UNITED STATES GOVERNMENT

# *Memorandum*



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TO : Files

Denver, Colorado
DATE: September 18, 1968

FROM : H. T. Falvey

SUBJECT: Minutes of meeting to discuss friction reducing polymers with Mr. Lipstein, Fluids Unit, General Electric Company, Schenectady, New York - September 12, 1968

The meeting was called to order by Harold M. Martin, Chief, Hydraulics Branch. In attendance were:

L. O. Timblin, Chief, Chemical Engineering Branch
G. H. Johnson, Hydraulic Machinery
Dr. J. J. Cassidy, Professor at University of Missouri, Ford Residency Program
Dr. H. T. Falvey, Hydraulics Branch

and the following members of the Open and Closed Conduit Systems Committee:

G. N. Thorsky, Chairman, Canals Branch
C. E. Selander, Chemical Engineering Branch
H. J. Warren, Canals Branch
J. V. Walker, Irrigations Operations Division

Mr. Lipstein began by discussing the use of friction-reducing polymers in reducing drag on torpedoes. The major obstacle which had to be overcome in this application was dissolving the dry polymer in such a manner that a gummy substance would not form.

He then discussed the possible use of polymers in pump-storage units and their use to increase the peak capacity of storm sewers during floods.

The pump storage application elicited considerable discussion. Timblin voiced the fear that if the polymers are nutrients for the algae, the algae could pollute the storage basins. This would restrict the application of polymers to single-purpose pump-storage basins.

Extrapolating data from 2-inch pipes up to 10 to 20-foot-diameter conduits was questioned, since the friction reducing properties of the polymers seem to decrease as pipe diameter increases. The magnitude of the benefits derived by reducing friction in the pump-turbine unit was also questioned, since the total friction loss is a small percentage of the total loss through the unit, the total loss through the unit normally being about 5 percent.

Mr. Lipstein indicated the polymers would have to be used in concentrations between 20 and 100 ppm. He knew of no flocculation

studies with these concentrations. In addition, no data had been gathered to predict ultraviolet and shear degradation of the polymer with time. The polymers in solution are nontoxic, although they had been mixed with toxic materials in the past.

The group felt that one possible area of application would be in flash evaporators in desalting plants. Mr. Lipstein reported findings with closed circulation cooling which indicate a decrease in the heat transfer coefficient in proportion to the decrease in friction coefficient. However, when boiling occurs, the heat transfer coefficient is increased. He had no data that would be useful to us with respect to flash evaporation.

The discussions generated several questions for which Mr. Lipstein will send us the available data. These questions included friction reduction versus pipe diameter for various polymer concentrations; polymer degradation due to radiation; nutrient value of the polymers to algae growth; molecular structure of the polymer chains; results of the storm sewer tests in Cleveland.

From the discussions, the polymers were found to reduce friction in small-diameter pipes and could act as soil sealants. In 20- to 100-ppm concentrations, the polymers did not change the viscosity of the fluid. One negative aspect of the polymer chains is their tendency to curl up and precipitate out of solution in the presence of salts. At the present time, polymers are uneconomical for other than one shot or peak flow conditions.

Two areas which seemed to merit additional study are the effects of the polymers on oxygenation of water and on cavitation potential.

The group concluded that although experiments with polymers in small-diameter pipes show promise as friction-reducing agents, positive answers must be obtained to a series of engineering, economic, and ecologic questions before the polymers can be tried in pump-storage or M&I waters.

Henry T. Falvey

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