



**ANNOUNCEMENT OF
SALE OR LICENSE**

**Synfuels Liquid Phase
Hydrogenation Technology**

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SYNFUELS ACETYLENE HYDROGENATION TECHNOLOGY

Synfuels International, Inc. of Dallas, Texas, USA, a developer of natural gas to ethylene and natural gas to liquid fuel technologies and catalyst systems (see: www.synfuels.com), is offering for sale or licensing, their proprietary technology, a liquid phase acetylene to ethylene hydrogenation and catalyst system. Technical and economic analysis of this technology indicates it to be superior to any competing technology. The continuous liquid phase conversion of acetylene to ethylene has been successfully demonstrated by Synfuels at their demonstration plant in Bryan, Texas. The technology has been proven in laboratory and Development Unit studies and is now ready for commercialization. In addition to the acetylene to ethylene conversion unit operation, Synfuels has successfully demonstrated the conversion of natural gas to liquid fuels in a continuously operating plant that incorporated natural gas to acetylene, acetylene to ethylene and ethylene to liquid fuels. The goal of the Synfuels Hydrogenation Technology was to develop safer acetylene to ethylene hydrogenation technology that had operating cost efficiencies and required lower capital investment compared with existing gas phase technologies. Synfuels Hydrogenation Technology has the potential to become the leading process for conversion of acetylene to ethylene and its derivatives.

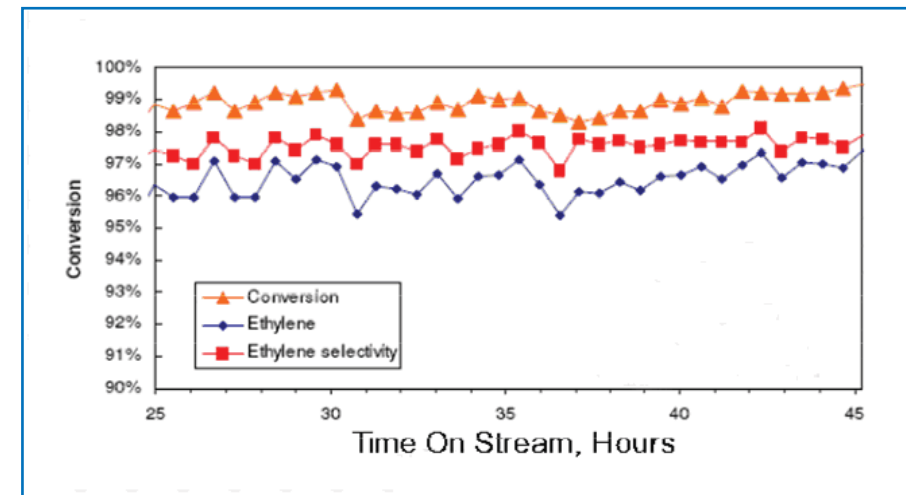
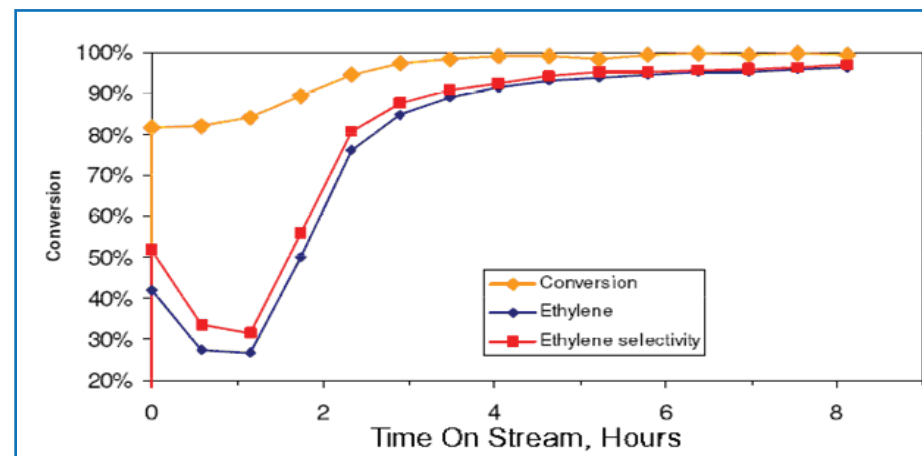
THE SYNFUELS APPROACH TO ETHYLENE FROM ACETYLENE: SAFER AND LOWER COSTS

