

## Design Project

Fall 2004

Acetone is typically produced in commercial quantities as a by-product during the formation of phenol. However, acetone manufactured thus generally contains small amounts of the reactant benzene and the desired product phenol. In the past, these impurities were deemed to be within allowable limits. However, recent downward revisions of these limits by the US Food and Drug Administration has made alternative processes (which do not involve benzene) more attractive. We wish to begin the design of one such alternative process to produce 10,000 metric tons of acetone per year with a purity of 99.9%.

As part I of the project, you need to gather information about the process for acetone production and develop a flow diagram. In particular, you need to do the following:

1. Describe the reactions that occur in the process where acetone is produced as a by-product during the formation of phenol from benzene (*process 1*).
2. Describe the reactions that occur in the process where isopropyl alcohol is used as a reactant (*process 2*).
3. At what conditions (e.g. pressure, temperature) do the reactions for process 2 occur? What conversions can be expected?
4. Utilize the Douglas Hierarchy and develop a flow diagram for process 2. Describe each step as well as the rationale for each alternative. Find out the cost prices of the reactants and the selling price of acetone and perform a preliminary economic analysis.