NEXTCHEM | STAMICARBON

NITRIC ACID TECHNOLOGY

MAXIMUM ENERGY RECOVERY WITH MONO AND DUAL PRESSURE

NX STAMI NITRATES™ LAUNCH™

WHAT ARE THE CHALLENGES

FOR NITRIC ACID PLANTS?

When setting up a nitric acid plant, your aim is to **maximize energy recovery while minimizing your cost of investment.** That makes the single-train design process a real challenge.

We have what it takes to deliver **the nitric acid plant that covers all your needs.** Because we draw on experience going back many decades and always use components that have proven their reliability in industrial settings.

Since the 1930s we have licensed a range of **safe, reliable and sustainable nitrate technologies** and built over 40 nitric acid plants worldwide. Depending on your preferences, we offer best-in-class, **mono and dual pressure nitric acid technologies.**

See the difference we make for you.

We have what it takes to deliver the nitric acid plant that covers all your needs.


65%
100%

SMART PROCESS DESIGN

WITH MONO OR DUAL PRESSURE TECHNOLOGY

Our mono and dual pressure plant designs are ideal for nitric acid production across all capacity ranges, including small-scale nitric acid plants, as found in the fertilizer industry. These designs can be adapted to a wide variety of project requirements, allowing fully flexible mono-pressure and dual-pressure configurations rather than fixed capacity limits.

Both processes are characterized by reliable operation, high tail-gas temperatures of up to 480°C, maximum energy recovery and minimal greenhouse gas emissions. The elevated tail-gas temperature also promotes effective N_2O decomposition without requiring external agents such as natural gas, further enhancing environmental performance.

Corrosion risk from condensation and re-evaporation is minimized through our smart heat-exchanger layout. The design works seamlessly with commonly used building materials, reducing heat-exchanger manufacturing costs and strengthening long-term process reliability.

