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Surveys of Foreign Scientific and Technical Literature

CURRENT INFORMATION ON LUBRICATION AND FUEL TECHNOLOGY

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FOREWORD

Part I of this report is an analytical investigation of certain specific topics which are of special interest to the sponsors of Work Assignment No. 28. Part II is a compilation of abstracts which pertain to specific subjects in Part I.

Full translations of some of the source materials used in this report may be available from other agencies or commercially. Interested readers may obtain translation data for individual sources by using the form attached at the end of this report.

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PART I. ANALYSIS OF DATA

This report is an analytical survey of several Soviet articles or collections of articles on fuels and lubricants, which are of interest because of some special points mentioned in them. First, the general information presented in the articles is outlined briefly; second, points of special interest in these articles are discussed. The sources in this report include two collections of abstracts. As the articles in these collections are concerned with very specific problems, it was deemed expedient to make indicative abstracts of these studies; however, some informative abstracts were prepared for the articles which seemed to be of importance with regard to some pertinent problems, mainly in the field of friction studies.

Fuel Problems

The first two articles discussed in this report are devoted to fuel problems. The problem of improving the performance characteristics of jet fuels by using additives has been studied for a long time. This method of improving the properties of fuels is simple and inexpensive; however, sometimes more is exptected from the additives than they can produce, because the mechanism of their action is not known, at least not completely.

In the study discussed below the authors attempted to evaluate the effect of antioxidant additives to jet fuels using the four most known additives as examples. An investigation was made of the type of action of the most frequently used jet-fuel antioxidants. The effect was studied on TS-1 and a deeply hydrogenated sulfur-free fuel to which known amounts of definite sulfur compounds, active or inactive, were added. It was found that some additives inhibit the primary stage of oxidation, but do not prevent the corrosion of copper metals and the oxidative condensation of the primary oxidation products. Some antioxidants do not inhibit the primary oxidation stage, i.e., the formation of soluble resins, but successfully inhibit their condensation and corrosion of copper metals by active sulfur.

The source and properties of the low-aromatic fuel used for comparison are not given except for a few remarks: the boiling range is that of T-fuels; hydrogenation is deep;

content of aromatics is 3—4%. It seems that this fuel was used as a sulfur-free medium to study the effect of definite sulfur compounds, active or inactive, added in known amounts. Thus, the effect of each sulfur compound could be studied separately.

Apparently, the low aromaticity of this fuel was another factor to be accounted for in the evaluation of the effect of the antioxidants, as it is known that polycyclic aromatics form sediment.* Only one series of experiments, namely the inhibiting effect of ionol on sediment formation and bronze corrosion, was tabulated with this fuel. It is stated that the FOA-2 and aliphatic tertiary amine C_{21} (DuPont) additives prevented the formation of sediment (nearly) and corrosion of bronze "in these fuels", i.e., presumably TS-1 and hydrogenate (+ added sulfur compounds), which differ in the content of aromatics but gave similar results on the formation of sediments [1, p 55].

The authors do not give any preference for any type of antioxidant. The findings are that some antioxidants, e.g., ionol or p-hydroxydiphenylamine inhibit the formation of the primary oxidation products (soluble resins), but do not prevent copper metal corrosion and sediment formation, if mercaptans are present. The authors warn against the ineffectiveness of ionol and other antioxidants of similar type of action in fuels with active sulfur used in systems with parts from copper or copper alloys.

DuPont's FOA-2, defined as a copolymer of the methacrylates of 2-(diethylamine)ethanol and laurinol, or a tertiary aliphatic amine C_{21} (ESSO) permits the formation of soluble resins but inhibits their oxidative condensation and corrosion of copper alloys. The authors note that it is not expedient to evaluate the effectiveness of antioxidant additives by the amount of soluble resins obtained after heating the fuel. The preference may be concluded from the above data for each special case. The description of the effect of the additives studied seems to be consistent in itself and no grammatical or syntactical inconsistencies were found in the original, in the discussion of the results or in the authors' summary [1].

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* Bushuyeva, Ye. M., and I. Ye. Bespolov. Effect of the structure of aromatic hydrocarbons on the thermal stability of jet fuels. Khimiya i tekhnologiya topliv i masel, no. 1, 1966, 45-48.

Another problem of interest concerning the improvement of fuels is the reforming of a gasoline (actually the 71—102°C fraction of the Karadag gasoline) in a fluidized bed on a rhenium-palladium-alumina catalyst. It is rather remarkable that, according to the original, this catalyst is to be treated with hydrogen sulfide prior to its use. Ordinarily, H_2S is considered to be a poison for catalysts, especially those containing platinum group metals.

An investigation of the pertinent literature revealed that the H_2S treatment is definitely performed on this catalyst to improve its efficiency. The above-mentioned reforming increased by five times the content of aromatic hydrocarbons in the fraction treated. It was also noted that the stability of the catalyst was four times higher in the fluidized bed as compared with the stationary layer.

The investigation indicated that the palladium-rhenium-alumina catalyst definitely is to be treated with hydrogen sulfide. Reference to this subject goes back to 1954. Sulfur compounds present in the crude Il'sk-Khadyzhenskaya gasoline did not inactivate such hydrogen sulfide treated catalyst under the conditions selected*; this is considered as an additional advantage of the catalyst. Another paper states that batches of the catalyst were treated with hydrogen sulfide**, while a third paper reports that the catalyst is to be treated with hydrogen sulfide***. The treatment of Al_2O_3 with HF is also prescribed.

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* Shuikin, N. I., Kh. M. Minachev, and M. A. Ryashentseva. An active and stable palladium catalyst for dehydrogenation of six-member ring cyclanes. IN: Akademiya nauk SSSR. Doklady, v. 101, no. 1, 1955, 107-109.

** Minachev, Kh. M., M. A. Ryashentseva, and Yu. A. Afanas'yeva. Catalytic isomerization of n-hexane. Neftekhimiya, v. 1, no. 4, 1961, 482-483.

*** Ryashentseva, M. A., Kh. M. Minachev, and Yu. A. Afanas'yeva. Catalytic properties of rhenium-palladium-alumina catalysts in the transformations of hydrocarbons and their mixtures. Neftekhimiya, v. 2, no. 1, 1962, 37-40.

Rhenium was introduced into the catalyst based on some previous findings by M. S. Platonov (1936—1937), A. A. Balandin (1958), and H. Hummel (East German patent no. 11796, 9 July 1956)*. The introduction of rhenium in an amount of 1%, equal to that of the palladium**, improves the stability and the efficiency of the catalyst.

It is not specifically stated that the palladium-rhenium-alumina catalyst is to be used for sour petroleum products; it was used for individual hydrocarbons** or B-70 gasoline with a specified sulfur content not more than 0.05%***, and its insensitivity against sulfur compounds in crude gasoline was mentioned as an additional advantage (see above). The sulfur content of the 71—102°C fraction of Karadag gasoline reformed on the catalyst is not mentioned in the source. However, it can be assumed that this content should not be high as the Karadag crude belongs to the Great Baku crudes, the sulfur content of which is generally low. It can be concluded from an earlier remark**** that this catalyst can be used successfully for reforming of sulfur containing fuels [2].

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* Minachev, Kh. M., M. A. Ryashentseva, and B. A. Rudenko. Transformation of n-hexane, methylcyclopentane and cyclohexane on rhenium-alumina catalyst under conditions of high hydrogen pressure. IN: Akademiya nauk SSSR. Izvestiya. Otdeleniya khimicheskikh nauk, no. 8, 1960, 1471-1480.

** Minachev, Kh. M., M. A. Ryashentseva, and Yu. A. Afanas'-yeva. Catalytic isomerization of n-hexane. Neftekhimiya, v. 1, no. 4, 1961, 482-483.

*** Ryashentseva, M. A., Kh. M. Minachev, and Yu. A. Afanas'-yeva. Catalytic properties of rhenium-palladium-alumina catalysts in the transformations of hydrocarbons and their mixtures. Neftekhimiya, v. 2, no. 1, 1962, 37-40.

**** Shuikin, N. I., Kh. M. Minachev, and M. A. Ryashentseva. An active and stable palladium catalyst for dehydrogenation of six-member ring cyclanes. IN: Akademiya nauk SSSR. Doklady, v. 101, no. 1, 1955, 107-109.

Lubricant and Friction Problems

Some information on lubrication of equipment at high and very high temperatures in satellite countries can be obtained from the following article on the problem of lubrication under extreme conditions in Romania. The paper is a comprehensive survey of Romanian and foreign high-temperature lubricants used in Romania. Romanian research on lubricants was also reported. The author classified lubricants by temperature ranges (to 250, 250 to 450, 450—750, and 600—1200°C for lubricants used in machining metals), types (oils, greases, pastes), composition (petroleum derivatives, colloidal graphite, silicone-base lubricants, soaps, sodium acetate, gas black as a replacement for graphite, molybdenum disulfide, plus various antioxidant additives), viscosity, and industrial application (such as for antifriction bearings). Individual lubricants were identified by national standard designations or manufacturing plants, and several Romanian factories using specific lubricants were mentioned. Comparisons of Romanian and foreign qualities (Soviet MK 22 and C-265 gas compressor oils, and the US "Mobile Temp Grease" for antifriction bearings) were made in several cases. Information on the use of the lubricants is given in the following table [3].

Soviet interest in friction and lubrication problems is very clearly reflected in a collection of studies published in 1965 by the Scientific Council for Friction and Lubricants [4]. This collection is divided into three sections: 1) study of lubrication; 2) new lubricants; and 3) new construction materials for system friction points. The preface of the collection spells out the obvious importance of the solution of friction and lubrication problems for the conquest of space and ocean depths, along with other modern engineering trends. The absence of a fully developed friction and lubrication theory is mentioned in connection with the emphasized need for the development of such a theory. The 61 studies of the collection are contributions to the further development of the friction and lubrication theory and attempt to solve certain practical problems.

Analysis of the main topics of the studies indicates that the interest of the Soviet researchers was concentrated at the following points: 1) extreme conditions, boundary and dry friction; 2) the role of oxygen in dry friction

LUBRICANTS USED IN ROMANIA [3]

Group 1. Lubricants (oils and greases) used at temperatures up to 250°C

Lubricant	Temperature Regime	Equipment being lubricated	Remarks
Oils			
C-255, C-265	160°C	Gas compressors (Nitrogen Fertilizer Combine-Plant in Piatra Neamt-Roznov)	For saturated steam; STAS-55 Specif.
C-315	160°C		For superheated steam
423	160°C		STAS 751-49
V-10.004	160°C		STAS 387-49
MK 22	160 C		Made in USSR
419	120—140°C	Screwstock chains in Krantz-type dryers and thermostats	Contains 5% colloidal graphite
405	up to 350°C	Metal surfaces at working temperatures	Contains 5% molybdenum disulphide
Silicon oils	200—250°C	Imported modern equipment	
Greases			
Rul 145, Rul 165	145—165°C	Antifriction bearings	STAS 1608-50
Rul S140	up to 100°C	Calender bearings in corduroy dryers (Danubiana - Bucuresti Tire Factory)	Contains 2% lanolin
Rul SL 140	up to 100°C		Contains antioxidant additives; similar to US Mobil Temp Grease
Rul S 180	140°C		STAS 2721-51
LD 170	up to 230°C	Exposed bearings in rotary boilers	

LUBRICANTS (continued)

Group 2. Lubricants used at temperatures ranging between 250—450°C

Lubricants	Equipment being lubricated	Remarks
Kluber oil, type KR 29 EHD-MF	Cold metal treatment (plastic deformation)	Imported from West Germany
Molykote Fett 1142	Small size bearings (dental equipment)	Imported from West Germany
SI 44, silicon based	Bearings, max revolution 20,000 rpm	Imported from France
Silicon oils, types A, C, G, M		Imported from West Germany

Group 3. Lubricants used at temperatures ranging between 450—750°C

Molykote HTP, Molykote M (high-temperature pastes)	Imported from West Germany

Group 4. Lubricants used at temperatures ranging between 600—1200°C

Phosphaterm RN	Imported from West Germany

and dry friction in vacuum or inert gases; 3) the problem of seizing; 4) polymer-to-metal friction and lubrication*; and 5) improvement of lubricants by additives. The emphasis on extreme conditions and on boundary or dry friction may refer to the above-mentioned importance of solving friction problems for space or deep sea environments. This view may be supported by mentioning friction conditions on bearings of cryogenic pumps for spacecraft [4, p. 233].

New lubricants discussed include the use of powdered polymers, pigment dyes, modified silica gel and polymer-modified oils. Topics of special interest concerning construction materials are friction properties of refractory metals in inert gases [4, p.154-157], and the surface treatment of metals with some non-metals, such as S, Se, or Te, similar to nitriding or case-hardening [4, p. 187-182].

The collection has been abstracted from cover to cover. The abstracts are given in Part II of this survey [4].

Another collection published in 1966 by the Scientific Council for Friction and Lubrication has a pronounced theoretical slant, though the theoretical expostulations of the contributors are based on their experimental findings [5]. The present status of the theory of friction and wear and lubrication in the USSR can be characterized by the emphasis on attempts to understand the fine details of friction and wear phenomena and to model their specific aspects on the basis of the analytical dependences found.

