Industrial Keynote Abstract

Hydrogen: Some Background on Uses and Multilevel Optimization of a Global Production Enterprise

Dr. Oliver J. Smith IV

Senior Engineering Associate
Global Operations Organization-HyCO Plant Process Engineering
Air Products and Chemicals, Inc

Hydrogen is the most abundant element in the universe but almost no free elemental hydrogen exists terrestrially. Though talk of a hydrogen economy has been around since the early 1950’s, currently its main domestic use is in the refining of petroleum and as a petrochemical feed stock. The demand in petroleum refining has risen dramatically in the last decade due to the decreased availability of light sweet crude feed stocks. To meet this increased demand the current most cost effective production technology is steam reforming of natural gas or other light hydrocarbon feeds. In this presentation an overview of hydrogen and Steam Methane Reforming (SMR) will first be given.

Air Products is the world’s largest merchant hydrogen supplier with a global fleet installed capacity of over 2 billion standard cubic feet per day of production from 30 world scale facilities servicing almost 200 customers. In areas of high customer concentration, many of these facilities are interconnected via pipelines. With yearly energy costs of over $US 1 billion, the optimal operation of each individual facility as well as each pipeline enterprise becomes very important. To make this a tractable problem, a multilevel optimization approach has been used. The most detailed level first looks at the optimal design and operation of equipment at each facility. The next level, with fewer details, considers the optimal operation of each plant. The final level, with the fewest details, considers the sourcing strategies for each pipeline enterprise. An overview of this approach with some real world examples will be given.