

FROM (NAME & LOCATION) J. H. Davidson - B2S J

DATE

November 12, 1971

CC

H. S. Bergen - B2S A
 T. L. Gossage - B2S L
 N. T. Johnson - B2S J
 C. L. Bradford - B2S G

SUBJECT

REFERENCE

TO

R. S. Bevacqua 1550
 C. Boutin 1800
 J. G. Bryant 1650
 A. B. Capps III 1070
 R. J. Christman 1070
 C. L. Clay 1070
 P. D. Craska 1940
 G. F. Fague 1320
 H. R. Ford 1070
 J. G. Frederiksen 1460
 R. A. Garcia 1010
 P. G. Haislmaier 1410
 D. R. Hansen 1800
 L. T. Johnson 1650
 J. Kriss 5120
 D. H. Lewis 1180
 J. S. Pullman 1650
 A. J. Rego 1210
 D. Goodwillie 5080
 T. Ishijima 5260

H. J. Richardson 1410
 C. F. Seger 1010
 L. C. Shelton 1820
 P. L. Slayton 1650
 D. W. Stegen 1460
 R. V. Weyland 1180
 P. D. Fowlkes W4A
 J. F. Herber T3G
 G. G. Kosup B2S K
 F. H. Langenfeld B2S G
 C. Paton B2S H
 W. R. Richard T3A
 J. R. Savage B2N B
 D. F. Smith B2N G
 L. R. Stark W4A
 J. D. Sullivan T3G
 R. L. Wagner 1760
 J. N. Haggart 5040
 P. J. A. Marsh 5040
 E. M. Potter B2N K
 J. V. Morse 1920

At the Specialty Products General Sales Meeting last spring we talked briefly of a new family of phosphate esters which was in the process of development. Since that time, we have produced the first commercial quantities of the basic ester and are ready to go to market with a full line of phosphate ester fluids. These products are known as the Pydraul "E" series fluids and have a number of advantages over competitive phosphate ester hydraulic fluids. The addition of a family of "straight" or 100% phosphate ester fluids gives us the most complete line of fire resistant hydraulic fluids marketed by any company in the world.

The Pydraul "E" series consists of four products covering the complete range of viscosities used by industry: Pydraul 30 E, Pydraul 50 E, Pydraul 65 E and Pydraul 115 E. The number of each product represents the 100°F. viscosity in centistokes and the E stands for ester.

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These products correspond approximately to 150 SSU, 220 SSU, 300 SSU and 550 SSU. The product numbers are denoted in centistokes rather than Saybolt Seconds Universal (SSU) to avoid confusion with our present Pydraul products.

The Pydraul "E" series fluids have application in three major areas; the industrial market (hydraulics and air compressors), the turbine market (control system fluid and bearing lubricant) and the military market (hydraulic systems aboard ships).

Industrial Market

In the industrial market our primary targets initially will be those accounts we have been unable to sell due to their preference for a "straight" phosphate ester fluid. Some of these accounts have specifications requiring a 100% phosphate ester fluid, some have had odor or seal problems (due to chlorine content) with our present Pydraul fluids and others have a lack of confidence in the fire resistance and/or quality of our low cost Selector 2 Pydraul fluids. The following accounts have been designated specific targets due to their large potential and our knowledge of their requirements:

<u>Account</u>	<u>Potential (ooo's Pounds)</u>
Alcoa	400
U. S. Steel	500
Chevy Tonawanda	400
Chevy Toledo	300
Columbia Gulf	200
Union Carbide	150
Du Pont	100

The appropriate salesman for each of these accounts should immediately begin laying the groundwork for our products. Every salesman should seek out opportunities for the Pydraul "E" series fluids since there are many more potential customers than those listed above.

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Turbine Market

Two distinct market potentials exist for our all phosphate ester fluids in the turbine area--first, as a hydraulic fluid in the electrohydraulic control systems of steam and gas turbines and second, as a bearing lubricant for gas and steam turbines. Our main target and the major OEM is General Electric in both cases. Approval of Pydraul 30 E and 50 E for use in electrohydraulic control systems of General Electric turbines is expected by the end of 1971. Specific accounts will then be identified and your efforts should start to convert them from Fyrquel or Houghtosafe to Pydraul E series.

Approval must be obtained from the OEM for use of fire resistant lubricants in his turbine and compressor bearings. We are working with General Electric, Westinghouse and others and will inform you of our progress from time to time.

Fantastic growth is forecast for the gas and steam turbine market--for electrical generation, for gas transmission, for rotary drives, for ship propulsion, etc. We see the turbine bearing lubricant area as a major opportunity for long range expansion of our phosphate ester market.

Military Market

The U.S. Navy purchases significant amounts of straight phosphate ester fluids under specification MIL-H-19457 B for use in aircraft carrier deck edge elevators and other hydraulic systems. Qualification under this specification requires samples from a full scale production run and we are applying for such qualification. This will first, allow us to bid on the military procurements (low price but good volume) and, second, and most important, will give us entry to certain OEMs, such as Westinghouse, who demand MIL-H-19457 listing as part of their technical approval procedures. This program will be handled by the Product Group together with our Washington Representative.

