# Dimethyl Carbonate

MCDERMOTT TECHNOLOGY

## Overview

McDermott offers the Versalis/Lummus Technology process for the production of dimethyl carbonate (DMC), a non-toxic intermediate used in the production of polycarbonates, lubricants, solvents, and other products. DMC is also used directly as a solvent or a gasoline/diesel fuel additive. The Versalis/Lummus Technology DMC process is a unique, non-phosgene route using CO, methanol and $O_2$ to produce DMC, $CO_2$ and water. It avoids the safety and waste product issues associated with conventional phosgene-based DMC processes. The $CO_2$ can be sent to a CO generation unit and recycled back to the process. This environmentally safe process produces high purity product and can be applied to large capacity plants. Since McDermott also offers the Versalis/Lummus Technology diphenyl carbonate (DPC) process, there are opportunities for energy integration as well when both DMC and DPC are produced.

Versalis/Lummus Technology also offers high purity dimethyl carbonate (HDMC) technology to produce 99.99% pure DMC. HDMC is generally used for lithium ion batteries.

## Advantages

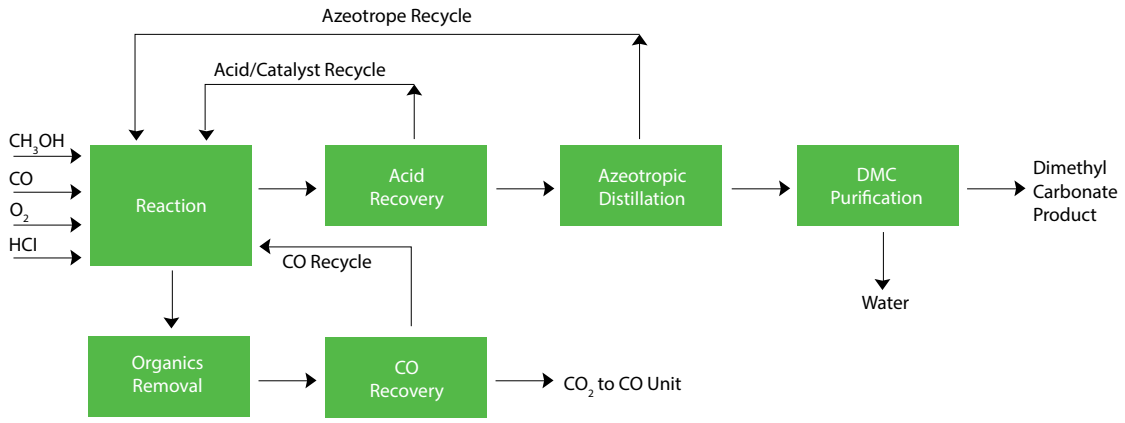
| Process Features | Process Benefits |
|---|---|
| Oxidative carbonylation of methanol | Large availability of raw materials • $CO_2$ is the only by-product, which can be converted to CO and recycled within the process |
| Green process | Does not use phosgene • Environmentally safe • No dangerous intermediates or by-products • Extensive heat integration |
| One step reaction | Catalyst is re-oxidized in a one-stage single CSTR reactor using $O_2$, which is an inexpensive oxidant • Less process complexity • Low investment |
| In situ continuous catalyst regeneration | Normal operation requires no make-up catalyst |
| Proven at high capacity (up to 50 kta per train) | Economies of scale |

## Performance Characteristics

| Typical Overall Material Balance | |
|---|---|
| **Feeds** | *MT/MT DMC Product* |
| Methanol (100% basis) | 0.768 |
| CO (100% basis) | 0.587 |
| $O_2$ (100% basis) | 0.326 |
| HCl (30 wt% solution) | 0.023 |
| **Main Products** | |
| Dimethyl Carbonate | 1.000 |
| $CO_2$ to CO unit | 0.355 |
| Other ($H_2O$, Vents) | 0.350 |

| Typical DPC Product Quality | |
|---|---|
| Purity | 99.8 wt.% min |
| Color APHA | 5.0 max. |
| Acidity (as $H_xCO_3$) | 50 ppm wt max. |
| Chlorine (organic cmpd) | 100 ppm wt max. |
| Methanol | 100 ppm wt max. |
| Water | 100 ppm wt max. |

## Block Flow Diagram



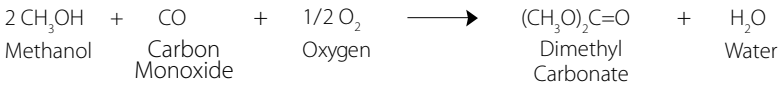

## Process Description

Methanol, CO and $O_2$ react in the presence of a copper-containing catalyst to yield DMC and water. The main by-product is $CO_2$, with minor amounts of organics like dimethyl ether and methyl chloride. A small quantity of HCl is fed to the reactor to maintain catalyst activity.

Unreacted gases, saturated with organics, are fed to the organics removal section. The clean gases—composed of CO, $CO_2$ and inerts—are subsequently fed to the CO recovery unit where CO is recycled back to the reaction section and $CO_2$ is sent to an OSBL CO generation unit.

The reaction section effluent, containing unreacted methanol, DMC, water, and traces of catalyst and HCl, is sent to the acid recovery section where catalyst and HCl are separated and recycled back to the reaction section. The remaining effluent is fed to the azeotropic distillation section. Methanol/DMC azeotrope is recycled back to the reaction section and DMC with water are fed to the final purification section to obtain DMC product.

## Process Chemistry

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