THE UTILIZATION OF NATURAL GAS FOR CHEMICAL PRODUCTS
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Abstract Prepared by the Author

Natural gas is the raw material of a large and rapidly growing synthetic organic chemical industry which is largely a development of the last decade. By efficient fractionation natural gas is separated into a "dry" portion containing methane, ethane and propane, and a "liquefied" portion containing propane, isobutane and butane. When necessary for subsequent manufacturing processes these components may be separated in a substantially pure state by further fractionation.

During the last decade chemists have found that the hydrocarbons composing natural gas are not as inert as was formerly thought, and that these hydrocarbons will react when activated by the effects of heat, pressure, chemical reagents and light; also that the reactions can be made to proceed at practicable speeds and to provide good yields of useful products with moderate operating conditions, especially if catalysts are employed.

At present there are four basic methods of converting natural gas hydrocarbons to other products. These are:

1. Decomposition: Splitting the hydrocarbon molecule into fragments by heat alone (pyrolysis), with the aid of catalysts, or by electric discharge, and generally including, especially in pyrolysis, the recombination of these fragments into new products. The most important primary products derived from this process are: hydrogen, acetylene, ethylene, propylene, butylene, isobutylene, butadiene, benzene, naphthalene, anthracene and carbon black. From these a host of products are made including several plastics and synthetic rubbers, solvents, high octane motor fuels, explosives and antifreeze.

2. Oxidation: Reaction of the hydrocarbon molecule with oxygen, air or oxygen-containing compounds activated by heat or catalysts, whereby oxygen is introduced into the hydrocarbon molecule, or the molecule is changed to carbon monoxide and hydrogen or finally to carbon dioxide and water. Important products of this reaction are alcohols (particularly methyl), formaldehyde, acetaldehyde, acetic acid, carbon monoxide and hydrogen. From these are obtained refrigerants, solvents, several types of phenolic plastics, medicinals, dyestuffs and motor fuels.

3. Halogenation: Reaction of the hydrocarbon molecule with a halogen, generally chlorine, activated by heat, light or catalysts whereby one or more halogen atoms are introduced into the hydrocarbon molecule by replacing an equivalent number of hydrogen atoms. Some important