Three studies (pp 5-18, 19-34 and 35-41) are devoted to attempts to compute the actual contact surfaces, degree of their approaching each other and to an evaluation of the contact of wavy surfaces. The parameters named above are included in many equations for the computation of friction and wear. The problem of the effect of normal shiftings in materials on the friction force is treated in three papers (pp 42-59, 60-82 and 83-90). Special conditions of high-speed friction are discussed in an article (pp 91-97). The basic study on the theory of thermal contacts in local friction is presented by M. V. Korovchinskiy (pp 98-145) and on the thermal dynamics of external friction by A. V. Chichinadze (pp 146-157). Metal deformations and

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* See further the special book devoted to metal-to-polymer friction problems [6].

the effect of friction on this process are investigated (pp 158-162 and 163-167). An interesting problem of the atomic transfer of materials in friction is given in a study (pp 168-172). Antiseizing properties of phosphated metal surfaces coated with solid lubricants are discussed in an article (pp 173-178). The last two articles (pp 179-185 and 186-194) are devoted to the analytical modeling of friction phenomena [5].

In the monograph by Sh. M. Bilik the characteristic properties of plastics are viewed from the standpoint of using plastics as antifriction materials. The construction of such pairs and methods of their manufacturing are given and the fields of application are listed.

The chemical nature of some resins and antifriction compositions from them, structural formations in such materials and their transformations under load and elevated temperature conditions are discussed in Chapters I, II, and V. Physical and chemical properties of plastics, formation of metal-to-plastic friction contacts, the microtopography of the contact surfaces and the processes of wear are described in Chapters I, II, and IV. Antifrictional properties and wear resistance of plastics and plastic compositions with various fillers are given in Chapters VI and VII. The effect of electric charges (triboelectricity) on the friction behavior of metal-plastic pairs is explained in Chapter VIII. Constructional properties are handled in Chapter IX, and the fields of application of metal-to-plastic friction elements are listed in Chapter X. The experimental data used in the monograph were obtained by the author and his associates at the All-Union Scientific Research Institute of Railway Transportation (TsNII MPS).

A list of the fields of application from Chapter X includes railway transportation and engineering, metal rolling, chemical engineering, agricultural machinery, the automobile and textile industry. From the point of view of potential aerospace application, oxygen installations, high pressure pumps and equipment for corrosive agents mentioned warrant attention. However, the aerospace applications of plastic-to-metal friction elements were not directly mentioned [6].

The importance of faultless supplying of military rocket units with lubricants was stressed in an article by Marshal N. Krylov. In this article, which in general aims

at improving all services of the rear echelon which are extended to fighting units, Marshal Krylov mentions that the present position of the Chief of Supply of Fuel and Lubricants should be reclassified to the Chief of Services. He mentions that, among other qualifications, this officer must have an adequate knowledge of rocket troop deployment, their materiel, hydrodynamics and the physical and chemical properties of fuels. The word "lubricants" is not used in this context, but it appears that the omission was made to avoid redundance, because lubricants are mentioned in the preceding and the following paragraphs. No other statements as to the nature or the specifications of the lubricants could be found in the article [7].

REFERENCES

1. Chertkov, Ya. B., and V. M. Ignatov. Comparison of the effectiveness of jet-fuel additives. Khimiya i tekhnologiya topliv i masel, no. 6, 1966, 53-56.

2. Minachev, Kh. M., M. A. Ryashentseva, V. I. Garanin, and Yu. A. Afanas'yeva. Reforming the 71—102 fraction of Karadag gasoline in the presence of a fixed and a fluidized-bed catalyst. Neftekhimiya, v. 5, no. 4, 1965, 498-500.

3. Cretulescu, C. Equipment lubrication at high and very high temperatures. Constructia de Masini, v. 17, no. 3, 1965, 151-155.

4. Akademiya nauk SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965. 246 p.

5. Akademiya nauk SSSR. Nauchnyy sovet po treniyu i smazochnym materialm. Novoye v teorii treniya (Recent developments in the theory of friction). Mowcow, Izd-vo Nauka, 1966. 195 p.

6. Bilik, Sh. M. Pary treniya metall-plastmassa v mashinakh i mekhanizmakh (Metal-plastic friction pairs in machines and mechanisms). Moscow, Izd-vo Mashinostroyeniye, 1965. 311 p.

7. Krylov, N. The role of rear echelons in improving the readiness of rocket units. Tyl i snabzhemye, no. 9, 1965, 7-13.

PART II. ABSTRACTS

Section 1

ACC NR: AT5020431 SOURCE CODE: UR/0000/65/000/000/0005/0007

AUTHOR: Akhmatov, A. S.; Ustok, Kh. Z.

ORG: none

TITLE: Dependence of boundary friction forces on pressure

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 5-7

TOPIC TAGS: lubricant, lubricant property, friction, boundary friction, lubrication, metal friction, lubricating oil, surface friction / GOST 982 53 transformer oil, MZP 6 watch oil

ABSTRACT: The isothermic dependence of static boundary friction on pressure was studied. Specific pressures ranging from grams to tens of tons were used. Pure stearic acid, and industrial oils such as vaseline oil, GOST 982-53 transformer oil and MZP-6 watch oil were the lubricants used with the following metals: steel (not specified), chromium, aluminum, copper and nickel. An exponential dependence on the pressure was found for the friction force; this dependence is determined by the type of basic dependences of atom interactions on

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ACC NR: AT5020431

the distances between the atoms. Orig. art. has: 4 figures. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/ OTH REF: 004

Card 2/2

ACC NR: AT7003369 SOURCE CODE: UR/0000/65/000/000/0008/0012

AUTHOR: Vinogradov, G. V. (Prof.; Dr. of chemical sciences); Korepova, I. V.; Pavlovskaya, N. T.; Podol'skiy, Yu. Ya. (Candidate of technical sciences)

ORG: none

TITLE: Lubricating effect of low-molecular-weight hydrocarbons under heavy friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 8-12

TOPIC TAGS: metal friction, friction coefficient, lubricant, low molecular weight hydrocarbon

ABSTRACT: The purpose of the work was to elucidate the relationship between the structure and the oxidizability of hydrocarbons and their antifriction, antiwear and antiseizure properties. The following low-molecular-weight hydrocarbons were selected for the study as most convenient study objects: benzene, heptane, cyclohexane, toluene, p-xylene cumene, dicumylmethane and tetralin. The factors investigated were: oxidative effect of the ambient medium, oxidizability of

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ACC NR: AT7003369

the lubricant, and conditions of oxygen transfer to friction zones. The results of the study were presented in graphic form. It was found that such easily oxidizable low-molecular-weight hydrocarbons as cumene, tetralin and dicumylmethane have the highest antiseizure properties of the hydrocarbons studied under heavy friction. Thus, the oxidizing effect of molecular oxygen determines the antiseizure properties of lubricant hydrocarbons. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 002/ OTH REF: 002/

Card 2/2

ACC NR: AT7003370 SOURCE CODE: UR/0000/65/000/000/0012/0015

AUTHOR: Garkunov, D. N. (Dr. of technical sciences); Markov, A. A.; Golikov, G. A.

ORG: none

TITLE: Relationship of redox reactions in friction pairs with the difference of electric potentials on the contacts.

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 12-15

TOPIC TAGS: metal friction, lubricant, redox reaction.

ABSTRACT: Inasmuch as the course, intensity and direction of redox reactions on friction pairs under boundary or dry friction are determined by the nature of the metals in friction and by the difference in the work function ($A_{m_I}-A_{m_{II}}$) on the contact surfaces of these metals, which is determined by the difference in potentials, an attempt was made to explain atom transfer in friction pairs from the point of the difference in potentials on contact surfaces. The following materials were studied: electrolytic chromium on steel 30KhGSA, steel 30KhGSA, steel 1Kh18N9T, bronze BrAzhMts, brass

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ACC NR: AT7003370

LS59-1, copper M-1. The contact difference of potential was determined in reference to gold, either without any lubricant, or with the following lubricants: TsIATIM-201, oils AMG-10 or MS-20, or glycerol. The friction surfaces were given a 7--8 class finish. The authors' summary was that: 1. the contact difference of potentials actually determines physical and chemical processes which result in atom transfer of metals in friction; 2. measuring of the contact difference of potentials according to the method developed by the authors makes it possible to evaluate the antifriction properties of metals and lubricants in boundary friction. Orig. art. has: 2 graphs and 1 table.
[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 004/

Card 2/2

ACC NR: AT7003371 SOURCE CODE: UR/0000/65/000/000/0015/0019

AUTHOR: Matveyevskiy, R. M.

ORG: none

TITLE: Critical temperatures of lubricating oils during the tests on machines with point and linear contact.

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 15-19

TOPIC TAGS: metal friction, lubricating oil, lubrication, seizing

ABSTRACT: A review is given of experimental works on determining seizure. A concept is introduced of a constant quantity equal to the product of the friction coefficient f, specific load P_{sp} and gliding velocity v in the moment preceding seizure: $f \cdot P_{sp} \cdot V = \text{const}$. This implies the existence of a constant temperature in the moment of seizure. Such temperatures are computed and compared with those determined experimentally, with satisfactory agreement. The results of this review confirm the influence of the decisive effect of temperatures on the stability of the boundary layer of a lubricant; the temperatures computed may serve as upper limits for the use of oils

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ACC NR: AT7003371

for friction surfaces and for an approximate computation of the expected temperature on the contact of elastic-plastic materials with a low hardness. Orig. art. has: 3 graphs and 1 table. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65 ORIG REF: 001/

Card 2/2

ACC NR: AT7003372 SOURCE CODE: UR/0000/65/000/000/0020/0023

AUTHOR: Panova, L. V.

ORG: none

TITLE: Study of the phenomena of monoaxial compression and translational shift of boundary lubricating layers.

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 20-23

TOPIC TAGS: metal friction, lubrication, lubricant grease, calcium stearate

ABSTRACT: Unusual mechanical properties of boundary lubricating layers were studied by a new method of a sheaf of layers. Extensive experimental data on this method accumulated at the Physics Laboratory, lead by Stankin, are briefly described. This data represents the most significant part of this material. The inferences of the study are: 1) boundary lubricating layers have true elasticity of form and follow Hook's law; 2) boundary layers of calcium stearate have a very high elasticity if their thickness is less than 25 x 2 molecular layers; 3) the presence of inflection points in elasticity curves is explained as reversible molecular restructuring; and 4) the

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ACC NR: AT7003372

particular properties of the elastic hysteresis are explained as the process of reinforcement of the boundary layer. Orig. art. has: 5 graphs and 1 table. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 002

Card 2/2

ACC NR: AT7003373 SOURCE CODE: UR/0000/65/000/000/0023/0026

AUTHOR: Podol'skiy, Yu. Ya. (Candidate of technical sciences); Korepova, I. V.; Vinogradov, G. V. (Prof.; Dr. of chemical sciences)

ORG: none

TITLE: Study of the lubricating effect of petroleum oils in a wide range of sliding velocities

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 23-26

TOPIC TAGS: metal friction, friction coefficient, lubrication, lubricating oil

ABSTRACT: Sliding friction was studied in the range of eight decimal orders in air and in vacuum to elucidate the role of the ratio of the ratio of wear and regeneration of surface layers. The reason for this study was the importance of the role of steel oxidation processes in hydrocarbon media. The data obtained indicates that at constant temperatures and under constant loads a decrease and an increase in sliding velocity results in seizing. There are differences in the

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ACC NR: AT7003373

mechanism of hot and cold seizing: adhesive bonds are active in the former, while the plastic flow of metals is responsible for cold seizing. Orig. art. has: 1 graph. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003; OTH REF: 003/

Card 2/2

ACC NR: AP7003374 SOURCE CODE: UR/0000/65/000/000/0026/0030

AUTHOR: Ratner, S. B.

ORG: none

TITLE: Check on the applicability of the hydrodynamic theory of lubrication to the friction of polymer materials

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 26-30

TOPIC TAGS: polymer, polymer material, friction, friction coefficient

ABSTRACT: Experimental data are presented which confirm relationships for the friction coefficient, viscosity, velocity, pressure and length of a bearing which were found by Sommerfeld, Mitchell, G. White and O. Denny. Further improvement of the existing equation is necessary by introducing new lubrication parameters; however, no definite suggestions are made. Orig. art. has: 4 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 001/ OTH REF: 001/

Card 1/1

ACC NR: AT7003375 SOURCE CODE: UR/0000/65/000/000/0030/0035

AUTHOR: Fuks, G. I.

ORG: none

TITLE: Effect of the polymolecular boundary layer on static friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 30-35

TOPIC TAGS: friction, boundary friction, static friction, lubrication

ABSTRACT: Literature data are reviewed and the conclusion is made that boundary friction in polymolecular boundary lubrication is determined both by the interaction of lubricating layers with the solid body and by the molecular mechanical properties of this layer. This means that the adhesion-mechanical theory of friction is also applicable to boundary friction, if differences of the solid and of the boundary layer are accounted for. Orig. art. has: 4 graphs and 3 tables.
[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 017/ OTH REF: 008/

Card 1/1

ACC NR: AT7003376 SOURCE CODE: UR/0000/65/000/000/0036/0041

AUTHOR: Vinogradov, Yu. M.

