

NORAM
SULFURIC ACID
Products and Services

BRICK-LINED ACID TOWERS



NORAM offers **Brick Lined Acid Towers**, the proven industry standard for over a century.

In the NORAM design, a dished bottom is used with heavy metal wall thickness to provide a rigid support for the brick. This shape maintains the brick under compression, a state where this material has excellent strength characteristics. In contrast, flat-bottom towers are structurally weak, and flexing of the steel and locally concentrated loads have often caused cracks in the brick liner and heaving due to sulfate formation.

The bottom outlet nozzle for the acid is fitted with a special alloy liner and is sized to be self-venting, thus minimizing gas entrainment.

The gas inlet nozzle is brick-lined and sloped to prevent back-flow of acid spray into the duct.

The packing support is provided by a self-supporting dome with an open area of about 60 percent. The radial thrust of the dome onto the wall is taken up by a stiffening ring. The dome support system is proven in several hundred towers in acid service. It is one of the strongest structures and has been known since antiquity. A major benefit compared to the arch and beam design is that there is no localized load on the tower bottom.



NORAM Acid Towers can be supplied with NORAM HP™ (High Performance) Saddle Packing which is custom-manufactured and proven in over 75 installations. This packing has a pressure drop of about half that of standard 3" ceramic saddles. The gas flow capacity of HP™ Packing is about 25 percent larger than that of standard 3" saddles. NORAM's correlations used for sizing acid towers and for predicting pressure drop are based on systematic measurements in operating sulfuric acid plants. Data was also taken on the pressure drop through the dome packing support. Steps have been taken to ensure that the packing support will not become the bottleneck in a NORAM Acid Tower.



NORAM Acid Towers are supplied with the SMART™ Acid Distributor. This distributor, proven in more than 75 installations, uses a pipe system located in the gas space above the packing, avoiding the problem of gas flow restrictions of buried pipe headers. Acid is distributed through individual downcomers which penetrate into the packing domain and discharge the acid at low velocity. Splashing and spray formation are minimized, thus reducing liquid load on the mist eliminators. A key benefit of the NORAM Acid Tower is the provision of external inspection ports for the SMART™ Acid Distributor. Nozzles and ports are fitted to the tower shell to access the end caps of the radial distributor arms. Inspection and clean-out of the SMART™ Distributor are possible without requiring tower entry by maintenance staff. A brief plant shut-down of about four hours is adequate for this work.

State-of-the-Art Brick Lining

Brick lining has traditionally been used in acid towers as it withstands the widest range of acid concentrations under upset conditions. Alloy towers may experience localized corrosion when dilute acid or oleum formation occurs. The complex gas and liquid flow patterns within acid towers may lead to stagnant zones where acid films are either diluted through absorption of moisture from the gas or concentrated through SO₃ absorption. Brick lining is a reliable choice for acid tower construction. NORAM Acid Towers offer the state-of-the-art bricking system constructed from ASTM Type III acid proof brick, backed by PECORA MASTIC™ and TEFLON™ membranes.

Self-supporting Dome Packing Support

The NORAM Acid Tower offers a self-supporting ceramic dome packing support with an open area of 60 percent. The dome provides significant advantages over the arch and beam type packing support. The primary disadvantage of the arch type of packing support is that each arch footing imposes a high point load on the tower floor. The loading eventually generates tension cracking of the mortar around the footing, resulting in acid leakage. The problem is exacerbated by the physical presence of the numerous arches, which restrict accessibility for floor maintenance and repair. The NORAM self-supporting dome does not have any contact with the tower floor, eliminating any load and leaving the floor area free of obstruction from arches, thus facilitating inspection and maintenance.



Stable Dished Bottom

The bottom of the NORAM Acid Tower is constructed in a dished shape, resulting in a more stable shape for brick lining as compared to traditional flat tower bottom designs. All the bricks on the floor are maintained in compression by the dish shape, which minimizes the formation of cracks and acid leakage to the tower bottom shell.

Reduced Pressure Drop

NORAM Acid Towers offer HP™ Saddle Packing which has been proven to reduce pressure drop and provide excellent mass transfer.

Uniform Acid Distribution

Incorporating the SMART™ Acid Distributor into a new NORAM Acid Tower provides uniform acid distribution without spray generation. All downcomers have the same liquid head due to minimal losses in the SMART™ Acid Distributor. The number of irrigation points per unit tower cross-sectional area is selected to achieve wetting of the packing within one foot of tower packing height.



External Inspection Ports

The pipe design concepts of the SMART™ Acid Distributor allows fitting external inspection ports to each distributor arm so that the distributor can be cleaned from the outside without requiring tower entry by maintenance staff. This reduces maintenance costs and increases safety for personnel.



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NORAM BRICK-LINED ACID TOWERS
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NORAM ANODICALLY PROTECTED ACID COOLERS
NORAM SX™ ACID COOLERS
NORAM SX™ TOWERS AND NORAM SX™ PUMP TANKS

NORAM EQUIPMENT INTERNALS, PERIPHERALS AND ANCILLARY EQUIPMENT

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
NORAM SX™ MATERIAL
NORAM SX™ ACID DISTRIBUTORS
NORAM SX™ PIPING
NORAM SX™ VALVES
NORAM GAS DUCTING
NORAM DAMPER
NORAM SULFUR GUNS

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