Pydraul "E" Series versus Competitive Phosphate Esters

The primary suppliers of 100% phosphate ester fluids are Stauffer Chemical Company (Fyrquel) and E. F. Houghton Company (Houghtosafe). With the Pydraul "E" series, Monsanto is in a far better position to insure a continuing supply of phosphate esters to industrial users when compared with competition. Stauffer produces the Fyrquel series fluids with raw materials [cresols (cresylic acid) and xylenols/ derived from coal tar acids and petroleum refining by-products. This is a distinct disadvantage from two standpoints: (1) cresylic acid products have been in short supply for a number of years with no improvement in sight and (2) cresylic acid based materials are

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coming under considerable fire from various government agencies on toxicity. Some of you may be familiar with the long history on the toxicity of phosphate esters made from ortho cresol--now all phosphate esters made from all cresols and cresyl acids are under scrutiny. With regard to Houghtosafe, E.F. Houghton does not produce phosphate esters but buys them from FMC Corporation. Because of this, they are at the mercy of FMC with regard to the quality and quantity of phosphate esters they can sell. In contrast to Stauffer and FMC, Monsanto phosphate esters are not based on cresylic acids. Our raw materials are synthesized products made from readily available, large commercial volume organic and inorganic chemicals. Unlike Houghton, we are not at the mercy of another company with regard to the price, quality and quantity of our end product.

A major selling advantage for the Pydraul "E" series products is their increased thermal and oxidative stability compared to Fyrquel and Houghtosafe. Thermal stability tests on the various products show the Pydraul "E" series has a noticeable advantage over the Fyrquel fluids and is far superior to the Houghtosafe products. The following shows viscosity increases for comparable viscosity grades (220-230 SSU) at various test temperatures. The percent viscosity increase indicates the extent to which a fluid degrades and polymerizes (to form higher viscosity products) under thermal stress conditions. Tests are conducted for 168 hours with an air flow of 5 litres per hour through the fluid.

% Viscosity Increase

<u>Test Temp.</u>	<u>Pydraul 50 E</u>	<u>Fyrquel 220</u>	<u>Houghtosafe 1120</u>
250°F.	6.9	3.4	51
325°F.	14.0	69.0	Solid Tar
350°F.	17.6	Solid Tar	Solid Tar

While we recognize that hydraulic system temperatures do not reach 250 - 350°F., fluid degradation does take place at lower temperatures. Tests such as the above are accelerated tests and indicate what will happen to fluids over longer periods of time at lower temperatures.

With regard to other important properties for hydraulic fluids such as lubricity, fire resistance, viscosity characteristics, corrosion inhibition, elastomer compatibility, etc., the Pydraul "E" series fluids are equal in all respects to competitive esters. Details of all significant tests are contained in the attached brochures. Additional data will be passed along as fast as it becomes available.

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Pricing

Since we want to begin selling the Pydraul "E" series fluids immediately for industrial hydraulic applications, air compressors and electrohydraulic control systems on turbines, the pricing structure will be competitive on all quantities from T/L drums down to 1 - 4 drum quantities. There may be a few cents per gallon variation among Monsanto, Stauffer and Houghton prices at certain order levels but the overall price level for competitive phosphate esters will remain the same. A price sheet will be issued as soon as possible, but drum pricing for the Pydraul "E" series fluids is as follows:

Dollars/Gallon	Pydraul 30 E	Pydraul 50 E	Pydraul 65 E	Pydraul 115 E
T/L Drums	\$3.65	\$3.65	\$3.65	\$3.95
10 - T/L Drums	\$3.75	\$3.75	\$3.75	\$4.05
5 - 9 Drums	\$3.80	\$3.80	\$3.80	\$4.10
1 - 4 Drums	\$3.85	\$3.85	\$3.85	\$4.15
5 Gallon Cans	\$4.10	\$4.10	\$4.10	\$4.40

There will be no list price for bulk quantities of any of our phosphate esters. All bulk prices will be by quote from the product group taking all pertinent factors such as T/C or T/T, freight rates to customer, competitive situation, etc. into consideration.

Budget

Our 1972 budget for the Pydraul "E" fluids is 200 M pounds (approximately 20 M gallons). Our budget for the years 1973 - 1976 increases at a rapid rate and we should establish a good base in 1972 if we expect to meet our goals in the years following. Our raw material costs are very volume sensitive, especially at the lower levels and we must steadily increase volume to get our gross profit to an acceptable level. Obviously even low volume customers will help us toward our 1972 budget and to a higher gross profit level. We again stress the need to meet our goals with this excellent new line of products.

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Long Term Growth

Our long term expectations for the Pydraul "E" series products are high in both industrial hydraulic, compressor and turbine applications. Without question, combined turbine control and bearing systems present the largest long term potential and we foresee volume usage by the mid and late 70's. It is important that this new product line get off to a flying start and the industrial hydraulic, compressor and turbine control applications must carry this burden. We ask for your best efforts in accomplishing this important objective.

We will have an opportunity to talk in depth about these new fluids at the next sales meeting. In the meantime, we hope you will write or call with questions regarding your customers specific applications and we will do our best to answer them. Good Hunting!

J. H. Davidson

R. E. Hatton

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