



Lummus Technology
a CB&I company

Dimethyl Carbonate

Overview

Lummus Technology offers the Polimeri/Lummus process for the production of dimethyl carbonate (DMC), a non-toxic intermediate used in the production of polycarbonates, lubricants, solvents, and other products, including pharmaceutical applications. DMC is also used directly as a solvent or a gasoline/diesel fuel additive. The Polimeri/Lummus DMC process is a unique, non-phosgene route using CO, methanol and O₂ to produce DMC, CO₂ and water. It avoids the safety and waste product issues associated with

conventional phosgene-based DMC processes. The CO₂ 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 Lummus also offers the Polimeri/Lummus diphenyl carbonate (DPC) process, there are opportunities for energy integration as well when both DMC and DPC are produced.

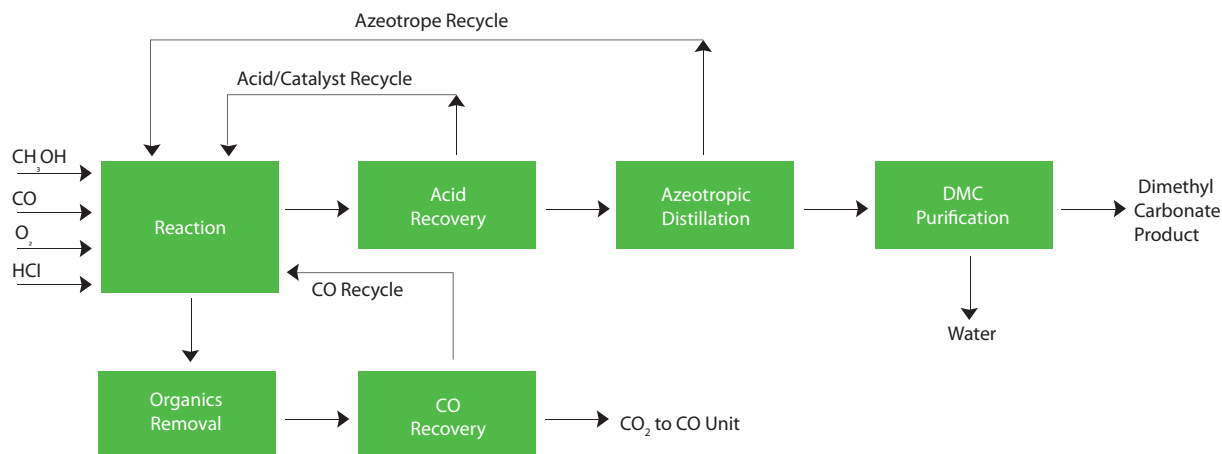
Advantages

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
<i>In situ</i> 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		Typical DMC Product Quality	
Feeds	MT/MT DMC Product	Purity	99.8 wt.% min
Methanol (100% basis)	0.768	Color APHA	10 max.
CO (100% basis)	0.519	Acidity (as H _x CO ₃)	50 ppm wt max.
O ₂ (100% basis)	0.296	Chlorine (organics cmpd)	100 ppm wt max.
HCl (30 wt% solution)	0.023	Methanol	100 ppm wt max.
Main Products		Water	100 ppm wt max.
Dimethyl Carbonate	1.000		
CO ₂ to CO unit	0.301		

Block Flow Diagram



Process Description

Methanol, CO and O₂ react in the presence of a copper-containing catalyst to yield DMC and water. The main by-product is CO₂, 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, CO₂ and inerts – are subsequently fed to the CO recovery unit where CO is recycled back to the reaction section and CO₂ 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

