. The SGH pump utilizes an integral pump/motor cantilever shaft and requires no seals or sleeve bearings in contact with the pumped fluid. The hollow shaft motor is protected from corrosive fumes by means of a special vapor seal. No metal contacts the fluid. Even the stainless steel shaft is sleeved in thermoplastic. Flow is maintained at 155 gpm against a 65' tdh.

The caustic solution is pumped through the spray nozzle in the shower head, which thoroughly saturates the packed media. The neutralized scrubbed air passes from the packed media through a 6" thick high efficiency polypropylene mist eliminator pad. The fine knitted wire mesh takes out the suspended droplets of caustic solution, allowing

only clean, dry air to return to the atmosphere through the exhaust blower. The entrained fluid drains back into the sump.

The use of a pH probe constantly monitors the recirculation solution, which must be kept highly alkaline to assure neutralization of the sulfur dioxide gas. When the pH drops below 8.5 the scrubber automatically regenerates itself. This is accomplished by discharging a portion of the spent solution, energizing the caustic transfer pump to meter a controlled quantity of chemical and then adding make up water until the sump is at its preset level.

In the original design, Gaylord employed a bellows pump. Experience showed excessive maintenance and long lead time to secure replacement parts. The new designs incorporate a Vanton ¼ HP Flexi-i-liner® rotary diaphragm pump which has demonstrated greater reliability and more accurate metering of the concentrated sodium hydroxide on demand.

The Vanton design incorporates a Hypalon flexible liner in a Teflon body block. The pump is self-priming, completely sealless, and inert to the caustic. There are no stuffing boxes, check valves, gaskets or other potentials for leakage.

Gaylord also manufactures a similar scrubber for the foundry industry that uses a sulfuric acid based scrubbing solution. Since the Vanton pump designs limit fluid to nonmetallic materials that are compatible with sulfuric acid and caustic soda, purchasing and inventory requirements are simplified, and pump maintenance is cut to a minimum.

According to Gaylord's vice president, Kevin Crawford, there has not been a single reported pump failure since the pump upgrades went into effect more than a year ago.

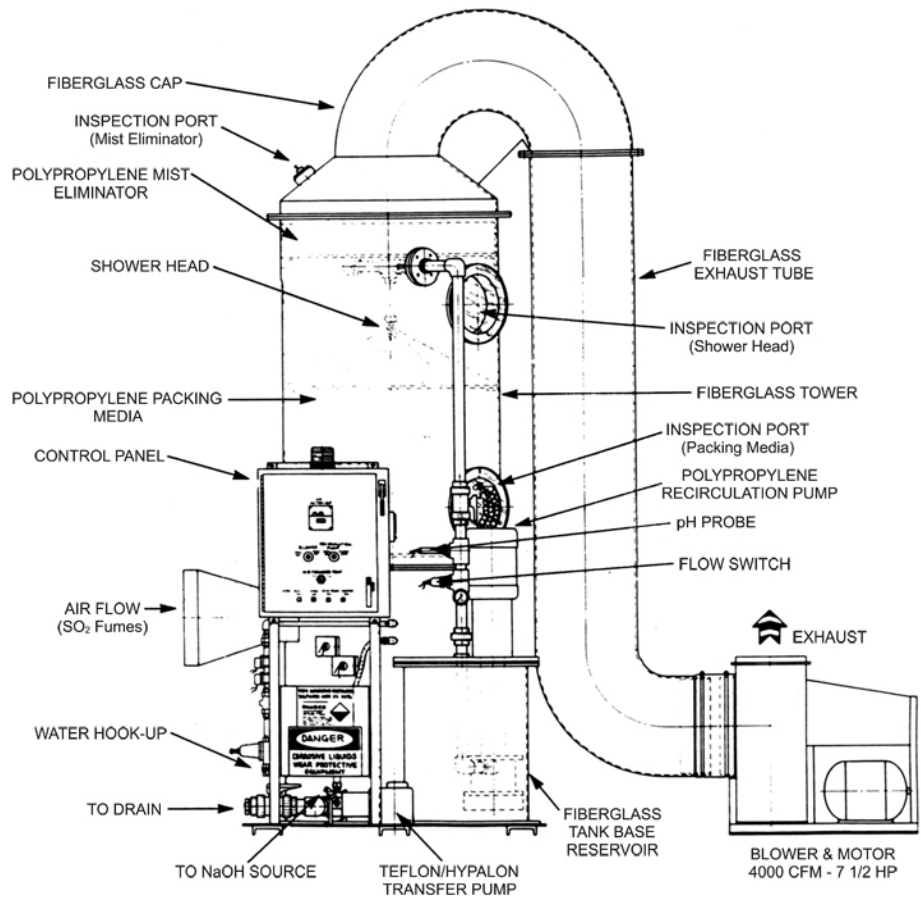


Figure 2: Engineering drawing of Gaylord SO₂ scrubber, which relies on non-metallic components to handle corrosive and abrasive gases and liquids.