



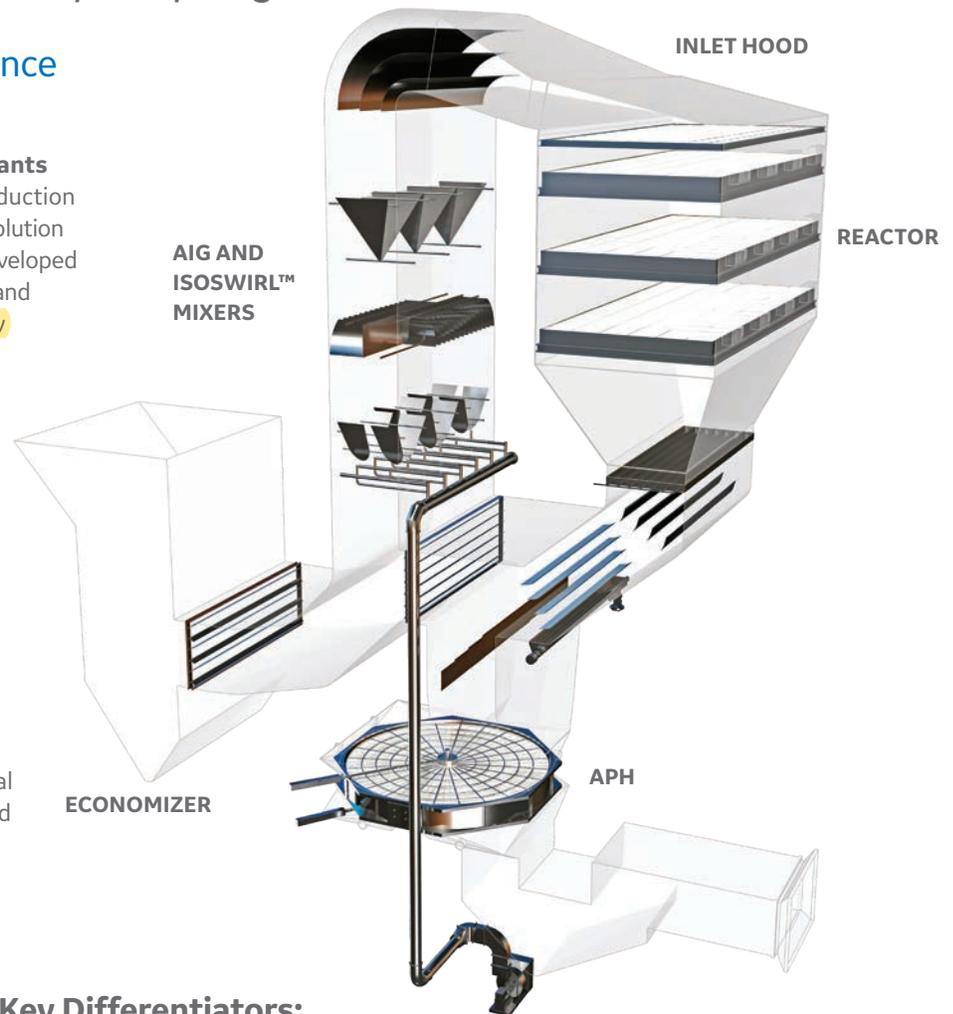
# SCR IsoSwirl™ Mixer And High Efficiency Ammonia Injection

GE's world leading SCR system is further improved with the addition of a highly efficient Ammonia Injection Grid (AIG) and mixing technology which can remove up to 95% of NO<sub>x</sub> from flue gas.

## Unique Design Adds Performance Benefits to GE's SCR Design

With over 80 systems installed in power plants around the world, GE's Selective Catalytic Reduction (SCR) system is a leading industry-recognized solution for removing NO<sub>x</sub> from the boiler flue gas. GE developed the high efficiency ammonia injection grid (AIG) and IsoSwirl™ mixing system to meet the increasingly stringent NO<sub>x</sub> emission targets being imposed by regulatory authorities worldwide.

Ammonia is injected into the flue gas duct using the optimized AIG design and is efficiently mixed with the boiler flue gas using proprietary IsoSwirl™ static mixers. The intense turbulent mixing patterns created and the even flow distribution of the flue gas into the catalyst layer(s) allow up to 95% NO<sub>x</sub> removal. The high efficiency AIG and the IsoSwirl™ mixers support the SCR catalyst in reliably meeting NO<sub>x</sub> removal guarantees for long term operation, delivering the most competitive initial capital investment and lowering operational and maintenance costs.



