



UAN Solution Technology

A Totally Integrated Plant Design for Efficient UAN Production

A FULLY INTEGRATED FACILITY

KBR's Weatherly unique facility design fully integrates four chemical processes: urea, nitric acid, ammonium nitrate and UAN. The result is an efficient and cost-effective way to produce UAN solution.

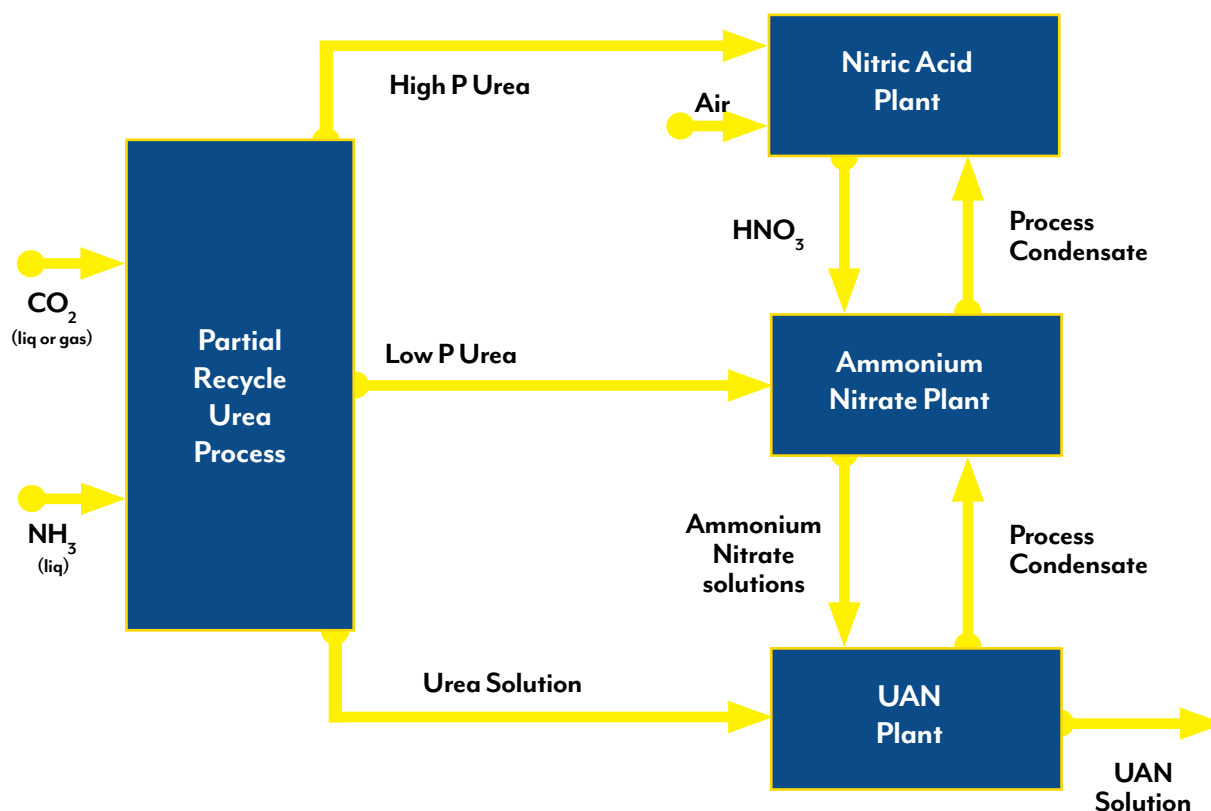
KBR's Weatherly facilities maintain low capital investment while yielding high conversion efficiency and low production costs.

KBR WEATHERLY UAN PROCESS OVERVIEW

The diagram below presents a simplified illustration of the KBR's Weatherly integrated UAN process. Production starts with the raw materials, liquid anhydrous ammonia and carbon dioxide (liquid or gaseous), being fed to the urea plant.

