

NEXT-GEN FERTILIZER TECHNOLOGY

Designed for tomorrow

A SUSTAINABLE FUTURE

We are up to the challenge

Agriculture is facing many challenges. A huge increase in food production is needed to feed the burgeoning population, projected to hit 9.7bn by 2050. How can we feed everyone while taking better care of our planet? How can we improve yield as arable land declines?

With more than 75 years' expertise in the fertilizer industry, we are well placed to

help address these challenges.

As the **global leader in urea technology**, we draw on knowledge acquired over decades of continual innovation to develop creative, technological solutions. We deliver innovative technologies to create **enriched specialty fertilizers that help create a sustainable future.**

We pioneer
with a higher
purpose.





Stami Specialties-branded products and services give you the competitive edge. Stami Specialties is a **byword for smart, innovative, futureproof solutions**. A range of new and existing technologies that give you access to value-added niche markets.

OUR SPECIALTY SOLUTIONS

Next-level fertilizer technology

1

AdBlue® design

Our premium AdBlue® technology produces 32.5% aqueous urea solution (AUS32), also known as diesel exhaust fluid (DEF), to reduce NOx in diesel engines.

2

UAN design

Stamicarbon's integrated UAN design process enables simple designs, and low investment and operating costs. It also performs well on energy consumption.

3

UAS design

To meet increasing demand for granulated urea sulfur, we have developed a unique flexible process for the production of granulated urea with ammonium sulfate.

4

Controlled-release fertilizer design

Our controlled-release fertilizer design with PurActive™ technology, developed in association with Pursell Agri-Tech, is a one-stop-shop package to kick-start your new product line.

ADBLUE® DESIGN

Reducing NOx emissions from diesel engines

AdBlue® – known as diesel exhaust fluid (DEF) in the US – is an aqueous urea solution of 32.5% high-purity urea in 67.5% deionized water. Registered as AdBlue® in Europe, it's also known as ARLA32 or AUS32. AdBlue® has been developed to reduce NOx emissions from diesel engines.

The ISO 22241 AdBlue® specification prescribes AdBlue® composition limits, analysis methods, storage, and transportation requirements.

Strict quality management is needed to ensure urea and AdBlue® process, storage and transportation remain ISO-compliant.

AdBlue® production

Diluting urea prills in deionized water is currently the most widespread AdBlue® production method. This does have some drawbacks, though:

- Possible noncompliance with ISO 22241, due to the high biuret content in solid urea
- High production costs due to the need for finishing and dissolving
- High emissions from the urea plant due to the extra finishing step

We have developed a solution that raises the performance bar.



Stamicarbon's solution is more efficient and more sustainable:

Producing AdBlue® directly from an aqueous urea solution from any urea plant

- Guaranteed high product quality (AdBlue® is ISO 22241-compliant)
- Low production costs for urea powder as there's no finishing or blending
- Lower emissions when AdBlue® production takes place in an existing urea plant

Directly from
an aqueous urea
solution from any
urea plant.



How stamicarbon adds value

Stamicarbon is the world's leading name in the design and development of urea plants and licensing of technologies for the fertilizer and plant nutrition industry. We have designed around 50% of the world's urea plants and have licensed more than 1.5 million tonnes of annual global AdBlue® capacity to produce AdBlue® directly from urea solution.

The leading expert in urea technology, Stamicarbon diversifies in AdBlue® technology and takes an active role in the development of standardized and tailor-made designs for new plants and upgrades. Stamicarbon's technology produces high-quality ISO 22241-compliant AdBlue® at new and existing urea plants. Our AdBlue®-related services include:

1. AdBlue® certificate consultancy
2. AdBlue® quality management from process design to production, storage, and transportation in emerging DEF markets
3. AdBlue® plant operator training



Learn more at

www.stamicarbon.com



Your benefits

- Guaranteed premium AdBlue® production that outperforms the ISO standard
- The most economical way to produce premium AdBlue®
- The most environmentally friendly way to produce premium AdBlue®
- High-quality references in emerging AdBlue® markets

Stamicarbon plays an active role developing standardized and tailor-made designs.



2

UAN DESIGN

Fully integrated low-cost process

Urea ammonium nitrate (UAN), a liquid fertilizer containing 32% nitrogen, is easy to handle and use, making it an attractive proposition.



