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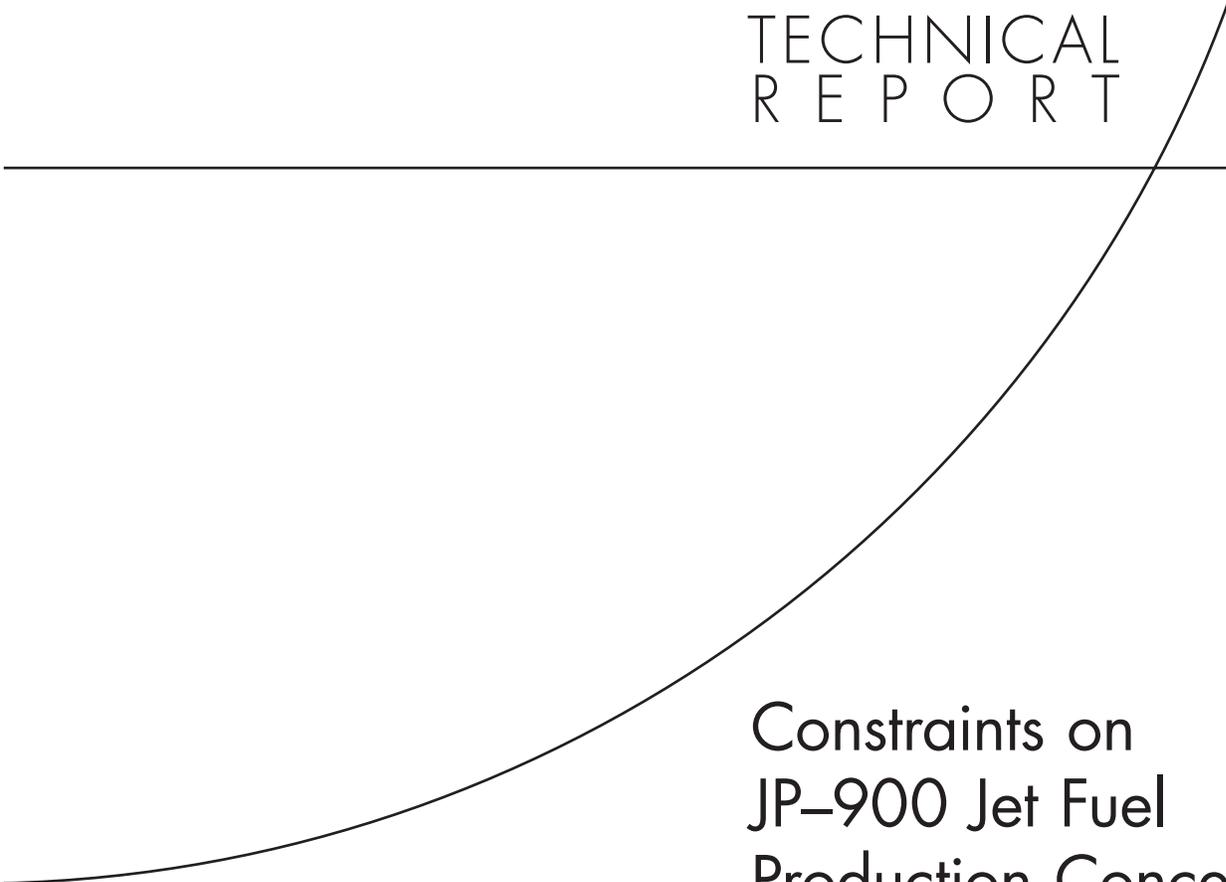
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TECHNICAL
R E P O R T



Constraints on
JP-900 Jet Fuel
Production Concepts

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Prepared for the United States Air Force

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Summary

Researchers at the Energy Institute of Pennsylvania State University (Penn State) are conducting research on producing jet fuel by coprocessing coal or coal-derived products with low-value liquid intermediates produced during petroleum refining. To date, most of this research effort has focused on a coal-tar blending process. Penn State currently plans to build a one-barrel-per-day pilot plant and produce 100 barrels of product to be delivered to and tested by the Air Force Research Laboratory.

Recognizing the limited availability of the coal-tar derived liquids used in the coal-tar blending process, the Penn State research team has recently shifted its attention to a co-coking process, in which a mixture of solid coal and a refinery intermediate, decant oil, is used to produce a combination of liquid fuels and coke.

The findings and recommendations of the RAND Corporation review of these two processes are as follows:

Finding 1

Our review of Penn State's work on JP-900 revealed a research team with considerable expertise in coal pyrolysis. Coal pyrolysis as a means of producing liquid fuels was studied extensively during the first half of the 20th century, but few research teams today have the expertise to address how pyrolysis might be exploited and combined with other liquid-fuel production approaches, including coal and biomass liquefaction via Fischer-Tropsch synthesis, and with other biomass routes to liquid-fuel production. (See pp. 8–9.)

Recommendation

Consider supporting laboratory research and engineering analyses focusing on identifying possible opportunities by which pyrolysis can significantly improve the energy efficiency and costs of producing liquid fuels from coal and/or biomass.

Finding 2

The limited availability of coal tar seriously impedes the ultimate production potential of the Penn State coal-tar blending process. At most, successful development would produce only a

few thousand barrels per day of jet fuel. The net displacement of imported oil would be even smaller (pp. 3–4).

Recommendation

Cease all research directed toward developing this process, and cease testing fuels produced from this process. This includes terminating the planned pilot-scale operations at the Harmarville, Pennsylvania research site (p. 8).

Finding 3

For the Penn State co-coking process, the limited availability of decant oil and the limited markets and high quality specifications for premium coke will limit liquid-fuel production to less than 140,000 barrels per day, only a portion of which would likely be suitable for use as a jet fuel. Less than 8,000 barrels per day of this production would be attributed to coal. The net increase in U.S. coal production due to developing the co-coking process would be negligible, about 2 million tons per year, and this estimate assumes that process economics are favorable and that one-half of U.S. decant oil production can be diverted to co-coking (pp. 5–7).

Recommendation

Cease all research directed toward developing (including product testing) any co-coking process concept that depends on large amounts of decant oil for the production of jet fuel. If work is to continue on co-coking, it should be limited to fundamental research investigating the feasibility of co-coking concepts that use feedstocks that are at least an order of magnitude more abundant than decant oil and produce higher liquid and lower coke yields.