CATALYTIC GAS CLEANING

ELEX
FOR BETTER AIR

ELEX – EXCELLENT INDUSTRIAL GAS CLEANING SINCE 1934

ELEX is the globally recognised leader for the cleaning of industrial gases and recovery of reusable materials. Each of the more than 7‘000 plants installed worldwide since 1934 focuses on specific customer needs. Depending on stated requirements, the plants are either completely manufactured by ELEX or within the parameters of project-related cooperation agreements, as new units or extensions to existing plants.

We are dedicated not only to cutting-edge technology but also to the utmost reliability and durability of our products. This commitment lies at the heart of our product design, making our name synonymous with the flawless purification of industrial gases. Our expertise in crafting integrated solutions assures our customers that they can trust us both now and in the future. ELEX stands unrivaled in quality and our innovative spirit will undoubtedly continue to shape the next 7‘000 units and beyond.

HIGH QUALITY ASSURANCE - YOUR WORRY FREE SOLUTION

When we talk about quality, we mean much more than just flawless technology, customer-oriented solutions and products that are reliable and durable. Our passion for quality runs like a red thread through every aspect of our collaboration – be it before, during or after the production and installation of your plants.

Our business philosophy is shaped by years of experience, highly skilled and flexible employees and our comprehensive expertise, which allows us to optimize your plant to meet your specific requirements throughout its entire lifecycle. Our goal is to always provide you with tailored solutions that meet your needs.

MINIMUM EFFORT DURING THE EVALUATION PHASE

Lightening your work load begins as early as the project-planning stage. We place great emphasis on listening to you and asking the right questions to provide you with the best possible solution in the shortest time and with the least effort on your part.

UNINTERRUPTED OPERATION DURING THE IMPLEMENTATION PHASE

With Swiss reliability and thoroughness, we meticulously conduct our preliminary clarifications and holistic project planning to ensure that the installation of your plant leaves you entirely satisfied. We prioritize punctuality and cost adherence, while minimizing any impact on your operations until the handover of the facility.

MAXIMUM RUNNING TIMES DURING THE OPERATING PHASE

After our highly qualified engineers have installed the plants with their expertise and carefully trained your technical staff, it is extremely rare that further support from our side is needed. You will also experience this level of reliability. Our plants are known for their remarkable dependability and enduring performance. However, should you ever require our assistance, whether for comprehensive maintenance, integrating new components or consulting on modernizing the plant, we will be readily available to help.

Woodchip stove, Sweden
DeNOx

Cement works, Italy

CATALYTIC GAS CLEANING

Since 1988, ELEX has been at the forefront of providing cutting-edge solutions for the catalytic cleaning of gases. Our innovative process effectively reduces toxic elements such as NOx, dioxin, furan, hydrocarbons and ammonia, enabling you to meet the most stringent global environmental standards without generating residues necessitating disposal.

SCOPE OF APPLICATION

Catalytic gas cleaning is primarily employed in waste incineration plants, sludge incineration facilities, hazardous waste incineration plants, cement production sites and biomass incineration facilities. However, it can also be adapted for a wide range of other combustion processes. Additionally, ELEX offers catalytic gas cleaning systems in various configurations, including clean gas configurations, raw gas configurations, high-dust configurations and low-temperature systems. We are eager to assist you in finding the optimal solution for your specific requirements. Thanks to our extensive experience and ongoing research, we develop tailored catalytic gas cleaning systems that consistently deliver the best possible results.

