



Combined Reverse-Brayton Joule-Thompson Hydrogen Liquefaction Cycle

Gas Equipment Engineering Corporation
Milford, CT
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This presentation does not contain any proprietary or confidential information

Project ID # PDP46



Program Information

- ❖ US DOE Research and Development Grant - Hydrogen Production and Delivery
- ❖ Program Topic - Hydrogen Delivery
 - Subtopic – Hydrogen Liquefaction
- ❖ \$2.6 M for Pilot Plant Design, Fabrication, and Testing
- ❖ 23% Cost Share
- ❖ Projected Start Date June 1, 2005



Project Partners

Team Member

Gas Equipment Engineering
Corp.

R&D Dynamics
Bloomfield, CT

AMCS
Princeton, NJ

Responsibility

Project Management
Detailed Design
Liquefier Fabrication
System Testing

Turbo-Expander Design and
Fabrication

Cycle Modeling
Liquefier Control Program



Approach

- ❖ Use Twin Turboexpander-Compressors
- ❖ Build Small Scale Pilot Plant of 200 to 500 kg/day
 - Consistent with Small Service Station Size Application
- ❖ Scaleable to >50,000 kg/day Systems
- ❖ Emphasis on Capital and Operating Cost Minimization
- ❖ Power Requirement Target of 3.6 – 5.0 kWh/kg



Turbo-Expander Description

- ❖ single stage turbine and compressor mounted on the same shaft
- ❖ two foil gas journal bearings
- ❖ pair of foil gas thrust bearings
- ❖ labyrinth turbine inlet seal
- ❖ insulator plate between cryogenic turbine and ambient temperature compressor



