Half-century of proven experience

When selecting phenol technology to maximize the return on your capital investment, it makes sense to choose an experienced licensor with a legacy of process innovation. At KBR, our product teams have been involved in leading-edge phenol technology for over 50 years and our execution teams have completed more than 50 phenol projects worldwide. Once your plant is onstream, KBR provides technical services to continually optimize production and meet your goals.

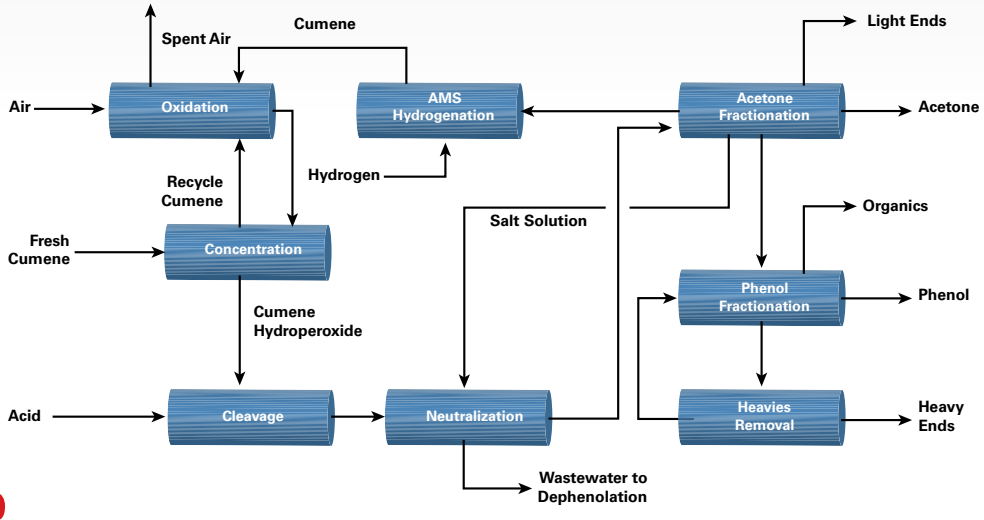
KBR's phenol technology team provides services to clients including technology licensing and support in the initial planning phase of projects, through process design, engineering and construction of phenol plants.

Benefits of KBR's phenol process:

- Increases efficiency and integration
- Maximizes plant reliability and operability
- Offers reduced capital and operating costs
- Produces highest yields and lowest emissions

The KBR phenol process:

Cumene is oxidized with air at high efficiency to produce cumene hydroperoxide (CHP). CHP is then concentrated and cleaved to phenol and acetone in the presence of an acid catalyst using KBR's Advanced Cleavage System. Our experts have optimized reaction conditions to provide high selectivity and safety. Once the catalyst is removed, the cleavage mixture is fractioned to produce high-purity products. The process produces extremely high-quality phenol and acetone suitable for all applications. The fractionation train can be designed to either separate alpha methyl styrene (AMS) as a pure co-product or hydrogenate AMS to cumene for recycle to oxidation. Phenol and, optionally, co-product acetophenone (AP) are recovered from a heavies stream, which is a useful fuel. The aqueous effluent is pretreated to allow efficient biotreatment of plant wastewater.



KBR
TECHNOLOGY

To learn more, visit: petrochemicals.kbr.com or e-mail petrochemicals@kbr.com

Optimized oxidation system

Having an optimized oxidation system in the phenol technology you choose is essential to generate a high oxidation yield. With KBR, our phenol technology employs a highly efficient dry oxidation system, which results in an oxidation yield of more than 95 percent by lowering the formation of by-products. The operating conditions in the oxidation system are optimized weighing all factors such as reaction kinetics and selectivity, air compression and vent gas treatment cost requirements and process safety by minimizing the inventory of CHP.

Highly Efficient Purification Technology

While there are other types of phenol technology, KBR's produces the highest purity phenol in the industry. Total cresols are typically less than 100 ppm, and total organic impurities less than 20 ppm. The highly efficient dry oxidation and advanced cleavage systems employed in KBR's phenol technology result in very high yields of phenol and acetone, thus eliminating the need for a heavy-end cracking system found in some phenol plants. This not only reduces capital and operating costs, but also improves product quality.

Integrated Pollution Prevention and Safety Systems

KBR pioneered the development of many environmental control features used in phenol plants, including the integrated vent scrubbing system, catalytic oxidation of off-gas and efficient dephenolation systems. Many of the benefits from our phenol plants include achieving the lowest emissions, prevention of pollution and meeting the most stringent standards in the industry. KBR developed many of the safety systems used in phenol plants throughout the world. We have continued to develop new systems and improve existing ones as our commitment to safety in each of our phenol plant designs. As a result of this emphasis, KBR phenol plants have an unmatched safety record.

KBR Phenol Product Quality

Property	Specification
Appearance	Clear
Purity (dry basis)	99.99 wt% min.
Total Organic Impurities, Excluding Cresols	< 20 wt ppm
Water	< 100 wt ppm
Color (APHA)	< 4
Solidification Point (dry material)	40.85 °C min.
Total Carbonyls	< 5 wt ppm
2-Methylbenzofuran (2-MBF)	< 1 wt ppm
Sulfuric Acid Discoloration (SAD) test	96% min.
Iron	< 0.2 wt ppm