

COMMERCIAL PROCESSES

Naphthalene is produced by the following processes:

1. Recovery from coal tar
2. From petroleum
 - Unidak process
 - Hydeal process
 - Process given by faith

1. Recovery from coal tar:

The tar acid-free chemical oil is charged to the system where most of the low boiling components, e.g., benzene, xylene, and toluene, are removed in the light-solvent column. The chemical oil next is fed to the solvent column, which is operated under vacuum, where a product containing the prenaphthalene components is taken overhead. This product, which is called coal-tar naphtha or crude heavy solvent, typically has a boiling range of 130-200⁰C and is used as a general solvent and as a feed stock for hydrocarbon-resin manufacture because of its high contents of resinifiables, e.g., indene and coumarone (see hydro carbon resins). The naphthalene – rich bottoms from the solvent column then fed to the naphthalene column where a 78⁰C freeze –point product (78⁰C naphthalene) is produced .the naphthalene column is operated at near atmospheric pressure to avoid difficulties, e.g., naphthalene-filled vacuum jets and lines, which are inherent to vacuum, distillation of this product. A side stream, which is reach in methylnaphthalenes, may be taken near the bottom of the naphthalene column. The crude 78⁰ C naphthalene that is produced by distillation is not of suitable quality for many applications and must be further upgraded.

The main impurity in crude 78⁰C coal-tar naphthalene is sulfur, which is a present in the form of thionaphthalene (1-3%). Methyl and dimethylnaphthalene, much crude coal-tar naphthalene are also presents (1-2 wt%) with lesser amount of indene, methylindenes, tar acids, entire bases.

2. From petroleum:

Unidak process:

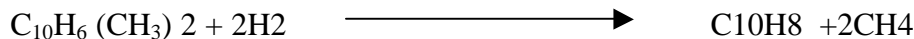
In the unidak process (Union Oil Company of California), the feed, which may be catalytic reformat bottoms, enters a fractionator where a naphthalene concentrate, a middle product of alkylnaphthalenes which is treated further, and a small amount of bottom which is used fuel oil are produced. The alkylnaphthalenes which are mixed with make-up hydrogenate 3.5 Mpa (500 psig) and some water to moderate the reaction, are transferred to a fixed-bed reactor. The reaction product enters a high-pressure separator where 80-wt% hydrogen is evolved and recycled. Low-pressure separator releases a small amount of fuel gas and the dealkylated product is sent to the feed. The naphthalene concentrate is purified from a by-product which can be used is gasoline.

Hydeal process:

The hydeal process (Universal Oil Product) a feedstock which is derived from heavy reformat a processed with excess hydrogen over a chromia-alumina catalyst of high purity and low sodium content. Naphthalene is recovered by distillation after treatment with clay to remove traces of olefins.

A typical process of producing naphthalene from petroleum is given by *Faith*.

Reaction (typical):



Utilities Requirements (typical):

BASIS: 50million pounds Naphthalene/Year

	HEAVY REFORMAT	CATALYST CYCLE STOCK
Electric power	420KW	630 kW
Fuel	40,000,000Btu/hr	90,000,000Btu/hr
Steam	4,000 lb/hr	0
Circulating water	900 gal/min	1,500gal/min

PROCESS

Naphthalene may be produced from petroleum fractions high temperature and pressure in the presence of hydrogen, either with or without catalyst.

Suitable feeds may be bottoms distilled from catalytic reformat or a narrow cut distilled and concentrated from refractory cycle oils. For example, typical rerun bottoms (400⁰F end point) from catalytic reformat would contain 95% aromatics made up of 20-30% alkylbenzene; 10-15% naphthalene and 15-16% methylnaphthalene.

A typical fluid catalytic cracking cycle oil (450-550⁰F cut) might contain 50% aromatics, most of which are mono-, di- and tri-methylnaphthalenes. Before dealkylating, this stock would have to be concentrated by extraction and desulfurized.

In either case the concentrated aromatic feed would be pumped along with a hydrogen-rich gas to a demethylation reactor. Typical range of operating conditions for a noncatalytic thermal dimethylator are 150 to 1000psi, 1400⁰F, hydrogen naphthalene ratio of 3:1 to 25:1, residence time of 2 to 300seconds. The dimethylated product is quenched as it leaves to the reactor and sent to a separator from which part of the hydrogen rich gas recycled and part burnt as a fuel. The liquid product is distilled to separate naphthalene, gasoline, and fuel oil. Some of the aromatic concentrate may be recycled.

The naphthalene produced is usually better 99% pure and low in sulfur content.