Drive down manufacturing costs

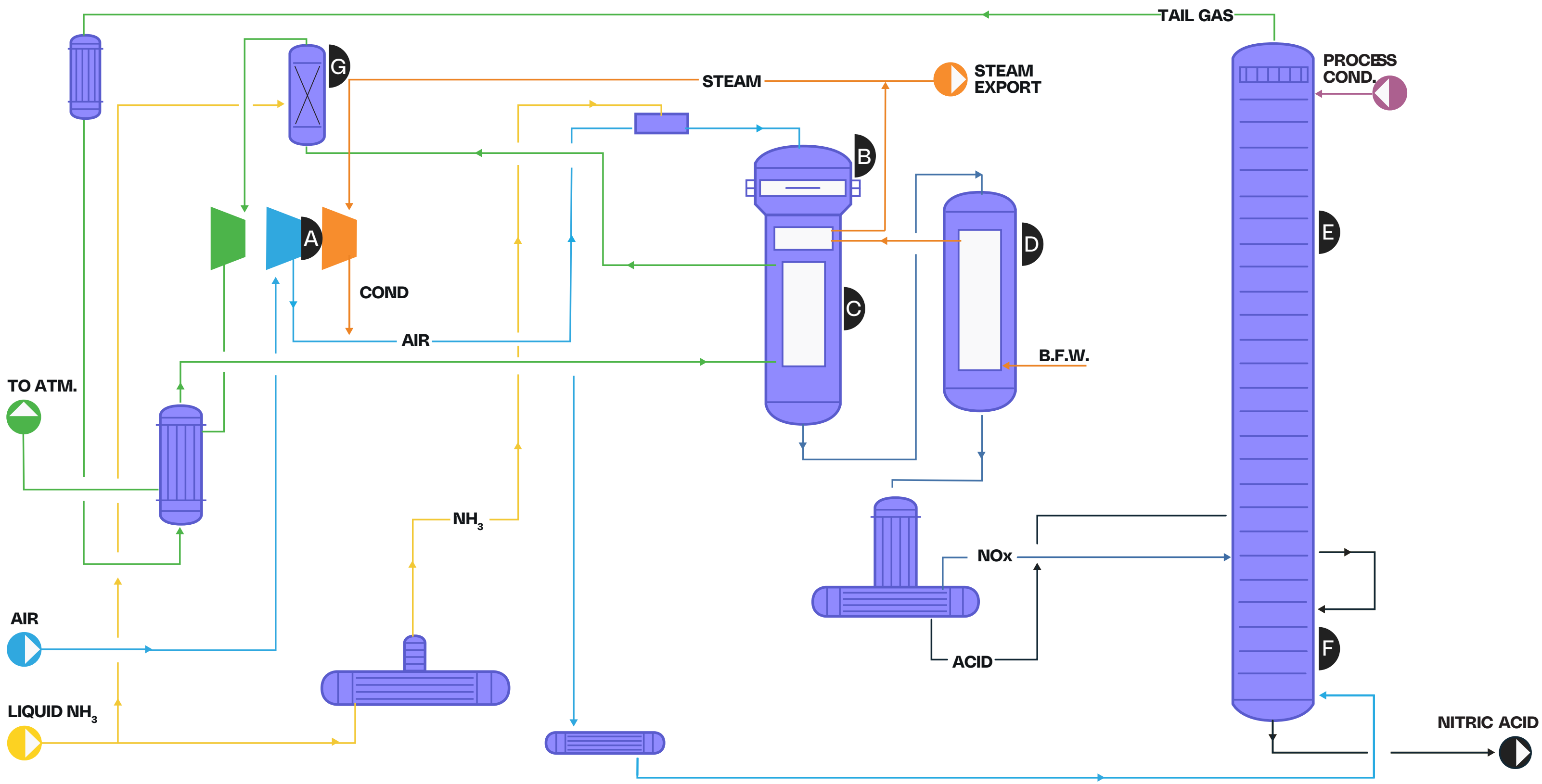
Sustainable benefits

High tail gas temperature boosts N_2O decomposition without adding external agents like natural gas.

Extra power generation and heat recovery (enabled by high tail-gas temperature) minimize energy loss through tail-gas emissions

Corrosion prevention by design promotes process safety and reliability.

MONO PRESSURE TECHNOLOGY FOR THE NITRIC ACID PRODUCTION PROCESS



A Compressor train

B Burner

C Tail gas heater

D Waste heat boiler

E Absorption column

F Bleaching column

G N_2O/NOx abatement reactor

MONO PRESSURE TECHNOLOGY MAIN FEATURES

- The process operating pressure is 8 bar (a).

- A mixture of compressed air and NH_3 is fed into the ammonia burner, where NH_3 is oxidized to NO on Pt/Rh gauzes. Small amounts of N_2 and N_2O are formed as side products. Optimum gauze temperature is ensured.

- The NO is oxidized to NO_2 in the gas phase downstream, leading to the formation of HNO_3. The heat released by the oxidation reaction is used to generate high-pressure steam and heat the tail gas.

- Downstream of the waste heat boiler, the nitrous gas is cooled down further in a boiler feed water preheater. This is then fed into the cooler condenser, where a weak acid solution is condensed and transmitted to the oxidation/ absorption column. The remaining gas enters the bottom of the oxidation/ absorption column, which consists of a series of sieve trays.

- The acid from the sieve trays is fed into the upper bleaching trays, which are situated at the bottom of the absorption column. Here, the acid undergoes air stripping to remove traces of NOx, leaving a colorless nitric acid solution of approx. 58-63 wt%.

