Abstract

Process Economics Program Report 35E

ON-PURPOSE BUTADIENE PRODUCTION

(December 2012)

1,3-Butadiene is currently almost entirely produced as a by-product of ethylene steam cracking of naphtha or gas oil feedstocks. A switch to lighter feedstocks has reduced the amount of butadiene available from ethylene cracking and presented a foreseeable market demand for on-purpose butadiene. The small amount of butadiene produced during steam cracking of light feedstocks is not economically recoverable.

The demand for 1,3-butadiene continues to grow driven primarily by the development of demand in the emerging markets, especially for motor vehicle tires. As a result of the decreasing trend in supply and the growth trend in demand, the price of butadiene has risen significantly and been volatile. Today there is growing interest in producing butadiene from renewable resources. These conditions have renewed interest in on-purpose butadiene production.

In this PEP Report, we first extensively review proven or potential technologies for producing 1,3-butadiene, whether commercial or in the research or development stage such as processing renewable feedstocks. Emphasis is on developments since 1990 for n-butane and mixed butenes feedstocks.

The process economics are then developed in this PEP Report for producing 100,000 mt/year of 1,3-butadiene by two currently commercially successful processes: n-butane dehydrogenation and mixed butenes oxidative dehydrogenation. We also develop the process economics for our version of the American Process, a two-stage ethanol to butadiene process developed by Carbide and Carbon Chemicals Corporation in the 1940s. These three processes have demonstrated the most commercial success.

A private report by the

Process Economics Program

Report No. 35E

ON-PURPOSE BUTADIENE PRODUCTION

by Richard H. Nielsen

December 2012

Santa Clara, California 95054

IHS Chemical agrees to assign professionally qualified personnel to the preparation of the Process Economics Program's reports and will perform the work in conformance with generally accepted professional standards. No other warranties expressed or implied are made. Because the reports are of an advisory nature, neither IHS Chemical nor its employees will assume any liability for the special or consequential damages arising from the Client's use of the results contained in the reports. The Client agrees to indemnify, defend, and hold IHS Chemical, its officers, and employees harmless from any liability to any third party resulting directly or indirectly from the Client's use of the reports or other deliverables produced by IHS Chemical pursuant to this agreement.

For detailed marketing data and information, the reader is referred to one of the IHS Chemical programs specializing in marketing research. THE IHS CHEMICAL ECONOMICS HANDBOOK Program covers most major chemicals and chemical products produced throughout the world. In addition the IHS DIRECTORY OF CHEMICAL PRODUCERS services provide detailed lists of chemical producers by company, product, and plant for the United States, Europe, East Asia, China, India, South & Central America, the Middle East & Africa, Canada, and Mexico.

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Concluded)

FIGURES

FIGURES (Concluded)

TABLES

TABLES (Continued)

TABLES (Continued)

TABLES (Concluded)