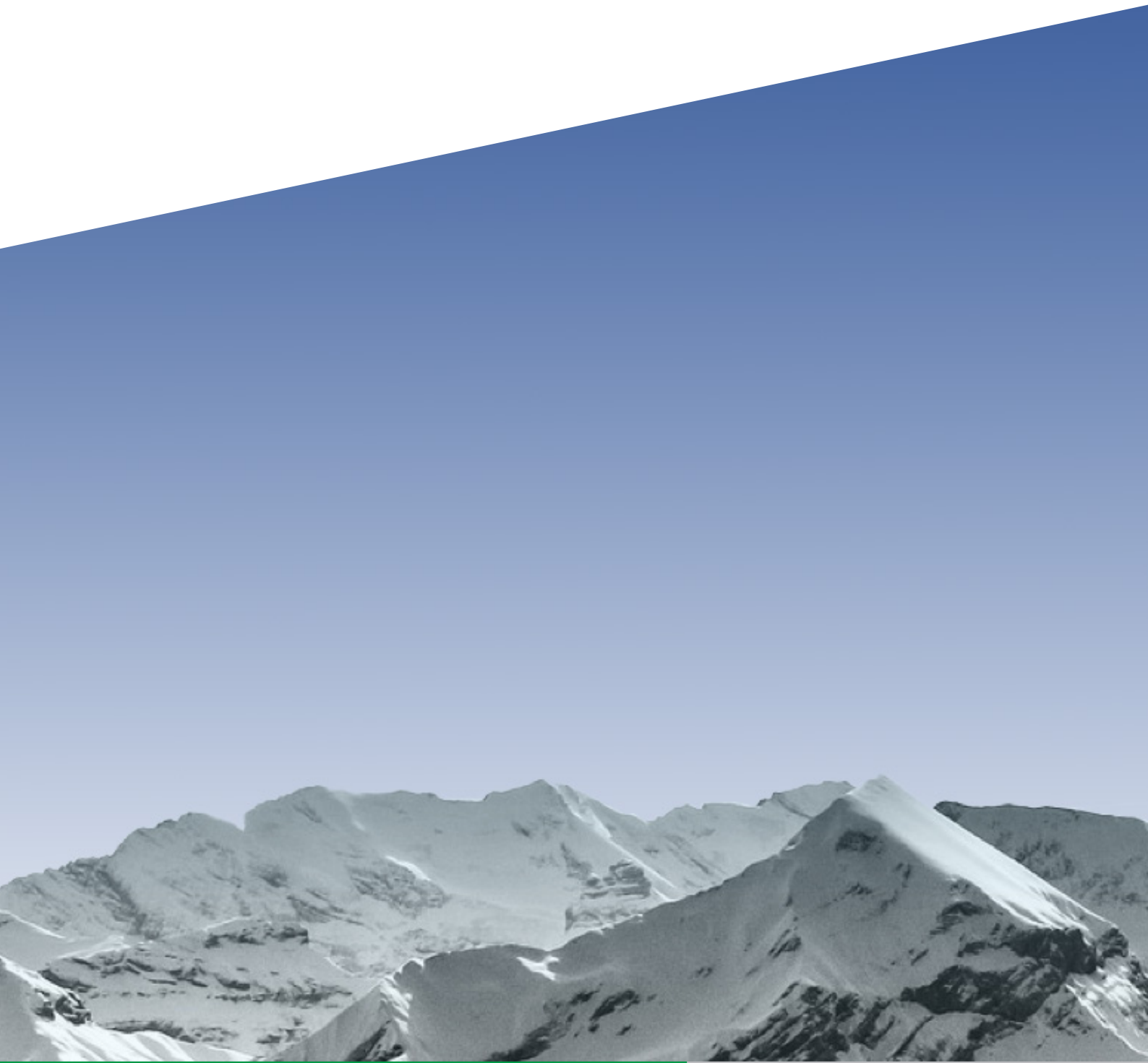


Hug Engineering AG - About Us

WE REDUCE EMISSIONS



hugengineering.
A FAURECIA COMPANY

LEADING ENVIRONMENTAL TECHNOLOGY FOR HIGH HORSEPOWER ENGINES

Particulate matter and exhaust gases are harmful to people and the environment. Nitrogen oxides, carbon monoxide and unburned hydrocarbons generated during the combustion of fossil fuels are particularly hazardous. Diesel engines also emit particulate matter which is now classified as carcinogenic by the WHO.

