

Exhaust gas with SO₂
 The exhaust gas enters into the scrubber. This gas results from burning hydrocarbon and contains SO₂ (plus SO₃ and other contaminants).

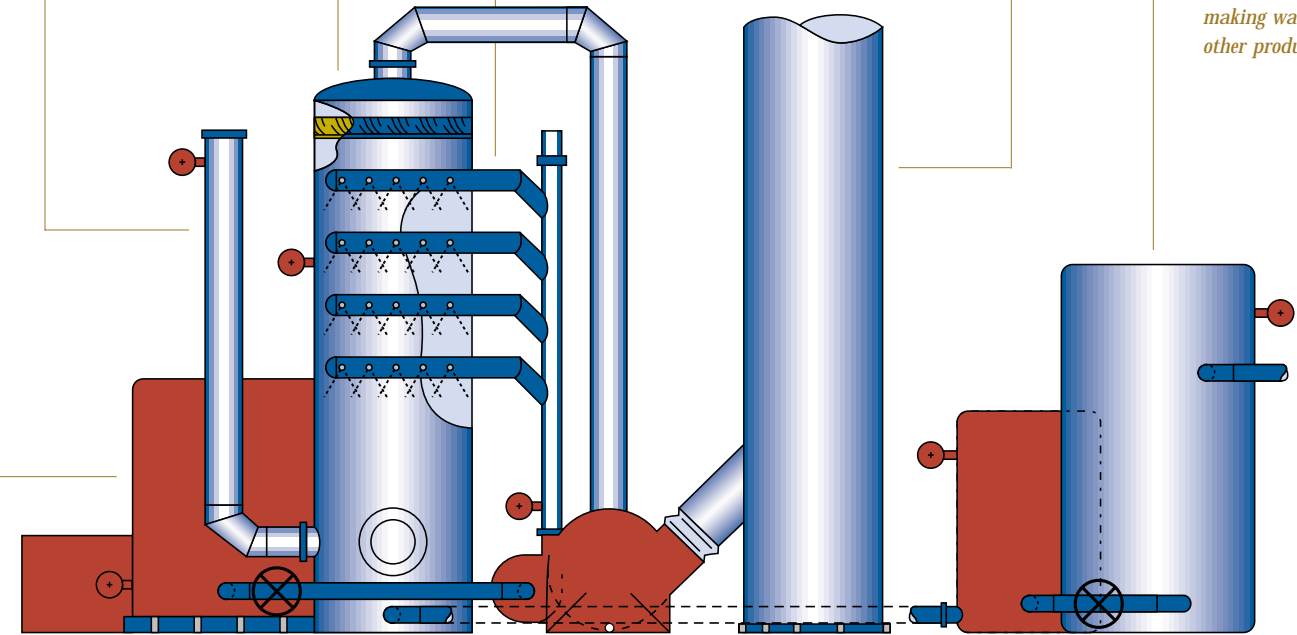
Ball mill/slurry prep tank
 The slurry is mixed and pumped through the spray headers into the scrubber. Depending on the substances present in the exhaust gas, the slurry used in the FGD process can be a mixture of crushed limestone, gypsum, and/or calcium carbonate plus water.

Scrubber
 The rising exhaust gas is intercepted by a misting of slurry. The slurry meets with the SO₂ in the exhaust, resulting in a simple chemical reaction, extracting sulfur from the gas. The sulfur and limestone combination in the form of calcium sulfide or calcium sulfate precipitates as a sludge-like substance, which is then pumped to the separation process.

Spray headers
 The slurry is pumped to the scrubber and through the spray-headers at a very high rate, causing the slurry to mist.

Scrubbed gas/exhaust stack
 The resulting environmentally safe gas is vented to the atmosphere.

Separating vessel (sludge)/H₂O tank
 The sludge and the water are separated, with the water being recirculated into the process. This leaves behind the sludge, which can be sold as fertilizer or as a raw material used in making wallboard and other products.



Denali market potential

Denali's goal is to become a leading provider of fluid handling solutions by offering a broad range of products, components and systems. These solutions will be tailored to meet the needs of a diverse set of process industries, ranging from wastewater to power generation. We estimate the worldwide annual "end-use" markets for these products to be greater than \$200 billion.

Samples of the processes for which Denali supplies products are listed on the right of the illustration. As shown in blue, Denali currently provides products related to containment, transportation and a few other applications. The targeted products, depicted in red, are the equipment and components the

company will pursue over time, in addition to continuing to expand our current products and services.

One example of a growth opportunity lies in clarifiers and thickeners. The fact that Denali does not yet supply these products, integral to our goal of offering more complete solutions, shows that we still have ample room for growth. We will continue to expand our selection of these and other vital pieces of processing equipment and instrumentation components. Expanding the scope of products within Denali will also allow for greater customer support and service.

A typical system: Flue gas desulphurization

Scrubbers

The flue gas desulphurization (FGD) system pictured is built around what is known as a "scrubber." Although it may come in a variety of sizes and uses, every scrubber is essentially a piece of equipment that removes contaminants from a gas stream. For example, a scrubber may be designed to remove odors from a wastewater plant, poisonous fumes from a smelter, or sulfur from the exhaust stream of a hydrocarbon-burning power plant.

In this diagram, we focus on the last example, as without such scrubbers, we would all be faced with increased threat of acid rain – a problem we can all relate to. We look at the system in two "fluid" paths: the exhaust gas containing sulfur dioxide (SO₂) and the slurry. This process of removing sulfur and other contaminants from exhaust gas is called "flue gas desulphurization."

Fiberglass reinforced plastic (FRP)

FRP is a common material used in building scrubber components because this material stands up well to corrosion and wear. Most of the washing processes use a chalk and gypsum base in the slurry, which can form aggressive mixtures of acids during the desulphurization process. Thus, corrosion resistance is critical in an FGD system, and this is FRP's strength.

Denali's role

Currently, Denali supplies the holding tanks, the piping and ducting systems, the scrubber shell itself, the spray headers, and many of the valves used in this process to customers throughout North America and Europe. Growth opportunities for the company lie in the mixing, separation, and pumping elements of the FGD system, and expanding to the rest of the world.