SCR CATALYSTS: PRODUCTION PROCESS AND REACTION

Reaction

The nitrogen oxide (NOx) reaction with added ammonia takes place on the catalyst surface. The reaction equations are as follows:

\[
\begin{align*}
4\text{NO} + 4\text{NH}_3 + \text{O}_2 & \rightarrow 4\text{N}_2 + 6\text{H}_2\text{O} \\
\text{NO} + \text{NO}_2 + 2\text{NH}_3 & \rightarrow 2\text{N}_2 + 3\text{H}_2\text{O} \\
2\text{NO}_2 + 4\text{NH}_3 + \text{O}_2 & \rightarrow 3\text{N}_2 + 6\text{H}_2\text{O}
\end{align*}
\]

Apart from the reduction of nitrogen oxides, the catalyst is used to break down dioxins and furans. The catalytic destruction of dioxins is an exception in that the reaction does not give rise to a waste stream, as the following equations show:

Chlorinated hydrocarbons, where \( y > z \)
\[
\text{CxHyCl}_z\text{O}_2 + (x + x - 3 + y + z) \text{O}_2 \rightarrow x\text{CO}_2 + (y - 2 - z - 2) \text{H}_2\text{O} + z\text{HCl}
\]

Chlorinated hydrocarbons, where \( y < z \)
\[
\text{CxHyCl}_z\text{O}_2 + (x + x - 3 + y + z) \text{O}_2 + (z - 2 - y - 2) \text{H}_2\text{O} \rightarrow x\text{CO}_2 + z\text{HCl}
\]

Oxidising catalysts are used to break down CO and hydrocarbons.
\[
\begin{align*}
2\text{CO} + \text{O}_2 & \rightarrow 2\text{CO}_2 \\
\text{CxHy} + z\text{O}_2 + \text{H}_2\text{O} & \rightarrow x\text{CO}_2 + z\text{H}_2\text{O}
\end{align*}
\]

Ammonia is converted into NO, NO\(_2\), N\(_2\) and N\(_2\)O in the presence of the oxidising catalyst.

Production

STEP BY STEP TO PERFECTION

Experience, expertise and strict quality control are in place at each stage of the production process.

Since the formulation is the key to product quality the materials in each charge must be precisely weighed. The kneading process makes it possible to work the paste, and is responsible for many of the properties of the finished product.

The extruder gives the catalyst its honeycomb structure. Every catalyst element is given a unique number so that the entire production and application history can be tracked and traced.
The next production stage is drying the catalyst elements. The progress of the drying process is followed by monitoring the weight loss.

When the correct moisture content is attained the catalyst is ready for calcination. Controlled heating of the dried elements, known as “calcination”, results in the final properties of the catalyst. The latter is then subjected to extensive testing before being released for delivery to the customer.

To facilitate installation in the SCR reactor each catalyst element is housed in a steel module.