A combination of different exhaust gas purification processes

Industrial exhaust gas purification is a vast area. There are many different technologies and facilities for the effective treatment of pollutant emissions. This is primarily due to the high heterogeneity of exhaust gases from different industrial processes. PES delves deeper.

‘In order to find the best possible exhaust gas purification solution for an industrial application, the various factors of an application must be carefully considered,’ explains Thomas Kraus, Sales Manager Europe at centrotherm clean solutions GmbH & Co. KG. ‘In addition to

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Depending on the application, the composition of the exhaust gas can vary greatly from process stage to process stage. The modular system allows individual adaptation to the specific process application.

This poses a challenge for conventional systems for exhaust gas purification, as individual exhaust gas purification technologies are often pushed to their limits for variable gas compositions. centrotherm clean solutions GmbH & Co. KG has therefore developed a modular system for cleaning exhaust gas.

The modular system combines different cleaning technologies put together depending on requirements. Cleaning systems for thermal or wet-chemical treatment as well as dry bed absorbers can be combined with each other according to customer specifications. At the same time, intelligent communication of the system modules guarantees safe and cost-optimised operation at all times.

This diagram shows a combined exhaust gas cleaning system with two absorber modules, a pump module and a thermal module (from left to right). Source: centrotherm clean solutions GmbH & Co. KG
environmental protection and minimisation of health risks for employees, operational and maintenance costs, running costs and the flexibility of the process to adapt to different process conditions also play a central role. While the various options for exhaust gas cleaning, such as exhaust gas combustion, the removal of pollutants using a dry bed absorber or wet scrubbing, have been established on the market as individual systems for some time, combinations have so far not gained much acceptance. The reasons for this include the high complexity of such complete systems and the fact that most suppliers specialise in one technology.

**Modular design for the best possible exhaust gas cleaning**

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By closely coupling the signalling with the production plant, the exhaust gas purification system automatically regulates the necessary output for disposal, as well as selection of the module that is suitable for the respective process step. ‘As the solution is not an out-of-the-box product but always custom tailored, we can be flexible in adapting the system to the requirements on site,’ says Kraus.

**Application example: Purification of a toxic, highly flammable gas mixture from a semiconductor process**

The waste gases to be disposed of are fed to the plant via a central raw gas inlet with the aid of an integrated pump. Depending on the composition of the exhaust gas flow, the appropriate cleaning technology is allocated via a 3-way valve. In this particular case, the exhaust gas is first passed through two dry-bed absorber modules connected in series, in which reactive exhaust gas components are bound to granules by chemical absorption. ‘For this type of cleaning, a range of different absorber materials is available that has been developed especially for this area of application,’ continues Kraus. This technology is particularly suitable for the removal of highly toxic exhaust gas components as these are irreversibly bound to absorber granules, thus enabling safe and easy handling.

If the exhaust gas composition changes in a further process step, the system automatically switches to the other module - for example, to a burner scrubber. This is particularly suitable for demanding industrial applications and performs cleaning by means of a combination of thermal treatment (exhaust gas combustion) and subsequent washing out. This means that the harmful gases are thermally decomposed at very high temperatures and the combustion products are washed out in a subsequent wet processing section.

Easily combustible or pyrophoric gas mixtures, etc. can be disposed of. Even gases that can only be decomposed at high temperatures, such as perfluorinated...
hydrocarbons (PFCs), which are particularly harmful to the climate - can be disposed of in this way in an environmentally friendly manner. The combination of both system types means the optimum exhaust gas cleaning technology is available for each process step, thus ensuring optimum cleaning efficiency at minimum operating costs at all times.

‘In developing our modular system, we have responded to the growing demands placed on modern exhaust gas purification systems. Benefits for customers played a central role in this. The combination system allows us to adapt flexibly to individual needs and challenges,’ Kraus concludes.

The centrotherm clean solutions exhaust gas cleaning concept is designed for low-maintenance and reliable operation, while also allowing uninterrupted operation during maintenance work. Thus, in addition to the modules combining different technologies, individual backup configurations are also possible. For example, if a module is serviced or fails, the system automatically switches to another module. The central control for all modules allows simple and practical operation of the entire system.

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‘In order to find the best possible exhaust gas purification solution for an industrial application, the various factors of an application must be carefully considered,’ explains Thomas Kraus, Sales Manager Europe at centrotherm clean solutions GmbH & Co. KG. ‘In addition to environmental protection and minimization of health risks for employees, operational and maintenance costs, running costs and the flexibility of the process to adapt to different process conditions play a central role.’

Source: centrotherm clean solutions GmbH & Co. KG

This combined exhaust gas cleaning system is equipped with a thermal module, two dry bed absorbers and a pump module. Source: centrotherm clean solutions GmbH & Co. KG

In addition to the combination of different technologies, backup configurations are also possible, which, for example, ensure uninterrupted operation even during maintenance work. Source: centrotherm clean solutions GmbH & Co. KG