With our products and our technology know-how accumulated over several decades, we are making a substantial and sustainable contribution to reducing global particulate matter and exhaust gas emissions.

ABOUT US

Hug Engineering AG, founded in 1983 with its headquarters in Elsau, Switzerland, is today one of the leading manufacturers of exhaust gas purification systems for diesel and gas engines used in both stationary and mobile applications. The company provides efficient solutions and customized concepts for exhaust gas cleaning. As one of the few manufacturers in the world, we develop, design and produce all key components ourselves at our company headquarters in Switzerland. Hug Engineering AG is certified in accordance with ISO 9001 and 14001.


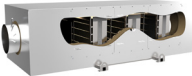



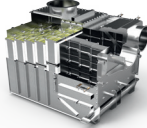

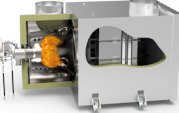



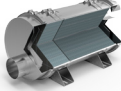
Hug Engineering AG belongs to Faurecia S.A., one of the leading automotive suppliers in the field of emission control.

INTERNATIONAL SALES AND SERVICE

Using a global distribution network, Hug Engineering AG is present in the most important international markets. This guarantees constant and prompt support in terms of sales, repair, spare parts and servicing of the products.



APPLICATIONS AND PRODUCT LINES

 combikat™	<ul style="list-style-type: none"> Power plants Combined heat and power plants (Emergency-) electricity generators 	200 - 40.000 kW	
 COdiNOx™	<ul style="list-style-type: none"> CO₂-fertilization and combined heat and power for greenhouses 	200 - 6.000 kW	
 mobiclean™	<ul style="list-style-type: none"> Locomotives Track construction machines Railcars 	200 - 5.000 kW	
 nauticlean™	<ul style="list-style-type: none"> Yachts Inland water vessels Miscellaneous vessels <p>With classification (e.g. Lloyd's)</p> <p>With class (e.g. Lloyd's)</p>	200 - 9.000 kW	
 clean4marine™	<ul style="list-style-type: none"> Seagoing vessels Cruise ships Cargo ships Inland water vessels 	500 - 40.000 kW	
 mobiclean™ R	<ul style="list-style-type: none"> Construction machinery Commercial vehicles Trucks Buses, motor coaches Railcars Vehicles for agricultural and forestry purposes 	15 - 5.000 kW	

EXPERTISE FOR YOUR SUCCESS

KEY COMPONENTS FROM ONE SINGLE SOURCE

From standard products to special designs

A diverse range of ceramic honeycombs and catalytic converters is manufactured in the Elsau factory in Switzerland. The wide range of our own products, such as catalytic converters, particle filters, monitoring and control systems, makes Hug Engineering the only complete system provider. New ceramic materials and catalytic converter coatings are developed in the company's chemical laboratories. At the same time, special designs in small series can also be realized to meet specific customer requirements. As one of the few manufacturers in the world, Hug Engineering AG develops and manufactures all key components at its own factory. This means our customers receive perfectly matched components with premium Swiss quality from one source.

