

STAMI UREA EVOLVE

Upgrading your existing plant





HOW CAN WE HELP YOU?

We help you find the right technologies.





INTRODUCTION

Stamicarbon is the **world market leader in designing, licensing and developing urea plants**. Through our Stami Urea business unit we apply our expertise, knowledge and experience to help you find the right fertilizer production technologies, emission reduction technologies and all technologies

for the integration of urea and adjacent processes. Moreover, we are 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. We are there throughout your plant's entire life cycle.

LICENSING STATE-OF-THE-ART UREA PLANTS

We offer you technological solutions, products and/or services that match your requirements.

When it comes to creating a urea plant, our engagement and commitment does not stop after signing the contract and building your plant. We have developed an extensive technology, product and service portfolio for urea plants. We distinguish ourselves from the competition with our high-quality standards and our Full Life Cycle philosophy.

Enjoy a full service

With continuous support through the whole life cycle of your plant, regardless of what stage your plant is at, we offer you bespoke technological solutions, products and/or services that match your requirements. We offer a set of three series that suit a wide range of real world specifications. We call these our LAUNCH, ADVANCE and EVOLVE series. Your plant's

life cycle starts with launching the design, executing the engineering, procurement and finally, construction of your plant. After the LAUNCH phase of the plant, you enter into the next stage – ADVANCE. Our products and services optimize the plant's performance. Furthermore, we provide you with the knowledge and latest designs in urea technology to upgrade your plant to EVOLVE to the next level.

LAUNCH™

Creating your plant

Launch a new plant, with all the technologies, products and services needed for successful, sustainable and profitable urea production.

Solutions for melt synthesis
Solutions for urea finishing

ADVANCE™

Optimizing your plant

Advance your plant performance, reduce downtime, improve product quality and increase efficiency with these products and services:

Support and plant staff training
Optimizing plant output and operation control
Improving product quality
Improving safety and environmental impact
Inspections and plant maintenance

EVOLVE™

Upgrading your plant

Evolve your plant to the next level with revamp and debottlenecking:

Increase product capacity
Reduce emission output
Reduce energy consumption



UPGRADING YOUR EXISTING PLANT



Our EVOLVE series provides the technology and solutions you need to upgrade your plant when new circumstances demand it. This ensures your aging plant remains compliant with amended legislation and stays competitive by adapting to changes in market conditions. To do so, EVOLVE includes such products and services as **plant assessments, revamp studies, process design and debottlenecking.**

Stamicarbon has successfully completed **more than 110 revamp projects** at all types of urea plants. Thanks to a combination of state-of-the-art technologies and expert know-how, we can immensely improve plant performance and/or capacities.

Our EVOLVE series offers **three main revamp solutions**, each of which can be tailored to your specific needs.

EVOLVE Capacity™

Boost output at your plant by anything from 10% to 100%

EVOLVE Emission™

Reduce your emissions in step with international standards

EVOLVE Energy™

Lower your steam use and optimize your feedstock consumption

EVOLVE™

1

EVOLVE Capacity™

Optimize equipment and processes to improve your plant performance, production and energy consumption? Through this assessment we focus on ways to minimize ammonia consumption, energy consumption and effluents; and maximize plant on-stream time and plant capacity.

2

EVOLVE Emission™

Reduce your emissions in step with international standards? Our technologies improve the health, safety and environmental aspects of urea plants. Our MicroMist Venturi Scrubber and Jet Venturi Scrubber are amongst the most efficient concepts to keep your emissions under control.

3

EVOLVE Energy™

Through continuous innovations in urea melt production technology and urea granulation technology we can revamp your urea plant to lower energy consumption and construction costs, while raising the efficiency of your production and reducing your emissions. Let's assess your plant?



EVOLVE CAPACITY™

Our expertise will ensure your urea plant **operates sustainably at maximum capacity**. We will help you optimize equipment and processes to improve plant performance, production and energy consumption. A Plant Performance Assessment will help us to focus on ways to minimize ammonia consumption, energy consumption and effluents; and maximize plant on-stream time and plant capacity.





Your benefits

- You can take full advantage of the plant's design margins.
- You can boost urea production without extra people or infrastructure.
- You can reduce your total costs to lower the price of your urea.
- You can give your plant a competitive edge.

