DeNOx Mixer

Sulzer Mixer-Injector for Selective Catalytic Reduction

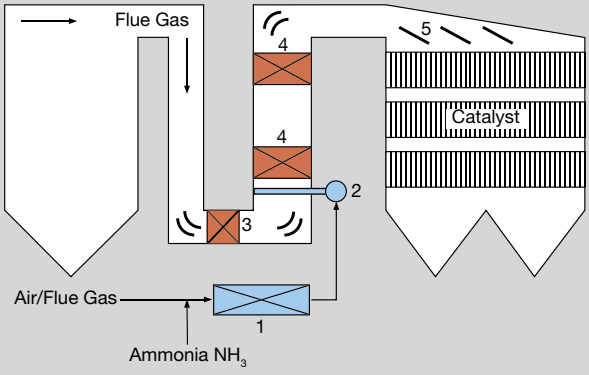
Static Mixer in the SCR process

The Sulzer SMV Mixer in combination with the patented Sulzer Ammonia Injector represents a proven, highly efficient and reliable technology to distribute ammonia into flue gas in front of the SCR Reactor of coal or gas fired boiler applications.

The simultaneous mixing of ammonia and NO_x as well as equalizing of gas temperature gradients with the SMV Mixer creates almost ideal reaction condition in the catalyst bed.

This is available for a minimum pressure drop of 1-2 mbar only, at no additional maintenance cost.

Typical Layout for Coal Fired Boiler



1 *SMV side-Mixer for NH_3 evaporation*
2 *Patented Sulzer Ammonia Injector, no trimming, no plugging, no maintenance*
3 *SMV Flue Gas Premixer for NO_x and Temperature Distribution*
4 *Main Mixer for Ammonia mixing*
5 *Even distribution of NO_x, Ammonia, and Temperature at the catalyst face*

Advantages

Improved NO_x distribution due to continuous mixing action, leading to even distribution of the reactants in front of the catalyst.

Reduced temperature gradient in the flue gas provides equal reaction condition across the catalyst bed.

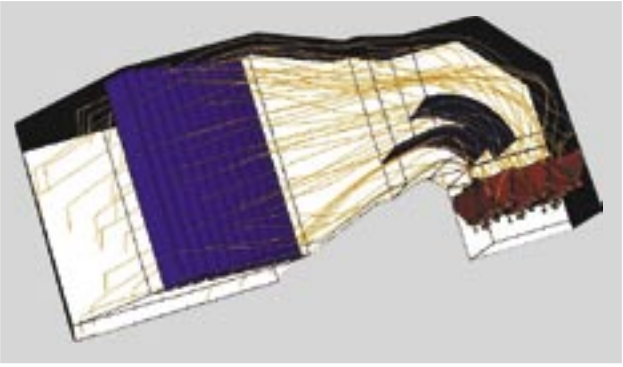
Uniform NH_3/NO_x concentration helps to achieve a high NO_x reduction rate at minimum ammonia slip.

Improved utilization leads to a longer life cycle of the catalyst.

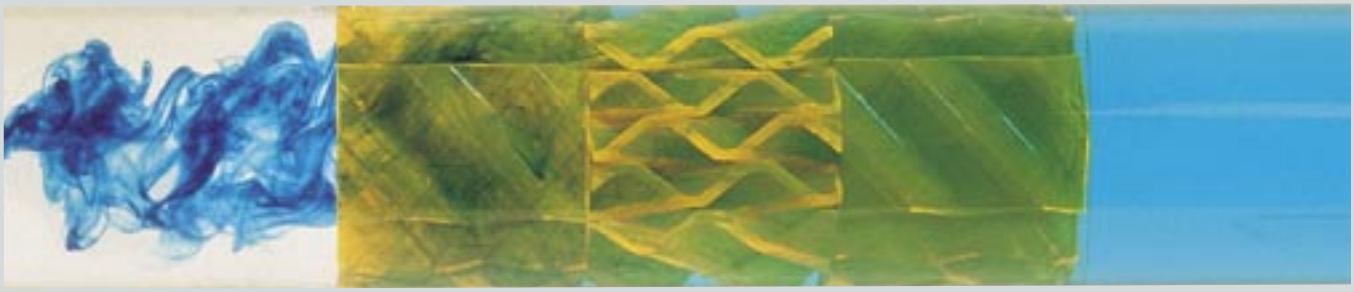
Low pressure drop in the flue gas compared to conventional injection grids (1-2 mbar, less than 1” WG).

Virtually no maintenance required for trimming of the AIG.

No evidence of corrosion or abrasion even for high temperature and high dust application so far.



Streak lines of ammonia injected in front of a SMV Mixer with extremely limited space available in front of the catalyst



Sulzer SMV Mixer for continuous in line mixing of additives. As shown, the mixer length required for a high degree of homogeneity is short.