ORG: none

TITLE: Effect of various factors on lubrication in metal cutting

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 36-41

TOPIC TAGS: friction, metal friction, metal cutting, lubrication, lubricant additive, sulfur compound

ABSTRACT: A review on the effect of cutting speed on liquid lubrication states that the basic factors which determine the lubricating effect are: 1) the chemical reactivity of the lubricants and, 2) penetration of the liquid lubricant to actual contact spots of the cutting tool with the metal; this second factor is determined by the cutting speed. Orig. art. has: 4 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 011/ OTH REF: 002/

Card 1/1

ACC NR: AT7003377 SOURCE CODE: UR/0000/65/000/000/0041/0044

AUTHOR: Vinogradova, I. E.; Khalikov, R. Kh.

ORG: none

TITLE: Study of dixanthate-type antiseizure additives

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 41-44

TOPIC TAGS: friction, metal friction, seizing, lubrication, lubricant additive, sulfur compound, dixanthate, xanthogene

ABSTRACT: Two types of organosulphur compounds were studied: xanthogenes (O,O-diesters) and xanthates (O,S-diesters) in TS-14.5 oil (TU 110-61) solution in amounts equivalent to 1.25% sulfur content. The antiseizure properties of such mixtures were studied on a four-ball apparatus. The findings were as follows: 1) dixanthates decompose at elevated temperatures to simpler compounds, such as H_2S, S, mercaptans, dialkylsulfides, dialkyldisulfides and xanthic acid; 2) as hydrogen sulfide is the most active of these compounds, the antiseizing properties and corrosiveness depend on the depth of decomposition

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ACC NR: AT7003377

and amounts of H_2S evolved; 3) metal sulfides and, at elevated temperatures, higher metal sulfides are formed; 4) inasmuch as xanthogens are less stable than xanthates, they decompose earlier and faster than the latter, and their antiseizing properties disappear more rapidly. Ethylene xanthates (LZ-6/9 and LZ-23k) are recommended as antiseizing additives to oils. Orig. art. has: 4 tables. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/

Card 2/2

ACC NR: AT7003378 SOURCE CODE: UR/0000/65/000/000/0045/0048

AUTHOR: Zaslavskiy, Yu. S.; Yevstigneyev, Ye. V.; Shor, G. I.; Lebedeva, F. B.

ORG: none

TITLE: Study of the chemical activity of antiseizing additives to oils at temperatures from 200 to 600°C

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 45-48

TOPIC TAGS: friction, metal friction, lubrication, lubricant additive, antiseizing additive

ABSTRACT: For correct evaluation of the chemical activity of an oil additive it is necessary to determine its behavior at temperatures higher than those used for conventional testing, namely, at 250°C. The authors developed an experimental method and constructed a device for the determination of the chemical activity of oil additives in their interactions with metals at temperatures from 200 to 600°C.

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ACC NR: AT7003378

A satisfactory reproductibility of the results is affirmed. A schematic sketch of the device is given in the original. Orig. art. has: 4 graphs and figures. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 002/ OTH REF: 001/

Card 2/2

ACC NR: AT7003379 SOURCE CODE: UR/0000/65/000/000/0048/0052

AUTHOR: Kleymenov, B. V.; D'yachkova, Ye. A.; Sanin, P. I.

ORG: none

TITLE: Some data on the mechanism of action of organic compounds with a trichloromethyl group in friction under heavy loads

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 48-52

TOPIC TAGS: friction, metal friction, friction wear, lubricant, lubricating oil, lubricant additive, organophosphate compound, organophosphorus lubricant additive

ABSTRACT: A series of (trichloromethyl)phosphonates (tabulated in the original) and butoxy(trichloromethyl)phosphonic acid were studied with respect to their antiwear properties. The effect of phosphorus in the molecule was determined by a comparison with the effect of acetic and trichloroacetic acid. The purpose of the study was to elucidate the effect of the CCl_3 group. The tests were conducted on a four-ball apparatus. The results obtained indicate that organic

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ACC NR: AT7003379

acids with the trichloromethyl group have a very high antiwear property. Replacing mobile acid hydrogen with an aliphatic radical or an aliphatic base results in a sharp decrease in antiwear properties. It was found that the presence of the trichloromethyl group increases the concentration of the hydrogen ions in the friction zone in the process of thermal transformation of the additives. Orig. art. has: 1 graph, 1 table and 3 formulas. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 004/ OTH REF: 002/

Card 2/2

ACC NR: AT7003380 SOURCE CODE: UR/0000/65/000/000/0052/0056

AUTHOR: Kolesnichenko, L. F.

ORG: none

TITLE: Change in the structure of the surface layer of metals in friction in connection with the effect of the lubrication media

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 52-56

TOPIC TAGS: friction, metal friction, lubrication, lubricating oil

ABSTRACT: The purpose of the study was to elucidate the regularities in changes of the fine structure of surface layers of technically pure iron in the process of boundary friction, caused by the introduction of surfactants. The structure of the metal was studied by the x-ray method and microhardness was determined. Vaseline oil with and without 0.2% oleic acid was used as the lubricant. As the introduction of surfactants intensifies plastic deformation in friction, hardening of the thin metal layer is produced. The effect of surfactants depends on the load: 1) under comparatively low loads the active lubricant

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ACC NR: AT7003380

decreases wear by separating the surfaces in friction; under high loads the adsorption-active lubricant plasticizes thin surface layers of metal, thus increasing the wear; the crystalline structure of the metal surface layer is distorted which causes an increase in hardening. [W.A. 28]
Orig. art. has: 4 graphs. [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/

Card 2/2

ACC NR: AT5020432 SOURCE CODE: UR/0000/65/000/000/0057/0060

AUTHOR: Kostetskiy, B. I.; Natanson, M. E.; Skarchenkov, K. Z.; Topekha, P. K.

ORG: none

TITLE: Selection of additives for lubricating oils

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 57-60

TOPIC TAGS: lubricant, lubricant additive, friction, metal friction, metal, lubrication, lubricating oil, organophosphorus lubricant additive, organosulfur lubricant additive, organofluorine lubricant additive, additive / KIGVF 1 additive, KIGVF 2 additive, MS 20 lubricating oil, KE 4 friction apparatus

ABSTRACT: Effective additives to lubricating oils must decrease 1) cold seizing at low sliding velocities, 2) oxidation at medium velocities, and 3) shift the beginning of thermal seizure to high velocities. Oil testing must be aimed at these properties. In the results of their studies the authors detected some new types of highly effective antiwear additives, such as thiocyanates and dithi-

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ACC NR: AT5020432

zonates of metals, mainly of copper, iron, cobalt or manganese, and complex sulfur- and fluorine-containing compounds KIGVF-1 or KIGVF-2. These compounds form stable colloidal solutions in lubricating oils. On decomposition and at high speeds on friction surfaces these compounds form sulfides or fluorides of the metals and promote adsorptional plastizing of the friction surfaces. Tests were run with MS-20 oil on a KE-4 machine. [The composition of compounds KIGVF-1 and -2 is not given in the original] Orig. art. has: 2 tables.

[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 010/

Card 2/2

ACC NR: AT7003381 SOURCE CODE: UR/0000/65/000/000/0060/0063

AUTHOR: Myannik, E. I.; Sher, V. V.; Sanin, P. I.

ORG: none

TITLE: Phosphonitrile compounds -- synthetic additives for lubricating oils

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow Izd-vo Nauka, 1965, 60-63

TOPIC TAGS: lubrication, lubricating oil, lubricant additive, organophosphorus lubricant additive, organophosphorus compound

ABSTRACT: The purpose of the study was to synthesize a series of triphosphonitrile esters $N_3P(OR)_6$, where R is an aliphatic or aromatic radical, and to test the compounds obtained for their applicability as antiwear additives for lubricating oils. Synthesis was achieved by reacting phosphonitrile chloride with sodium alcoholates or phenolates. The antiwear properties were tested on a four-ball apparatus. The results indicate that a general feature in the use of all tested compounds is considerable wear at critical and above-critical loads. This can be improved by introducing more active groups than alkoxy, or phenoxy groups into the triphosphonitrile ester molecule. The tests indicated that the triphosphonitrile esters studied increased the critical load of the oil used. Aromatic esters had the maximum activity. Orig. art. has: 1 graph and 1 table. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 001/ OTH REF: 008/

ACC NR: AT7003382 SOURCE CODE: UR/0000/65/000/000/0063/0067

AUTHOR: Myannik, A. O.; Shepeleva, Ye. S.; Sanin, P. I.

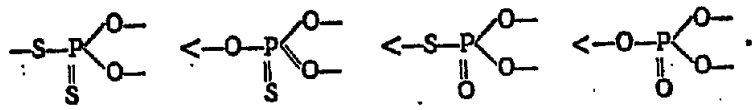
ORG: none

TITLE: Effect of the structure of some phosphoric and phosphonic esters on their activity as antiwear additives

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 63-67

TOPIC TAGS: lubrication, lubricating oil, lubricant additive, organophosphorus lubricant additive

ABSTRACT: A study of organophosphorus compounds which contain a trichloromethyl group as antiwear additives was prompted by a desire to elucidate the effect of other modifying groups. Esters of phosphoric thiophosphoric acid and phosphonic acids were studied in a highly refined oil. The following sequence of increasing antiwear activity was found for thioacids:



However, it is noted that the presence of sulfur in the phosphate molecule increases the antiwear activity for loads above critical. Esters of methylphosphonic acid are close in properties to phosphoric esters. The introduction of a trichloromethyl group sharply reduces wear and seizure under high loads. Orig. art. has: 2 tables, 2 graphs and 10 formulas. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 004/ OTH REF: 002/

AUTHOR: Nosov, M. I.

ORG: none

TITLE: Polysiloxanes as additives which increase the lubricating effect of mineral oils and hydrocarbons

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 68-72

TOPIC TAGS: friction, metal friction lubrication, lubricating oil, organosilicon lubricant

ABSTRACT: The purpose of the work was to elucidate: 1) the conditions under which the combination of polysiloxanes with mineral oils can display high lubricating properties; 2) the mineral oil components which are most effective; 3) whether the results can be reproduced with individual hydrocarbons; 4) the effect of the nature of polysiloxanes under conditions of boundary friction; 5) the effect of additives on lubricating properties of a polysiloxane solution in oils. MK-22 petroleum oil, its group composition fractions and some diphenylmethane derivatives were selected as lubricants; polysiloxanes were represented by polyethylsiloxane, polymethylsiloxane and polymethylphenylsiloxanes with various degrees of phenylation. The effect of phosphorus-, sulfur- and chlorine-containing additives was also studied. It was found that the synergistic effect of the lubrication of polysiloxanes and mineral oils depends on the preliminary conditioning of friction surfaces in polysiloxane-containing media. The synergistic effect is caused by the content of aromatics in oils and by the thermooxidative properties of both hydrocarbons and polysiloxanes. A high antiwear effect is obtained by the addition of sulfate (tert-dodecyl mercaptan), while an antiseizing effect is achieved by adding dibenzyl disulfide. Orig. art. has: 4 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 001/ OTH REF: 002/

ACC NR: AT5020433 SOURCE CODE: UR/0000/65/000/000/0072/0075

AUTHOR: Bartenev, G. M.; Yel'kin, A. I.; Gridunova, Ye. B.; Voyevdskaya, M. V.

ORG: none

TITLE: Effect of lubricants on the friction of rubber on metal at low temperatures

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 72-75

TOPIC TAGS: rubber, friction, lubricant, low temperature effect, lubrication, grease, low temperature lubricant, rubber friction, low temperature research / TsIATIM 221 lubricant, TsIATIM 205 lubricant

ABSTRACT: The effect of some solid, semi-solid or liquid lubricants on the initial (i.e., maximum) friction in a rubber-metal pair was studied at low temperatures. The lubricants used were: 1) finely dispersed KT graphite; 2) molybdenum disulfide; 3) liquid siloxane lubricant no. 3; 4) TsIATIM-221 grease, containing lubricant no. 3, and TsIATIM-205, based on hydrocarbons. Measure-

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ACC NR: AT5020433

ments were conducted in the temperature range of 50 to -200°C under constant load of 2 kg/cm^2, nominal contact surface was 1.5 cm^2 and sliding velocity was 1 mm/min. It was found that at those temperatures solid lubricants are more effective than liquid ones. The use of liquid lubricants is expedient only down to temperatures of their solidification, below which rubber "freezes" to the metal. [W.A. 28] Orig. art. has: 2 graphs. [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 005/

Card 2/2

ACC NR: AT7003384 SOURCE CODE: UR/0000/65/000/000/0075/0077

AUTHOR: Bezborod'ko, M. D.; Solomenko, I. I.

