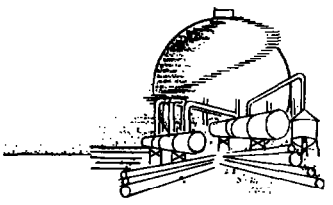

PROCESS ECONOMICS PROGRAM

SRI INTERNATIONAL
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Abstract

Process Economics Program Report No. 44A

AMMONIA

(July 1980)

Energy costs have always been the major element in the cost of ammonia, they have now become so overriding that natural gas rich countries may well be able to export to the industrial countries in quantities large enough to stifle new construction in these countries. Some present producers in fact are concerned that they may not be able to remain in the business.

The future of the ammonia industry in the high-energy-cost industrial countries is uncertain. Ammonia plant licensors, therefore, have redoubled their efforts to develop processes that use less energy. Of the several such processes that have resulted, an ICI process and a Kellogg process may be able to produce ammonia with an energy consumption as low as 23.4 million Btu per short ton of ammonia.

This study compares the ammonia-synthesis-loop operation in a Kellogg-type conventional-pressure (about 3000 psia) process with that in a Kellogg-type low-pressure (about 500 psia) process.

Kellogg has also developed a reforming process that is probably used in conjunction with the low-pressure ammonia synthesis process but it was not evaluated in this study.

The battery limits capital investment estimated for the ammonia synthesis loop in the low-pressure process is almost 55% greater than that for the loop in the conventional-pressure process. This is primarily because of the greater process complexity, which substantially increases field construction costs. If the capital investment in the synthesis gas section is assumed to be essentially unchanged, the impact of the increased investment in the synthesis loop is a 21% increase in the battery limits cost for the entire ammonia plant. However, a net reduction in investment requirements for reforming may result from the reduced need for high pressure steam.

Except for energy, every production cost element in the low-pressure process is greater than in the conventional-pressure process. However, with natural gas priced at $2.30/million Btu, the energy saving is enough to offset the disadvantage in other cost elements. We conclude that the low pressure process has good prospects for adoption in high-energy-cost regions.

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AMMONIA

SUPPLEMENT A

by KENNETH E. LUNDE

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For detailed marketing data and information, the reader is referred to one of the SRI programs specializing in marketing research. The CHEMICAL ECONOMICS HANDBOOK Program covers most major chemicals and chemical products produced in the United States and the WORLD PETROCHEMICALS Program covers major hydrocarbons and their derivatives on a worldwide basis. In addition, the SRI DIRECTORY OF CHEMICAL PRODUCERS services provide detailed lists of chemical producers by company, product, and plant for the United States and Western Europe.

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