NORAM

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SF™ SPLIT FLOW GAS HEAT EXCHANGERS

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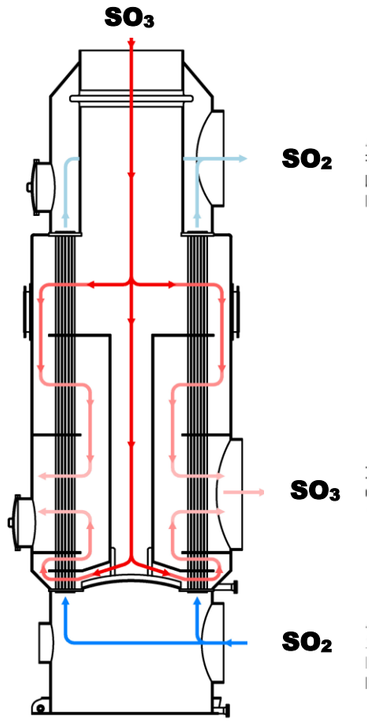
SF™ SPLIT FLOW GAS HEAT EXCHANGERS

The **NORAM SF™ Split Flow Gas Heat Exchanger** is a patented special RF™ Radial Flow Exchanger. It has been conceived to deal with a number of specific maintenance problems in sulfuric acid plants.

In some applications—for example, in SO_3 Coolers or in Cold Exchangers—condensation can occur in the vicinity of the cold tubesheet. Condensed acid causes corrosion and sulfate formation leading to high pressure drop and ultimately exchanger failure. Similarly in Air Preheaters, the furnace temperature must be limited to prevent high temperatures on the hot tubesheet. A consequence is lower thermal efficiency.

In Cold Exchangers, the SF™ Gas Exchanger design helps prevent problems by raising the temperature of the cold tubesheet and of the tube area near the tubesheet above the dew point of the gas. A small portion of the hot gas is sent to the cold end of the exchanger to sweep the tubesheet in a co-current flow arrangement. This hot gas sweep elevates the tubesheet temperature above the dew point so that condensation is avoided. The bulk of the gas remains in the normal counter-current flow arrangement. Both gas streams meet at a common exit duct located some distance above the cold tubesheet. Through baffle spacing, satisfactory heat transfer rates are obtained in the vicinity of the cold tubesheet and pressure drop and flows of the two gas streams are balanced through the geometry.



The patented SF™ Exchanger eliminates the need for sacrificial gas exchangers offered by some contractors.

In the case of an Air Preheater, a portion of the cold gas is sent past the hot tubesheet to lower the tubesheet temperature. The exchanger's LMTD, or temperature driving force, can increase and resulting in several good things. The furnace gas flow is reduced along with the size of the exchanger, furnace, and blower. The equipment becomes smaller, more efficient, and more reliable.

For an SO_3 cooler, the hot sweep also allows a reduction in size and complexity. A standard SO_3 cooler requires a large recycle of hot exhaust air to prevent condensation at the cold end of the exchanger. The hot sweep feature provides warm gas to the cold end and greatly reduces the need for a large air recycle. The result is a smaller blower, smaller exchanger, and reduced ducting sizes.

Design and Applications

The SF™ Exchanger is a special design and application of the RF Exchanger, incorporating all the features and benefits of the RF Exchanger.

Cold Exchanger

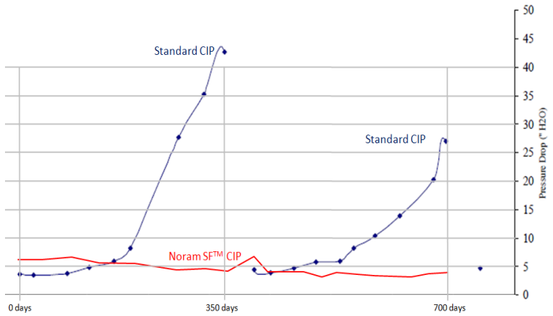
In Cold Exchanger applications, condensation in the vicinity of the cold tubesheet is a common occurrence. This can be avoided by passing a small portion of the hot SO_3 gas past the cold tubesheet to keep the metal above the dew point temperature. On the SO_2 side, small amounts of entrained acid mist will be vaporized.

SO_3 Cooler

In metallurgical plants, SO_3 gas cooling may be required if the gas strength exceeds 10% SO_2. This is commonly achieved by the use of an air-cooled SO_3 Cooler. The cold tubesheet will be cooled by the cold ambient air and may experience condensation. The SF™ design can be used to raise the metal temperature at the cold end of the exchanger.

Air Preheater

The furnace temperature in an Air Preheater must be limited to avoid overheating the tubesheet at the hot end. The SF™ design can be used to cool the hot tubesheet with the cold gas, thus allowing the furnace operating temperature to be raised, resulting in a larger thermal driving force. The larger temperature difference will result in a smaller exchanger with the attendant cost savings.

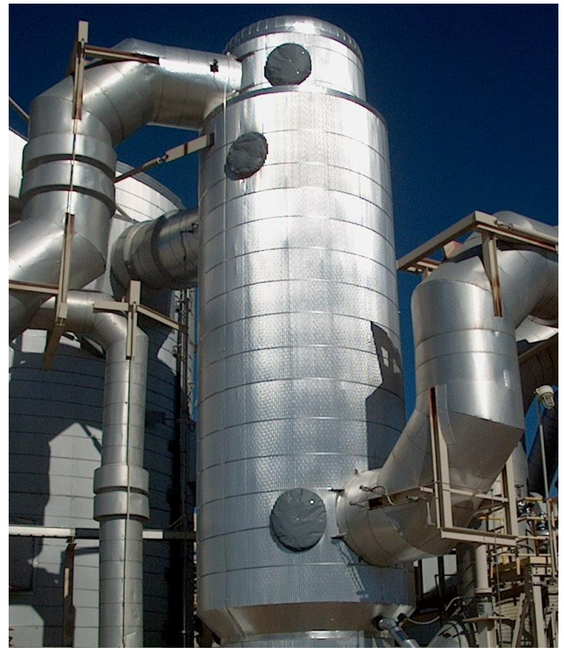


Control of Tube Sheet Temperature

The SF design allows control of the cold or the hot tubesheet temperatures, thus reducing the risk of damage due to condensation or high temperature corrosion.

Good Performance Over All Flow Ranges

The SF™ split flow design operates over the entire flow range without need for process control. The flow split is achieved in the design through pressure balance between the co-current and counter-current zones. As the flow rate to the exchanger changes, the pressure balance changes in the same proportion, hence maintaining the design flow split.



Compact Design

The diameter of gas exchangers is often dictated by the volumetric flow rate on the shell side. By using a SF™ design, the shell diameter of an exchanger can be minimized. This feature can offer the benefit of allowing shop fabrication as opposed to field fabrication in cases of exchangers required to handle large gas flows.

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