

# HTZ

In ammonia, methanol, hydrogen and other plants having a steam reforming unit, it is imperative to remove sulphur efficiently from the hydrocarbon feed in order to prevent poisoning of the nickel catalyst in the reformer.

Desulphurisation is commonly initiated by a hydrogenation step where organic sulphur compounds are converted into hydrogen sulphide (H<sub>2</sub>S). The hydrogen sulphide is then quantitatively absorbed on zinc oxide down to or in some cases even below the equilibrium level according to following reaction:



For this purpose, Topsøe offers a series of zinc oxide absorbents designated HTZ-3, HTZ-4 and HTZ-5. The HTZ Series has made Topsøe a leading supplier of zinc oxide absorbents to the industry providing very high absorption capacity for all applications.

## HTZ-3

HTZ-3 is Topsøe's standard sulphur absorbent used for removal of hydrogen sulphide and to some extent also certain organic sulphur compounds depending on operating temperature. HTZ-3 is characterised by its very high purity (>99% zinc oxide), which together with a high bulk density ensures an absorption capacity up to 510 kg/m<sup>3</sup> (31.5 lbs/cuft). As a result of the high density and purity, HTZ-3 typically provides 20-30% more zinc oxide for a given volume purchased than other commercial zinc oxide products corresponding to a 20-30% longer lifetime operating at the same conditions.

HTZ-3 is recommended for operating in the temperature range 300-400°C (570-750°F) and for gases containing more than a few ppm sulphur.

## HTZ-4

HTZ-4 is a specially promoted sulphur absorbent. HTZ-4 has absorption properties very similar to HTZ-3, but in addition it is capable of absorbing carbonyl sulphide (COS) even at ambient temperature. HTZ-4 is composed of approximately 90% zinc oxide, the balance being mainly alumina (Al<sub>2</sub>O<sub>3</sub>).



HTZ-4 is recommended in cases where all or part of the sulphur in the feed is present as carbonyl sulphide and where no hydrogenation catalyst is placed upstream the zinc oxide. The reaction is initiated by hydrolysis of carbonyl sulphide, catalysed by alumina:



The humidity present in the feed gas will normally be sufficient for the reaction. The absorption capacity of HTZ-4 is, like for HTZ-3, reduced at low temperatures.



## HTZ-5

HTZ-5 consists (like HTZ-3) of more than 99% zinc oxide. However, pore volume and surface area are much higher for HTZ-5 than for HTZ-3. The high surface area makes HTZ-5 very suitable for absorption of hydrogen sulphide at low temperatures and/or low hydrogen sulphide content in the gas.

As mentioned, the sulphur pick-up rate is very temperature dependent, but the pick-up rate also depends on porosity and zinc oxide surface area. Therefore, at low temperatures, it is possible to obtain a higher sulphur pick-up per m<sup>3</sup> (cuft) with HTZ-5 than with HTZ-3, even though the bulk density of HTZ-5 is approximately 25% lower than that of HTZ-3.

## Pressure Range

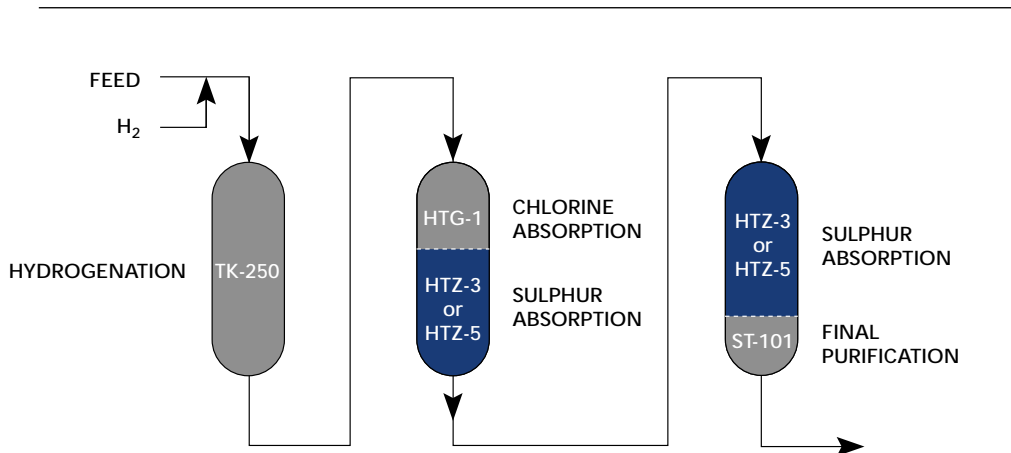
The operating pressure for the HTZ absorbents is determined by the reformer and is typically in the range of 10-50 kg/cm<sup>2</sup> (150-750 psig).

## High Purity Absorbents

The HTZ Series is manufactured from raw materials of very high purity. It is essentially free of elements such as arsenic and chlorine, which might poison downstream catalysts. Nor does HTZ have any silica containing binding material, which may promote carbon formation by cracking of hydrocarbons.

The combination of very high purity and an excellent absorption capacity has for several years been proved industrially making Topsøe's HTZ Series the preferred choice worldwide for sulphur absorption.

### CATALYST CONFIGURATION IN A DESULPHURISATION SYSTEM



### TYPICAL CHEMICAL AND PHYSICAL CHARACTERISTICS FOR HTZ SERIES

	HTZ-3	HTZ-4	HTZ-5
SHAPE	Extrudates	Extrudates	Extrudates
SIZE, DIAMETER	4 mm	4 mm	4 mm
LENGTH	4-8 mm	4-8 mm	4-8 mm
ZnO (wt %)	>99	87-90	>99
Al <sub>2</sub> O <sub>3</sub> (wt %)	<1	Balance	<1
MAX. SULPHUR ABSORPTION			
KG S/100 KG HTZ (LBS S/100 LBS)	39	35	39
KG/M <sup>3</sup> (LBS/CUFT)	510 (31.5)	430 (27)	390 (24)

Proven by Performance

**HALDOR TOPSØE A/S**

