

The breakthrough Nitrogen Oxide reduction technology

Anticipating ever more stringent international emissions legislation on Nitrogen Oxide (NOx) across all regions of the world, Faurecia, the world leader in emissions control technologies, is presenting the Faurecia ASDS (Ammonia Storage and Delivery System), its breakthrough NOx reduction technology for Diesel engines. Faurecia has taken a 21.2% strategic shareholding in Amminex A/S – a Danish company with leading-edge expertise in the treatment of nitrogen oxides and the inventor of the ASDS.

The Faurecia ASDS is a pure ammonia Selective Catalytic Reduction (SCR) system –as an alternative to liquid SCR systems– which delivers very precise amounts of ammonia to a catalyst in the exhaust line. This step enables highly efficient removal of NOx from Diesel engine exhaust gases for both passenger cars and commercial vehicles. Faurecia is confident that this technology will offer significant advantages to automakers when meeting Euro 6, Tier 2 Bin 5 and future Euro 7, Tier 2 Bin 2 emissions regulations for Diesel NOx reduction.

“As the co-inventor of the Diesel Particulate Filter, which has now become standard equipment on Diesel vehicles, Faurecia has a strong history of developing leading solutions for Diesel engines,” said Jean-Marc Hannequin, President of Faurecia Emissions Control Technologies.

“The technology invented by Amminex, associated with the recognized development and industrial expertise of Faurecia in the emissions control field, will lead to another breakthrough in Diesel emissions control, which has the potential to become the new world standard for NOx reduction,” stated Christophe Bouly, Global Innovation Director at Faurecia Emissions Control Technologies.

Understanding how liquid SCR works

SCR is the most efficient technology to reduce NOx in the exhaust gas. Today, SCR uses a liquid urea based agent called AdBlue® that releases ammonia which reduces the NOx to harmless nitrogen.

Step one: Thermal-Hydrolysis of Urea

The engine control unit injects AdBlue® into the exhaust line, and then a preliminary chemical reaction produces ammonia (NH₃).

Step two: NOx Reduction

Inside the SCR converter, a second reaction uses the ammonia to reduce nitrogen oxides present in the exhaust gas and produce harmless nitrogen and water.

The Faurecia ASDS

In the near future, Faurecia believes that SCR efficiency will be significantly improved using a proprietary new technology: the Faurecia ASDS, which is a pure ammonia SCR system invented by Amminex. This collaboration will lead to another breakthrough in Diesel emissions control technologies.

This new technology replaces the AdBlue® tank by cartridges with a salt containing pure ammonia (NH₃). The start-up unit and the two main cartridges contain a mix of salt and ammonia. This storage material is called “AdAmmine” and has been developed by Amminex. Compared to the liquid technology, here the agent is introduced into the exhaust system as pure ammonia – safely released from a compact solid. This technology is more efficient than AdBlue® and there is more than twice the amount of ammonia available per litre for NOx conversion to nitrogen and the activation time of the NOx conversion is much faster.

Understanding how Faurecia ASDS works

At low temperatures (below 50°C) the ammonia is safely stored in the salt in solid form. At ignition of the engine, the start-up unit is electrically heated. In less than 2 minutes the temperature reaches 60°C and the salt releases pure ammonia on demand. This permits immediate distribution of ammonia in the exhaust line and the reduction of NOx. The pure ammonia is then routed under low pressure to the control unit. An electrical valve accurately pilots the distribution of ammonia that is then sent to the exhaust line.

While the start-up unit is operating, one of the main cartridges is heated. Due to its larger size the warming process is longer, but the start-up unit is always dosing while the main unit is being heated. When the main cartridge has reached its operating temperature, it takes over the release of pure ammonia from the start-up unit.

Nitrogen Oxide reduction

Inside the SCR converter, the reduction of nitrogen oxides present in the exhaust gas with ammonia produces the non-pollutants nitrogen (N₂) and water (H₂O). When the main unit is active, the start-up unit is recharged with ammonia released from the main unit which at the same time releases ammonia to the exhaust line. When the engine is turned off, the distribution of the ammonia is stopped. As the temperature drops, the pure ammonia returns to its solid form and is once more stored in the salt.

Key Faurecia ASDS advantages versus liquid SCR

	Liquid SCR – AdBlue®	Faurecia ASDS – AdAmmine
Time needed to heat exhaust gas to convert AdBlue® into ammonia	approx. 10 minutes	under 2 minutes
Time needed under cold start ¹	approx. 15 minutes	under 3 minutes
Weight ² at equal driving distance	40 kg	27 kg
Grams of ammonia per litre	185 g/l	450 g/l

Other benefits to consider

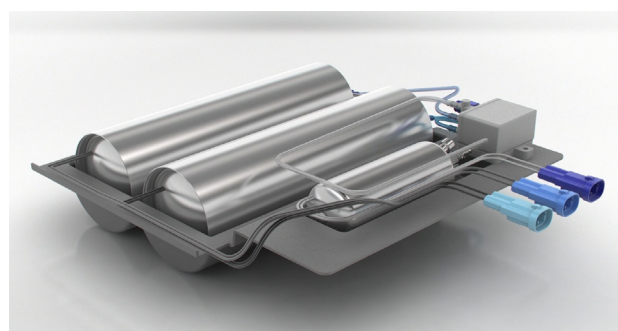
- Exhaust system design: With no risk of deposits unlike with liquid SCR, the pure ammonia gas gives greater flexibility for the OEM to choose between close-coupled, under-floor or even future SCR-coated DPFs for DeNOx-configuration.
- Real world driving emissions: ASDS SCR performs well under all engine loads, outside the NEDC certification cycle, and especially during city driving when compared to liquid SCR.

Summary

Faurecia has high expectations that its breakthrough ASDS technology in partnership with Amminex will become the new world standard for NOx reduction, just like the DPF (Diesel Particulate Filter) – co-invented in 2000 by Faurecia and Peugeot – has become the world standard for Diesel particulate filtration.

This conviction is based on the four Faurecia ASDS key advantages over liquid SCR:

1. Faster activation of NOx conversion
2. Faster activation under cold starts
3. Lower system weight at same kilometre autonomy
4. More than double the ammonia volume per litre available for NOx conversion to nitrogen.



¹ AdBlue® freezes at -11°C, the tank needs to be heated which needs a lot of time and energy to thaw the ice.

² AdBlue® = full tank, AdAmmine = full cartridge