Phoenix equipment corporation

Plant # 232

100 TPD Ammonia Plant for Sale

Capacity
100 tons per day

Feedstock
Natural Gas

Product
Ammonia of 99.97% purity

Process Technology
N-Ren Amopak Process

Consumption per Ton of Products
Natural Gas 38,000 SCF
Steam 3,500 lbs per ton
Electricity 740 KWH per ton
Cooling Water 75,000 Gallons

Major Equipment
Worthington compressors A & B
Ammonia converter
Converter heat exchanger
Synthesis gas cooler
Methanator
CO2 absorber
Regenerator
Primary condenser
Condensate separator
Primary & secondary separators
First & second let-down drums
Ammonia knock-out drum
Acid gas cooler
Vent condenser receiver
Refrigerant receiver
Fin fan condenser

BRIEF PLANT DESCRIPTION

Used 100 TPD skid-mounted ammonia plant designed by N-Ren (Amopak process) immediately available for quick loading and shipment. All the equipment has been dismantled. The plant includes the process sections of (a) Natural gas desulfurization (b) Catalytic steam reforming (c) Carbon monoxide shift (d) Carbon dioxide removal (e) Methanation (f) Ammonia synthesis (g) Purification. The plant has (3) Worthington, multi-purpose and multi-stage electric motor driven reciprocating compressors (now only 2 such compressors available, A & B). Each compressor consists of (4) stages for syngas, (3) stages for process air and (1) stage for ammonia refrigeration. The plant also has (2) Worthington reciprocating electric motor driven compressors to recirculate the syngas back to the synthesis loop. The primary reformer was rebuilt in 2011 and has not been used since then. There are 64 catalyst tubes in the reformer with tube material of HP modified, 25-35 with Niobium. Operation pressure of reforming and purification section: 240 psig; synthesis loop: 4850 psig, maximum 5150 psig.

For more information contact -
Edward Zhang, Plant Sales

To discuss plants you are selling -
Jesse Spector

plants@phxequip.com

Tel : (+001) 732 442 6990

There are (2) idled small Ammonia units ("Amopak"). These (2) units were designed for a capacity of 90 to 120 ton per day each of anhydrous ammonia.

Former C&I Girdler Engineers designed, built, and commissioned the units. Later, the "N-Ren" company acquired the technology and know-how from C&I Girdler, including these units. The units were reportedly built and commissioned in 1966 possibly.

The basic design and configuration of these (2) units are the same as any other Ammonia Technology as major sections include:

- Primary Reformer, Secondary Reformer, Shift converters, Methanation.
- The compressor trains consist of an air compressor to supply process air, a refrigeration compressor and a synthesis loop compressor.

In this technology, the main compressors have been built on a single crank shaft of a multipurpose and multistage one compact unit. Otherwise the principle of the "design built" is the same as any other ammonia plant except it has been built on a modular and skid mounted base frame - since the design is packed it has been designated "Amopak" Ammonia technology. These units are relatively easy to dismantle and transport for relocation. The skid mounted equipment on several assemblies will significantly reduce the installation timing and ultimately will reduce the project total installed cost.

Concept of small ammonia plant development
These units developed to monetize the abundance of natural gas in remote areas in which gas transportation to consumers was not feasible, but natural gas could be used to make ammonia and ultimately nitrogenous fertilizer for the local market.

Concept of modular design / skid mounted Amopak units
In this concept the equipment to be manufactured in area with available qualified crafts and fabrication shop. The major equipment is to be skid mounted in several assemblies, installed on a steel frame, shipped and installed on the site. This concept should shorten the construction period, consequently reducing total installed costs of the project and bringing about production quicker.

More Specifics on each Unit:

Unit #1 has (3) Worthington, multi-purpose and multi stage electric motor driven reciprocating compressors (Note: Compressor #C is missing). Each compressor consists of (4) stages for synthesis gas, (3) stages for process air and (1) stage for ammonia refrigeration. Unit #1 also has (2) Worthington reciprocating electric motor driven compressors to recirculate the synthesis gas back to the synthesis loop. The loop should operate at 4,500 psig pressure. In Unit #1, the primary reformer was re-tubed in 2011 but never came back in line and has been mothballed since then. There are 64 catalyst tubes in the reformer with tube material of HP Modified, 25-35 with Niobium.

Operation Pressure:
Reforming and Purification section: 240 psig.
Synthesis Loop - 4850 psig, maximum 5150 psig.

Material Consumption:
32.2 mmbtu per short ton after steam credits; or
34 mmbtu per short ton before steam credits
Steam Consumption: 4600#/short ton
Electricity: 865KWH/short ton

Unit #2 has (2) main multistage, multipurpose "White Superior" electric motor driven reciprocating compressors. Each compressor has (4) stages for the synthesis gas, (3) stages for process air, (1) stage for ammonia refrigeration and (1) stage for synthesis gas recirculating syn gas to the loop. (Note: The two compressors are missing.)
The synthesis loop operates at 5,000 psig. Unit #2 went down in 1987 - 1988 due to downstream limited consumption for product. Since then, the Unit #2 was kept down and saved as a spare parts pool for the Units #1 and 3.

Operation Pressure:
Reforming and Purification section: 240 psig.
Synthesis Loop - 4850 psig, maximum 5150 psig.

Material Consumption:
32.2 mmbtu per short ton after steam credits; or
34 mmbtu per short ton before steam credits
Steam Consumption: 4600#/short ton
Electricity: 865KWH/short ton

Performance Test
A capacity and reliability test was performed on October 14, 1985 on Unit #1 to identify the maximum capacity, the limitation and potential bottle-necks on the maximum production rate. The report of the performance test and the energy and material balance showed it achieved a rate of 100 tons plus per day. The front-end of Unit #2 was kept down but the loop was kept as back up for the loop of Unit #1.

Major Revamp and improvement done on Unit #1 in 2012 and prior to permanent shutdown:

- Retubed the main W.H. Boiler
- Installed the Low NOx burners on primary reformer furnace
- Retubed primary reformer with tubes material of 25-35 HP modified-Niobium
- The transfer line between Primary and Secondary reformer was replaced
- Installed new W.H. Boiler on the outlet of the H.T. Shift converter
- Replaced the packing ring on the CO2 absorber with plastic material
- Has a new plate type exchanger on Rich-Lean of MDEA solution
- Also some of the control system in the control room has been replaced
- Most of the piping, block valves and control valves were replaced
- The electric motors were inspected, cleaned and preserved
- The above modification improved reliability and efficiency.

Note: Unit #1 was not restarted after this revamped and was kept down.