THE DIESEL PARTICLE FILTER (DPF)

Counteracts soot residues

The combustion process in diesel engines generates soot particles that can be extremely fine. The average diameter is around 80 nanometers. Diesel soot particles between 20 and 300 nanometers are considered to be highly carcinogenic and promote the greenhouse effect in the atmosphere. Hug soot particle filters are based on a ceramic honeycomb structure that allows the exhaust gas to flow through the porous walls. During the process, the particles are separated onto the filter surface and converted to CO₂ and water vapour using the catalytic coating. In order to ensure optimum particle filter operation, filter variants with different geometry and microporous structure are used, depending on the specific requirements. Diesel particle filters manufactured by Hug Engineering eliminate more than 99% of soot particulates.

SELECTIVE CATALYTIC NO_x-REDUCTION

Counteracting nitrogen oxides with urea

Nitrogen oxides (NO_x) cause smog and can result in paralysis of the central nervous system or trigger pulmonary edema. NO and NO₂ nitrogen oxides can be reduced by using selective catalytic reduction (SCR process). During the SCR process, the exhaust gas mixed with a reactant (usually a urea solution) flows through honeycombed, fine cell catalysts. During the process, the nitrogen oxides (NO_x) on the active surface of the catalyst react with the reactant to form water and non-toxic nitrogen. The NO_x reduction rate can be as much as 99%.

CATALYTIC OXIDATION OF HYDROCARBONS AND CARBON MONOXIDE

Effective flue gas detoxification

Carbon monoxide (CO) is a colorless and odorless gas that has a significantly greater affinity to hemoglobin than oxygen. Hemoglobin binds the oxygen in the red blood corpuscles of people and vertebrates. Inhalation of carbon monoxide inhibits this function, and the body is poisoned due to lack of oxygen. Using a downstream oxidation stage after catalytic nitrogen oxide reduction (SCR), CO and unburned hydrocarbons (HC) can be largely eliminated. This is because the harmful gases are already oxidizing on the active surface of a honeycombed ceramic catalytic converter coated with precious metals. The oxidation rate of CO and HC can be as much as 99%.

TECHNOLOGIES AND TECHNIQUES

- Diesel particulate filtration with catalytic soot regeneration
- SCR – Selective Catalytic NO_x Reduction
- Catalytic oxidation of HC and CO

DOSING- AND REGENERATION SYSTEMS

- Dosing systems for urea injection
- Regeneration systems for reliable active filter regeneration

DIESEL PARTICLE FILTERS

- Catalytic coatings for reliable passive regeneration at low exhaust gas temperatures
- Various shapes (rectangular, round, oval)
- Round filters available up to 22"
- Cell structure: 90 – 300 cpsi
- Soot reduction rate: > 99%

CATALYTIC CONVERTERS FOR DIESEL AND GAS ENGINES

- Oxidation catalytic converters for various applications
- DeNO_x catalytic converters
- Ammonia reduction catalytic converters

Hug Engineering is a global pioneer of SCR technology with urea for diesel engines and of catalytic diesel particle filter technology.

