



Business Area
Nitric Acid

Nitric Acid

Revolutionary plant design

Weatherly Inc. has been building nitric acid plants worldwide since 1959. Weatherly combines years of experience with cutting-edge technology.

Weatherly maintains a commitment to constantly improve chemical production processes. As a result, the company has developed a superior design for nitric acid production. Weatherly's high monopressure plant provides low capital cost, high ammonia conversion, reduced catalyst cost, low maintenance cost, and minimal site area requirements. Additionally, the design is extremely energy efficient.

To fully understand what makes Weatherly's nitric acid plants so effective, consider the process:



A simplified nitric acid plant

Manufacturing nitric acid starts with two raw materials – atmospheric air and ammonia (NH_3). These are shown in the flow diagram on the opposite page.

Before atmospheric air can be used, it must be filtered, compressed, heated, and filtered again. Weatherly plants can extract approximately ninety percent of the horsepower needed for compression from heated tail gas, a highly efficient design feature. Liquid ammonia is prepared separately; it's filtered, vaporized and superheated, and filtered again.

Once prepared, the raw materials move on to conversion and heat recovery stages. The clean streams of air and ammonia are intimately mixed and evenly distributed over a platinum catalyst. At this point, an exothermic reaction between ammonia and oxygen occurs, producing nitric oxide and water vapor. The resulting process gas is passed through the heat exchanger train where the major portion of this reaction energy is recovered as heat. The process gas is cooled, forming weak nitric acid. Nitric acid and remaining process gas are separated and fed into the absorption system.

In the final stage, nitric oxide, nitrogen dioxide, oxygen and water are combined in an absorber column, forming nitric acid of the desired strength. A portion of the reaction energy recovered in the heat exchanger train is used to reheat the tail gas to provide power for the air compressor by driving a hot gas expander.

So what's so special about Weatherly's high monopressure design?

Unlike other designs that change pressures at different production stages, Weatherly's nitric acid plants utilize a single high pressure level. This high pressure approach allows for smaller, lower cost plant equipment – which significantly reduces capital cost. Also, Weatherly's high monopressure design is more energy efficient. Lastly, the plant can be designed to allow manufacturers to produce different product acid concentrations.

Weatherly's nitric acid plants are vertically-oriented, an arrangement which minimizes site area requirements. The vertical design and equipment arrangement also minimizes piping runs and expansion problems in high temperature gas piping. This compact layout provides easy access for operation and maintenance.

Engineers are trained to consider clients' needs and combine energy recovery options to minimize plant operating and capital costs. Weatherly analyzes specific site utility unit costs and tailors plants to fit site requirements.