ORG: none

TITLE: Lubricating effect of oils in a dispersed state

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 75-77

TOPIC TAGS: friction, metal friction, lubrication, lubricating oil, oil dispersion

ABSTRACT: The lubrication of MT-16p oil in bulk and in the form of an aerosol (oil fog) was compared on a special four-ball apparatus. It was found that critical seizing loads were higher at the same temperature, if oil fog was used. This is explained by better air access in the case of using a fog and by better oxidizing of the oil as compared with oil in bulk; tests in an inert gas (nitrogen) confirmed this. It was assumed that the oxidation products contained in oils become more active in the presence of oxygen. Orig. art. has: 4 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 005/

Card 1/1

ACC NR: AT7003385 SOURCE CODE: UR/0000/65/000/000/0078/0081

AUTHOR: Bilik, Sh. M.; Tsurkan, I. G.; Cherkasskaya, P. M.

ORG: none

TITLE: Effect of oil viscosity on the antifriction properties of metalpolymer friction pairs

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 78-81

TOPIC TAGS: friction, polymer, metal friction, lubricating oil, lubricating oil viscosity

ABSTRACT: The effect of oil viscosity on the value of the friction coefficient and on the intensity of heat evolution was studied on an MI-1M four-ball apparatus for sliding of polished steel on capron and a grafted resin [unspecified]. Nonpolar hydrocarbon oils with viscosities of 4, 8, 18, 31, 68, and 100 centistokes at 50°C, and railway wheel-shaft lubricating oils with viscosities from 12 to 60 centistokes at 50°C were used. The shaft oils were straight run

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low-viscous distillates blended with mazut; they contained natural polar components. It was found that: 1. the friction coefficient decreases 50% with decreases in viscosity of one decimal order; 2. values of the friction coefficient and temperature increase are less in nonpolar lubricants than in shaft oils with natural polar components. This can be explained as the better thermal conductivity of nonpolar oils. Orig. art. has: 3 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/

Card 2/2

ACC NR: AT7003386 SOURCE CODE: UR/0000/65/000/000/0081/0085

AUTHOR: Ventsel', S. V.; Lelyuk, V. A.

ORG: none

TITLE: The results of an investigation of working-in of friction pairs

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 81-85

TOPIC TAGS: friction, metal friction, lubricating oil, friction wear

ABSTRACT: An attempt was made to determine experimentally the working-in of a friction pair with fresh and used lubricant; the latter is supposed to contain particles which consist of dust, wear- and oxidation products. The study was aimed at revising the specifications and conditions for the working-in of tractor engines plants. It was found that the antifriction properties of used oil are higher than those of fresh oil. Orig. art. has: 4 graphs and figures. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 005/

Card 1/1

ACC NR: AT5020434 SOURCE CODE: UR/0000/65/000/000/0085/0088

AUTHOR: Dymkovskiy, N. V.; Likhtman, V. I.

ORG: none

TITLE: Friction and wear of graphite materials working in fluid butt contact packings

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 85-88

TOPIC TAGS: friction, friction wear, metal friction

ABSTRACT: Experiments were conducted on a device modeling the working conditions of butt contact packings of shafts. The effect of water in the clearance between the graphite ring and steel surfaces was studied. The conditions and the mechanism of the friction and wear of graphite in fluid media was investigated. The separating role of adsorbed water (water film) was elucidated. Orig. art. has: 1 table. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 008/

Card 1/1

ACC NR: AT5020435 SOURCE CODE: UR/0000/65/000/000/0088/0092

AUTHOR: Klimov, K. I.; Mikheyev, V. A.

ORG: none

TITLE: Effect of a gaseous medium on the efficiency of oils under conditions of rolling friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 88-92

TOPIC TAGS: friction, metal friction, roller bearing, lubrication, lubricating oil, lubrication oil oxidation

ABSTRACT: The purpose of the study was to clarify the effect of oxygen, vacuum or inert gases, such as nitrogen, on the chemical processes occurring in mineral oils, synthetic lubricants and polysiloxanes which are caused by high temperatures arising in contact spots. The findings were as follows: 1. chemical processes in the friction zone, which result in the consumption and decomposition of lubricants, take place with and without the participation of oxygen. The effect of oxygen on the rate of oil consumption depends on the chemical composition of the lubricating oil. 2. Nitrogen increases

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ACC NR: AT5020435

the life of oxidizable oils, such as mineral oils or polyethylsiloxanes, but is ineffective for an oxygen-inert lubricant, such as polymethyl- or polyphenylsiloxanes or diesters. 3. Vacuum increases the useful life of lubricants by diminished oxidation and decreases it by increased evaporation. 4. The testing of lubricants both in air and in nitrogen makes it possible to evaluate the highest possible useful effect of additives. Orig. art. has: 3 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65 ORIG REF: 003/ OTH REF: 002/

Card 2/2

AUTHOR: Korogodskiy, I. V.

ORG: none

TITLE: Effect of highly dispersed particles in oil on the working-in of friction pairs

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 92-96

TOPIC TAGS: friction, metal friction, antifriction material, lubricating oil

ABSTRACT: The important effect of dispersed microparticles on the working-in of friction surfaces was confirmed experimentally by a comparison of micropolished specimens worked-in without any lubricants, with a lubricant (spindel oil) and with spindel oil which contained 2.5% organosol of iron. In the opinion of the author, highly dispersed particles: 1) fill in micropits adsorbed on friction surfaces and increase by that amount the area of actual contact, thus diminishing the load; 2) increase the adhesion of the lubricant, which diminishes the frequency of ruptures of the

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lubricating film; 3) reinforce the lubricating layer with respect to the shear strength and 4) increase the plasticizing of the thin surface layers. The author suggests the use of an equation derived by him for a generalized criterion K_o:

$$Ko = 1 + a\frac{W_b}{W_r} + b\frac{W_r}{W_b},$$

where W_r and W_b are the wear of the bushing and the rolling part, respectively, and where a and b are constants. The physical meaning of K_o is the specific energy of the dispersed particles in the process of friction. Orig. art. has: 2 graphs and pictures. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65 ORIG REF: 012/

Card 2/2

ACC NR: AT7003388 SOURCE CODE: UR/0000/65/000/000/0097/0102

AUTHOR: Bogomolov, N. I.

ORG: none

TITLE: Effect of lubrication on the friction force in metal cutting

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 97-102

TOPIC TAGS: friction, metal friction, metal cutting, lubrication, lubricating oil, grease

ABSTRACT: A study of deformation and friction forces in the process of microcutting of metals (steel or copper) with a single abrasive grain was conducted. The findings were that: 1) boundary friction, close in its value to the friction of freshly denudated surfaces, arises in the zone of microcutting; and 2) the most efficient lubricant is the one which decreases the sticking of metal to the surface of abrasive grains and to the binder. Orig. art. has: 4 figures. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 014/

Card 1/1

ACC NR: AT7003389 SOURCE CODE: UR/0000/65/000/000/0102/0107

AUTHOR: Gerasimenko, V. A.; Kalinin, Yu. T.; Klepach, S. I.; Ostrovtsev, M. I.; Semechkin, L. Ya.; Semenido, S. G.; Shchegolev, N. V.

ORG: none

TITLE: Selection of oil for internal combustion engines. (A study of the thermal field of a bearing at various regimes of the engine's work).

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i movyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 102-107

TOPIC TAGS: internal combustion engine, lubrication, lubricating oil, internal combustion, engine bearing

ABSTRACT: This study is an attempt to determine the optimum viscosity and the effect of oil directly on an internal combustion engine. The thermal field of a bearing was taken for the criterion of the oil performance. The method and device developed for the determination are described. Orig. art. has: 4 figures.

[W.A. 28]

SUB CODE: 11,21/ SUBM DATE: 22May65/ [BN]

Card 1/1

ACC NR: AT5020436 SOURCE CODE: UR/0000/65/000/000/0107/0113

AUTHOR: Raskin, Yu. Ye.; Gornets, L. V.; Nosov, Yu. A.

ORG: none

TITLE: Evaluation of the lubricating properties of working fluids for hydraulic systems of aircraft

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 107-113

TOPIC TAGS: aircraft, hydraulic system, organosilicon lubricant, synthetic lubricant, polyester, friction wear, lubricant, lubricant property, hydraulic fluid, lubrication

ABSTRACT: Experience has shown that the evaluation of a hydraulic fluid for aircraft by tests run at room temperature is insufficient, because critical loads considerably diminish with an increase in temperatures, especially in the case of synthetic fluids designed for performance at elevated temperatures. Therefore, several hydraulic fluids were tested at temperatures similar to those of their actual use. The tests were run: 1) on a four-ball apparatus with steel balls, in the presence of air; and 2) on a hydraulic stand with an axial pump with a sliding valve. Two variants of the pump

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ACC NR: AT5020436

were used: 1) a smaller one with steel-to-bronze cardan joints and a larger one with steel-to-steel cardan joints. The following fluids were tested:

Fluid Designation	Nature of the Fluid	Fluid Design.	Nature of the Fluid
No. 7	Polyalkylsiloxane	AMG-10AIT	Mineral oil based + a combination of antioxidants
7-30-S	Polyalkylsiloxane + 30% organic ether*		
7-40S-3	Polyalkylsiloxane + 40% organic ether* + antiwear additive	AMG-10SV	Mineral oil based + a stabilized thickener
7-50S-3	Polyalkylsiloxane + 50% organic ether* + antiwear additive	AMG-10S-2 No. 2	Dibutylphenyl phosphate based
DS-18-1	Hexalkyl disiloxane ether** + antioxidant		

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ACC NR: AT5020439

AMG-10	Mineral oil based
AMG-10IT	Mineral oil based + antioxidant

Remarks of the writer:

* An ambiguous term in Russian, can mean "ether" or "ester"
** Hexalkoxydisiloxane?

Comparative testing of the fluids on the four-ball apparatus and on the pump indicated that the four-ball test alone is insufficient; e.g., AMG-10-SV fluids showed a critical load of 50--60 kg at 150°C on the four-ball apparatus, which seemed to be a satisfactory value, but which failed during the pump test. Failure of fluids during the pump test included jamming of pistons, breakage of rods, wear of the cardan joint, the sliding surface of the valve and bearings. It was noted that the larger pump produced three times more failures than the smaller one. Investigation of these failures indicated that the steel-to-steel cardan joint is inadequate; it had to be replaced by a steel-to-bronze joint. Fluid 7-50S-3 was found to be the best; therefore, additional four-ball tests were run with this

fluid to elucidate the wear on load, sliding velocity, materials of the friction pair and the nature of the ambient gas. The results are given graphically in the original. Orig. art. has: 5 graphs and 5 tables. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/

ACC NR: AT7003390 SOURCE CODE: UR/0000/65/000/000/0114/0118

AUTHOR: Nosov, M. I.; Vinogradov, G. V. (Prof.; Dr. of chemical sciences)

ORG: none

TITLE: Polysiloxanes as lubricating media

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 114-118

TOPIC TAGS: lubrication, organosilicon, lubricant, antiwear material, antifriction material, polyorganosiloxane

ABSTRACT: The first stage of this study was an attempt to elucidate the effect of oxidation on the lubricating properties of polysiloxanes. In the second stage, the effect of additives on the antiwear and antifrictional properties of polysiloxanes was studied. The tests were carried out on a M-4 four-ball apparatus with ShKh-6 steel balls in air (with blowing, without blowing and in vacuum). The lubricants tested were polymethylsiloxane, polyethylsiloxane, and polymethylphenylsiloxanes with a low, medium and high phenyl group content. Some disiloxanes and silanes were also used. A series of

organic compounds, such as triphenyl phosphate, sulfole [tertdodecylmercaptan], thiophene derivatives, etc., were used as additives. Cumene hydroperoxide was used as oxidation initiator. The results of the study indicated that, in general, molecular oxygen and oxidation initiators have the same effect on the lubricating properties of polysiloxanes as on mineral oils, but to a lesser degree, which can be explained by the higher thermooxidative stability of polysiloxanes. The lubricating properties of polysiloxanes are complicated by the cross-linking, heterolytic decomposition, formation of insolubles products on the friction surfaces, etc. Some additives might improve the antiwear properties of polyethylsiloxane; however, polymethylphenylsiloxanes were not improved. The antifrictional properties of polysiloxanes are more affected by the additives, than are the antiwear properties. The results are presented graphically in the original. The effect of the additives can be explained by the transfer of oxygen which can be considered as a natural antiseizing additive. Orig. art. has: 5 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 001/ OTH REF: 003

ACC NR: AT7003391 SOURCE CODE: UR/000/65/000/000/0118/0121

AUTHOR: Mustafayev, V. A.; and G. V. Vinogradov

ORG: none

TITLE: Powdered polymers as lubricating materials for heavy regimes of sliding friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 118-121

TOPIC TAGS: lubrication, antifriction materials, polymer, polymer powder, sliding friction

ABSTRACT: The problem of antiwear and antifriction properties of powdered polymers is important from the standpoint of their use as thickeners for the manufacture of grease and for machining of polymers. Dry powders of polyprophylene, emulsion polystyrene, polyvinylchloride, polymethylmethacrylate, polyformaldehyde and polyallyltrimethylsilane were tested on a four-ball apparatus. The general finding was that the optimum antiwear properties in friction against steel surfaces are displayed by polymers sufficiently stable at low temperatures, but chemically activated at elevated temperatures. This combination of properties ensures low wear at low speeds by mechanical separation, and at high loads by chemical modification of steel. The antifriction properties are in good agreement with the antiwear properties of powdered polymers. Orig. art. has: 2 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/