Synfuels Hydrogenation Technology has many advantages and is based on a novel and efficient hydrogenation catalyst system and its use in a cost competitive and easy to operate liquid phase reactor. Acetylene is one of many products formed when hydrocarbon feedstocks are subjected to high temperature "cracking" environments (e.g. 500-3500F). Product streams from these processes generally contain low concentrations of acetylene (i.e. 0.25-0.95 wt. %). Higher concentrations can be achieved under certain cracking conditions. If desired, acetylene can be separated from the product mixture by a variety of techniques including extraction,

distillation and absorption. Most often acetylene is removed by catalytic hydrogenation to produce ethylene or ethane. A variety of processes and catalysts have been developed to accomplish this hydrogenation reaction. Most traditional technologies involve gas phase environments where process control, particularly with higher acetylene concentrations, can be inherently difficult. Scientific documentation of this hydrogenation chemistry is well known and is crowded with both old and new reports. Although gas phase applications are proven and currently in use, we believe that there is a viable market for this improved technology which results in a more efficient and easily controlled process.

Synfuels Hydrogenation Technology's uniqueness is derived from its novel catalyst system and its liquid phase nature. In this process acetylene is dissolved in a solvent and then converted to ethylene across a catalyst bed. Since the technology operates in a liquid phase, heat removal problems, associated with conventional gas phase processes, are easily controlled. Two uniquely different catalysts have been developed. Prolonged tests of both catalysts in laboratory operations gave excellent results related to conversion, yield and catalyst stability.

Scale-up catalyst testing at the Synfuels Demonstration Unit yielded excellent results. Because of its unique ease of control, high conversion, excellent selectivity and competitive cost, Synfuels is convinced that this technology should offer significant value to anyone looking at production of ethylene via hydrogenation of acetylene. The Synfuels Hydrogenation Technology has the following advantages compared to existing



acetylene to ethylene technologies:

- Extremely low probability of thermal runaway
- Highly selective conversion to ethylene (i.e. low ethane production)
- High acetylene to ethylene conversion
- Lower levels of unwanted side reactions such as polymer formation
- Inherently safer than gas phase systems
- Low capital costs due mainly due to operations at low hydrogenation pressure

The hydrogenation segment of Synfuels Technology involves dissolution of acetylene in a selected solvent followed by hydrogenation to ethylene. Hydrogenation of acetylene to ethylene is an extremely exothermic reaction and must be carefully controlled. Operation in liquid phase is one of the key advantages of Synfuels Hydrogenation Technology because it allows easy control of heat dissipation. This control is difficult in conventional gas phase processes.

The Synfuels Technology is unique, and patent applications are currently being processed to provide protection for this intellectual property. As indicated above, two catalyst systems have been developed. The lower cost version was chosen for scale up and development. Design of a generic commercial unit has commenced and FEL-2 has been completed. Mechanical flow diagrams have been finished and show the simplicity of the overall process. The process utilizes conventional equipment so scaling up from the Demonstration Unit

capacity to commercial throughputs should not be an issue. Unit operations involved include dissolution, stripping, and use of a trickle bed hydrogenation reactor, all of which are well understood in the Chemical Engineering world. As part of the FEL-2 project, the ISBL cost of a commercial scale unit has been developed and is available for review. When processing streams contain more than 1% acetylene, Synfuels Hydrogenation Technology will be significantly less expensive than the gas phase alternative.

COMPETITIVE TECHNOLOGY

A cursory investigation related to competitive processes for producing ethylene from acetylene shows that Pd based catalysts are most often the ones of choice. Suitable supports include alumina, silica and calcium carbonate. Various other catalyst promoters and enhancers (e.g. Ag, Pb, K, Ga, In, etc.) are also reported in the literature. Gas phase processes are most often reported. In these processes acetylene concentrations in the reactant stream are low (i.e. <0.95%). Literature descriptions of these processes often refer to the difficulty in controlling the reactions due to their extremely exothermic nature.

While gas phase hydrogenation technology works well at lower acetylene concentrations, there is virtually no alternative to Synfuels liquid phase technology for processing streams containing more than about 1.0% acetylene. Higher concentrations produce exotherms that cannot be practically controlled when operating in gas phase.

THE SYNFUELS ADVANTAGE

The Synfuels Hydrogenation Technology because of its inherent ease of process control, high conversion, excellent selectivity and economics, promises to become a key technology for the production of ethylene and downstream derivatives. Synfuels believes their Hydrogenation Technology will prove to be valuable to companies that wish to safely and efficiently convert acetylene to ethylene.