# TREVERLYST Catalyst

Procedure for Storage of Catalysts During Temporary Reactor Shutdown

This procedure is recommended to be used for safe storage of TREVERLYST catalysts that are used for the production of MTBE, TAME and ETBE during any temporary shutdown.

The main purpose of this write up is to guide our customers in preservation of TREVERLYST catalyst during any temporary shutdown lasting more than 10 days. For more information, please contact our technical experts.

### CAUTION

During the production of MTBE, TAME and ETBE the TREVERLYST catalyst comes in direct contact with polymerisable materials such as isobutylene, butadiene and isoamylene. During shutdown of the reactor if TREVERLYST catalyst is allowed to remain in contact with these monomers there is a risk of polymer/gum formation, especially at high temperatures. This can lead to a strong exothermic reaction and can lead to catalyst failure. Further, the polymer/gum thus formed can clog the macro pores of the catalyst, thereby fouling it. This phenomenon is more likely to occur at higher temperatures. Besides this, at high temperatures the catalyst can undergo desulphonation, thereby depleting its catalytic activity. Furthermore during washing the catalyst with a solvent, this solvent can react with the remaining petrochemicals which again can lead to an exothermic reaction.

## RECOMMENDED STORAGE AND HANDLING CONDITIONS

1. Turn off the source of heat to the reactor, thereby bringing it down gradually to ambient temperature.
2. During the cooling continue flow of reactants through the reactor, gradually reducing the flow. If the reactor is equipped to recycle the feed, stop the fresh flow and continue with only the recycled flow. Alternatively if the end product of the reactor (e.g. MTBE, TAME or ETBE) is available, use it to flush off polymerisable compounds from the column.
3. Continue above step till temperature differential between the outlet and inlet stream is within 5°C.
4. Flush the reactor with 2 bed volumes of methanol to purge remaining polymerisable compounds and end product. Make sure that there is no exothermic reaction.
5. Remove excess methanol from the catalyst bed by pressurization with nitrogen, taking care not to dry the catalyst. WARNING: Dry catalyst swells significantly during subsequent rewetting and might even break the equipment. Rewetting the catalyst might lead to an exothermic reaction. Dry catalyst might become electrically charged and precaution has to be taken.
6. Close the inlet and outlet valves of the reactor and leave the catalyst soaked in methanol.

## RECOMMENDED PROCEDURE FOR RESTART OF THE REACTOR

1. Fill up the column with methanol in an up flow mode.
2. Rinse the TREVERLYST catalyst with 2 bed volumes of methanol to remove any impurities that might have formed during the shutdown period. Note: the used methanol can be sent to the methanol recovery system.
3. The TREVERLYST catalyst is now ready for use again.

Operating conditions refer to the use of the product under normal operating conditions. They are based on experience in industrial applications. However, additional data are needed to calculate the resin volumes for larger plants. For more questions please contact our technical experts.

Governmental regulations vary from country to country. Please seek advice from your local CHEMRA representative in order to determine the best catalyst choice and operating conditions.

Safety

Please note, that polymeric resins can swell significantly between the aqueous and pure solvent phases or when rewetted. Care should be taken. Glass columns and even steel columns can break. Wear glasses when using resin systems. To avoid high pressure build up, an operation in counter current or up-flow through the polymer bed shall be considered.

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