

Abstract
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OPTIONS FOR REFINERY HYDROGEN
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The need for hydrogen in petroleum refineries worldwide is growing as demand increases for lighter and cleaner fuel products. This report describes developments affecting the refinery hydrogen balance in the United States, Western Europe, and the Asia-Pacific region, and the potential for future hydrogen deficits. We discuss the basic options available for increasing hydrogen availability. Hydrogen recovery processes to upgrade refinery offgas streams to 90%+ purity are almost always more economical than on-purpose hydrogen production. We provide a detailed review of commercial hydrogen recovery processes (pressure swing adsorption-PSA, membranes, and cryogenics), whose capacity is expected to increase dramatically.

Hydrogen is produced in refineries by hydrocarbon steam reforming and noncatalytic partial oxidation. The steam reforming process is the industry's most widely used technology and is expected to remain so at least through the 1990s. In this report, we describe the technology and economics of both processes. Costs are estimated for steam reforming using natural gas feedstock with flexibility to process propane and butane, and for noncatalytic partial oxidation using coker offgas feedstock. Results show the two processes are competitive-the optimal solution for refinery hydrogen depends on each refinery's unique configuration, feedstock availability, and local requirements.

We also discuss the sources and uses of refinery hydrogen, and provide a detailed listing of worldwide hydrogen producing (on-purpose and by-product) and consuming units in refineries. Announced new hydrogen capacity is also listed. This information will be useful for refiners, hydrogen suppliers, and petrochemical producers with excess hydrogen in identifying future needs and opportunities.

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