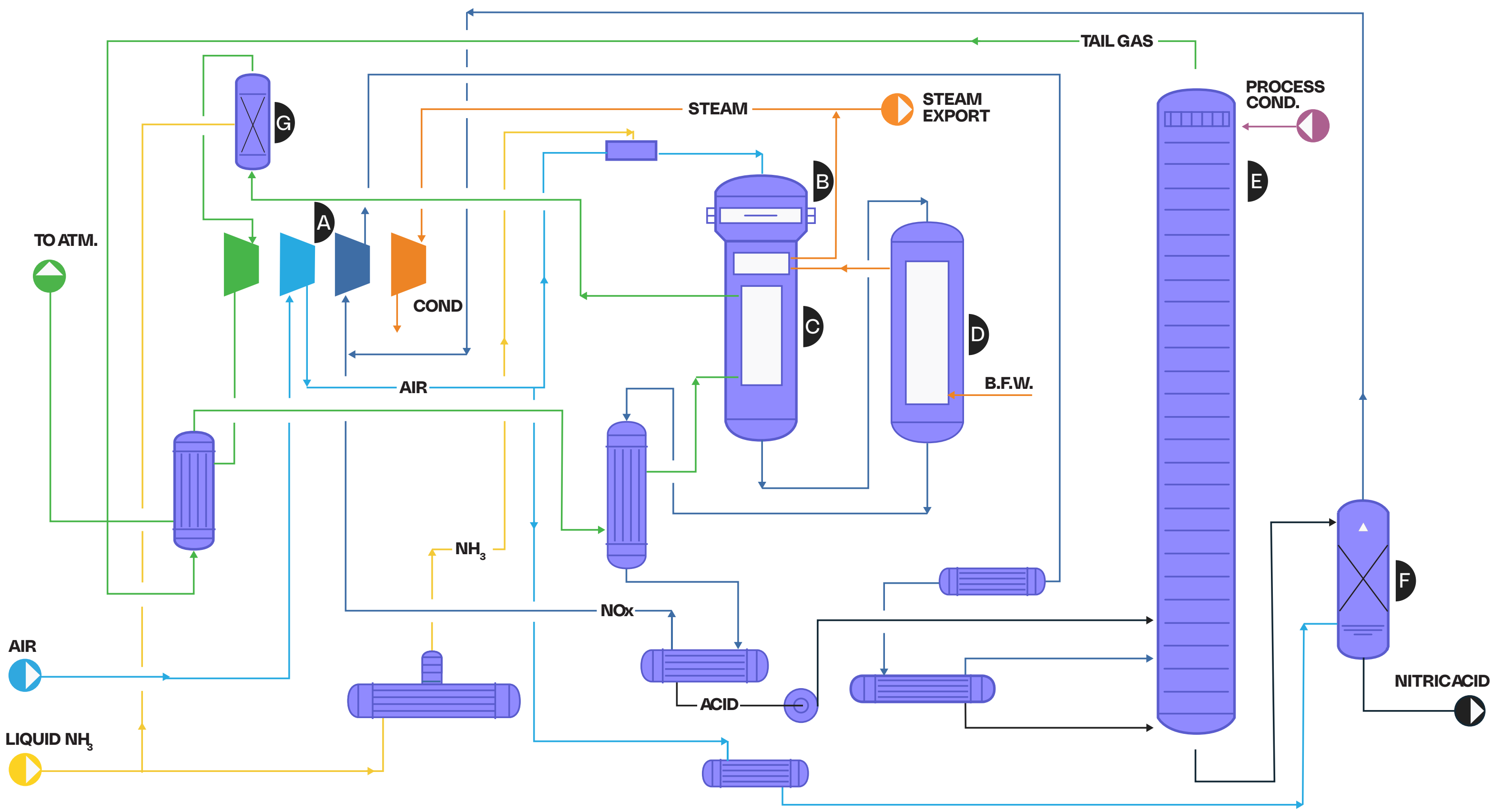
- Traces of NOx and N_2O remain in the overhead vapor from the absorption/ oxidation column. To get this down to an acceptable level, this tail gas is heated to approx. 480°C and fed through a tertiary abatement system. Here, N_2O and NOx are converted into water and nitrogen by means of two catalyst beds.

- In the expansion turbine, the tail gas is expanded. The in-line compressor train configuration enables the energy this releases to drive the air compressor. Additional power is generated by a steam turbine or electromotor.

- After expansion, the tail gas stream is still hot enough for another heat exchanging step, which lowers the temperature of the tail gas released to the atmosphere.

CONSUMPTION		
Operating range	%	70 - 110
NH_3 consumption	kg/ton 100% HNO_3	284
Pt losses (incl. recovery)	g/ton 100% HNO_3	0.035
HP steam export, 45 bar, 450°C	kg/ton 100% HNO_3	> 600
NOx	ppm vol	< 20
N_2O	ppm vol	< 20
Cooling water	ton/ton 100% HNO_3	110

DUAL PRESSURE TECHNOLOGY FOR THE NITRIC ACID PRODUCTION PROCESS



- A Compressor train
- E Absorption column
- B Burner
- F Bleaching column
- C Tail gas heater
- G N_2O/NOx abatement reactor
- D Waste heat boiler

DUAL PRESSURE TECHNOLOGY MAIN FEATURES

- Air is filtered and compressed to approx. 5 bar(a) and mixed with evaporated ammonia.

- The ammonia/air mixture is fed into the ammonia burner. NH_3 is oxidized to NO on Pt/Rh gauzes and small amounts of N_2 and N_2O are formed as side products.

- The NO is oxidized to NO_2 in the gas phase downstream, leading to the formation of HNO_3. The heat released by the oxidation reaction is used to generate high-pressure steam and heat the tail gas.

- Downstream of the waste heat boiler, the nitrous gas is cooled down further to below its dew point. This is then fed into the low-pressure cooler condenser, where a weak acid solution is condensed and transmitted to the oxidation/absorption column.
  The remaining nitrous gas is compressed to 11 bar (a) by the NOx compressor and re-cooled to below its dew point to form a more concentrated acid solution in the high-pressure cooler condenser.

- The remaining gas enters the bottom of the oxidation/absorption column, which consists of a series of sieve trays.