INCREASING YOUR PLANT'S OUTPUT

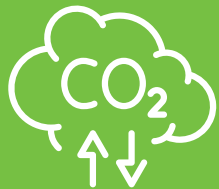
Let's debottleneck your plant

Debottlenecking your plant is one way of increasing capacity. Potential gains depend on the availability of feedstocks, utilities

and particular plant limitations. We have developed several **debottlenecking solutions** to meet your precise requirements. Hybrid solutions are also available.

EVOLVE Capacity™ designs	Expected capacity increase* %
More-in More-out Design	10 - 30
Double Stripper Design	30 - 40
Add-On Mega Capacity Design	30 - 50
Pool Condenser/Reactor Design	50 - 100

*Based on nameplate capacity. The actual capacity gain depends on the original design margins of large-capital equipment.



EVOLVE EMISSION™

It is perfectly
suited for smaller
capacities.





Your benefits

- Easy installation due to modular design
- Meets stringent new emission regulations
- Tried-and-true high-performance submicron particulate
- Best available turndown ratio
- High-quality low-maintenance components
- Suitable for revamping or retrofitting existing scrubbers
- Proven track record

REDUCING YOUR PLANT EMISSIONS

We have developed several technologies to improve the health, safety and environmental (HSE) aspects of urea plants in response to the imposition of ever-stricter emission standards. The finishing section is typically the main source of ammonia emissions in modern urea plant. We can **reduce your ammonia emissions to meet international standards**, regardless of whether your

finishing section is geared to prilling or granulation.

How we reduce your emissions?

We offer two proven technologies for emission prevention in urea production.

The **MicroMist Venturi Scrubber** and the **Jet Venturi Scrubber**.

1

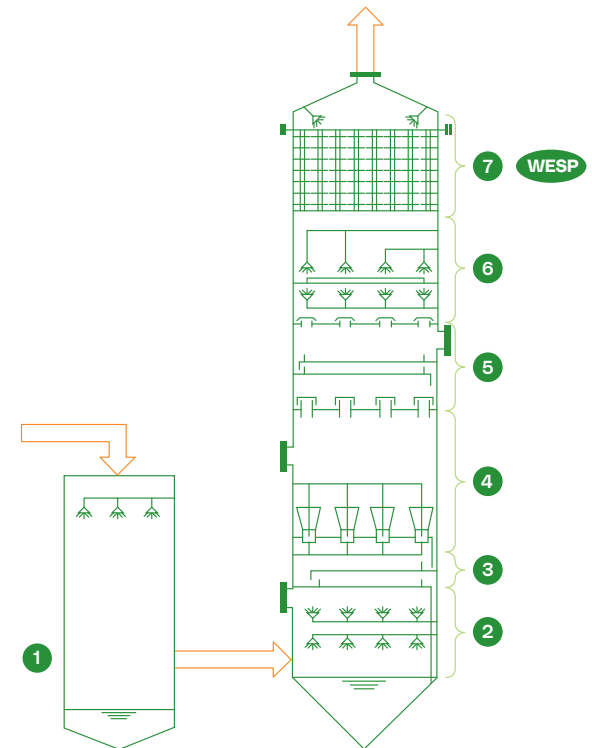
MICROMIST VENTURI SCRUBBER

This scrubber is among our most effective emission control technologies. The highly efficient scrubbing technology collects high submicron particulate matter (<1.0µm) and ammonia, producing concentrated blowdown streams. The MicroMist Venturi Scrubber can collect urea dust emissions as low as 10mg/Nm³.

How does it work

The Envirocare MMV scrubbing system can contain up to six stages that progressively treat and purify the exhaust gas from our fluidized-bed urea granulator. The six (or seven) stages are represented in the figure and consist of:

1. Concentrated urea quench
2. Diluted urea quench
3. DOI conditioning trays
4. MicroMist™ Venturi (MMV) tubes
5. Acid treatment for NH₃ capture
6. High-efficiency mist eliminator stage
7. Wet Electrostatic Precipitator (WESP) - optional to further reduce dust