SUCCESS FIGURES

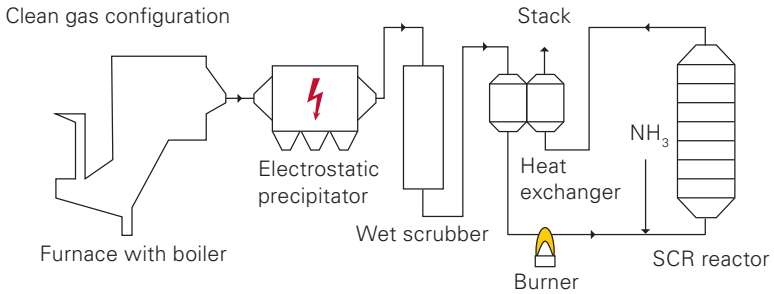
46 CATALYTIC GAS CLEANING SYSTEMS

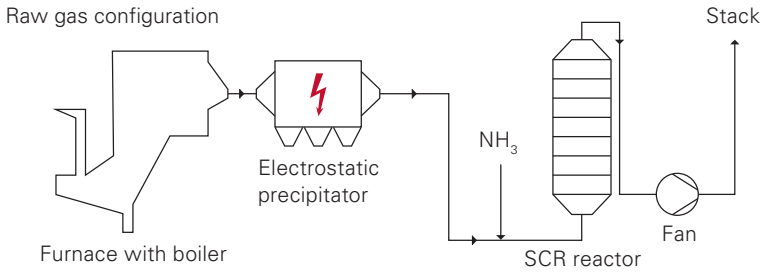
140 m^3 MAX. CATALYST VOLUME

600‘000 m^3/h EFF MAX. GAS VOLUME

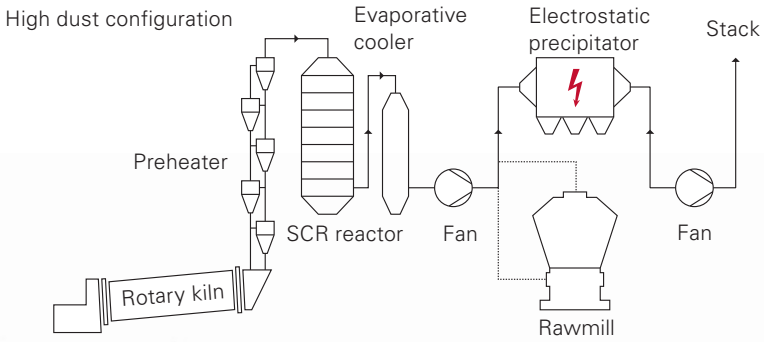
OPTIMAL EFFICIENCY IN EACH AREA OF APPLICATION THROUGH INDIVIDUAL PLANT CONCEPTS

ELEX has pioneered the development of specialized catalytic systems designed for waste and refuse incinerators, taking into account the heterogeneous composition of the materials to be incinerated as well as the resulting mix of flue gas components and gaseous pollutants. Through our dedication to innovation, we aim to maximize the effectiveness of flue gas cleaning in these challenging settings.





In the context of cement production plants, the strategic placement of the SCR (SCR = Selective Catalytic Reduction) reactor is crucial to achieving peak efficiency. ELEX has patented a unique process where the SCR reactor is positioned directly behind the preheater. This strategic location ensures that the SCR operates at the optimal temperature, courtesy of the system itself, eliminating the need for additional energy inputs that would be necessary if the SCR reactor were situated elsewhere in the process.

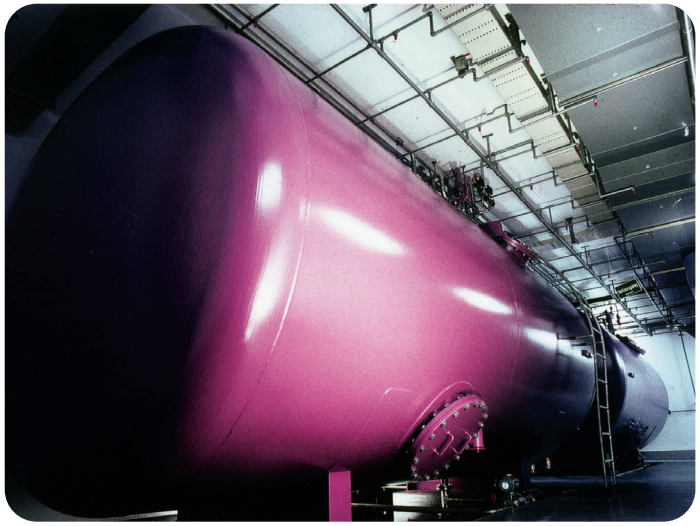


SUPERIORITY OF THE SCR SYSTEM APPLIED BY ELEX

Through the application of catalytic gas cleaning multiple pollutants can be efficiently eliminated within a single facility. Furthermore, it is evident that SCR technology, especially at high levels of denitrification, surpasses other methods both environmentally and economically.

In detail, this means:

- Highest degrees of NOx removal (> 95 %) with minimal NH_3 slip (< 5 mg/m^3 (i.N.))
- Removal of dioxin and furan by oxidation
- Removal of other pollutants, such as polycyclic hydrocarbons (TOC), by oxidation
- NH_3 deriving from the raw material and often found in the raw gas is used for the NOx reduction in the catalyst, thus reducing the amount of injected ammonia.



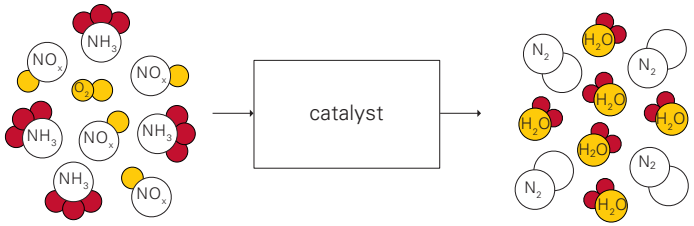
Ammonia tank

Ammonia injection

THE SCR TECHNOLOGY BY ELEX REPRESENTS THE COMBINATION OF SUPERIOR PERFORMANCE AND UNMATCHED RELIABILITY

Deciding on the best technological system is one important aspect. The other is that the system philosophy is interpreted and implemented to suit each individual problem. This is why ELEX products are market leaders in terms of performance and reliability.

