2.0 OBJECTIVE

The goal of Task 4 is to design the reactor and wax withdrawal portions of a Bench-Scale Fischer-Tropsch Reactor (BFTR) and to estimate the cost of the total system. Reactor diameter should be minimized to reduce the consumption of synthesis gas, which would otherwise be the major BFTR operating cost element.

Specific criteria influencing design of the BFTR are:

- selection of catalyst
- measurement of catalyst activity and yields in a meaningful hydrodynamic regime with the 5-inch effective diameter reactor
- measurement of the catalyst deactivation rate
- selectivity of the catalyst
- generation of accurate material balances at constant operating conditions over several months
- evaluation of the viability of different wax withdrawal systems
- production of moderately large quantities of distillate and catalyst-free wax for product evaluation tests
- accommodation of more active catalysts than those currently available
- measurement of hydrodynamic parameters such as gas holdup, and bubble diameters.
- operation part of the time at 4-inch effective diameter to conserve synthesis gas and test the hydrodynamic effects

The size of the reaction system is set by the requirements that the reactor operate in the churn-turbulent hydrodynamic flow regime, as commercial reactors will, and that reasonable synthesis gas conversion levels of 40-50% be achieved in a single-pass.

The large volume of synthesis gas which will be consumed during the BFTR's life dictates that the system be sited at Air Products' LaPorte, Texas plant, where relatively cheap syngas is available. At LaPorte, the BFTR could also utilize ancillary equipment provided for the Liquid Phase Methanol reactor system, such as the gas metering train, product storage tanks, and plant utilities.