CFD for effective and optimum design

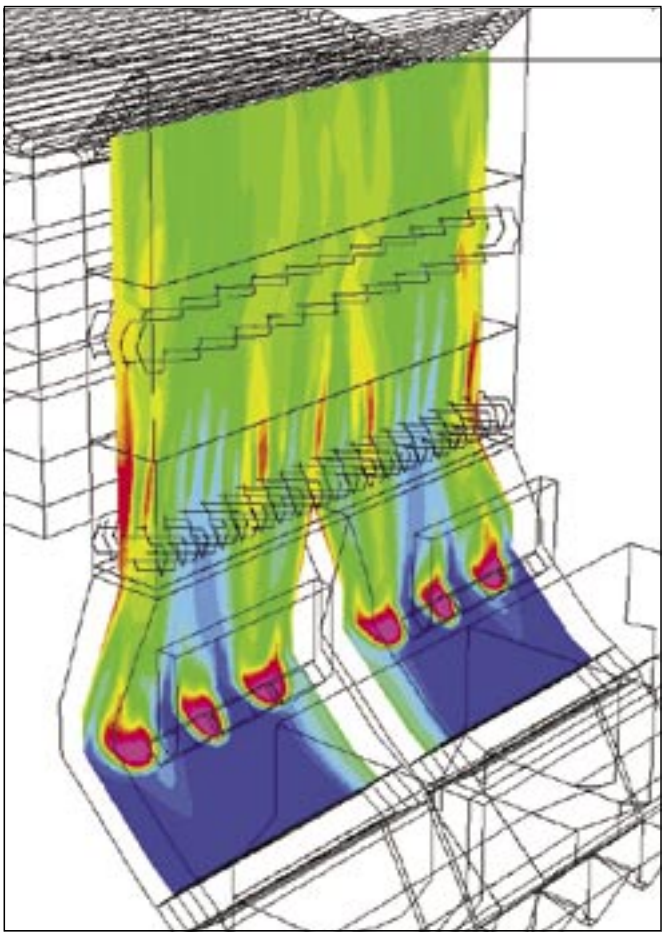
CFD represents an efficient and effective tool to optimize the design of the Mixer/Injector configuration as well as of the flow conditioning internals like guiding vanes.

CFD helps a lot to design and optimize a test model configuration.

Model mixing

Model mixing is used to tune the Mixer/Injector configuration and the flow conditioning internals.

Model mixing allows determining the basis for scale up and the guarantee values (typically NH_3 homogeneity, pressure drop, etc.), as well as dust deposition behaviour.



Temperature homogenization upstream of a flue gas heater

Model mixer set up with Sulzer SMV Mixer

SMV Mixer lifted to duct.

Typical results

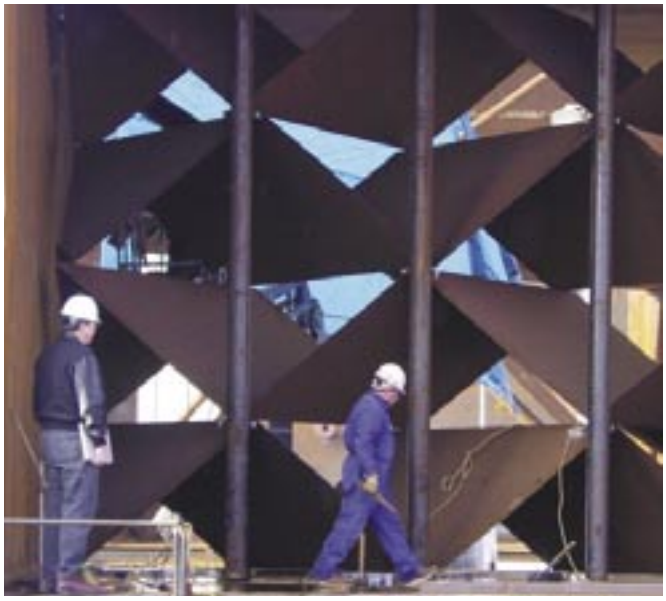
of a coal fired power plant after installation of an SCR reactor equiped with a Sulzer SMV Mixer/Injector.

Process conditions after boiler			
$V_{\text{Flue gas}}$	norm	=	1 800 000 Nm^3/h
	min	=	600 000 Nm^3/h
$V_{\text{Ammonia}} / V_{\text{Flue gas}}$		=	1 : 2500
NO_x content		=	900 mg/Nm^3
Flue gas Temperature		=	348 °C
Reactor inlet after Sulzer SMV Mixer Typically guaranteed by Sulzer			
ΔT	max deviation	=	+/- 1 °C max.
NH_3 concentration	1σ	=	+/- 10%
	max	=	+/- 20%
velocity distribution	1σ	=	+/- 15%
	max	=	+/- 30%
Δp_{mixer}		<	1.1 mbar
Reactor outlet Typically guaranteed by system or catalyst supplier			
Ammonia slip		<	1ppm (vol)
NO_x content		<	190 mg/Nm^3
$\Delta p_{\text{duct+mixer/injector+catalyst}}$		<	12 mbar

Installations

Sulzer has been designing and supplying SMV Mixers and Injectors for DeNOx application for more than 25 years. With more than fifty installed mixers running to full satisfaction of the users, Sulzer has proven to be a most reliable supplier of Static Mixing Technology in this segment.

SMV Mixer with Ammonia Injector pipes ready for transport



Inspection on an SMV Mixer with Sulzer Ammonia Injector

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Sulzer Chemtech Ltd, a member of the Sulzer Corporation, with headquarters in Winterthur, Switzerland, is active in the field of process engineering and employs some 1200 persons worldwide.

Sulzer Chemtech is represented in all important industrial countries and sets standards in the field of mass transfer with its advanced and economical solutions.

The activity program comprises:

- Process components such as trays, structured and random packings, internals for separation columns and reaction technology
- Engineering services for separation and reaction technology such as optimizing energy consumption, plant optimization studies, pre-engineering for governmental approval, basic engineering
- Separation and purification of organic chemicals by means of crystallization and membranes
- Mixing and reaction technology with static mixers

Distributed by:

23.15.06.40 - IX.03 - 30 - Printed in Switzerland