ACC NR: AT7003392 SOURCE CODE: UR/000/65/000/000/0121/0126

AUTHOR: Vasil'yeva, L. S.; and V. V. Sinitsyn

ORG: none

TITLE: Lubricating materials and the resistance to rotation of roller bearings

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 121-126

TOPIC TAGS: lubrication, grease, roller bearing, roller bearing lubrication

ABSTRACT: This study was devoted to determining the dependence of the resistance to rotation of roller bearings on the nature of the lubricating materials. Oils MK-22 and MK-8, and greases: TsIATIM-201, konstalin, and solidol and some lithium or sodium stearate thickened oils were used. No significant effect of the nature of the lubricating material on the resistance to rotation of the roller bearing was found. The problem of viscosity was not investigated in the study. Orig. art. has: 4 graphs. [W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/ OTH REF: 002

ACC NR: AT7003393 SOURCE CODE: UR/000/65/000/000/0126/0131

AUTHOR: Petyakina, Ye. I.; I. E. Vinogradova; P. P. Bagryantseva; A. M. Rabikovich

ORG: none

TITLE: Antiwear additives of the zinc dithiophosphate type and their properties

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 126-131

TOPIC TAGS: lubrication, lubricant additive, antiwear additive, zinc dithiophosphate

ABSTRACT: Phosphates, phosphites, and especially zinc dithiophosphates [phosphodithioates] are widely used as antiwear additives which also have weak antiseizing properties. In addition, these additives have some antioxidant, anticorrosive and detergent properties. In this connection, zinc dithiophosphates of various structure were prepared by treating aliphatic alcohols, alkylphenols, alkylated aromatic hydrocarbons (components of the phenolic refining of residual oils) with phosphorous pentasulfide and zinc oxide; the properties of the resulting compounds were studied in TS-14.5 oil. It was found that 1) it is expedient to use zinc dithiophosphate additives because of their multifunctional properties under various conditions; 2) the additive EFO*-zinc is superior to other zinc dithiophosphates and is recommended for automative

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ACC NR: AT7003393

transmission oils. Orig. art. has: 3 graphs and 5 tables. [W.A. 28] [BN]

*$(R)_2PSSZnSS\ [OCH_2CH(CH_3)_2]_2$, where R are alkylated aromatics from phenolic refining extracts.

SUB CODE: 11,21/ SUBM DATE: 22May65

Card 2/2

ACC NR: AT5020437 SOURCE CODE: UR/000/65/000/000/0131/0134

AUTHOR: Sentyurikhina, L. N.; Z. S. Rubtsova; and K. I. Kiimov

ORG: none

TITLE: Study of the longevity and antifriction properties of solid lubricant coatings

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 131-134

TOPIC TAGS: solid lubricant, lubricant property, molybdenum disulfide, lubrication, antifriction material, solid lubricant coating/ VNII NP 212 lubricant, 213 lubricant, 229 lubricant, 230 solid lubricant

ABSTRACT: There are practically no data available on the abrasive stability and friction properties of solid lubricant coatings at elevated temperatures. This prompted an investigation of such properties for several coatings on a specially devised apparatus. The apparatus essentially consisted of a rotating roller coated with some solid lubricant and a steel band gliding on this roller. The friction coefficient was computed from the equation:

$$\mu = M/0.5\ r\ P_1, \text{ where}$$

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ACC NR: AT5020437

M is the moment of friction, P_1 (in grams) is the stress on the band, and r (in cm) is the radius of the roller. The coatings consisted of MoS_2 as filler, and a binder. The following substances were used as binders: K-55 organosilicon resin (grease VNII NP-213); EP-096 epoxy resin; K-41 urea-formaldehyde resin (VNII NP-212); and sodium silicate (VNII NP-229). The thermal stability of all these binders was tested. The weight loss for the organic resins used was up to 20% in the range of 200--350°C, while Na_2SiO_3 and organosilicon resin lost 5--6% at 300--350°C. The kinetics of the losses of the filled coatings was determined and is presented graphically in the original. The results are similar to those obtained for the thermal stability of the binders. The dependence of the longevity, i.e., resistance to wear, and of the friction coefficient on temperature were determined and presented graphically in the original. The optimum resistance and the minimum friction coefficient coincide at 100°C. No connection was found between the thermal stability of the binder and the possibility to use the solid lubricant coatings. It appears that wear resistance depends on the adhesive and cohesive properties of the binders, and on their ability to hold MoS_2 in the cells of the polymer network. Orig. art. has: 4 graphs and figures, and 1 table. [W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 10Sep65/ SOV REF: 006/ OTH REF: 007

Card 2/2

ACC NR: AT5020438 SOURCE CODE: UR/000/65/000/000/0134/0138

AUTHOR: Oparina, Ye. M.; L. N. Sentyurikhina; V. G. Dmitriyeva; Ye. E. Pisarevskaya; L. N. Petrova

ORG: none

TITLE: High temperature greases based on pigments

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow. Izd-vo Nauka, 1965, 134-138

TOPIC TAGS: lubrication, solid lubricant, dye, pigment, vat dye, indigo, violanthrone, isoviolanthrone, dimethyoxyviolanthrone, calcium stearate, high temperature lubricant, dye chemical, lubricant additive, organosilicon lubricant, organic lubricant

ABSTRACT: This study is devoted to an investigation of greases prepared from polymethylphenylsiloxane fluids (with various methyl and phenyl group ratios), and some pigments used as thickeners. The following pigments were used: 1) pigment SA (anthraquinone intathrene blue); 2) vat vlue H; 3) vat blue 0; 4) vat light blue K; 5) indigo; 6) dihydroxyviolanthrone; 7) violanthrone, 8) isoviolanthrone; 9) dimethoxyviolanthrone; and 10) calcium stearate (TsIATIM-22/S). Concerning the thickening capacity, pigments 4, 5, 6, and 9 proved to be inadequate thickeners,

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ACC NR: AT5020438

other pigments form greases, which are near TsIATIM-221 in their properties. The stability of mixes was tested under storage conditions and at 150°C. Evaluation of the stability was carried out on an ETs-3 centrifuge (test-tube type). More tests were conducted with pigment SA and isoviolanthrone, which displayed the best thickening properties and thermal stability. The weight losses of grease prepared with pigment SA and various liquid polymethylphenylsiloxanes reached 17—29% at 300°C. Effective viscosity and mechanical resistance in g/cm^2 and at 150°C was determined for isoviolanthrone based greases. Indanthrene and isoviolanthrone based polysiloxane greases were tested on roller bearings at 150°C and 15000 kg/cm^2 load. The tests indicated that such greases have no advantages as compared with soap-silicone greases such as TsIATIM-221 or TsIATIM-221S. It was found that the pigment can also be used for enhancing the colloidal stability of graphite or molybdenum disulfide based silicone greases. Pigments contribute to the formation of films of solid lubricants on low-load bearings at temperatures of 300—350°C, which makes it possible to keep the bearings working at 350°C for more than 3000 hr. Orig. art. has: 4 tables.

[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 10Sep65/ SOV REF: 001/

Card 2/2

ACC NR: AT7003394 SOURCE CODE: UR/000/65/000/000/0138/0140

AUTHOR: Makeyeva, Ye. D.; A. P. Blyudov; T. K. Ostrovskaya; S. G. Veysman

ORG: none

TITLE: New types of plastic greases based on non-soap thickeners

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow. Izd-vo Nauka, 1965, 138-140

TOPIC TAGS: lubrication, grease, lubricating oil, organosilicon lubricant, solid lubricant, organofluorine compound, antifriction material

ABSTRACT: As grease prepared with non-soap thickeners have a series of advantages as compared with soap-thickened greases, three types of non-soap thickened greases were studied. The following thickeners were used: 1) bentone, obtained from bentonite clays and dimethyl-alkylbenzyl-ammonium chloride (alkyl--C_{16} to C_{18}); 2) silica gel modified with surfactants; 3) sodium (octadecylamide) terephthalate bentonite greases. Bentonite clay of the Askam deposit was found to be most suitable because of its high dispersion, swelling and absorbtion capacity. Low molecular polar compounds such as acetone or methanol enhance the thickening properties of bentones. Sodium nitrite (0.5%) was used as the best anticorrosion additive; molybdenum disulfide (4%) was the antiwear additive; and phenotiazine (0.15%) was used

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ACC NR: AT7003394

as the antioxidant. Stand tests indicated that VNII NP-226 bentonite grease was more than three times as effective as YaNz-2 grease.

Silica gel greases

Silica gel was treated for hydrophobization with butanol, quaternary ammonia bases, or alkylhalosilanes. Greases were obtained from: 1) mineral oils with butoxy silica gel for high speed spindles and for packing materials in electronics; 2) organosilicon fluids with low butoxy silica gel for friction parts working at temperatures to -60°C; 3) polyhydnic alcohols with silica gel modified with quaternary ammonia bases for valves in the petroleum industry; 4) fluoroorganic fluids with trimethylsilyl derivatives of silica gel for equipment used in the production of concentrated acids.

Amidoterephthalate greases

These greases were prepared from mineral oils or organosilicon fluids thickened with sodium octadecylamideterephthalate $C_{18}H_{37}NH-CO-C_6H_4-COONa$. These greases are water resistant, mechanically and chemically stable, and are highly resistant to atmospheric corrosion. They are effective lubricants at 150°C.

[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65

Card 2/2

ACC NR: AT7003395 SOURCE CODE: UR/0000/65/000/000/0140/0143

AUTHOR: Semenido, Ye. G.; Shchegolev, N. V.; Semechkin, L. Ya.; Ostrovtsev, M. I.; Klepach, S. I.; Kalinin, N. N.; Gerasimenko, V. A.

ORG: none

TITLE: Some special features of the behavior of oils with polymer additives in friction pairs

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 140-143

TOPIC TAGS: friction, metal friction, lubrication, lubricating oil, lubricant additive, polymer additive

ABSTRACT: A temporary decrease is noted in the viscosity of polymer thickened oils at high rpm in friction pairs: shaft--bearing. The phenomenon is explained by the orientation of polymer macromolecules in zones of a high shift gradient. The connection between the polymer and oil molecules weakens, which results in a decrease in viscosity. A decrease in friction losses and a drop of temperature are observed under the described condition. Therefore, a decrease can be observed in fuel consumption (up to 15%). Orig. art.

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ACC NR: AT7003395

has: 1 graph and 3 tables. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/ OTH REF: 005/

Card 2/2

ACC NR: AT7003396 SOURCE CODE: UR/0000/65/000/000/0144/0147

AUTHOR: Semenido, Ye. G.; Runenkov, A. V.; Shchegolev, N. V.; Grishin, A. I.; Sharapov, V. I.; Kyuregyan, S. K.; Sheremet, I. I.; Milyutikov, Yu. D.; Pakhotov, K. A.; Lozar', A. S.; Traktovenko, I. A.; Turkevich, A. I.; Sazontov, Yu. P.

ORG: none

TITLE: Wear investigation of modern engines which work on polymer thickened oils.

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 144-147

TOPIC TAGS: internal combustion, engine, engine wear, lubrication, lubricating oil, polymer thickened lubricating oil

ABSTRACT: This study contains the results of long-time comparative tests of carburetor and diesel engines: ZIL-130; GAZ-M-13; YaMZ-236; A-401, YaAZ-204 and DI2A running on polymer thickened oils and on oils without such additives. Oils ASZp-110, SAE-30, engine oil SU, DSp-8, DSp-11, MT-14p and MT-16p were used. Satisfactory to good results

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ACC NR: AT7003396

are noted. Orig. art. has: 1 graph and 3 tables. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 002/

Card 2/2

ACC NR: AT7003397 SOURCE CODE: UR/0000/65/000/000/0147/0150

AUTHOR: Shchegolev, N. V.; Semenido, Ye. G.; Sanin, P. I.; Semechkin, M. A.; Sharapov, V. I.; Telegin, V. G.; Traktovenko, I. A.; Lazareva, Ye. V.; Sher, V. V.; Dem'yanov, L. A.

ORG: none

TITLE: Effect of polymer additives on antiwear properties of oils

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 147-150

TOPIC TAGS: lubrication, lubricating oil, lubricant additive, polymer additive, antifriction material, antiwear additive

ABSTRACT: In a study on the effect of polymer additives on the antiwear and antiseizure properties of polymer thickened motor oils, the following polymers were investigated: polyisobutylene, polymethacrylate, and copolymers of methacrylic acid and its nitrogen-containing derivatives. The molecular weight of the polymers studied was in the range 10,000--20,000. In some oils, additive DF-11 (zinc dialkyldithiophosphate) was used. According to their increasing

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ACC NR: AT7003397

effectiveness with respect to antiwear properties, the polymers studied can be arranged into the following sequence: polyisobutylene < polar polymers < polymethacrylate. DF-11 improves antiwear properties and therefore must be regarded as a necessary component. The viscosity of the thickened oil played a lesser role than the nature of the polymer thickened. Orig. art. has: 1 graph and 9 tables.

[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/

Card 2/2

ACC NR: AT7003398 SOURCE CODE: UR/0000/65/000/000/0150/0153

AUTHOR: Fialkov, A. S.; Vil'kin, M. A.; Zaychikova, A. S.; Kazakova, O. B.

