Chemicals from Acetylene: Back to the Future?

Between 1960 and 1970, when worldwide acetylene production peaked, it served as the primary feedstock for a wide variety of commodity and specialty chemicals. Advances in olefins technology, concerns about acetylene safety, but mostly loss of cost competitiveness, reduced and effectively limited the importance of acetylene.

Now, with the current rise in petroleum prices, acetylene is finding a new place in the chemical industry. Conventional steam cracker feedstocks, be it from crude oil or refinery products, has continued to increase in cost versus the feedstocks for acetylene production, natural gas and coal.

With the proven competitiveness of vinyl chloride from coal in China, other important acetylene derivatives will be re-examined for large scale production. Regions with low cost coal and natural gas will consider acetylene as a chemical feedstock and will re-examine the known and potential derivative chemicals that can be produced from acetylene. A new report from Nexant, Inc., entitled "Chemicals from Acetylene: Back to the Future?" analyzes the technologies and economics of producing acetylene and commercially proven and technically attractive acetylene derivatives. Major topics evaluated in the report include the following:

Nexant examined and describes the process routes for acetylene production and the derivatives of acetylene. Cost of production economics were developed on a regional basis that will enable an assessment of the export potential of the derivatives from low cost coal and natural gas regions.

For acetylene production, we reviewed and evaluated the processes and economics of the major commercial and developing technologies, including:

- Calcium carbide from coal
- Partial oxidation of natural gas
- Electric arc or plasma pyrolysis of coal
- As a byproduct of ethylene steam cracking

The commercially practiced acetylene derivatives that were investigated include:

- Acrylic acid
- Acrylonitrile
- BDO/THF
- Vinyl acetate
- VCM/PVC

Additionally, we looked at prospective acetylene-based products that are technically feasible and might be produced if acetylene can be produced cheaply enough:

- Ethylene (via acetylene hydrogenation)
- Benzene (via acetylene cyclotrimerization)

These prospective routes are straightforward processes that could very well be economically feasible and competitive under the right circumstances.

REPORT OVERVIEW

Subjects Addressed:

- Describe and evaluate the technology issues and developments around acetylene production and the production of chemicals from acetylene feedstock
- Develop economics for acetylene from natural gas and coal, as well as byproduct from ethylene production
- Develop regional cost of production economics for integrated complexes of acetylene through the various derivatives for the USGC and for resource rich regions of China and Eastern Europe (coal) and the Middle East
- Develop regional export competitiveness by comparing the delivered acetylene derivative costs from the low cost producing regions to the U.S. and Western Europe

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