Plant benefits

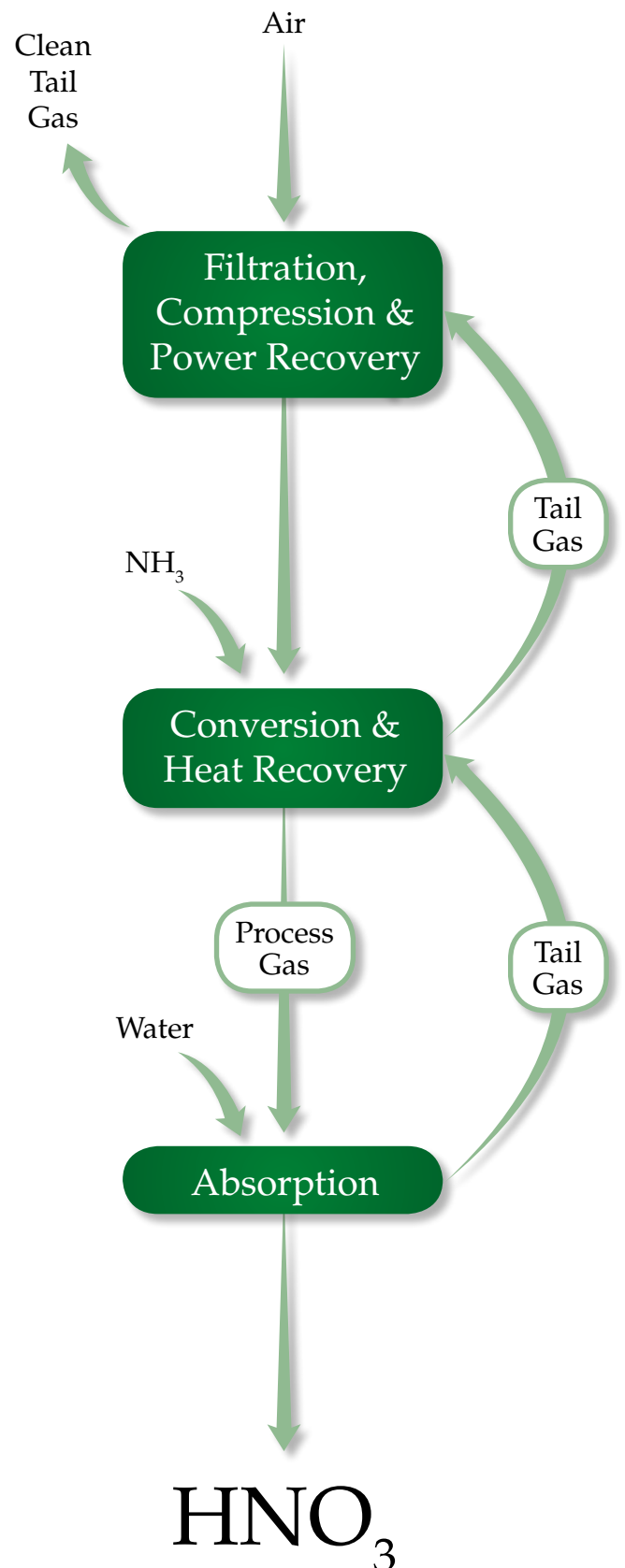
- Low capital cost – because Weatherly’s technology operates at a higher pressure than competing processes, equipment is smaller and less expensive, reducing the overall plant investment.
- High ammonia conversion – by emphasizing clean raw materials, thorough mixing, even distribution and stable temperature, the design delivers extremely high ammonia conversion. Also, Weatherly’s catalyst basket design significantly enhances conversion. On average, the system maintains efficiencies of 95 percent or higher.
- Low catalyst cost – combining the latest development in platinum recovery systems with Weatherly’s high ammonia conversion result in highly efficient platinum use.
- Low NO_x emissions – obtained by utilizing Weatherly’s proven extended absorption design; even lower emissions are possible by coupling with catalytic NO_x reduction systems.
- Reduced maintenance cost – the vertical equipment arrangement minimizes piping runs and expansion problems, reducing maintenance expense.
- Minimal site area requirements – because Weatherly plants are vertically oriented and utilize smaller equipment, site area demands are minimal.
- Energy recovery - Weatherly’s plant design obtains energy recoveries as high as 5.23 GJ per metric ton (4,500,000 BTU per short ton). Each plant is customized to minimize costs.

Flexible power recovery options

Weatherly’s nitric acid plant has been designed with flexible power recovery options. Manufacturers can easily add energy recovery equipment according to their own schedules. Power recovery options include:

- Exploiting steam generation capabilities to supply an export of saturated or superheated steam.
- Reheating tail gas to enhance power recovery in an expander turbine as part of the air compressor train.
- Utilizing excess power available from generated steam and tail gas by converting it into electricity.
- Providing ammonia vaporization energy requirements from low level heat sources.

Nitric Acid Process



The bottom line

In four decades, Weatherly has built over 65 nitric acid plants. During this time, the company has never stopped seeking ways to improve production processes. No part of the process is insignificant.

Weatherly's nitric acid process delivers increased effectiveness and production efficiency. The single high pressure design provides for smaller, lower cost equipment, a reduction in site area needed, and minimized maintenance. Additionally the Weatherly-designed raw material handling, mixing and catalyst basket enhances ammonia conversion. Power recovery options are available, reducing production costs. Several process innovations contribute to the efficient use of ammonia and platinum. The list goes on.

The result: in addition to being a high-quality, dependable source of nitric acid, Weatherly plants are extremely cost-effective to start-up and maintain. If you're looking to bring nitric acid production in-house, research Weatherly.

About Weatherly

Based in Atlanta, Weatherly Inc. is a member of the Chematur Engineering Group. The Chematur Engineering Group is active in many process areas utilizing its own technologies. In addition to the nitric acid process, we design a wide range of process for fertilizers, ethanol, nitration, peroxide and isocyanates. If you would like to know more about our other services, our contact information is listed below.

Since its inception in 1954, Weatherly has been actively engaged in developing and applying process technology for the chemical industry. In addition to process work, Weatherly offers full-service engineering services including basic and detail engineering, procurement, project management and construction services.

Weatherly has experience and knowledge in designing, engineering and constructing chemical plants on a world-wide bases. The company welcomes projects utilizing a variety of technologies. It makes no difference whether the process technology is owned by the customer, the Chematur Engineering Group, or is licensed from another supplier; Weatherly will be glad to devote its skills toward the successful completion of the project.



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