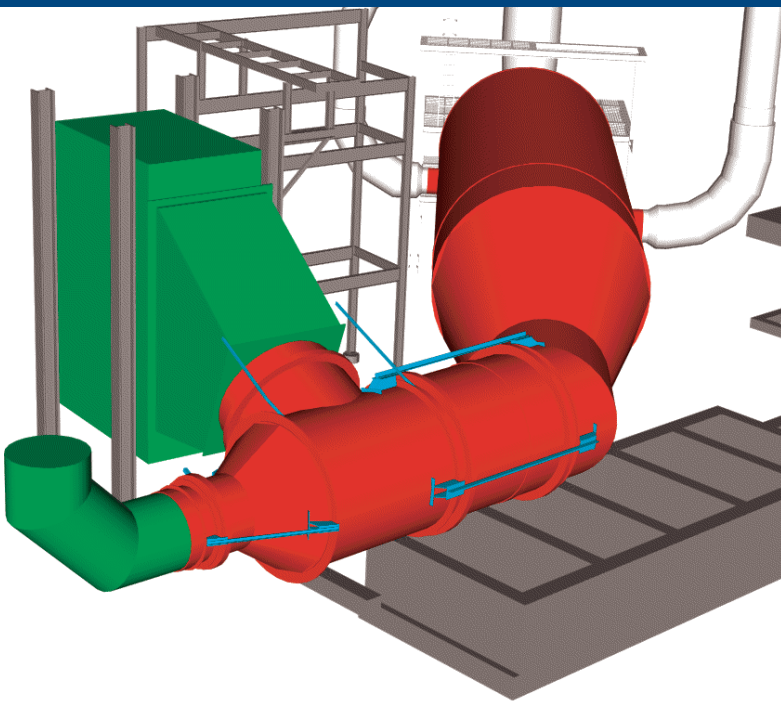


NORAM
SULFURIC ACID
Products and Services

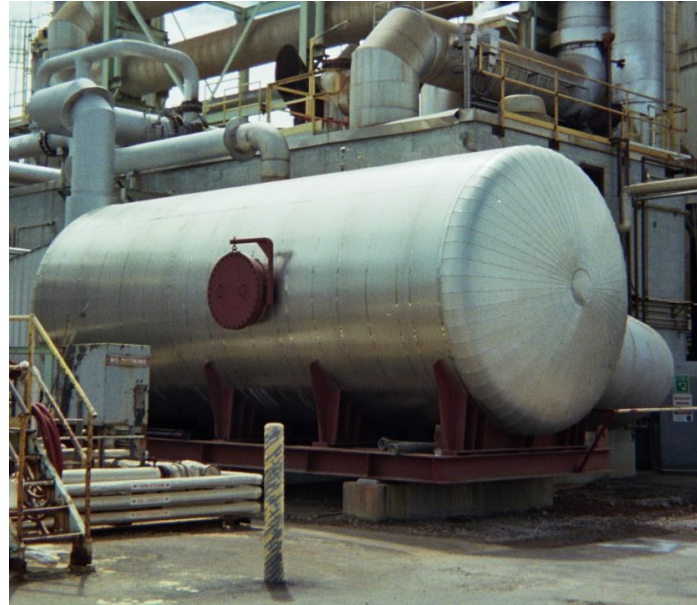
SULFUR & SPENT ACID BURNERS



The **NORAM Sulfur and Spent Acid Burners** are horizontal, cylindrical vessels that provide high efficiency combustion. Each NORAM Burner is custom designed to meet the required capacity and SO₂ strength using conventional pressure atomization sulfur guns.



The NORAM Sulfur and Spent Acid Burner combines burner geometry and multiple directed airflows with client-selected sulfur or acid injection equipment to achieve turbulent, well-mixed combustion zones within the furnace. The NORAM design reduces the formation of hot spots, keeping the overall combustion temperatures uniform to achieve efficient and complete combustion while minimizing NOx formation.



