Introduction

Phenol (C₆H₅OH) is a white, crystalline mass. It has a distinctive sweet, tarry odor and a burning taste.

Application

The cumene oxidation route is the leading commercial process of synthetic phenol production, accounting for more than 95% of phenol produced in the world. The remaining 5% is manufactured with a toluene-benzoic acid process.

Cumene Process

A typical phenol plant can be divided into two main areas: a reaction area and a recovery area. In the reaction area, cumene is oxidized to produce cumene hydroperoxide (CHP). The cumene hydroperoxide is concentrated to about 80% and fed to a reactor in which the cumene peroxide is cleaved to phenol and acetone. The cleavage reaction is carried out in the presence of an acid catalyst (e.g., sulfuric acid). The by-products of the cleavage reactions, as well as the catalyst, must be neutralized and extracted to avoid corrosion problems downstream.

In the recovery area, the phenol and acetone products are recovered and purified by distillation. Alpha-methylstyrene (AMS) is also recovered in this section. The AMS may be hydrogenated back to cumene or retained as a product. The recovered cumene (hydrogenated AMS) is recycled as feedstock to the reaction area.

Instrumentation and installation

The K-Patents Process Refractometer measures in-line the concentration of CHP after the reactor and at the evaporation stage. The measurement from the refractometer ensures process safety and provides the basis for continuous process optimization.

Typical measurement range after the reactor is 10-50% at a temperature of 100 °C (212 °F). After
evaporation the concentration is about 90% at a temperature of 90 °C (194 °F).

The K-Patents refractometer is also installed at the top and bottom of the distillation towers to measure phenol and acetone concentrations.

The refractometer's output signal can be used as real-time feedback to adjust reflux and boil-up rates of the distillation tower for maximized efficiency.

Hazardous and intrinsic safety approvals are available when required.

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<th>Instrumentation</th>
<th>Description</th>
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<td>K-Patents Process Refractometer PR-43-GP is a general industrial refractometer for pipes and vessel installations. The PR-43-GP can be installed with 2, 3 and 4 inch flange and 3 inch Sandvik L coupling process connections and a variety of flow cells for pipe sizes of 1 inch and larger.</td>
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| User Interface         | Selectable multichannel MI, compact CI or a web-based WI user interface options allow the user to select the most preferred way to access and use the refractometer measurement and diagnostics data. |

| Measurement range      | Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 % by weight.                                                                 |