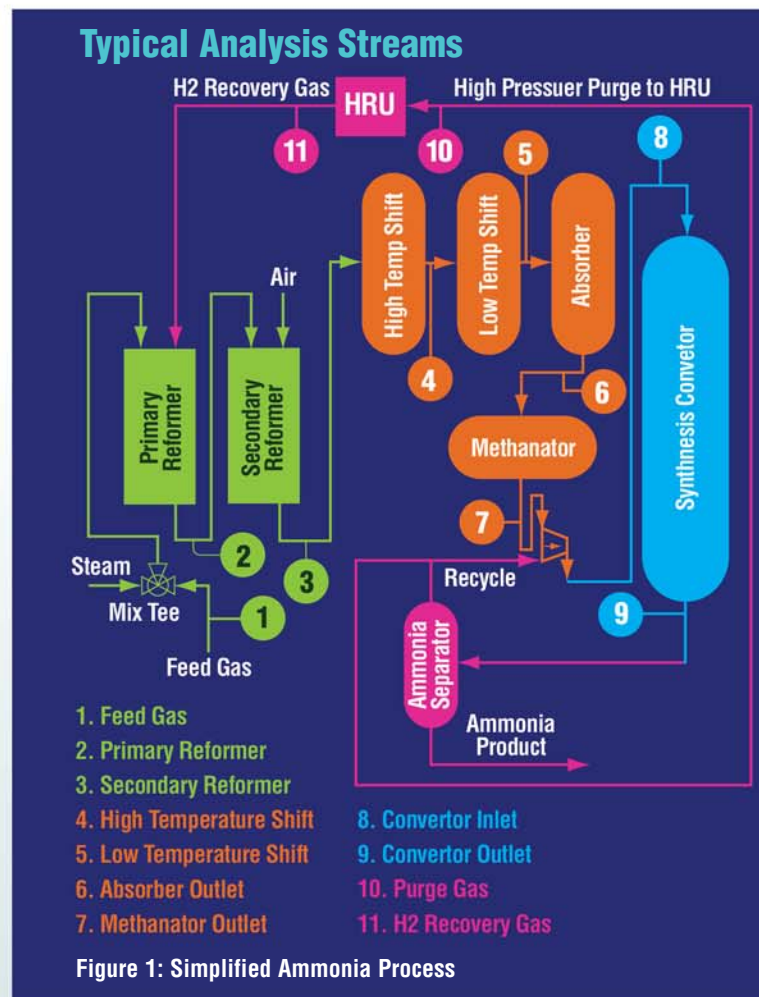


Extrel® customers have reported significant economic benefits when using an Extrel quadrupole mass spectrometer on Ammonia Process Control.

Extrel has well documented data and references supporting the economic payback of installing quadrupole mass spectrometers for process control. In conjunction with the installation of an Advanced Process Control system, the total savings for one Extrel customer was calculated to be more than \$1,000,000 over three years. By providing fast and accurate analysis of multiple streams, the return on investment can be less than 6 months due to:

- **Energy savings via lower fuel costs:** Accurate and fast analysis of the Natural Gas BTU value allows for tight control of the steam to carbon ratio, reducing waste and inefficiencies.
- **Increased production:** Ammonia production can be maximized through tighter control of the H₂/N₂ ratio, with the Extrel MAX300™ achieving a tolerance of +0.01%. Additionally, during startups, the plant reaches its operational set points in hours rather than days, allowing the plant to resume production quickly. According to one customer, each extra day of production is equal to \$180,000.
- **Increased efficiency:** Fast analysis of the methane slippage and inert gases allows the process to be safely run under optimum conditions. One customer's savings from only optimizing the purge gas was on the order of \$100,000 - \$200,000 per year.
- **Increased equipment life:** Tighter control algorithms also reduce stress on plant equipment such as compressors; extending their operational life and reducing maintenance downtime.

Extrel has the largest installed base of quadrupole mass spectrometers worldwide and is the recognized leader for Ammonia Production Control. Extrel has worked with many of the industry-leading ammonia process licensors such as KBR and Snamprogetti.



Application Background

Ammonia is normally produced from steam reforming of a natural gas feedstock. The production follows several independent processes, from the Primary Reformer, to the Shift Converters and finally to the Ammonia Converter. All of these processes have their own dynamics and are independently run at their individual optimum set points. Since the process effluent from one stage is fed into the next step, variations in sample composition will cause operational upset.

Fast analysis of multiple streams is necessary so that the plant optimization program can be used to control the Ammonia process. The Extrel MAX300 series of quadrupole mass spectrometers analyze from 8 to 12 process streams with a total cycle time of less than 2 minutes. It is an industry accepted fact that the use of a quadrupole mass spectrometer is economically necessary as technologies such as gas chromatographs or infrared analyzers cannot meet the required response time.

Key Application Facts

- Extrel is a worldwide leader in analysis for Ammonia Process Control.
- The Extrel MAX300 can analyze 8 - 12 streams in less than 2 minutes using the low dead volume, multiport rotary valve.
- If equipped with the optional electron multiplier detector, the Extrel MAX300 can measure parts per million of H₂S in the natural gas stream, protecting the Nickel catalyst from poisoning.
- The Extrel MAX300 utilizes next generation designs for the inlet, ionizer and filament assembly. This extends the life of the filaments, increases time between service and decreases maintenance down time.
- The Extrel MAX300 supports a variety of industry standard communications including ethernet, Bi-directional MODBUS, MODBUS RTU or TCP/IP, OPC and analog communication protocols.



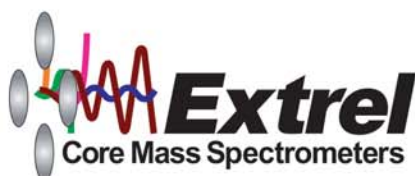
MAX300-LG



MAX300-IG

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