NOx formation can be problematic in an acid plant since some NOx will absorb in the acid to an extent that off-specification acid may be produced. High NOx concentrations can increase the rate of corrosion of ducting and ductile iron piping. Vessels containing residual NOx cannot be entered for maintenance until properly evacuated. This venting requirement can significantly lengthen the required shutdown time.

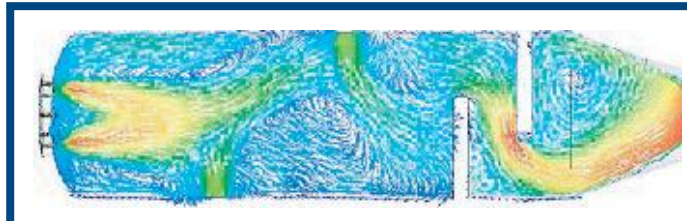
NORAM also offers engineered outlet vestibules matched to heat recovery equipment or brick lined ducting.

Computer Modeling of Gas Flow

NORAM uses Computational Fluid Dynamic (CFD) modeling to simulate furnace performance to aid in detailed furnace design. CFD provides pressure, temperature and flow maps of furnace combustion gases. These maps are then used to optimize sulfur or acid injection equipment orientation, gas flow patterns and rates, and baffle arrangements. CFD modeling allows NORAM to eliminate stagnant regions in the furnace design.



CFD Temperature Map



CFD Velocity Map

Strong, Stable Baffle Walls

Vertical brick partitions are used as baffle walls to promote gas mixing.



Robust Shell and Refractory/Brick Design

The proper mechanical design of the steel shell, supports and internal refractory/brick is crucial to the longevity of sulfur and acid burners. NORAM uses three dimensional differential stress analysis tools and programs to design robust shell structures and sliding supports to accommodate temperature-induced stress and growth. NORAM also works closely with refractory/brick suppliers to coordinate the design of the supports. Appropriate temperature grades of refractory/brick are used for different parts of the burner to improve longevity and minimize cost.



NORAM ENGINEERING AND CONSTRUCTORS LTD.

Suite #1800 – 200 Granville Street
Vancouver, British Columbia, Canada, V6C1S4
Tel: 604-681-2030 Fax: 604-683-9164

E-mail: acid@noram-eng.com Website: www.noram-eng.com

SERVICE TO THE SULFURIC ACID INDUSTRY

**Ask about the products and services
NORAM supplies to the sulfuric acid industry:**

NORAM PLANTS, PROCESSES, SYSTEMS, AND PROCESS EQUIPMENT

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NORAM CLEAN START™ PROCESS
NORAM PLANT PREHEATING SYSTEMS
NORAM'S TURBOSCRUBBER FOR GAS SCRUBBING
NORAM STAINLESS STEEL CATALYTIC CONVERTERS
NORAM RF™ RADIAL FLOW GAS-TO-GAS HEAT EXCHANGERS
NORAM SF™ SPLIT FLOW GAS-TO-GAS HEAT EXCHANGERS
NORAM BRICK-LINED ACID TOWERS
NORAM SULFUR & SPENT ACID BURNERS
NORAM CELLCHEM SULFUR BURNERS
NORAM ANODICALLY PROTECTED ACID COOLERS
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NORAM SX™ TOWERS AND NORAM SX™ PUMP TANKS

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NORAM HP™ SADDLE PACKING FOR ACID TOWERS
NORAM SMART™ ACID DISTRIBUTORS FOR ACID TOWERS
NORAM TROUGH ACID DISTRIBUTORS FOR ACID TOWERS
NORAM SX™ CHIPGUARD CG™ ACID STRAINER
NORAM ENTRAINMENT MITIGATION DEVICE (EMD)
NORAM ACID DILUTION SYSTEMS
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NORAM SX™ ACID DISTRIBUTORS
NORAM SX™ PIPING
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