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Technical Information

Technical Data for Catalyst Application

(Example: Wire Enamelling Industry)

Capacity (Volume)	:	Nm^3 exhaust gas / h / catalyst element
Space Velocity	:	Nm^3 exhaust gas / h / m^3 catalst volume
Dwelltime	:	Seconds
Entry velocity	:	meters / minute or meters / second

In addition to the composition of the hydrocarbons and the catalyst entry temperature the exhaust volume capacity of the catalyst is of considerable importance when considering the obtainable combustion efficiency.

Actual operating values for volume capacity of metal supported catalysts were determined in the wire enamelling industry, which – if applied – will assure satisfactory combustion efficiency with the hydrocarbon composition expected in the exhaust from wire enamelling varnishes.

Of similar importance are optimum velocities within the catalyst bed and the depth of the catalyst element (evolved from practical applications) which will establish certain maximum and minimum limitations for the highest combustion efficiency obtainable.

Detailed explanations about the relation of volume capacity and gas velocities are listed below for the KATEC metal supported catalyst.

1. Volume Capacity for KATEC Metal Catalysts

The table in the Technical Information bulletin No. 1 lists the volume capacity for standard elements in Nm^3 per hour. The listed volumes represent the maximum capacity (100 per cent) for the element and the gas volumes can be treated when pure solvents such as Toluene, Xylene, etc. are used, which emit easily combustible hydrocarbons.

The element type 1–2 for example has a capacity of 800 Nm^3/h as maximum permissible loading.

When catalysts are applied in the wire enamelling industry, it must be considered that in addition to the pure solvents crack products from the resin itself must be oxidized. In order to obtain combustion efficiencies equal to pure solvent vapors, the volume capacity must be decreased for the individual element.

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Based on field experience we recommending the decrease of volume capacity from 100 per cent to 65 up to 70 per cent. Under these conditions and with proper entry temperature good combustion efficiencies are obtained.

We are recommending for example the decrease of the volume capacity of a 1–2 type element working in the enamelling industry to 550 Nm^3/h.

2. Space velocities

The space velocity is expressed as the ratio of exhaust gas volume per hour to applied catalyst volume.

$$\text{Space velocity} \quad \frac{\text{Exhaust gas } (Nm^3/H)}{\text{catalyst volume } (m^3)}$$

The KATEC all-metal catalyst for example should be applied in the wire enamelling industry at space velocities of 40.000 Nm^3/h of exhaust gas per cubic meter of catalyst.

The space velocity therefore must be considered to be a specific index number for the individual catalyst. High index numbers such as are obtained for the all-metal catalyst, establish that high combustion efficiencies are obtained with a relative small catalyst volume.

Example: Using the all-metal catalyst with a space velocity of 40.000 Nm^3/h the following catalyst volume is required:

$$\text{Catalyst Volume} = \frac{\text{Exhaust Gas Volume/h}}{\text{Space Velocity}} = \frac{1.000}{40.000} = 0{,}025\ m^3$$

The space velocity index numbers are smaller for other catalysts and many use 20.000 Nm^3/h/catalyst volume.
With a space velocity of 20.000 the following catalyst volume is required:

$$\text{Catalyst Volume} = \frac{1.000\ Nm^3\ \text{/Exhaust}}{20.000\ \text{Space Velocity}} = 0{,}05\ m^3$$

The example above indicates that for the treatment of an equal exhaust gas volume with less active catalysts about twice as much catalyst is required with consequential increase in catalyst space requirements and weight.

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