NOx reduction: The fundamental principle involves the injection of ammonia (NH3) into the gas stream before it enters the SCR reactor. As a result, on the catalyst surface the 3 substances nitrogen oxide (NOx), ammonia (NH3) and oxygen (O2) react and the nitrogen oxide (NOx) transforms to nitrogen (N2) and water (H2O).



- $NO + NO_2 + 2\ NH_3 \xrightarrow{catalyst} 2\ N_2 + 3\ H_2O$
- $4\ NO + 4\ NH_3 + O_2 \xrightarrow{catalyst} 4\ N_2 + 6\ H_2O$
- $6\ NO_2 + 8\ NH_2 \xrightarrow{catalyst} 7\ N_2 + 12\ H_2O$

Reduction of dioxin and furan: The significant advantage of the SCR system, in addition to its ability to convert nitrogen oxide, lies in its capacity to eliminate other contaminants from the gas, including dioxin and furan. Moreover, this process eliminates these pollutants without generating any residual byproducts that necessitate further disposal. The oxidation of dioxin and furan in SCR follows the formula below:

$$C_{12}H_nCl_{8-n}O_2 + (9+0{,}5n)O_2 \xrightarrow{catalyst} (n-4)\ H_2O + 12\ CO_2 + (8-n)\ HCl$$

$$C_{12}H_nCl_{8-n}O + (9{,}5+0{,}5n)O_2 \xrightarrow{catalyst} (n-4)\ H_2O + 12\ CO_2 + (8-n)\ HCl$$

The oxidation of dioxin, furan as well as hydrocarbons proceeds at the same temperature as the transformation of nitrogen oxide.

OPTIMAL EFFICIENCY THROUGH APPROPRIATE SIZING

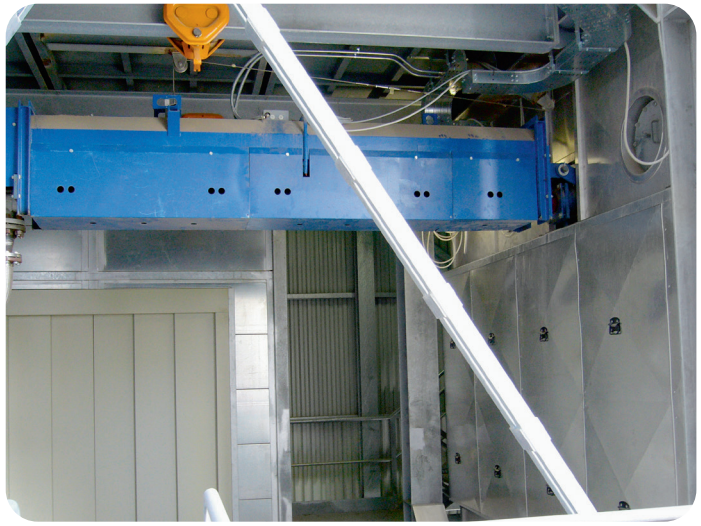
Plants that are either overdesigned or underdesigned ultimately lead to avoidable expenses. At ELEX, each plant is the result of precise planning and the tailored expertise of our engineers. The following parameters serve as the foundation for these processes.

The design of a catalytic denitrification system is significantly influenced by various factors, including the volume of gas to be treated, the required degree of NOx removal, the desired clean gas value and the acceptable slip of ammonia at the end of the process. The oxidation of dioxin and furan must be carried out separately as other parameters are taken into consideration. In general, the required catalyst volume is larger than that used for NOx removal only.

The plant achieves its highest efficiency when the speed of gas in the catalyst elements and the treatment time of the gases in the catalyst are optimally adjusted. However, there are temperature limits for catalytic denitrification operations. Exceeding these limits can result in catalyst inactivity, while too low temperatures can promote the formation of ammonia-sulfur compounds.

General operating values for SCR plants

- Gas volumes: 15‘000 to 600‘000 m^3/h
- NOx raw: 200 to 2‘000 mg/m^3
- NOx clean: 20 to 200 mg/m^3
- NH_3 slip: <5 mg/m^3
- Dioxin/furan removal: up to 99 %
- Reductant: e.g. ammonium hydroxide 25 %



Catalyst layers with dust blower

Ammonia evaporator

WE WILL NOT SETTLE FOR LESS THAN THE BEST WORLDWIDE

For a list of references and for more information, please visit our website at www.elex.ch.

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