



Hexamethyldisilizane (HMDS)

$C_6H_{19}NSi_2$

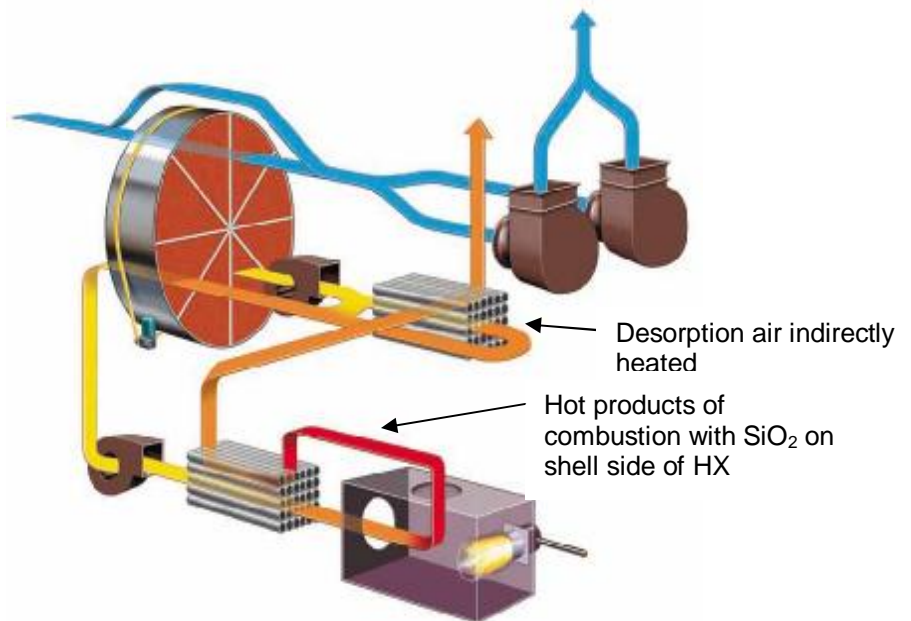
MW 161

BP 259°F (126°C)

The organic solvent, hexamethyldisilizane (HMDS), is used in the lithography process step in semiconductor manufacturing. After being coated on the wafer surface, it evaporates and is exhausted. Typically, HMDS is captured in the fab's solvent exhaust duct and is sent to solvent abatement equipment. If HMDS is present in the solvent exhaust, it should be considered in the solvent abatement system design. HMDS oxidizes to silica dioxide (SiO_2) particulate when it is combusted in an oxidizer. This white powder particulate can foul and coat catalyst, therefore, catalytic oxidizers should not be specified.

Munters' zeolite concentrator/thermal oxidizer technology is considered the preferred control option for semiconductor applications containing HMDS. HMDS with its high boiling point adsorbs very well on the zeolite rotor; just as well as other standard solvents. It also desorbs from the concentrator just as well. As the HMDS in the concentrate stream passes through the primary HX and is combusted in the combustion chamber of the thermal oxidizer, it oxidizes to SiO_2 the white particulate. This SiO_2 has been known to foul catalyst in catalytic oxidizers, build up in RTOs and build up in some thermal recuperative oxidizers. However, it has not proven to be a problem in the thermal recuperative oxidizer design that Munters provides.

Munters' thermal oxidizer design minimizes any negative impacts of SiO_2 . Whereas other thermal oxidizers have been designed with the hot products of combustion (containing SiO_2) passing through on the tube side of the heat exchangers, Munters' design sends the clean air for preheat through the tube side and the hot products of combustion pass through on the shell side. This avoids tube plugging and allows much easier cleaning should any SiO_2 form. Munters has been providing rotor concentrator/thermal



Munters Zeolite Rotor Concentrator/Thermal Oxidizer



HMDS continued...

oxidizer systems to the semiconductor industry for over 15 years. Most customers with 10+ year old equipment still find just a small amount of white powder residue on the bottom of the combustion chamber but no buildup on the heat exchangers. For those using a larger quantity of HMDS in their processes, a slight amount of white powder can be found on the heat exchangers but not enough to require significant cleaning and not enough to cause any operational or performance issues with the system. Munters recommends that the oxidizer be opened and checked every year or two as a precaution and that significant silica accumulation be cleaned out as necessary. Access doors are included in the oxidizer design to allow for cleaning.

Another precaution is that hot oxidizer exhaust should not be used to regenerate/desorb the rotor concentrator since the oxidizer exhaust contains some level of SiO_2 particulate. The particulate could also foul or coat the rotor concentrator just like catalyst. Munters' design uses a secondary heat exchanger to indirectly heat the required desorption air using the hot oxidizer exhaust. A slip stream is taken from the process exhaust and is heated in the secondary heat exchanger before returning to clean the rotor. The hot oxidizer exhaust with the particulate still entrained provides the required heat and is then exhausted to the stack.

In summary, HMDS is well treated by Munters' zeolite rotor concentrator/thermal oxidizer systems as long as certain design considerations mentioned above are taken into consideration.