

**SEATTLE CHEMICAL INDUSTRIES
ENGINEERING DEVELOPMENT LABORATORY
SEATTLE, WASHINGTON 98195**

TO: Team C

FROM: Engineering Management

SUBJECT: Evaluation of Friction Losses in Pipe and Fittings

The Ethylene Oxide Production Facility must frequently estimate pumping requirements for the flow systems they have designed. The process engineers have asked us to determine whether the generalized friction loss information in the literature is adequate for the specific pipe and tubing they typically use. For this purpose, we have had a flow loop constructed in our laboratory with pressure taps installed on each branch. We have three different diameters of rough pipe and have matched one of those in smooth tubing. In addition, we have a station in which various fittings or control valves may be installed for evaluation.

We would like you to establish a friction factor - Reynolds number relationship that can be used for design purposes. Please also evaluate the losses to be expected in typical fittings. Try to be as general as you can and cover the widest Reynolds number range possible with this equipment. Please include an error analysis and discussion of sources of error in the measurements and design. We are particularly interested in a thorough analysis of the control valve.