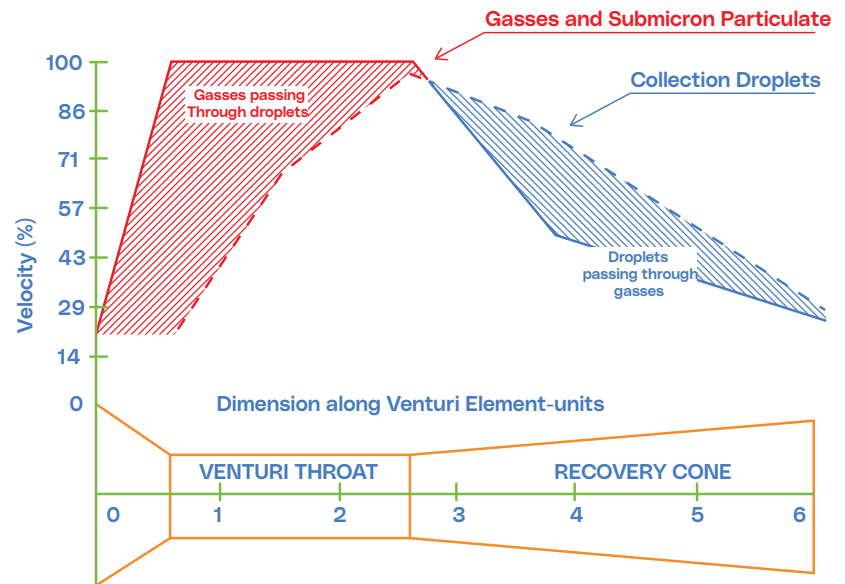
The MicroMist™ Venturi submicron collection Stage

Each Venturi tube includes a converging conical section (the inlet), where the exhaust gas is accelerated to throat velocity, a cylindrical throat, and a conical expander, where the exhaust gas is slowed down and energy is recovered. A MicroMist™ atomization nozzle is located at the entrance of each Venturi tube for co-current spray. A second nozzle is coaxially located in the throat of the Venturi tube. The throat nozzle is directed upstream for counter-current spray, and is primarily used to maintain the required pressure drop across the Venturi to assure gas/particle interaction, when there are large fluctuation in the exhaust gas volume to be treated. Both the inlet and throat nozzles are operated at high pressure, producing fine droplet sprays.

In the MMV tube, exhaust gases containing particulate matter interact twice with the scrubbing liquid droplets (acceleration and deceleration). This promotes submicron particulate collisions with MicroMist™ droplets, resulting in high capture efficiencies of submicron particulate matter.

The final design, configuration, the total pressure drop over the MicroMist™ Venturi scrubber and the setup of the acid treatment is driven by the requested urea dust and ammonia emission values present in the air permit of the plant and the specific requirements of the client.

Particle-droplet double collisions along the MMV stage





2

JET VENTURI SCRUBBER

The best-in-class
no-fan emission
control process for
prilling towers.

The **Jet Venturi Scrubber** is the best-in-class no-fan emission control process for prilling towers. This lightweight, dual-stage emission control system can be placed on top of the prilling tower. The scrubber takes advantage of the principles of a jet eductor to create a velocity differential between high-pressure atomized scrubbing droplets and fine urea particulate matter, while also activating polluted airflow using the Venturi effect.



Did you know?

- Stamicarbon has the skills and capabilities to revamp/retrofit an existing tray or wet scrubber to a MMV scrubber design in order to improve the collection efficiency for submicron urea dust.
- Stamicarbon designed high efficiency scrubber concepts that collect the submicron urea dust coming from a prilltower. The newly developed scrubber technologies can either be installed on top of the prilltower or at ground level, depending on the allowable dynamic load of the prilltower and your requirements.
- Stamicarbon can offer its customer tailor-made schemes for reprocessing both Ammonium Sulfate (AS) as well as Ammonium Nitrate (AN) salts generated by acidic scrubbing processes with the possibility for full integration with the production of UAN or UAS product: www.stamicarbon.com/ammonia-salt-rework-design



EVOLVE ENERGY™

Our solutions
significantly
lower steam
utilization.





REDUCING STEAM USE

Through continuous innovations in urea melt production technology and urea granulation technology we can revamp your urea plant to lower energy consumption, reduce construction costs and raise the efficiency of your production.

How can we help you?

We start every revamp process with a

plant assessment and study, giving you an overview of your plant status quo and debottleneck opportunities. The outcome of this study is discussed with you first to ensure a tailor-made solution. The solution aims for a significant energy consumption decrease, while increasing your plant capacity and reducing emissions. This is how we do it.

