

RESEARCH AND TECHNOLOGY INSTITUTE OF OIL DRILLING EQUIPMENT OF RUSSIA

I. ANALYSIS OF MILITEC-1 TEST RESULTS / II. CONCLUSIONS AND RECOMMENDATIONS / III. METHODOLOGY

I. ANALYSIS OF MILITEC-1 TEST RESULTS

A. 1. Addition of Militec-1 to the initial stiff greases influenced friction characteristics differently depending on the grease. For instance, addition of Militec-1 to Dolotol AU led to the reduction of friction by a factor of 2-4.7 times at a pressure of 1000 kg. and of 1.38-1.54 times at a pressure of 2000-4000 kg. When measuring the load carrying ability of sliding friction pairs, Militec-1 provided an increase of 1.2-1.4 times.

2. When using Militec-1 with the stiff grease Litol-24, friction was reduced by a factor of 1.8-2.6 times at a pressure of 1000 kg. and by a factor of 1.2-1.5 times at a pressure of 2000-4000 kg. When measuring the load-carrying ability of sliding friction pairs, Militec-1 provided an increase of 1.74-1.92 times.

B. The addition of Militec-1 to the initial stiff grease caused a significant change in friction when the pressure was at 1000 kg. When more pressure was applied (2000-4000 kg.) the reduction in friction was less. We can conclude that in an industrial application, it is reasonable to add Militec-1 to the initial stiff grease and apply a film to contacting surfaces at room temperature. Using the pure additive Militec-1 in sliding friction junctions was ineffective.

C. In a comparison of the tribological characteristics between the best stiff grease and the base stiff grease, analysis of the data shows that Dolotol AU and Litol-24 may be considered to be the best stiff greases for sliding friction junctions with heavy load. These greases were modified with Militec-1 and that reduced the friction in sliding friction pairs by a factor of 1.6-4.5 times.

D. Analysis of the tests of Dolotol AU and Litol-24 with Militec-1 in rolling friction pairs shows that using Militec-1 does not worsen the contact of rolling bearings.

II. CONCLUSIONS AND RECOMMENDATIONS

A. Use of Militec-1 as an additive to Dolotol AU and Litol-24 in sliding friction junctions with heavy load was highly effective.

B. Experimental data show that at the zones with specific loads up to 20 MPa, addition of Militec-1 will allow an increase in load from 1.5 to 4.5 times depending on the initial stiff grease, a reduction of sliding friction and correspondingly of temperature on the contacting surfaces.

C. At the zones of high specific pressures of 20-80 MPa the reduction of friction was by a factor of 1.2-1.55 times for Dolotol AU and Litol-24.

D. The seizure point in load tests for Dolotol AU and Litol-24 with Militec-1 added showed an increase correspondingly of 1.4 and 1.9 times in comparison with the initial stiff grease.

E. In determining the most rational application policy for the use of Militec-1 use with stiff grease in friction junctions, it was found that when the stiff grease Dolotol AU is used, the addition of Militec-1 into the grease is effective. For Litol-24 the best results were achieved with by first applying Militec-1 to surfaces at room temperature and subsequently adding Militec-1 to the initial stiff grease.

F. The tribological characteristics of stiff grease EP-2 showed less positive results compared to the very positive results applying Militec-1 to the stiff greases Dolotol AU and Litol-24.

G. Adding Militec-1 to Dolotol AU and Litol-24 had no negative effect of the work of the materials in rolling bearings.

H. It is reasonable to use Militec-1 with stiff greases Dolotol AU and Litol-24 in friction junctions with heavy load when specific loads are up to 70 MPa and slip velocity is up to 0.3 m/s. Militec-1 should be added directly into the grease at a ration of 12% by weight.

I. It is recommended that Dolotol AU undergo comparative industrial tests with Militec-1 in chisels of the AU series.

J. Additional tests should be done to determine spheres of rational use of Militec-1 and its weight content including at high slip velocities up to 1.5 m/s. If the results are positive, the use of Militec-1 in chisels of the NU.N and V series will be significantly extended.

III. METHODOLOGY

1. Add 12% Militec-1 to the stiff grease.
2. Work about 20 minutes with a small load (close to 0 kg.).
3. Move up over a 5-minute period to a total load of 1000 kg.
4. Work about 20 minutes at a total load of 1000 kg.
5. Move up over a 5-minute period to a total load of 2000 kg.
6. Work about 20 minutes at a total load of 2000 kg.
7. Move up.....(steps continue as above until maximum load used in testing)
8. When measuring the load carrying ability of friction pairs, load was applied until seizure occurred.

These methodologies are standard for oil drilling equipment in Russia.

Dolotol AU is a stiff chisel (drill bit) lubricant for oil drilling equipment.

Litol-24 is the most popular stiff grease for industry in general.

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