



Sunoco/UOP Phenol Process

Petrochemical

Introduction

To compete in today's phenol and acetone markets, the producer needs the ability to supply consistently high-quality products with the most favorable investment and production economics. The Sunoco/UOP Phenol process fills that need with commercially proven technology for the cumene route to phenol and acetone, backed up by continuing improvements and service.

Cumene peroxidation is the preferred route to phenol, accounting for more than 90% of world production. The Sunoco/UOP Phenol process features low feedstock consumption (1.31 wt cumene/wt phenol) without tar cracking, avoiding the expense and impurities associated with tar cracking. High phenol and acetone product qualities are achieved through a combination of minimizing impurity formation and efficient purification techniques. Optimized design results in low investment cost along with low utility and chemicals consumption for low variable cost of production. Design options for by-product alphas-methylstyrene (AMS) allow producers to select the best alternative for their market: hydrogenate AMS back to cumene, or refine AMS for sale. No acetone recycle to the decomposition (cleavage) section, simplified neutralization, and no tar cracker make the Sunoco/UOP Phenol process easier to operate.

For production of cumene feedstock, UOP's Q-Max™ process can provide the highest quality cumene along with low benzene and propylene consumption and low overall capital and production costs. The Q-Max process uses a commercially proven, highly selective and stable zeolitic catalyst which is also regenerable. Integration of the Sunoco/UOP Phenol process with the Q-Max process also results in reduced utility costs, in addition to the benefits of a single-source technology supplier.

Description

Key process steps in the Sunoco/UOP Phenol process:

- Liquid-phase oxidation of cumene to cumene hydroperoxide (CHP). A small amount of dimethylphenylcarbinol (DMPC) is also formed, but low-pressure, low-temperature oxidation results in very high selectivity to CHP.



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- Concentration of CHP, recycling unreacted cumene to oxidation.
- Decomposition of concentrated CHP to phenol and acetone, accompanied by dehydration of DMPC to AMS, catalyzed by mineral acid. Unique design achieves a very high selectivity to phenol, acetone and AMS without using recycle acetone. The high overall yields from oxidation and decomposition combine to achieve 1.31 wt cumene/wt phenol without tar cracking.
- Neutralization of the decomposition catalyst.
- Recovery and purification of acetone and phenol products, and rejection of a small amount of by-products as heavy residue.
- Either AMS hydrogenation back to cumene for recycle to oxidation, or AMS refining for sale.

Feed and Product Quality

Most important cumene specifications:

Purity	99.90 wt-%, min.
Benzene	10 wt-ppm, max.
Toluene	5 wt-ppm, max.
Ethylbenzene	50 wt-ppm, max.
<i>n</i> -Propylbenzene	300 wt-ppm, max.
Butylbenzenes	100 wt-ppm, max.
(for 99.5 wt-% AMS purity)	

Phenol

	High-Purity	Ultra-High Purity
Grade	High-Purity	Ultra-High Purity
Applications	Epoxy BPA Miscellaneous	Polycarbonate Bisphenol-A

Total Carbonyls as Mesityl Oxide, wt-ppm <30 <15

Total G.C. Impurities, wt-ppm <100 <50

Acetone

Water Content <0.3 wt-%
Permanganate Fading Time >4 hours
Distillation Range <0.5 °C, including 56.1 °C

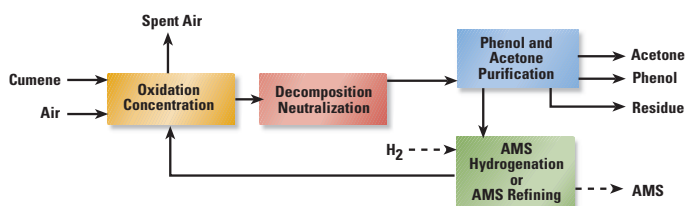
AMS

Applications - Co-monomer for ABS, styrene & polycarbonate plastics; also adhesives, paints, and fragrances

AMS Purity >99.5 wt-%

Commercial experience

Sunoco/UOP is a leading supplier of technology to the phenol industry, providing approximately 25% of world capacity for the cumene route. Sunoco produces over 590,000 MTA of phenol in its facility in Philadelphia, Penn, USA. Sunoco/UOP phenol technology is currently used in 11 plants worldwide having a total phenol capacity of more than 1,500,000 MTA. Four other units with a total design capacity of 600,000 MTA are in construction and design.

Sunoco/UOP Phenol Process Flowscheme**For more information**

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