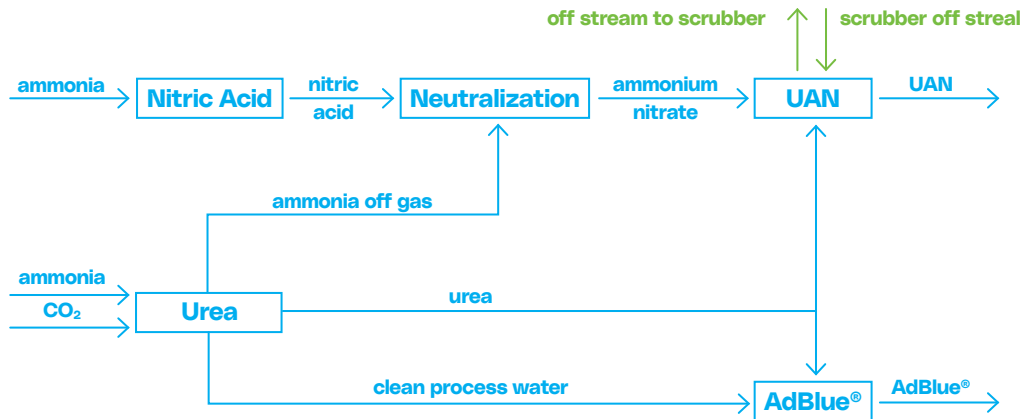
- Liquid UAN can be applied with conventional crop protection spraying equipment or stream bars, unlike solid fertilizers, which require dedicated equipment. **No additional equipment is needed.**

- UAN is a liquid, so it can be easily **enriched with other liquids**, to add essential nutrients, like phosphate, potash and sulfur, or nitrification inhibitors. It can even be applied in combination with crop protection products. As well as saving time, this also unlocks synergistic effects.

- There are **no restrictions on UAN transportation and storage** (unlike ammonia, whose transportation is subject to increasing restrictions). This also facilitates the transition from ammonia fertilization to UAN. The fluid can be stored in regular carbon steel tanks, provided corrosion inhibitors are added.

UAN production

An integrated production plant is the best place to produce UAN. There is no need for expensive solids formation and handling as the end product remains in liquid form and can be easily transported and stored in tanks. As a consequence, expensive prilling or granulation equipment is no longer needed.



The benefits of our UAN design technology

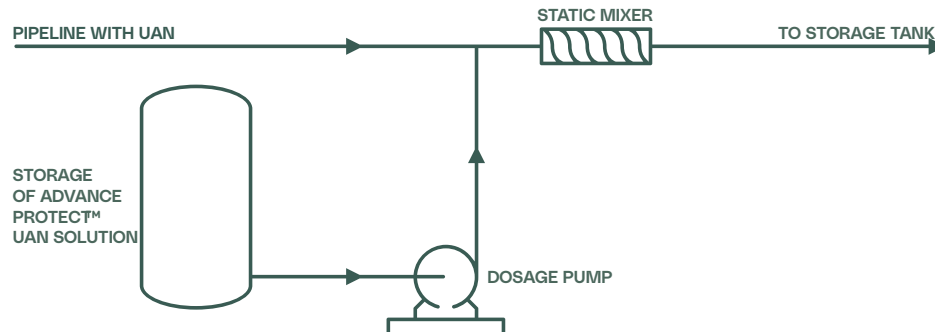
Stamicarbon's integrated UAN design process enables **simple designs, and low investment and operating costs**. It also performs well on **energy consumption**.

How it works

First, ammonia is fed into the nitric acid synthesis section. Ammonia and carbon dioxide are then fed into the

once-through urea synthesis section. The off-gas from urea synthesis contains ammonia. This is neutralized with nitric acid to form an ammonium nitrate solution. The ammonium nitrate is then mixed with dissolved urea from urea synthesis to produce UAN. A urea section at an integrated plant could be operating at way below 100% ammonia efficiency. That's because the unconverted ammonia from the urea section is converted into

ammonium nitrate in a downstream neutralization section (see the plant process flow diagram). A once-through urea section without a low pressure or medium pressure carbamate recycle renders a recycle concentration section superfluous, enables a scaled-back investment in costly high-pressure (recycle) pumps and reduces their relatively high electricity consumption.



Learn more at

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Additional advantages

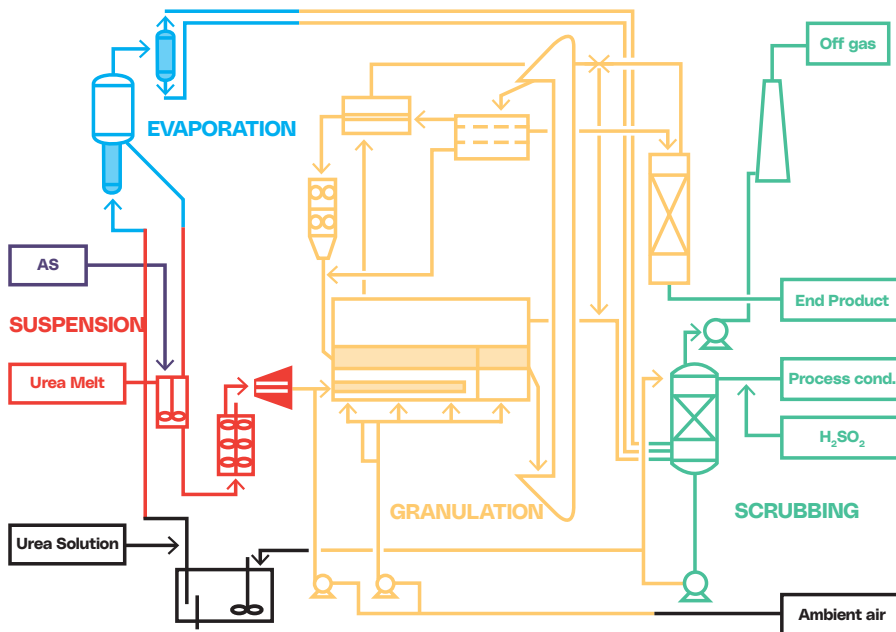
- Full waste stream recycling potential
- Additional DEF/AdBlue® production option

Simple designs,
and low investment
and operating costs.