Urea is produced utilizing KBR Weatherly's proven Partial Recycle Urea Process. High and low-pressure urea off gas (containing ammonia, carbon dioxide and water) move on to the nitric acid and ammonium nitrate plants respectively. The nitric acid and ammonium nitrate plants also utilize proven KBR's Weatherly technologies. Nitric acid is fed to the ammonium nitrate plant, where it is converted to ammonium nitrate solution.

In the UAN plant, ammonium nitrate and urea solutions are blended to produce UAN fertilizer solution. The plant provides the flexibility to adjust the ratio of these two solutions to obtain the percentage of nitrogen desired (usually between 28 and 32 wt.%). Process condensate from the ammonium nitrate plant is available to adjust UAN composition. This condensate is also used as absorber feed water in the nitric acid plant.



MAIN PROCESS FEATURES

Urea

- NH_3/CO_2 feed mole ratio of 4:1 to achieve 72 to 75% CO_2 conversion to urea at 4,000 psig
- Partial recycle of ammonia only, thereby avoiding high-pressure pumping of carbamate recycle
- More economical equipment design compared to carbamate recycle systems

These facilities are extremely simple and cost-effective. Unreacted ammonia and carbon dioxide are separated and sufficient ammonia is recycled to achieve the correct NH_3/CO_2 mole ratio in the high-pressure reaction system for optimum conversion. Low-pressure steam is generated in the reaction system by recovering heat of reaction.

The majority of older KBR's Weatherly once-through urea plants have now been redesigned and retrofitted to the partial recycle process to increase urea production.

Nitric Acid

- High ammonia conversion efficiency is obtained by high-quality filtration of both air and ammonia off-gas feeds to the gauze; intimate mixing of feeds in a static mixer; KBR Weatherly's proven converter design; and use of all stainless steel piping and equipment
- Urea off-gas is used for ammonia feed
- NO_x emissions are controlled by utilizing our proven KBR Weatherly's absorption design coupled with selective catalytic NO_x reduction system
- High-efficiency heat recovery includes: generation of high-pressure superheated steam for feed to the steam turbine; tail gas reheating for enhanced power recovery in the expander; and exhaust stack heat-recovery for boiler feed water preheating
- Compact layout provides easy access for operation and maintenance

KBR's Weatherly technology operates at a single or dual pressure. Clean raw materials, thorough mixing, even distribution and stable catalyst temperature result in high ammonia conversion. The vertical equipment arrangement minimizes piping runs and site area. KBR's Weatherly plant design is extremely efficient, obtaining energy recoveries as high as 5.23 GJ per metric ton (4,500,000 BTU per short ton).

KBR combines proven UAN plant experience with a commitment to continuously improve.

KBR Weatherly's nitric acid, ammonium nitrate, urea and fertilizer solution plants can be supplied on a turnkey basis or on the basis of engineering, procurement and construction advisory services designed to match clients' needs.



An integrated UAN facility

AMMONIUM NITRATE AND UAN SOLUTION

- Production of 75 to 83 wt.% ammonium nitrate in a two-stage-neutralization/scrubbing system results in low nitrogen losses (therefore high efficiency) and low-level effluent contamination
- Urea off-gas is used for ammonia feed
- Neutralizer overhead gas containing NH_3 , CO_2 and H_2O is cleaned up in a circulated packed scrubber
- Cooling of circulated condensate to the packed scrubber produces feed water for the absorber

Unique in its simplicity, the ammonium nitrate process is designed for high energy recovery while maintaining low emission levels. KBR's Weatherly ammonium nitrate plants are also available to produce solutions, high density prills or granular product. By integrating the urea, nitric acid and ammonium nitrate processes, KBR's Weatherly facilities provide a highly reliable source of UAN solutions. These plants can produce varying UAN solution strengths, and have the flexibility to vary the ammonium nitrate/urea ratio, based on client requirements.

THE BOTTOM LINE

By yielding high conversion efficiency and low production costs, KBR's Weatherly integrated UAN facility can lower your total operating costs. In addition to producing high quality chemicals, KBR's Weatherly facilities are extremely cost-effective to start up and maintain. If you're looking to bring UAN solution production in-house, KBR is your trusted partner.

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