- The acid exits the bottom of the absorption column and is fed into the bleacher where last traces of dissolved NOx are eliminated by air stripping, producing a colorless nitric acid solution of approx. 58-63 wt%.

- Traces of NOx and N_2O remain in the overhead vapor from the absorption/ oxidation column. To get this down to an acceptable level, this tail gas is heated to approx. 480°C and fed through a tertiary abatement system. Here, N_2O and NOx are converted into water and nitrogen by means of two catalyst beds.

- In the expansion turbine, the tail gas is expanded. The in-line compressor train configuration enables the energy this releases to drive the air and NOx compressors. Additional power is generated by a steam turbine.

CONSUMPTION		
Operating range	%	70 - 110
NH_3 consumption	kg/ton 100% HNO_3	282
Pt losses (incl. recovery)	g/ton 100% HNO_3	0.03
HP steam export, 45 bar, 450°C	kg/ton 100% HNO_3	> 800
NOx	ppm vol	< 20
N_2O	ppm vol	< 20
Cooling water	ton/ton 100% HNO_3	100

TERTIARY ABATEMENT SYSTEM

WE CARE ABOUT THE ENVIRONMENT

The most efficient and straightforward way to remove NOx and N_2O from tail gas emissions is through Stamicarbon's abatement system. We collaborate with the most experienced and qualified catalyst suppliers to ensure optimal performance and to meet the most stringent regulations.

The abatement system is located downstream of the absorbtion column, where the tail gas temperature is increased to 480°C. These conditions are ideal for efficient abatement while minimizing the required catalyst volume. The abatement of N_2O and NOx occurs in the same vessel. Upon exiting the reactor, the cleaned off-gas is sent to the expander and then released into the atmosphere at approximately 45°C. Due to the milder process conditions, no special materials are needed for the expander.

Did you know?

Stamicarbon offers this equipment as a full-service option (one-stop-shop). However, the choice of catalyst type and vendor is ultimately agreed with the client. Also, reloading can be directly managed by the client with no risk of additional charges.

MAIN PECULIARITIES:

- Easy reactor installation
- High N_2O and NOx conversion
- Long catalyst lifetime
- Minimized delta P
- No need natural gas
- No NH_3 slippage
- Optimal energy balance to achieve the desired tail gas temperature.
- Full life assistance

Stamicarbon is beside you every step of the way: from creating a new plant to optimizing and upgrading existing facilities in light of a sustainable and futureproof production.

CONCLUSION

Our solutions are built on 75 years of high-quality research and in-depth industry knowhow. We work closely with the entire value chain to improve and innovate our technologies. As the world's leading fertilizer authority, we show our commitment to driving the long-term success of the industry by sharing our insights, solutions and knowledge.

Get more insights
Brochures, papers and other information published over many decades are available at www.stamicarbon.com.
We also share our knowledge at various conferences to keep you up to speed on the latest developments in nitrates.

Contact us
Interested in advancing your plant? We look forward to discussing your requirements and putting together a personalized proposal.

STAMICARBON

NX STAMI UREA
Technology design
Equipment supply
UAN & UAS technology
Services & Solutions

NX STAMI AMMONIA
Technology design
Equipment supply
Services & Solutions

NX STAMI NITRATES
Mono & Dual pressure Nitric Acid Technology
NO_x & N_2O abatement
Equipment supply
Services & Sloutions

NX STAMI SPECIALTIES
NO_x reduction (DEF)
Controlled-release-fertilizer
Coatings & additives