ORG: none

TITLE: Use of some solid lubricants for increasing the service life of the brush commutator assembly of electric motors

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 150-153

TOPIC TAGS: electric engine, electric motor, electric motor collector, electric brush, solid lubricant, molybdenum disulfide, lithium carbonate

ABSTRACT: This paper contains the results of a study to improve the antifriction properties and wear resistance of electric brushes by introducing solid lubricants into them. Molybdenum disulfide, lithium carbonate, and coal tar pitch were used. The lubricants were introduced in vacuum and in an ultrasonic field with subsequent heat treatment. The tests were conducted at sea level and at an elevation of 18,000 m. A considerable increase in the service life of elec-

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ACC NR: AT7003398

tric brushes after the introduction of a solid lubricant can be explained by the fact that the antifriction properties of these substances do not depend on atmospheric conditions, contrary to those of graphite. Orig. art. has: 4 graphs and 1 table. [W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 004/ OTH REF: 001

Card 2/2

ACC NR: AT5020439 SOURCE CODE: UR/0000/65/000/000/0154/0157

AUTHOR: Chatynyan, L. A.

ORG: none

TITLE: Behavior of refractory metals and heat resistant alloys in friction at temperatures from 700 to 850C in argon or helium

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 154-157

TOPIC TAGS: friction, metal friction, refractory metal friction, refractory alloy, friction coefficient, molybdenum, tungsten, niobium, zirconium, nickel, carbide, silicide, boride, refractory metal, heat resistant alloy, metal wear resistance, alloy wear resistance, tungsten alloy, molybdenum alloy, niobium alloy, nickel alloy, alloy hardening, electrospark hardening /VZhL-2 alloy

ABSTRACT: The following materials were studied for wear resistance and friction properties in inert gases such as argon or helium at elevated temperatures: 1) refractory metals: Mo, W, Nb, Zr, Ni, etc; 2) heat resistant alloys of Mo, Nb, and Ni (VZhL-2, V-56

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ACC NR: AT5020439

and some others of the EI437B type); 3) VZhL-2 alloy after electrospark hard-facing with Cr_3C_2, TiC-WC; Mo_2C; $MoSi_2$, W_2B_5, ZrB_2, WC, Cr, W, Mo. Selection of metals and alloys was determined by their high mechanical properties, that of the coatings by their corrosion resistance. Nickel alloy VZhL-2 was developed for parts in friction which are designed to work under heavy loads at high temperatures in special media. It preserves its high physical and mechanical properties at 800C. The pure refractory metals mentioned above were tested for friction in argon or helium against a disc made from VZhL-2 at 800C: sliding velocity was 2.2 m/sec and specific load was 2.5 kg/cm^2. The results were presented as the dependence of the wear and of the coefficient of friction on melting temperatures. The appearance of the friction surfaces was noted. For nickel alloys the following observations were made: 1) wear resistance depends on plasticity at high temperatures; 2) the presence of additives, such as Si, B, Al, or Ti increases the brittleness of the alloys, but improves the working-in at high temperature friction. As alloy VZhL-2 was the most wear resistant as compared with other nickel alloys tested, its behavior in friction with molybdenum alloys was tested in inert gases at 800C. Its wear and coefficient of friction were lower than those of other Ni-alloys. The wear of Mo-Nb alloys was low. Hard-facing of VZhL-2 alloy with refractory metals or car-

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ACC NR: AT5020439

bides reduces nearly 50% of the wear. Hard-facing with carbides of molybdenum or chromium reduces the wear more than hard-facing with carbides of tungsten or double carbide of titanium and tungsten. The result of the study can be summarized as follows: 1) Surface oxide films are formed to a small degree in inert gases at high temperatures; the friction surfaces are in direct contact which causes overstressing of the surface layers. In such a case, wear depends mainly on hardness; the harder the material, the less wear. 2) The use of heat resistant materials is recommended both in the air and in inert gases to avoid softening and the seizing of surface layers at high temperatures. 3) The wear resistance of W and Mo at 800C in argon or helium is higher than that of Nb or Zr, which have lower melting points. Multi-phase structure is more wear resistant than single phase structure, e.g., a solid solution. The wear of brittle and less plastic materials is lower than that of plastic metals at high temperatures. 4) Of the materials tested the following were wear resistant: Mo, W, Nb and their alloys, the nickel alloy VZhL-2. Friction of this alloy with molybdenum alloy in argon or helium takes place without seizing and major wear. 5) Electrospark hard-facing of specimens from VZhL-2 with WC, $Cr_{23}C_6$; TiC-WC or Mo_2C produces strong adhesion of the coating to the metal. Further studies should permit wider use of highly wear-resistant carbides or hard alloys

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ACC NR: AT5020439

for joints in friction. Orig. art. has: 3 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22Nay65/ ORIG REF: 003/

Card 4/4

ACC NR: AT7003409 SOURCE CODE: UR/0000/65/000/000/0211/0214

ACC NR: AT703399 SOURCE CODE: UR/0000/65/000/000/0158/0161

AUTHOR: Kostetskiy, B. I.; Barbalat, B. M.

ORG: none

TITLE: Kinetics of the formation of secondary structures in wear processes

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 158-161

TOPIC TAGS: friction, friction wear, metal friction, metal structure, oxide film

ABSTRACT: The kinetics and the mechanism of changes in the structure of working layers of metal are viewed in wear processes for transition of the friction system from normal service conditions of stabilized wear to the malfunction state. Electrochemical potentials of friction surfaces were measured to study changes in the state of oxide films. The structure of the working metal layers underneath the oxide films was studied by x-ray method. Microhardness, coefficients of friction and distortions of the metal grains were noted. The general conclusion was that the development of wear processes has a series of transitional stages, such as start, working-in,

Card 1/2

ACC NR: AT703399

stabilized wear and malfunction conditions which begin after destruction of the oxide films. Orig. art. has: 5 graphs.
[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF? 003/

Card 2/2

ACC NR: AT7003410 SOURCE CODE: UR/0000/65/000/000/0214/0219

ACC NR: AT7003400 SOURCE CODE: UR/0000/65/000/000/0161/0164

AUTHOR: Snitkovskiy, M. M.; Silayev, I. I.; Dyatlov, A. A.

ORG: none

TITLE: Formation of fine structure of the surface of cast-iron friction pairs

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 161-164

TOPIC TAGS: friction, metal friction, cast-iron, cast iron structure, diesel engine, friction wear

ABSTRACT: The formation of fine structure of cast-iron friction pairs has been studied with regard to working conditions of piston rings and cylinder inserts of ship internal combustion engines. It was found that the main wear factors are intrusion of contacting materials and plastic deformation of the friction surfaces. The beneficial effect of graphite and phosphides in dry friction consists of a decrease in plastic deformation by the formation of coating layers which spend on surfaces in friction. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 004/

Card 1/1

ACC NR: AT5020440 SOURCE CODE: UR/0000/65/000/000/0164/0167

AUTHOR: Rabinovich, L. V.

ORG: none

TITLE: Use of aluminum alloys in friction joints of devices

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 164-167

TOPIC TAGS: metal friction, light metal alloy, aluminum alloy, antifriction material, seizing, antifriction metal, copper alloy, lubrication, antifriction bearing, lubricant

ABSTRACT: The use of light alloys is desirable for decreasing the weight of devices, e.g., in geodesy. Friction parts of such devices are usually made from steel or copper alloys. Difficulties in the movement of parts and jamming are often observed. An attempt was made to use aluminum alloys. The following alloys were selected because of their expediency: V95 deformable alloy and AL84 casting alloy. The tests conducted under dry friction under small loads confirmed the expediency of the use of these alloys for the friction joint of devices. [W.A. 28]

SUB CODE: 11,21/ SUBM DATE: 22May65/ [BN]

Card 1/1

AUTHOR: Pletnev, D. V.; Brusentsova, V. N.

ORG: none

TITLE: Properties of electrolytically deposited chromium coatings and their use on diesel engine cylinders from aluminum alloys

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 167-172

TOPIC TAGS: friction, metal friction, chromium plating, antifriction, material

ABSTRACT: As the successful use of wear-resistant chromium coatings is impossible without the exact account of the properties of the electrolytically deposited chromium, the optimum conditions of plating were studied. The results indicated that the wear resistance of chromium hardened cylinders from aluminum alloys is 2.5 times higher than that of series produced cast-iron cylinders. Orig. art. has: 1 table and 2 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 001/ OTH REF: 011/

Card 1/1

AUTHOR: Bakakin, G. N.; Lyubchenko, A. P.; Turovskiy, M. L.; Lyubarskiy, I. M.

ORG: none

TITLE: Working-in and wear of high mechanical strength cast iron

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 172-176

TOPIC TAGS: friction, metal friction, cast iron, friction wear

ABSTRACT: This paper was devoted to obtaining information on a series of parameters which are indicative for the process of working-in cast iron of increased mechanical properties. The material was combined in friction pairs with itself, A9-2 aluminum alloy and 20Ch2N4A case-hardened steel. The exchange of material or friction surfaces was investigated and discussed. Each combination of material has its special peculiarities in working-in. Orig. art. has: 3 figures. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/

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ACC NR: AT5020441 SOURCE CODE: UR/0000/65/000/000/0176/0182

AUTHOR: Vinogradov, Yu. M.

ORG: none

TITLE: Investigation of the effectiveness of chemical-thermal treatments for various metals

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo "Nauka", 1965, 176-182

TOPIC TAGS: friction, metal friction, antifriction material, sulfidization, sulfide film, metal surface treatment, friction wear, tellurization, sulfocyanidation, selenocyanidation/VTZ 1 titanium alloy, 45 steel, SCh18 36 cast iron, 1Kh18N9T steel

ABSTRACT: Sulfidization, selenidization and telluridization methods were experimentally tested on the following metals: St45 steel, SCh18-36 cast iron, 1Ch18N9T steel and VTZ01 titanium alloy. It was found that the treatment of metals with elements of group VI is prospective and should be investigated further; the direction of present research was confirmed. The thermographic method is suitable for the selection of active compounds; however, some side effects in salt melts

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ACC NR: AT5020441

are to be accounted for. Individual treatment for each method is essential. For carbon steels and cast iron, sulfidization is the best method; for stainless steels and titanium alloys, sulfocyanide, selenocyanide melts or telluridization are recommended. Orig. art. has: 3 graphs, 1 table, and 1 formula. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE:22May65/ ORIG REF: 004/ OTH REF: 004/

Card 2/2

ACC NR: AT7003403 SOURCE CODE: UR/0000/65/000/000/0183/0188

AUTHOR: Balter, M. A.; Turovskiy, M. L.

ORG: none

TITLE: Some criteria for determination of the wear resistance of high strength case hardened steel in rolling friction with slipping

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 183-188

TOPIC TAGS: friction, metal friction, friction wear, case hardening, case hardened steel, wear resistance, wear resistance criterium

ABSTRACT: The resistance to pitting of case-hardened steel was studied under conditions of heavily loaded rolling. The following parameters were studied: 1) hardness and microstructure of the surface layer; 2) roughness of the friction surface; 3) internal residual stresses. Pitting wear was measured on an ShR-4 four-ball apparatus under conditions of rolling friction with alternate slipping. Steel 18Ch2N4VA was selected for the study of the effect of hardness and microstructure on pit wear: roller bearings were made from steel 20Ch2N4A, case-hardened, with hardness HRC 60-61. The

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following criteria which determine the pit wear resistance of the case-hardened steel were found as the results of the study: 1) internal residual stresses, which confirms the fatigue nature of the pitting wear; 2) roughness of the friction surface and its changes in the process of wear. The results make it possible to explain the peculiarities of the pitting wear as follows: a) the low resistance of the polished surface can be explained as the disadvantageous distribution of the residual stresses; b) the positive effect of cold work on the wear resistance of steels with martensite structure can be explained as better stability of residual stresses under cyclic contact conditions; c) the plastic deformations of hard material work against pitting wear. Orig. art. has: 4 graphs and 1 table.
[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 006/
OTH REF: 002/

Card 2/2

ACC NR: AT5020442 SOURCE CODE: UR/0000/65/000/000/0188/0194

AUTHOR: Vasil'yev, I. V.; Yemets, L. F.

ORG: none

TITLE: New cermet anti-friction materials for joints in friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 188-194

TOPIC TAGS: friction, cermet, cermet wear material, cermet product, cermet bearing, tetrafluoroethylene, corrosion, corrosion medium, antifriction metal, solid lubricant, teflon, lubrication, antifriction material, powder metal

ABSTRACT: A study was made of the preparation and friction properties of cermet sliding bearings and end-face packings impregnated with Teflon to be used in aggressive media. Low carbon steel, chromium plated iron, type 1Ch18N9T stainless steel, bronze or nickel powder were used for forming the bearings by pressure and sintering. The pressure-formed and sintered bearings were vacuum impregnated with a Teflon suspension with subsequent drying and heating. Corrosive media were: 30 or 60% nitric acid or 1% caustic soda solution.