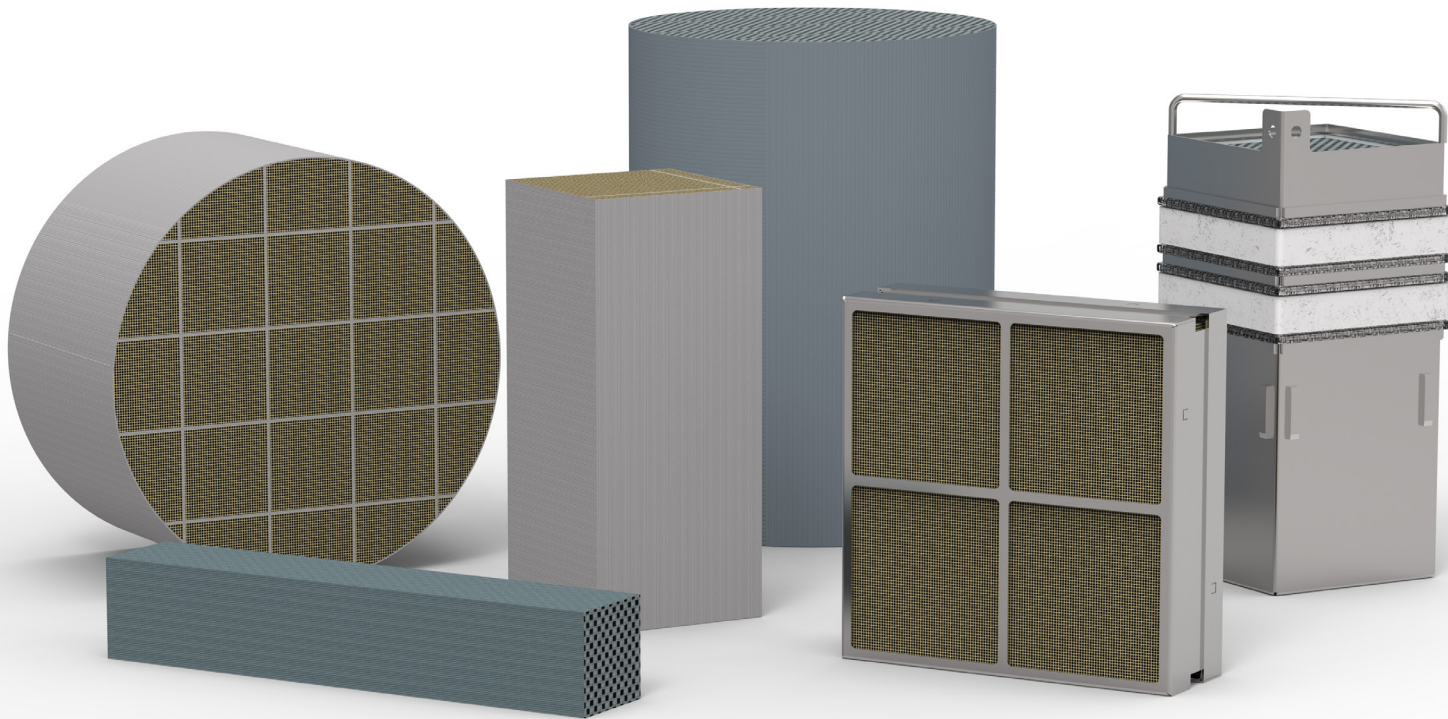


Figure: various DPF and SCR/Oxi substrates and filter cassette

SOLUTION PROVIDER BASED ON EXPERIENCE

ADVANCEMENT THROUGH INNOVATION

Hug Engineering pursues a mission of ongoing further development and optimization of in-house products, processes and technologies.

In our laboratories, we continuously test the materials and processes used for functionality with regard to their ceramic, chemical and physical properties, thus ensuring consistent premium quality.

EFFICIENT SOLUTIONS FOR YOUR EXHAUST GAS PURIFICATION

Thanks to many years of experience with numerous systems designed to meet specific customer requirements, Hug Engineering has accumulated unrivaled knowledge of exhaust gas cleaning.

- Advice, engineering, design, production and installation for different requirements and applications
- Very wide expertise to be able to meet the highest customer requirements
- Large selection of standard products
- Customised systems based on validated components
- High quality in R&D and production
- Tested and certified products
- Everything from a single source
- Large stock of spare parts
- First class service
- Supplier to and partner of engine manufacturers, plant constructors and operators
- Globally operating parent group