1

ENERGY CONSUMPTION DECREASE

To help decrease the energy (high-pressure steam) consumption of a traditional CO₂ stripping plant we apply **adiabatic flash technology**. That way we minimize the excess of low-pressure steam by utilizing a process-to-process heat exchanger. In this heat exchanger, the heat of condensation of condensing carbamate vapors is used to concentrate urea solution, resulting in steam

savings in the evaporation section. By increasing the efficiency of the HP stripper (and thus decreasing steam consumption) more carbamate vapors can be produced in the adiabatic flash section, leading to more process-to-process heat exchange and a further reduction of steam consumption.

We minimize the excess of low-pressure steam by utilizing a process-to-process heat exchanger.

2

CAPACITY INCREASE

Capacity increase of a urea plant can be achieved by **introducing a bypass line** directly from the reactor in the synthesis section to the newly build adiabatic flash section. Bypassing the HP stripper and bringing reactor liquid directly to the adiabatic flash section produces more carbamate vapors in that section, resulting in further decrease of the energy consumption.

3

EMISSION REDUCTION

Further reducing the emission of your plant can be realized by introducing an **atmospheric flash section** in the existing process line. This way more unconverted reactants are recycled back to the synthesis section before reaching the evaporation section and (over)loading the wastewater section, leading to a reduction of the plant emissions.

Capacity increase can be achieved by introducing a bypass line.

More unconverted reactants are recycled back to the synthesis section.



WE SHARE OUR
KNOWLEDGE
WITH YOU



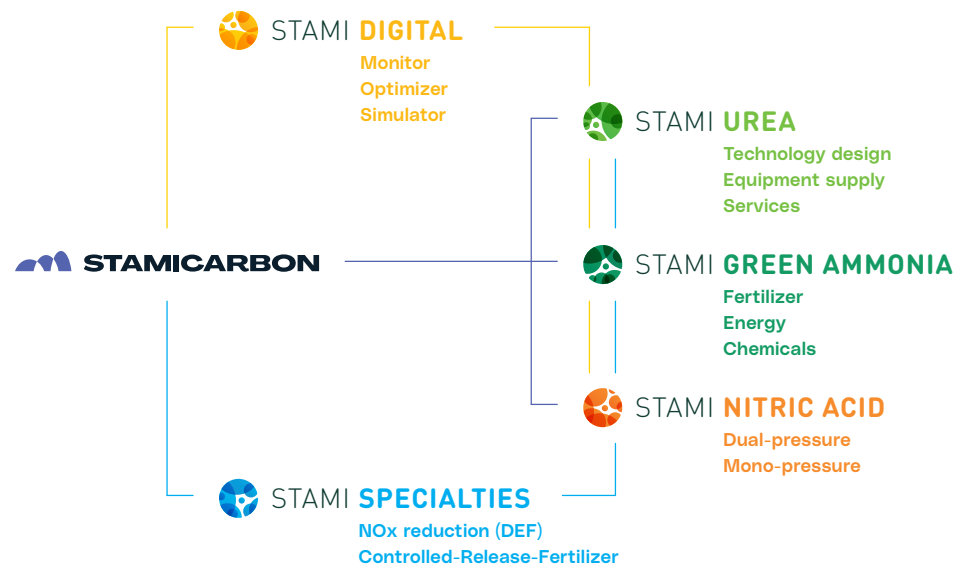
CONCLUSION

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 urea 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 urea.



Contact us

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

WE ARE STAMICARBON

Stamicarbon is the Nitrogen innovation and license company of the MAIRE Group. We are a trailblazing specialist in the fertilizer industry, with the vision needed to help feed the world and improve everyone's quality of life. As a global leader in fertilizer technologies, we have licensed more than 260 urea plants and completed more than 110 revamping and optimization projects.

Our leading position is based on more than 75 years' licensing experience and maintained by continuous innovation in terms of technologies, products and materials. Headquartered in Sittard, the Netherlands, Stamicarbon has a sales office in the USA and representative offices in Russia and China. For more information, see www.stamicarbon.com.

WHAT CAN WE DO FOR YOU?

Any questions about Stami Urea? Like to know how our expertise, knowledge and experience creating, optimizing and upgrading fertilizer plants can help you make the switch to sustainable, futureproof production? We are here for you. Contact our experts at www.stamicarbon.com.



Stamicarbon

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