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The results obtained indicated that: 1) bronze powder exceeds iron powder as an anti-friction material; 2) impregnation with Teflon increases by several times the wear resistance of the specimens and diminishes the coefficient of friction; 3) nickel powder caused high wear because of a tendency of nickel to cause seizure with the stainless steel used. In 60% nitric acid the best results were obtained with stainless steel or bronze cermets impregnated with Teflon in friction with Ch15N9Yu steel (nitrided). In 30% nitric acid the best results were obtained with 1Ch18N9T steel impregnated with Teflon, chromium. In 1% NaOH the best results were obtained with cermets from porous stainless steel or bronze, both impregnated with Teflon. Tests on MT-2M or MT-5 friction machines indicated that the best results with respect to wear resistance were obtained with cermets from stainless steel or chromium-plated iron, impregnated with Teflon, or on 1Ch18N9T steel or on PG-50 graphite, resin impregnated. Orig. art. has: 4 tables. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/

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ACC NR: AT7003404 SOURCE CODE: UR/0000/65/000/000/0194/0196

AUTHOR: Voskoboynikov, D. B.

ORG: none

TITLE: X-ray methods for the study of processes in the thin surface layer of bodies in friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 194-196

TOPIC TAGS: friction, metal friction, friction wear, friction surface, x-ray method

ABSTRACT: An x-ray method has been developed for studying the processes which take place in microstructure of the active layer of frictioning bodies. The method is applicable without the destruction of the specimen. A description and a schematic sketch of the installation are given in the original. An advantage of the method is the simultaneous recording of the whole picture of diffraction; the shortcoming is the comparatively low sensitivity and a long exposure. Orig. art. has: 1 figure. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/

Card 1/1

ACC NR: AT7003405 SOURCE CODE: UR/0000/65/000/000/0196/0200

AUTHOR: Snitkovskiy, M. M.; Nepomnyashchaya, S. A.; Metelitskiy, Yu. P.

ORG: none

TITLE: Improvement of the wear resistance of some materials by compression

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 196-200

TOPIC TAGS: friction, metal friction, friction wear, wear resistance, compressing treatment

ABSTRACT: The effect of thermomechanical treatment on the wear resistance of OTsS-5-5-5 bronze, R18 steel and cast iron against steel was studied. The results indicated that the thermomechanical treatment, i.e., compression of specimens at elevated temperature, increases wear resistance of ferrous and nonferrous metals, such as bronze. The temperature during compression must be lower than the temperature of the recrystallization of the specimen. The optimum temperature is to be higher than that of the decomposition of the unstable phase. The microstructure of the compressed specimen changes; the blocks

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of the mosaic structure decrease in size, but their number increases. Orig. art. has: 3 graphs and 2 tables. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 007/

Card 2/2

ACC NR: AT7003406 SOURCE CODE: UR/000/63/000/000/0200/0202

AUTHOR: Retunskiy, Yu. F.

ORG: none

TITLE: Use of solid polymer-based lubricating films for friction joints in automobiles

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izdvo Nauka, 1965, 200-202

TOPIC TAGS: automotive engine, lubrication, solid lubricant, lubricant film, polymer lubricant film, antifriction material

ABSTRACT: In 1963, the Central Plant Laboratory of the Gor'kiy Automobile Plant started studying the possibilities of using antifriction lacquers in heavily loaded friction joints of cars and trucks. The expediency of the use of such lacquers was confirmed for: 1) complete exclusion of the use of greases for low-speed heavily loaded friction joints; 2) accelerated working-in and prevention of seizing. The antifriction lacquers were formulated as follows: 1) solid lubricant GAZ -- a suspension of MoS_2 in a solution of ED-5 epoxy resin in a solvent (unidentified); 2) VNII-NP-212 solid lubricant (VTU NP No. 88-60) -- a suspension of MoS_2 in an alcohol

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solution of formaldehyde-melamine resin. Films were obtained by spraying in an electrostatic field. The thickness of the films was in the range of 12 to 20 microns. The following particulars were observed: 1) only one part out of two frictioning parts is to be coated; 2) the part which is continuously conveying the fresh surface into the friction zone is to be coated; 3) the hardness of the nonmoving part must not exceed that of the moving part; 4) the clearance between the parts must not be less than 40 microns. The experiments confirmed the expedience of the above conditions; the study is being continued. [W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/

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ACC NR: AT7003407 SOURCE CODE: UR/0000/65/000/000/0202/0208

AUTHOR: Georgiyevskiy, G. A.; Orlina, M. Ya.; Mal'tseva, N. N.

ORG: none

TITLE: Surface wear in the friction of plastic friction materials on metal

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 202-208

TOPIC TAGS: friction, friction wear, plastic material, polymer, polymer material, anti-friction material

ABSTRACT: It was observed that in the friction of plastic materials against cast iron, four distinct temperature zones of wear exist. 1) For plastic materials (baryta + resin and asbestos + resin): a) strong wear in the range 50--60°C; b) low wear in the range 100--300°C; c) strong destruction of the surface in the range 300--500°C; and d) relatively diminished wear in the range 500--800°C. 2) For cast iron the four zones are: a) increase of cast iron weight -- up to 400°C; b) intense wear in the range of 400--500°C; c) decrease in wear, caused by the transfer of plastic

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ACC NR: AT7003407

materials on cast iron surface up to 500--700°C; and d) an increase in wear -- over 700°C. The phenomenon are explained by the abrasion of plastics at low temperatures in the first zone; smearing, transfer of films from plastic to metal and deep tear of layers are the causes of the phenomena in the other zones. Orig. art. has: 4 figures and 2 tables. [W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 012/

Card 2/2

ACC NR: AT7003421 SOURCE CODE: UR/0000/66/000/000/0035/0041

ACC NR: AT7003408 SOURCE CODE: UR/0000/65/000/000/0208/0211

AUTHOR: Mustafayev, V. A.: Podol'skiy, Yu. Ya. (Candidate of technical sciences); Vinogradov, G. V. (Prof.; Dr. of chemical sciences)

ORG: none

TITLE: Effect of the nature of the gaseous medium on the friction of plastics

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 208-211

TOPIC TAGS: friction, polymer friction, polymer oxidation

ABSTRACT: The purpose of the study was to elucidate the effect of the oxidizing atmosphere (oxygen) on the friction of metal plastic pairs. Testolite, polypropylene and polytetrafluorethylene were used as plastics; the metals were: copper, aluminum, armco-iron, hardened steel and cast iron. Comparative tests were run in the air and in vacuum. The transfer of metal or hard plastic (textolite) was observed. The absence of oxygen prevented the oxidation of metal surface layers and promoted the seizure of metal-to-metal surfaces. In the case of soft plastics, when the metal transfer is insignificant, the effect of the oxidative ambient gaseous phase is also minor. Orig. art. has: 2 graphs.

[WA 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/

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ACC NR: AT7003422 SOURCE CODE: UR/0000/66/000/000/0042/0059

ACC NR: AT7003409 SOURCE CODE: UR/0000/65/000/000/0211/0214

AUTHOR: Kostetskiy, B. I.; Gorokhovskiy, G. A.; Kravchenko, V. G.

ORG: none

TITLE: Effectiveness of metal-polymer friction pairs in electrolytic media

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 211-214

TOPIC TAGS: friction, polymer friction, polymer oxidation, electrolytic medium

ABSTRACT: Especially intensive corrosion and wear were observed on metals from the metal-polymer friction pairs which worked in an electrolytic media, e.g., sea-water. The phenomenon is explained by grafting of free radicals formed by the mechanical destruction of polymers on the metal surface. This is a factor which diminishes wear in dry friction. Contrary to this, in the presence of electrolytes, the grafted metal surfaces become discrete cathode areas; an electric nonuniformity sponsors an intense course of electrochemical

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ACC NR: AT7003409

processes and causes corrosion. Orig. art. has: 2 figures.

[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 007/

Card 2/2

ACC NR: AT7003423 SOURCE CODE: UR/0000/66/000/000/0060/0082

ACC NR: AT7003410 SOURCE CODE: UR/0000/65/000/000/0214/0219

AUTHOR: Vasil'yev, I. V.; Kudryavtseva, B. M.

ORG: none

TITLE: Some regularities of metal wear in aggressive media

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 214-219

TOPIC TAGS: friction, metal friction, friction wear, metal corrosion, corrosive medium

ABSTRACT: Metal wear in a corrosive medium is a combination of two processes: a chemical or electrochemical interaction and mechanical abrasion of metal and of interaction products. Methods for studying wear account for the following facts: 1) mechanical strength of the "third" body -- protective films or corrosion products; 2) dimensional wear, which should be considered as wear criterion and not weight losses; 3) electrochemical processes. M. M. Khrushchov suggested the use of a Kh2M machine for the study of metal wear in liquid media. The study reported the purpose of this study was to examine further the corrosive and mechanical wear of metals from

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ACC NR: AT7003410

the point of the molecular-mechanical theory of friction. R18 steel was used as specimen in the Kh2M machine; the friction was conducted in distilled water, in sodium hydroxide and sulfuric acid solutions of various concentrations. The results confirmed the applicability of the molecular-mechanical theory of friction. It was found that the same kind of wear accompanied by plastic deformation is observed both in NaOH and H_2SO_4 solutions; this implies widening of the range of the specific wear to 10^{-3} - 10^{-7}. Orig. art. has: 2 graphs and 3 tables. [W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 006/

Card 2/2

ACC NR: AT7003423

ACC NR: AT7003411 SOURCE CODE: UR/0000/65/000/000/0219/0222

AUTHOR: Belyy, V. A.; Rutto, R. A.

ORG: none

TITLE: Antifriction coatings from polymers

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 219-222

TOPIC TAGS: friction, anti-friction, material, polymer, polymer antifriction material

ABSTRACT: Polyamide coatings of various thickness were studied on metal. An MI-1M Amsler machine was used. The following polyamides were mentioned in the study: polycaproamide (VTU MKhP 69-58), polyamide resin P-68 (TU 85-no. 300-61) and polyamide resin (VTU P-90-57). It was found that coatings deposited on a fresh sand-blasted surface have maximum statistical adhesiveness. Surfaces, mechanically polished to a fineness of class > 5--6 and sand-blasted and covered with phosphate film still have adequate adhesiveness to polymers. Polymer-coated friction joints are widely used where heavy loads are expected

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ACC NR: AT7003411

in friction joints of metal cutting machine tools, rolling mills, tractors and lifting equipment. Orig. art. has: 2 graphs and 2 tables. [W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 004/

Card 2/2

ACC NR: AT7003412 SOURCE CODE: UR/0000/65/000/000/0222/0224

AUTHOR: Bilik, Sh. M.; Tsurkan, V. P.

ORG: none

TITLE: Effect of the direction of flow of electric charges formed in friction on the wear of a metal-polymer pair

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 222-224

TOPIC TAGS: friction, anti-friction material, polymer, polymer antifriction material, electric charge

ABSTRACT: The wear is studied of two types of polymers: 1) electronegative, such as Textolite-PT, polymethylmethacrylate, DPK, AG-4, "asbodin", or epoxy resins, and 2) electropositive, such as polytetrafluoroethylene, graphite filled DPK, "voloknit", caprolon. In the friction against metal, the electropositive polymers give their electrons to metals, while the electronegative polymers accept the electrons. Experiments arranged in such a way so that polymer-metal friction pairs were electrically isolated, grounded or electrically biased along and against the electron flow, confirmed the above concept. It was found that all electronegative polymers wear the

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ACC NR: AT7003412

metal more than the electropositive polymers. In the case of electronegative polymers, metal is smeared on the polymer. The electropositive polymers hardly wear the metals; the polymer is smeared on metal. In the long run, the thickness of the "smeared on" film increases and the polymer is ruptured. Orig. art. has: 4 figures and graphs. [W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/

Card 2/2

ACC NR: AT7003413 SOURCE CODE: UR/0000/65/000/000/0225/0227

AUTHOR: Kestel'man, N. Ya.; Shapovalov, Yu. I.

ORG: none

TITLE: Wear of polyamides in sliding friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 225-227

TOPIC TAGS: friction, anti-friction material, polymer, polyamide, sliding friction, friction wear, solid lubricant

ABSTRACT: A thermal treatment is recommended for diminishing the friction of the polyamide-metal pairs. The decrease in the coefficient of friction is explained by the crystallization of the heat-treated polyamide. It is assumed that contact takes place on the surface of polyamide spherlites, which has less activity than that of the amorphous polymer. Heat treatment in oil increases the hardness of polyamides while the absorption of water (up to 3%) makes them softer. It is stated that the thermal treatment can be applied for increasing the service life of polyamide bushings. Orig. art. has: 2 graphs. [W.A. 28]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 003/ [BN]

Card 1/1

ACC NR: AT7003414 SOURCE CODE: UR/0000/65/000/000/0227/0233

AUTHOR: Georgiyevskiy, G. A.; Lebedev, L. A.; Orlova, V. V.

