



UAN DESIGN

Stamicarbon's low cost, fully integrated process for the production of liquid fertilizer UAN

The Stamicarbon integrated UAN Design process allows for a simple design and low investment and operating costs. It also is attractive with respect to energy consumption. Stamicarbon has an extensive track record with licensing UAN process technology, with over 150 years of cumulative experience.

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Why UAN?

UAN, a liquid fertilizer containing 32% nitrogen, is an interesting product due to its ease of handling and efficient use.

No additional equipment needed

Whereas dedicated equipment is required for the application of solid fertilizers, liquid UAN can be applied using conventional crop protection spraying equipment or stream bars.

Easy to add other liquid products

As UAN is a liquid product, other liquid products can easily be incorporated, providing the required nutrients such as phosphate, potash and sulphur, or adding nitrification inhibitors. It can even be applied in combination with crop protection products. This saves additional labor and caters for synergistic effects between liquid fertilizers and crop protection products.

Transportation and storage is easy and non-restricted

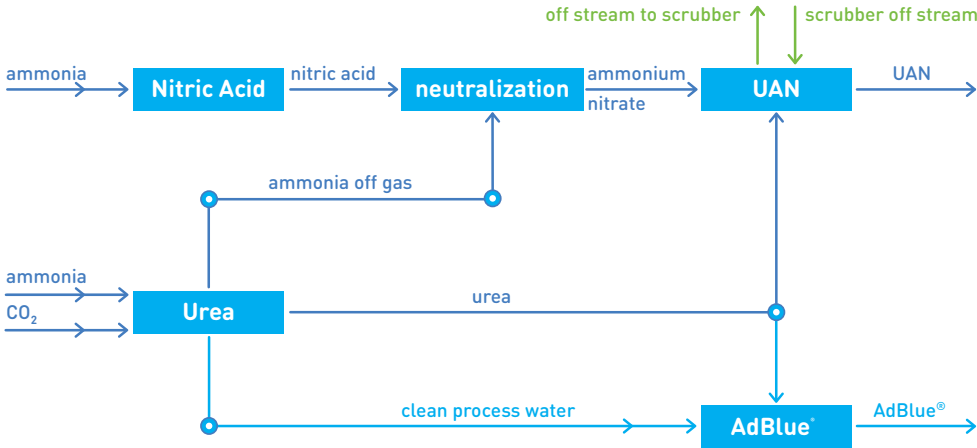
Transport of UAN is easy and non-restricted (unlike ammonia transport which is increasingly restricted) and supports the transition from ammonia fertilization to UAN. It can also easily be stored in tanks made from normal carbon steel, presuming corrosion inhibitors are added.

How UAN is produced:

It is most economical to produce UAN in an integrated production plant. The major advantage of an integrated UAN plant is that 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. This allows for the abolishment of expensive prilling or granulation equipment.

Stamicarbon’s fully integrated UAN Design:

After ammonia is fed to the nitric acid synthesis section, ammonia and carbon dioxide are fed to the once-through urea synthesis section. The off gas from the urea process containing ammonia is neutralized with nitric acid to form ammonium nitrate in solution. As the last step, the ammonium nitrate is mixed with dissolved urea from the urea synthesis to produce UAN.



The urea section in the integrated plant may operate at an ammonia efficiency that is way below 100%. This is because the unconverted ammonia leaving the urea section is converted into ammonium nitrate in the downstream neutralization section of the integrated plant (as shown in the plant diagram). This gives the opportunity to design a once-through urea section without a low pressure or medium pressure carbamate recycle. This saves a recycle concentration section, cuts back on the investment for costly high pressure (recycle) pumps and reduces the relatively high electricity consumption of these pumps.

Additional advantages:

Recycling of waste streams

The UAN Design allows for the complete recycling of waste streams from the urea granulation, in which acidic scrubbing with nitric acid results in urea-AN waste streams. It can therefore be fully recycled into the UAN process (see the green section in the previous process diagram).

AdBlue® production

In the design, it is possible to enable the production of DEF (Diesel Exhaust Fluid)/AdBlue® (see the blue section in process diagram). As the nitrogen concentration of DEF is lower than of the regular urea solution, clean process water produced in the integrated urea section needs to be added to reach the product specification.

The benefits of Stamicarbon’s UAN Design:

- A simple process scheme
- Low investment and operating costs
- Low energy consumption
- Potential to completely recycle waste streams
- Additional opportunity to produce DEF / AdBlue®