

# OFFICE MEMORANDUM



MICHIGAN  
STATE HIGHWAY DEPARTMENT  
JOHN C. MACKIE, COMMISSIONER

September 4, 1963  
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To: E. A. Finney, Director  
Research Laboratory Division

From: D. F. Simmons

Subject: Hydraulic Oil for use in the Houghton-Hancock Bridge, Research Project R-62 G-120. Research Report No. R-436.

In response to a request last Fall from Mr. William S. Olney, Office of Maintenance, through Mr. R. L. Greenman, the Research Laboratory Division undertook a study of oils used in hydraulic mechanisms of the Houghton-Hancock bridge (B01 of 31012). The request resulted from unsatisfactory performance of oil being used during cold weather. The object of the study was to determine the most suitable hydraulic oil for use in these mechanisms. It was desirable that the oil have properties ensuring that the mechanisms would work efficiently at temperatures from 100F to -40F. Mr. Olney stated that hydraulic systems manufactured by the Parker-Hannefin Corp. control the barrier operation, lift-span seats, and lock mechanisms on the bridge. The system requires 157 gal of hydraulic oil and operates at pressures of 1300 to 1600 psi.

Three oil companies - Texaco, Sinclair, and Gulf - were contacted for samples and technical data regarding suitable hydraulic oils to meet the desired requirements. Texaco was the only company interested in furnishing the requested information; Mr. W. W. Shuttleworth of the Texaco Oil Company's Chicago office, replied on November 27 recommending the use of Texaco Aircraft Oil AA. This particular oil was recommended because it not only has a reasonable viscosity at minus 40F, but it is oxidation inhibited and contains an anti-wear additive. Texaco Aircraft Hydraulic Oil is qualified under Military Specification Mil-H-5606A, Amendment 1. A copy of this specification was forwarded and could easily be adapted for use as a Departmental specification if deemed necessary.

In the meantime, Texaco Aircraft Hydraulic Oil A was put into the system (October, 1962), and apparently has been functioning satisfactorily since that time. Comparative data on the hydraulic oil presently in use and the recommended oil are as follows:

Oil	Pour Point, Degrees F	Viscosity, SUS		
		210 F	100 F	-40 F
Aircraft Hydraulic Oil AA	-75	42.9	74.0	1,500
Aircraft Hydraulic Oil A	-60	40.0	92.4	10,000

It is generally accepted that the viscosity of hydraulic oil in service should never exceed 4000 SUS and never be lower than 45 SUS within the temperature limits of its use. Also, it is generally agreed that an oxidation inhibitor and an anti-wear additive would be desirable, particularly in this type of use <sup>(1)</sup>. In addition, oil companies generally agree that the best specification for an oil in any hydraulic system should meet the recommendations of the manufacturer of that equipment. The recommendation of the Parker-Hannefin Co., manufacturers of this hydraulic equipment, is to use any good quality, petroleum-base hydraulic oil that will perform satisfactorily in the temperature range of 150F to -50F.

Mr. Olney was contacted by telephone about March 15, 1963, regarding to this study. He advised that there had been no apparent troubles this past winter with Texaco Hydraulic Oil A, with which the system had been charged in October 1962. Because of this satisfactory service and the limited amount of oil involved, it was his opinion that no further study was necessary at this time.

#### Summary

Latest developments seem to make it unnecessary to prepare a Department specification for oil on this one bridge. However, from technical data and material available on the subject, it appears that a type of oil similar to Texaco Aircraft Oil AA and meeting Mil-H-5606A, Amendment 1, would probably give even better service than the Texaco Aircraft Oil A used during the winter of 1962-63.

We concur, however, with Mr. Olney's belief that there is no need of changing to another oil as long as current oil is providing satisfactory service.

OFFICE OF TESTING AND RESEARCH



D. F. Simmons, Chemical Research Engineer  
Research Laboratory Division

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1. "Industrial Hydraulic Oils," Lubrication, Vol. 42, No. 7 (July 1956), p. 89-106.