KBR's Weatherly Dual-Pressure Nitric Acid Technology

Compact Design, Better Energy Integration, Lower Operating Cost

A MORE EFFICIENT ALTERNATIVE FOR NITRIC ACID PRODUCTION

Nitric acid is an essential raw material for the production of fertilizers. Approximately 80% of the nitric acid produced globally is used for production of ammonium nitrate (AN) and calcium ammonium nitrate (CAN), which are popular intermediates in fertilizer production.

The majority of the global industrial production of nitric acid utilizes catalytic oxidation of ammonia, followed by nitric oxide oxidation and absorption. The process chemistry was developed over 100 years ago, but the production process has been improved, and developments continue to take place to improve raw material and energy efficiencies, as well as to reduce plot size and capital investment.

Fertilizer producers have been under increasing pressure to remain competitive by securing favorably-priced feedstocks and reducing the cost of production. As a result, large, fully integrated, fertilizer complexes are becoming more popular. Despite their lower total installed cost (TIC), mono-pressure nitric acid plants may not be economical for producing over 750-1,500 tons per day of nitric acid due to high metal catalyst losses and lower ammonia selectivity.

KBR has been a pioneer in development, design and delivery of Weatherly nitric acid plants globally since the 1950s, and now with the capability to provide our own Dual Pressure Nitric Acid production process, which delivers lower operating costs due to higher heat integration advantages, as well as lower capital installed cost due to its compact layout that requires less steel and less piping.

TECHNOLOGY FEATURES

- Energy efficient tail gas heat recovery – KBR's Weatherly dual pressure process puts greater focus on recovering the heat of reaction via tail-gas heating for high-efficiency recovery in the tail-gas expander
- Tube-side cooler condensers – unlike shell-side condensers that have shorter total useful life due to shell-side corrosion, KBR's Weatherly technology utilizes zirconium tubes with zirconium lined tubesheets on the process side, increasing heat exchanger life to as high as 20+ years. This technology has been proven and used to retrofit shell-side coolers in existing nitric acid plants
- Compact vertical design – KBR Weatherly's proven, compact reactor and vertical heat recovery design enables a much more compact plant footprint, reducing expenditures in piping, piperacks and structural steel. This feature also allows for installation of nitric acid plants in fertilizer complexes with limited footprint available

LOWER OPERATING COST AND REDUCED CAPITAL EXPENSES

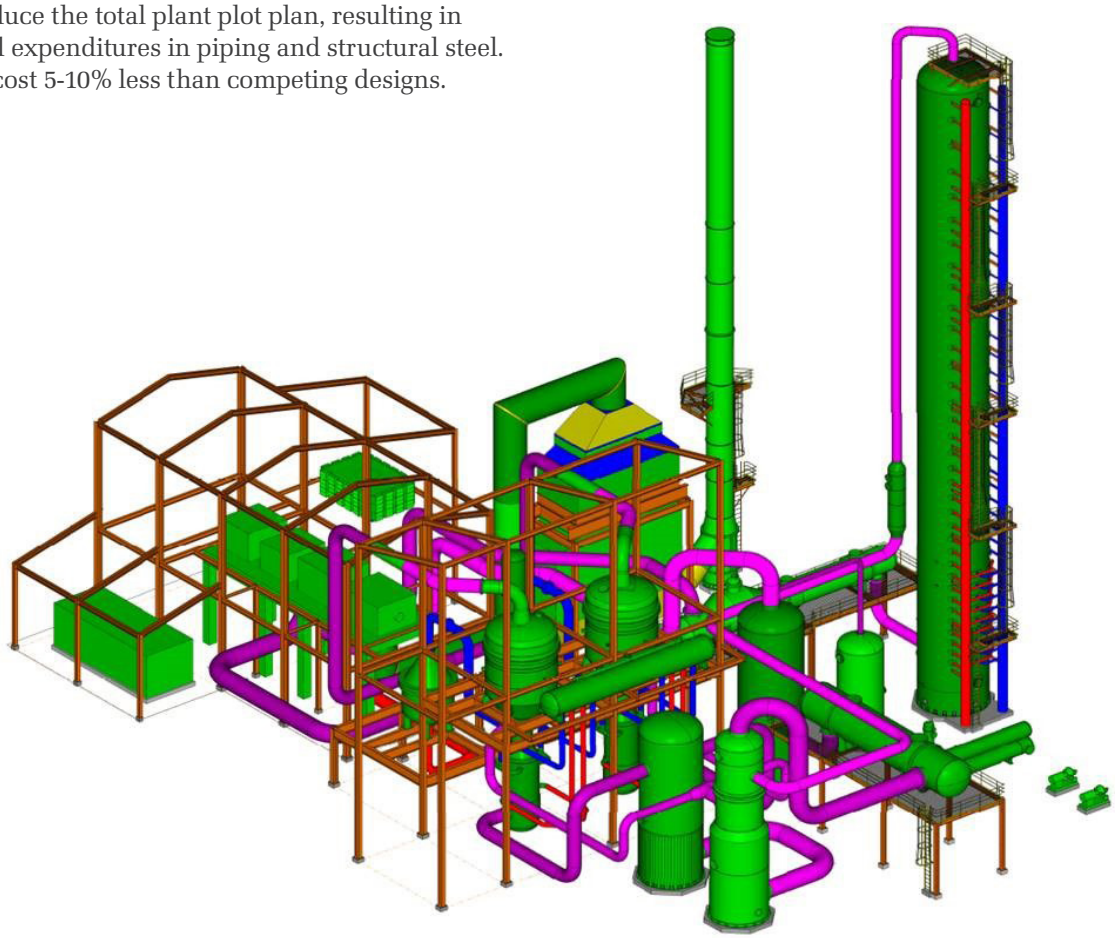
KBR's Weatherly Dual-Pressure Nitric Acid plants deliver lower operating costs with its more efficient heat recovery design. Tail gas exits the system at 620°C (1150°F), compared to competitors' typical temperature of 490°C (910°F), enabling more efficient recovery of energy that is subsequently used to generate energy to power up the system. Such innovation delivers operating cost advantages over competing technologies of $4 to $5/ton of nitric acid produced.

In addition, the KBR Weatherly dual-pressure design utilizes its proven vertical reactor and heat recovery design to reduce the total plant plot plan, resulting in lower capital expenditures in piping and structural steel. KBR plants cost 5-10% less than competing designs.

MONETIZE EXCESS AMMONIA, REDUCE LOGISTICS COSTS

KBR's Weatherly Dual-Pressure Nitric Acid plants are a good alternative for ammonia producers who have excess ammonia or wish to diversity their product mix. Nitric acid production is economically viable if excess ammonia of 70 tons/day or higher is available for conversion.

Nitric acid users might also consider producing nitric acid if they wish to increase plant capacity but are limited in logistics facilities – receiving racks, storage, etc. Producing nitric acid for captive consumption can be beneficial for production costs, logistics, health, safety and the environment.



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