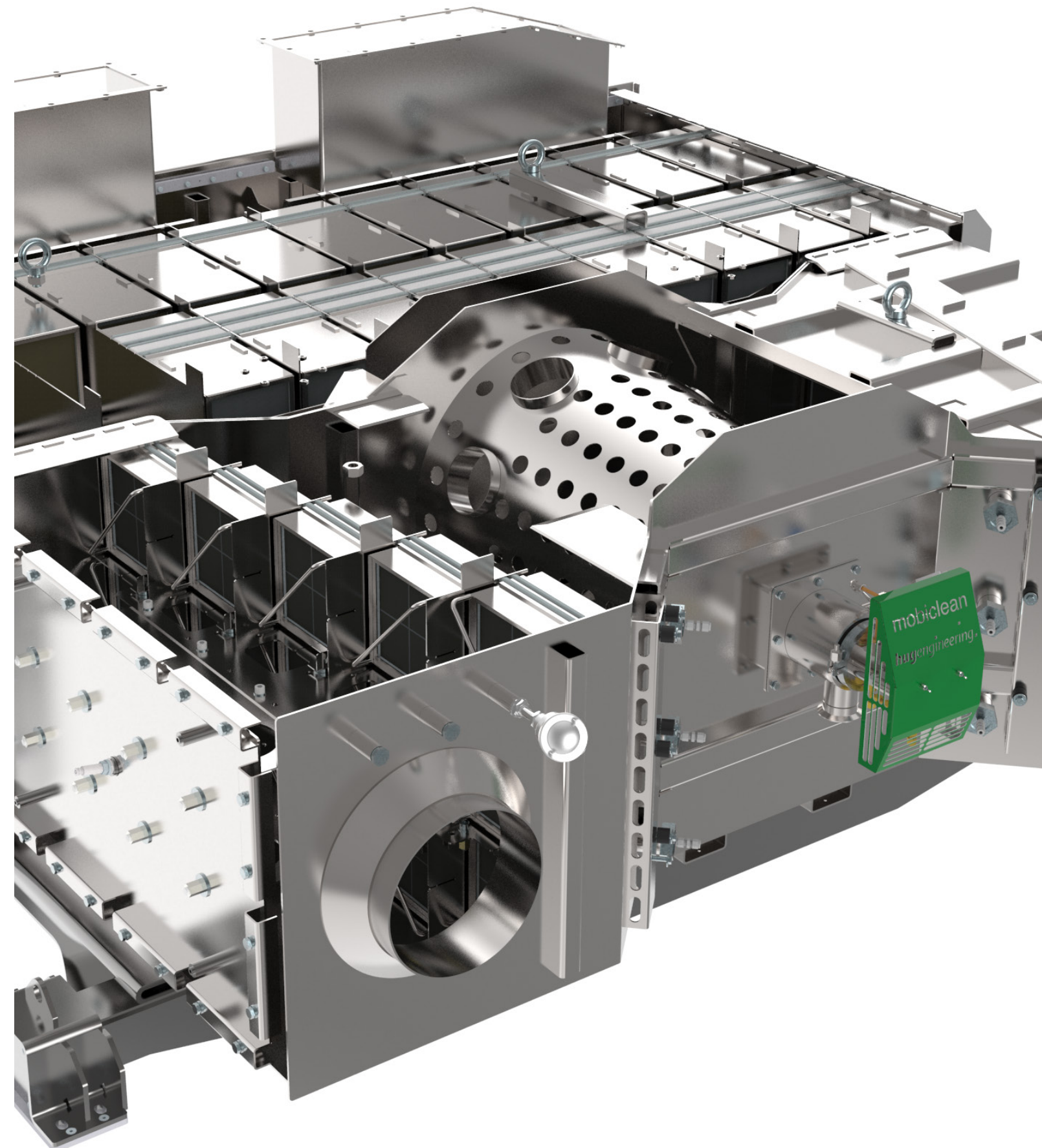
SERVICE AND SPARE PARTS

Customer Service for Hug Engineering means providing both - qualified specialists and original spare parts - on a global basis at all times. An experienced team of specialists advises and supports customers around the world in a constructive and efficient way with all issues, whether on site or by telephone.

Spare parts are also available quickly when required. We maintain well-stocked warehouses both at the headquarters in Switzerland and at our subsidiaries.

INTERNATIONAL AND NATIONAL CERTIFICATIONS

Hug Engineering systems comply with all common standards and certifications of international classification companies required for the various applications such as Lloyds Register, DNV GL, EN 15085, CARB, ABS, LEZ, RINA.



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