

Offering Competitive Advantages in Cost and Operability

For over 40 years, KBR has advanced ammonia technology with your key operational aims in mind: improved safety, lower capital costs and energy consumption, improved reliability and operability, and environmentally-sound operations. We offer expertise and processing solutions in conventional processing technology as well as many proprietary technologies for both syngas preparation and ammonia synthesis, including:

SMR

For conventional reforming operations, KBR's top-fired steam-methane reformer (SMR) design circumvents many of the mechanical design problems in competing primary reformer designs. The reformer tubes are efficiently heated from both sides, with firing occurring downwards from the top of the firebox, providing a relatively even load along the tubes. The convection section provides heat recovery from the flue gas for optimum furnace efficiency. Additionally, KBR's fired reformer can also be coupled with a gas turbine that drives an air compressor. This design allows the gas turbine exhaust to be used as preheated combustion air for the reformer radiant section, which reduces overall plant energy consumption.

KRES™

KBR Reforming Exchanger System (KRES) replaces a primary reformer with a fired preheater, autothermal reformer (ATR) and reforming exchanger. The system's proprietary design avoids direct firing on the exchanger tubes, which eliminates hot spots and keeps process temperatures lower. The system also provides decreased capital and operating costs, greatly-reduced plot space requirements and lower emissions compared to conventional reforming systems.

Purifier™

Following a mild primary reforming step and secondary reforming with excess air, KBR's proprietary cryogenic Purifier process removes excess nitrogen and impurities, resulting in nearly inert-free syngas. KBR's Purifier lowers capital and operating costs by allowing the reforming section to be operated with excess air and higher methane slip, reducing reforming catalyst volume and synthesis loop purge rates while eliminating the need for a separate purge gas recovery unit.

Waste Heat Boiler

Heat is recovered from the secondary reformer (or KRES) effluent in a waste heat boiler (WHB), often in combination with a steam superheater. KBR's proprietary design provides a vertical, natural-circulation, water-tube, floating-head design with refractory lining. Plant operators using our waste heat boiler design report lower initial costs, higher reliability and less maintenance. Another advantage with our design is the WHB tube bundle is removable, unlike bundles in a fired-tube boiler design.

Ammonia Synthesis Solutions

Chemical operators use KBR process technology in over 200 ammonia plants operating worldwide, which have earned a reputation for their high energy efficiency, operating reliability, and quality of construction. These plants employ a variety of proprietary process configurations and equipment items that KBR carefully selects to meet each client's specific needs and project requirements.

Conventional Ammonia Synthesis

KBR offers conventional ammonia process technology in which our well-known, top-fired primary reforming technology is combined with ammonia synthesis in a horizontal ammonia converter over a promoted iron magnetite catalyst at pressures of 140 to 170 bar. Having a long history of successfully optimizing energy consumption of this established process is what separates KBR from our competitors.

Horizontal Synthesis Converter

For conventional magnetite ammonia synthesis loops, KBR offers its horizontal ammonia synthesis converter. The converter contains two or three reaction stages, each with vertical downward flow in the magnetite catalyst beds. Intercoolers are provided between the catalyst beds for maximum conversion and heat recovery.

KAAP™ (KBR Advanced Ammonia Process) Loop

KAAP features ammonia synthesis over a proprietary promoted ruthenium on graphite catalyst that has an intrinsic activity ten to twenty times higher than conventional magnetite catalyst. This well-proven catalyst allows efficient ammonia synthesis at only 90 bar synloop pressure, which is two-thirds to one-half the operating pressure required for conventional ammonia synthesis. As a result of this lower pressure, only a single-case synthesis gas compressor is needed and vessel and pipe wall thicknesses are reduced throughout the synthesis loop, which reduces design complexity and equipment costs.

Unitized Chiller

The unitized chiller is a specially designed, multi-stream heat exchanger that cools the effluent from the ammonia synthesis converter with recycled gas and boiling ammonia refrigerant at several temperature levels. In doing so, the unitized chiller combines several heat exchangers, compressor knockout drums and interconnecting piping into one piece of equipment. This design saves pressure drop in the synthesis loop and reduces capital cost.

Synergistic Process Combinations

At KBR, our experts can combine our technologies in optimized configurations, resulting in further flexibility, process efficiency improvements and lower capital cost than conventional ammonia synthesis process schemes.

Lower Costs. Increase Energy Efficiency. Boost Reliability.

With over 50 years experience in designing and optimizing ammonia manufacturing facilities, KBR is a leading authority in ammonia and syngas solutions, and we have the technology and expertise to drive further process efficiencies in any plant, regardless of design. Let us put that experience to work for you.