UAS DESIGN

Modular UAS granulation technology



Sulfur is the fourth main nutrient for crops after nitrogen, phosphorus and potassium. Desulfurization of fuel and industrial emissions have led to ever greater sulfur deficiencies in agricultural soils and so increased demand for sulfur-based fertilizers. To meet this demand, we have developed a flexible modular process for the production of urea ammonium sulfate (UAS), due to its **superior agronomic product properties and process benefits**. The sulfate in ammonium sulfate is directly available to the plant, whereas elemental sulfur is not. The addition of ammonium sulfate to urea also reduces nutrient losses due to ammonia volatilization, a well-known issue with urea.

How does it work?

Our UAS granulation process comprises four main modules:



Learn more at

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1. Suspension

Granulation is a suitable production method for UAS with an ammonium sulfate content of 0–50 wt%. Solid ammonium sulfate is homogenized, milled and suspended in urea melt. If the ammonium sulfate concentration exceeds its solubility, the UAS suspension is fed to granulator compartments 1 and 2. A solid-free UAS melt can also be fed to compartment 3 to create an end product with a smooth surface.

2. Granulation

UAS granules are produced in the standard Stamicarbon fluidized bed granulation process.

3. Evaporation

The liquid effluent from the scrubber is concentrated and recycled into the granulator melt feed. The process is optimized to prevent fouling in the evaporation section.

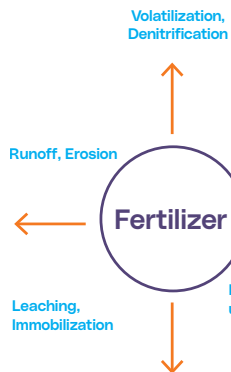
4. Scrubbing

The off-gases from granulation are scrubbed with water and a strong acid to capture dust and ammonia. The liquid effluent is discharged to the dedicated evaporation system.

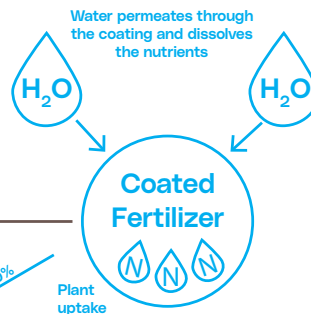
CONTROLLED-RELEASE FERTILIZER

The futureproof all-in-one fertilizer solution

TRADITIONAL FERTILIZER:



CONTROLLED-RELEASE FERTILIZER:



Capitalize on cutting-edge technology to offer farmers a whole suite of smart fertilizer products fine-tuned to their customer and crop needs.

Our controlled-release fertilizer design with PurActive™ technology, developed in partnership with Pursell Agri-Tech, is a one-stop-shop package to kick-start your new product line.

Improving efficiency, yield and sustainability

A smart fertilizer is much more efficient because it releases nutrients at just the right rate precisely when they are needed. These benefits are locked in to our controlled-release fertilizer design. This smart innovation helps farmers improve yields and optimize production. It is designed to minimize nutrient loss and limit environmental impact, in compliance with existing and pending legislation.

The secret is in the coating

The smart fertilizer has a polymer coating that prevents nutrients leaching and volatilizing. The coating is a semi-permeable membrane around the fertilizer. Water is able to permeate through the membrane due to the fertilizer's hygroscopic nature, dissolving the nutrients. The low nutrient concentration outside the membrane causes the dissolved nutrients to permeate through the membrane into the soil. This process is mainly controlled by temperature and so is synchronized with the growing process of the plant, leading to a highly efficient nutrient uptake.



Learn more at

www.stamicarbon.com

**Enjoy the whole package:
technology license, equipment
& support**

Our controlled-release fertilizer design with PurActive™ technology, developed in partnership with Pursell Agri-Tech, is a **one-stop-shop starter package** for a



wide range of controlled-release fertilizer products. Fine-tuned to specific customer and crop needs, without the need of in-house product development. So you get all the benefits of our state-of-the-art technology while keeping your investment costs low. You can rely on **full support from an experienced licensed technology provider** to ensure you make the best possible start and achieve high-quality products. Our **modular design** is easy to implement and you can produce under your own brand and in your own colors.



Learn more at

www.stamicarbon.com

Our PurActive™ trademark gives farmers peace of mind they are getting the best product on the market.



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 Specialties? 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

Mercator 3 - 6135 KW Sittard - Netherlands | P.O. Box 53 - 6160 AB Geleen - Netherlands
Tel. +31 46 4237000 - communication@stamicarbon.com - www.stamicarbon.com