Diphenyl Carbonate

MCDERMOTT TECHNOLOGY

Overview

McDermott offers the phosgene-free Versalis/Lummus Technology process for the production of diphenyl carbonate (DPC), a polycarbonate intermediate. In this process, dimethyl carbonate (DMC) reacts with phenol to produce DPC and methanol. The Versalis/Lummus Technology DPC process has no environmental or corrosion problems, and the by-product methanol can be recycled back to the DMC process. Since McDermott also offers the Versalis/Lummus Technology DMC process, there are opportunities for energy integration as well between the DMC and DPC units.

Advantages

Process Features	Process Benefits
High DPC product quality	Improves downstream polycarbonate quality, which is critical for optical media applications
No chlorine involved in DPC synthesis	Environmentally safe • No corrosion problems
Proven at high capacity (well over 100 kta)	Economies of scale • Supports world scale polycarbonate plant
Higher conversion per pass and lower recycle flows	

Performance Characteristics

Typical Overall Material Balance
(for stand-alone Versalis/Lummus Technology DPC technology)

Feeds	MT/MT DPC Product
Dimethyl/Carbonate (DMC) (100% basis)	0.434
Phenol	0.897
Catalyst	0.001
Main Products	
Diphenyl Carbonate (DPC)	1.000
Methanol	0.305
Anisole (Methoxybenzene)	0.007
Other (IPA, Vent, Heavies)	0.020

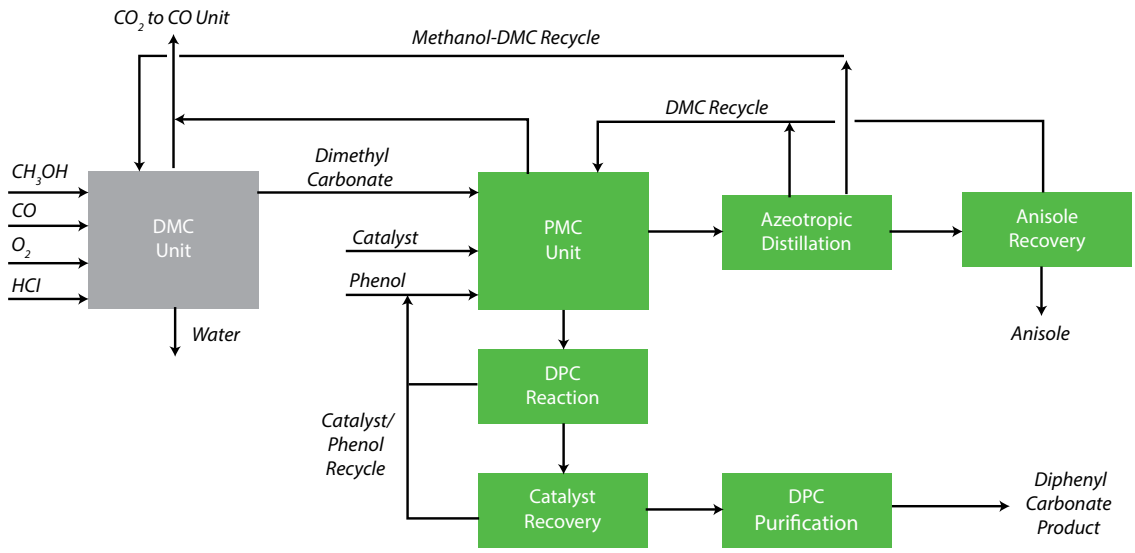
Typical Overall Material Balance
(for integrated Versalis/Lummus Technology DMC-DPC technology)

Feeds	MT/MT DPC Product
Methanol (100% basis)	0.030
CO (100% basis)	0.255
O_2 (100% basis)	0.142
HCl (30 wt% solution)	0.010
Phenol	0.896
Catalyst	0.001
Main Products	
Diphenol Carbonate	1.000
CO_2 to CO unit	0.154
Anisole (Methoxybenzene)	0.007
Other (H_2O, Vent, Heavies)	0.167

Typical DPC Product Quality

Purity	99.9 wt.% min
Color APHA	20 max.
Titanium	0.1 ppm wt max.
Iron	0.1 ppm wt max.

Block Flow Diagram



Process Description

DPC is produced in two steps: phenol and DMC react to form phenylmethyl carbonate (PMC), followed by PMC disproportionation to DPC.

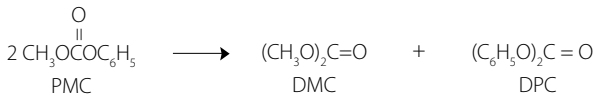
Phenol, DMC and catalyst are fed to the PMC reaction section where a small amount of anisole and CO_2 are also produced. A "light" stream—containing mainly methanol, DMC and anisole—is fed to the azeotropic distillation section, from which a methanol-DMC azeotrope is recycled back to the DMC unit, some DMC is recycled to the PMC reaction section, and an anisole/DMC mixture is sent to the anisole recovery section.

A "heavy" stream, containing mainly PMC and phenol, is fed to the DPC reaction section where disproportionation to DPC and some heavier by-products occurs. Unreacted phenol is recycled to the PMC section, while the balance is sent to the catalyst recovery area where recovered catalyst is also sent back to the PMC section. DPC is then purified of any residual heavies.

Process Chemistry

Phenyl Methyl Carbonate (PMC) Formation

PMC Disproportionation



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