NX STAMI DIGITAL
Monitor Simulator

References

Total capacity (mt/d)	Customers	Site	Country	Technology	Contractor
1400	DSM Agro Division	Geleen	Netherlands	Dual pressure design	Didier Engineering, Germany
670	UKF	IJmuiden	Netherlands	Dual pressure design	Didier Engineering, Germany
1100	Akdeniz Gubre Sanayi	Mersin	Turkey	Mono pressure design	Kellogg Continental, Netherlands
652	Fertilizantes Mexicanos	Pajaritos	Mexico	Mono pressure design	Krebs, France
600	UKF Fertilizers	Ince	UK	Mono pressure design	Sim. Chem., UK
570	Agrico Chemical Corporation	Oklahoma, Tulsa	USA	Mono pressure design	Pullman Kellogg, USA
800	Sonatrach	Annaba	Algeria	Mono pressure design	Krebs, France
570	Agrico Chemical Corporation	Oklahoma, Tulsa	USA	Mono pressure design	Kellogg Continental, Netherlands
700	Duslo	Šaľa	Slovakia	Dual pressure design	Société Krebs & Cie, France
225	Monomeros Colombo-Venezolanos	Barranquilla	Colombia	Mono pressure design	McKee, USA
255	Scottish Agricultural Industries	Edinburgh	UK	Mono pressure design	Humphreys & Glasgow, UK
675	Cuba Industrial	Cienfuegos	Cuba	Mono pressure design	Simon Carves, UK
820	Societe Rhodannienne d'Engrais	Chasse	France	Mono pressure design	Kuhlmann, France
725	Masinimport	Targu Mures	Romania	Mono pressure design	Didier-Werke, Germany
190	Haifa Chemicals	Ashdod	Israel	Mono pressure design	Staff
275	Kwinana Nitrogen	Kwinana	Australia	Mono pressure design	Humphreys & Glasgow, UK
185	Associated Chemical Companies	Harrogate	UK	Mono pressure design	Humphreys & Glasgow, UK
420	DSM	Geleen	Netherlands	Mono pressure design	DSM, Netherlands
530	Imperial Chemicals Industries	Severnside	UK	Mono pressure design	Humphreys & Glasgow, UK
810	Societé Egyptienne d'Engrais et d'Industrie, Chimique	Suez	Egypt	Mono pressure design	Uhde, Germany
330	Jwestling	Nebraska	USA	Mono pressure design	KT- Kinetics Technology, Italy

Total capacity (mt/d)	Customers	Site	Country	Technology	Contractor
2700	Pulway Azot	Puławy	Poland	Mono pressure design	Didier-Werke, Germany
530	Imperial Chemicals Industries	Severnside	UK	Mono pressure design	Humphreys & Glasgow, UK
295	Al Nasar Co.	Helwan	Egypt	Mono pressure design	Continental Engineering, Netherlands
255	SASOL	Sasolburg	South Africa	Mono pressure design	Simon Carves, UK
125	Sefanitro	Bilbao	Spain	Mono pressure design	Uhde, Germany
425	Columbia Nitrogen Corp.	Georgia, Augusta	USA	Mono pressure design	Braun, USA
160	Imperial Chemical Industries	Severnside	UK	Mono pressure design	ICI
160	Imperial Chemical Industries	Heysham	UK	Mono pressure design	ICI
260	Ruhrchemie	Oberhausen	Germany	Mono pressure design	Uhde, Germany
195	Kemira Oy	Oulu	Finland	Mono pressure design	Tippi Oy
320	Farbwerke 'Hoechst' (extension)	Höchst	Germany	Mono pressure design	Uhde, Germany
810	Fertilizer Corporation of India	Rourkela	India	Mono pressure design	Fertilizer Corporation of India
345	Hibernia	Wanne-Eickel	Germany	Mono pressure design	Uhde, Germany
225	Ministry of Coordination	Athens	Greece	Mono pressure design	Uhde, Germany
205	Nitratos de Portugal	Lisbon	Portugal	Mono pressure design	Werkspoor, Netherlands
200	KIMA (extension)	Assuan	Egypt	Mono pressure design	Uhde, Germany
150	Société Egyptienne d'Engrais et d'Industrie, Chimique	Cairo	Egypt	Mono pressure design	Uhde, Germany
320	Farbwerke 'Hoechst'	Höchst	Germany	Mono pressure design	Uhde, Germany
160	Imperial Chemical Industries	Ardeer	UK	Mono pressure design	ICI
90	African Explosives & Chemical Industries	Modderfontein	South Africa	Mono pressure design	Werkspoor, Netherlands
610	KIMA	Assuan	Egypt	Mono pressure design	Uhde, Germany
790	DSM	Geleen	Netherlands	Mono pressure design	DSM, Netherlands

WE ARE STAMICARBON

Stamicarbon, the nitrogen technology licensor of NEXTCHEM (MAIRE Group), designs and licenses fertilizer plant technologies, specializing in urea, green ammonia, and nitric acid. As part of NEXTCHEM, Stamicarbon leverages the capabilities and expertise of a world-leading engineering group. In total, Stamicarbon has licensed more than 260 urea plants and realized more than 100 revamping and optimization projects. Applying more almost 80 years of knowledge and experience, Stamicarbon offers you tailored solutions and services to maintain, improve and optimize plants in every stage of their life cycle, with a focus on sustainable fertilizer production. As pioneers with a higher purpose, Stamicarbon's vision is to help enable the world to feed itself and improve the quality of life. Stamicarbon is headquartered in Sittard, The Netherlands, and operates worldwide.

WHAT CAN WE DO FOR YOU?

Questions?
Would you like to know more? Talk to us - we're here for you! Contact our experts at **www.stamicarbon.com.**

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