## Customer Benefits

### GE Advantages:

- Designed for high performance applications where critical ammonia mixing with the flue gas is essential to obtain high NO<sub>x</sub> removal rates (up to 95%)
- Lower initial capital and operating costs for the SCR system compared to earlier SCR designs
- Highly efficient NO<sub>x</sub> removal and the ability to meet the most stringent regulatory requirements

### Key Differentiators:

- The enhanced injection grid is easy to maintain and employs lances (rather than a complex net of pipes and nozzles) to spray ammonia into the flue gas stream
- Proprietary IsoSwirl™ mixer technology located immediately downstream of the injection lances ensures thorough and even mixing of injected ammonia with flue gas
- Shape, quantity and in-duct location of the static mixing blades are tailored to customer's process conditions, ductwork arrangement and emissions requirement
- Requires less tuning and is more flexible

## Advantages of IsoSwirl™ Over Conventional Designs

The high efficiency ammonia injection grid uses diluted ammonia-air mixtures with external flow control and its design configuration features fewer pipes and nozzles compared to earlier SCR designs. This robust configuration is not only easier to access and maintain but also easier to operate and control, eliminating the complex operation of fine tuning the injection grid.

To obtain the proper  $\text{NH}_3/\text{NO}_x$  interface, the high efficiency system also features IsoSwirl™ mixers. These in-duct static mixers, located downstream of the ammonia injection grid, take the ammonia flow and mix it intensely with the flue gas stream. This produces an extremely well-mixed gas with enhanced distributions.

The effectiveness of the IsoSwirl™ mixers makes this ammonia injection system design ideal for high performance applications. The quality of the mixing enables the system to meet applications with challenging  $\text{NO}_x$  emission requirements or varying operating environments.

GE approaches each customer on a case-by-case basis. After thorough investigation of site constraints and required removal efficiencies, we will design the equipment accordingly and recommend the ideal shape, quantity and in-duct location of mixing blades that will fulfill the plant's requirements in an optimized and cost-efficient way.



### REDUCING COST OF ELECTRICITY

Simplified yet highly efficient design ensures lower initial capital cost and reduced operating and maintenance costs



### LOWERING ENVIRONMENTAL FOOTPRINT

Up to 95%

removal of  $\text{NO}_x$  from flue gas



### INCREASING FLEXIBILITY & RELIABILITY

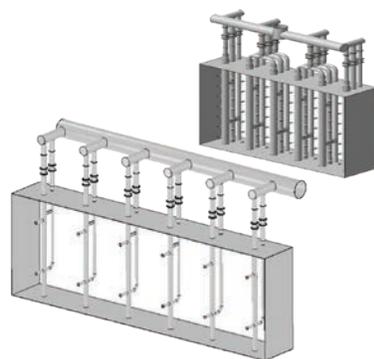
2.0%

ammonia to  $\text{NO}_x$  coefficient of variation can be achieved (compared to 5% variation in equivalent)

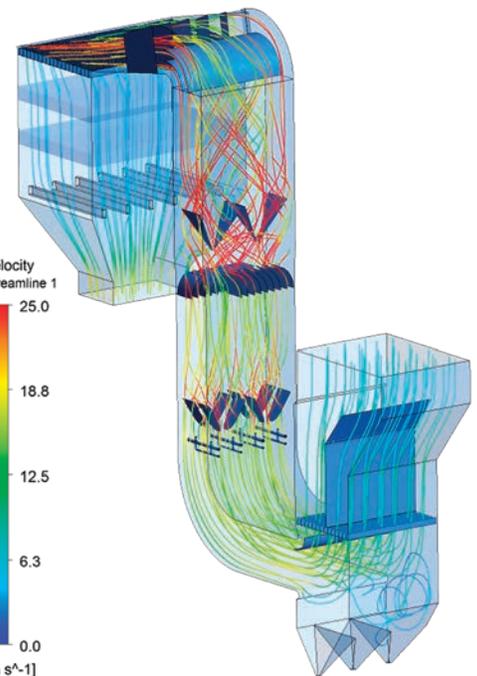


**IsoSwirl™ prototype mixer** undergoing performance testing at GE's research facility in Växjö, Sweden, one of the largest ECS research and development laboratories in the world.

**Computer generated image** showing the actual flow of ammonia and gas through the SCR ducting and the mixing of both gases as they pass through the IsoSwirl™ mixers.



**Arrangement of pipes and nozzles** in a conventional ammonia injection system (above, on the top) compared to the optimized design employed in the GE Proprietary high efficiency AIG (directly above).



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