ORG: none

TITLE: Friction of plastic on metal

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 227-233

TOPIC TAGS: friction, antifriction material, solid lubricant, polymer, plastic material, polymer antifriction material

ABSTRACT: The dependence of friction properties on processes which take place in the friction of a polymer against metal was studied by determining the changes in the friction coefficient with temperature changes, evolution of decomposition products, and changes in the properties of the friction surfaces. The tests were conducted on a I-47-K-54 machine. Asbestos (80%) + resin (20%) or barytal (80%) + resin (20%) plastics were tested with KhNMKh cast iron. The processes were found to be of a complex physical and chemical nature. At temperatures close to plastic decomposition, the friction could

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ACC NR: AT7003414

be defined as boundary lubrication. At high temperatures, the friction is close to dry friction. Orig. art. has: 4 graphs and 3 tables. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 014/

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ACC NR: AT5020443 SOURCE CODE: UR/0000/65/000/000/0233/0237

AUTHOR: Vaynshteyn, V. E.

ORG: none

TITLE: Materials for dry friction joints

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 233-237

TOPIC TAGS: friction, metal friction, dry friction, cryogenics, polymer teflon, solid lubricant, lubrication, lubricant property, molybdenum disulfide

ABSTRACT: This is a review of solid lubricating materials for use in dry friction joints. The potential use of such materials for aerospace conditions, i.e., high vacuum, cryogenic and elevated temperature, and cryogenic media (lox, liquid hydrogen) is discussed. Dry friction of metals in vacuum is undesirable because of the absence or small extent of the formation of oxide films. The molecular-mechanical theory, developed by I. V. Kragel'skiy, is mentioned in connection with the gradient of metal tear: a positive gradient $\frac{d\tau}{dZ}$ is desirable. Here, τ is resistance to shear, and Z is the

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ACC NR: AT5020443

distance from the friction surface in the depth of the metal. The following friction materials are either discussed or mentioned: thin metal coatings (Ni, Ag, Co, Au, Pd, Su, or Pb) with or without teflon; polymer coatings with or without MoS_2, WS_2, $MoSe_2$, WSe_2, or $NbSe_2$. Self-lubricating materials obtained from the above-mentioned components must produce a low coefficient of friction, have an adequate mechanical strength, thermal stability and resistance and machinability. A band material has been developed at IMASh, which consists of steel and porous bronze impregnated with polytetrafluoroethylene with or without MoS_2. A similar British product Du is mentioned. The instability of polytetrafluoroethylene under conditions of ionizing radiation, especially in air, is discussed. Materials are mentioned for the lubrication of ball bearing separators, such as cermet compositions on the basis of teflon and the above named sulfides and selenides. It is noted that WSe_2 and $NbSe_2$ (in combination with silver) are most effective lubricants, as compared with MoS_2. A composition of silver + tungsten-disulfide filled teflon was used for manufacturing ball-bearing separators of devices. The following requirements are set for materials which are to be used with the self-lubricating compositions: 1) the surface must be polished to a grade of fineness not lower than grade 10 according to GOST-2789-59; 2) hardness RC in the range of 55 kg/mm^2;

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ACC NR: AT5020443

3) if MoS_2 is used, either Mo-containing steels (Mo content not less than 8% or Mo-clad steels are to be used as counter-bodies. The article has 10 references, 2 of them are original Soviet works. Orig. art. has: 3 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/ ORIG REF: 002/ OTH REF: 008

Card 3/3

ACC NR: AT7003415 SOURCE CODE: UR/0000/65/000/000/0237/0241

AUTHOR: Lyubarskiy, I. M.

ORG: none

TITLE: The reversibility of structural changes in friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 237-241

TOPIC TAGS: friction, metal friction, metal structure, reversible structure change

ABSTRACT: This article is devoted to a discussion of the effect of the basic parameter of friction processes on the reversible structural changes which take place in boundary layers. Temperature T, pressure P, concentration of active media C, and time of the kinetic processes were selected as basic criteria. Illustrations of the processes were obtained on an ShR-2 machine, which imitated the gear meshing. Formation of a very thin 100% austenitic layer on the friction surface is given as one of the examples of structure transformations. It is noted in the summary that a high dispersion of the hard phase and an oriented evolution of the transformed phase

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ACC NR: AT7003415

are conditions which make the reversible transformation possible. Such a quasi-equilibrium system easily changes its structure if P and T change in the process of friction. Orig. art. has: 2 graphs.
[W.A. 28]
[BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/

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ACC NR: AT7003416 SOURCE CODE: UR/0000/65/000/000/0241/0243

AUTHOR: Gurko, I. I.

ORG: none

TITLE: Results of testing thread pairs in friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya smazochnogo deystviya i novyye materialy (Theory of lubricating action and new materials). Moscow, Izd-vo Nauka, 1965, 241-243

TOPIC TAGS: friction, metal friction, friction wear

ABSTRACT: Thread and nut pairs were tested on a special stand. The materials used were: 1) thread--steel 5, nut--LS59-1; 2) thread--steel 5, nut--SCh-18-3b; 3) thread--steel Kh17N2, nut--BrAZhMts-10-3-1.5; 4) thread and nut--steel Kh18N9T. The experiments were conducted with and without lubrication. The results are presented graphically. Orig. art. has: 3 graphs. [W.A. 28] [BN]

SUB CODE: 11,21/ SUBM DATE: 22May65/

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63/0167

ACC NR: AT6030387

Section 2

ACC NR: AT7003419 SOURCE CODE: UR/0000/66/000/000/0005/0018

AUTHOR: Demkin, N. B.

ORG: none

TITLE: Contact of rough surfaces

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 5-18

TOPIC TAGS: metal surface, metal finishing, metal friction, friction surface, friction surface contact, friction surface contact computation

ABSTRACT: An attempt is made to solve analytically the problem of the friction contact of rough surfaces. In this study, models of rough surfaces with ideal properties are taken as the basis for analytical calculation; comparisons with experimental data are used for assumptions of values sufficiently accurate for industrial approximations. First, geometrical characteristics of rough surfaces are discussed and a series of constants are derived for separate roughness elements, i.e., surface bulges which form the actual contact. Further, contact deformation is calculated for flat, conical, and spherical surfaces. Special cases of plastic, elastic or hardened plastic contacts are investigated

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ACC NR: AT7003419

analytically. In general, the author states that the special features of a contact can be calculated approximately on the basis of assumptions made in accordance with experimental data. The results, which are near agreement with experimental data, were obtained if a spherical model of micro-roughness is used; this model does not differ basically from the elliptical model. The results can be applied for practical calculation of friction processes. Orig. art. has: 8 figures, 3 tables, and 66 formulas. [W. A. 28] [BN]

SUB CODE: 11/ SUBM DATE: 22Feb66/ ORIG REF: 016/ OTH REF: 002

Card 2/2

ACC NR: AT7003420 SOURCE CODE: UR/0000/66/000/000/0019/0034

AUTHOR: Ryzhov, E. V.

ORG: none

TITLE: Geometrical characteristics of rough and wavy surfaces

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 19-34

TOPIC TAGS: metal surface, metal finishing, metal machining, metal surface roughness, metal surface waviness

ABSTRACT: The results are given of a study of the geometry of the roughness and waviness of machined metal surfaces. The geometrical characteristics are given for comparison. Steel or cast iron specimens were subjected to various methods of machining whereby the surfaces of various classes of finish were prepared. The measurements given in 15 tables present data on the parameters of the peaks and valleys, waviness and their orientation with respect to lay. The general conclusion is that the shape of separate microroughnesses or waves can be presented in the form of part of an ellipsoid or a toroid; in addition, cylindrical forms are possible. Orig. art. has: 15 tables.

SUB CODE: 11/ SUBM DATE: 22Feb66/ ORIG REF: 003 [W. A. 28] [BN]

Card 1/1

ACC NR: AT6030388 SOURCE CODE: UR/0000/66/000/000/0173/0178

ACC NR: AT7003421 SOURCE CODE: UR/0000/66/000/000/0035/0041

AUTHOR: Pribylev, A. A.

ORG: none

TITLE: Grid method for investigating surface quality

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 35-41

TOPIC TAGS: metal surface, metal surface curvature, industrial control, grid, grating, moire pattern

ABSTRACT: A method for industrial control of the production of items with a definite curvature is suggested. The method is based on viewing of the surface through grids (with textile or metal strings) or glass gratings which form a moire reflection pattern with the grid or grating shadows. The pattern of the moire image and the shape of the curves obtained made it possible to determine the radius of the surface curvature. The analytical part of the study includes equations on which the evaluation of the curvature radii is based. Orig. art. has: 7 figures and 10 formulas. [W. A. 28] [BN]

SUB CODE: 11/ SUBM DATE: 22Feb66

Card 1/1

ACC NR: AT7003427 SOURCE CODE: UR/0000/66/000/000/0179/0185

AUTHOR: Tolstoy, D. M.; Kaplan, R. L.

ORG: none

TITLE: The role of slider normal elevations in external friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 42-59

TOPIC TAGS: friction metal friction, lubrication, boundary friction, dry friction

ABSTRACT: The authors state that the effect of normal elevations of a slider on the dependence of the friction force on sliding velocity and the origin of anti-oscillations was ignored in earlier investigations. This effect was accounted for in V. A. Kudimov's theory. The authors applied this theory to the case of dry or boundary friction with positive results; the results of the application of the theory were confirmed experimentally. Findings of the study were as follows: autooscillations of the slider originate easily; their frequency depends on the mass and on the rigidity of the contact; their amplitude is sufficient to affect the friction force. These relationships are

also valid for lubrication and for the mixed boundary-hydrodynamic regime. The hydrodynamic wedging effect of the lubricant only quantitatively affects the above relationships. Orig. art. has: 9 figures, 1 table, and 13 formulas. [W. A. 28] [BN]

SUB CODE: 11/ SUBM DATE: 22Feb66/ ORIG REF: 020/ OTH REF: 001

AUTHOR: Shishinadze, A. V.; Baumgarte, A. E.; Khodorov, F. S.; Apalenov,

AUTHOR: Vets, V. L.

ORG: none

TITLE: Investigation of static friction in slide guides at low-frequency directed microvibrations

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 60-82

TOPIC TAGS: metal friction, metal machining, machine tool vibration, vibration effect

ABSTRACT: An experimental investigation has been made of the dependence of characteristics of static friction on the intensity, duration, and directivity of low-frequency (to 50—200 cps) vibrations. In the experiments, a heavy cast iron or steel carriage with a machined slide bar was pushed at a speed of 0.015—1.0 cm/min along a suitably slotted bed plate. The carriage had a mechanical vibrator mounted on it which could induce a normal and longitudinal or transverse vibratory microscopic shift of the carriage at a rate of 15—35 cps. The carriage contact area was 200 cm^2; the specific pressure varied from 0.5 to 2

kg/cm^2; and the experiments were made under conditions of poor lubrication and also under conditions of practically dry friction. Static friction was determined by measuring the tangential force required to shift the carriage with the vibrator switched off, which, for a given period of time, induced carriage vibration in a given direction with a given amplitude, or with the vibrator working continuously. Vibration amplitude was selected so that the vibrator-induced tangential force was smaller than the initial force of the static friction. The vibrator-induced vibratory shifting of the carriage (in the initial position) relative to the bed plate guides was tentatively designated as the contact surface vibropreparation. The experimental results showed that the relatively directed microvibrations appreciably affected the character and the magnitude of the force of the static friction. The vibropreparation with vibratory force amplitudes close to the magnitude of the initial static friction force increased the latter by a factor of 1.5—2. The static friction force also increased with increasing amplitude of the vibration force and duration of its application. Vibropreparation of the contact surface with low amplitude vibrations at higher frequencies decreased static friction by 20—30% compared with the initial magnitude. With increasing vibration amplitude, the difference in the vibropreparation effect for various frequencies of vibrations gradually decreased and disappeared completely when the vibration force approached the magnitude of the initial static friction

force. In this case, a stable increase was observed in the static friction. An analogous, sufficiently stable increase up to 1.2—1.4 times was observed in the static friction after vibropreparation with vibrations induced in a contact plane perpendicular to the direction of the subsequent carriage shift. On nonlubricated contact surfaces, the vibropreparation effect on the static friction was slightly (3—5%) greater than on poorly lubricated surfaces, but all the described relationships were the same. The effect of vibropreparation on the static friction was 8—12% greater for rough contact surfaces and 10—15% smaller for finer contact surfaces. In experiments with the carriage with a continuously working vibrator, the effective force of static friction was considered to be a tangential resistance against the carriage pushing force together with the action of the vibrator. The experimental data on the shift of the carriage with the vibrator switched-on qualitatively agreed with the corresponding data obtained with the vibrator switched-off. This showed that both the preliminary and presently superimposed microvibrations increase the effective force of the static friction at appreciable vibration amplitudes. On the basis of the experimental results, formulas were derived for calculating reliable friction joints in modern heavy and precision metal cutting machine tools, taking into account the effect of microvibrations unavoidable in metal machining. Orig. art. has: 14 figures and 27 formulas. [W. A. 28]

SUB CODE: 11/ SUBM DATE: 22Feb66/ ORIG REF: 015/ OTH REF: 001 [MS]

Card 3/3

ACC NR: AT6030384 SOURCE CODE: UR/0000/66/000/000/0083/0090

AUTHOR: Balakin, V. A.

ORG: none

TITLE: Some peculiarities of the friction and wear of materials at high sliding speeds

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 83-90

TOPIC TAGS: friction, sliding friction, high speed sliding friction, friction coefficient, friction coefficient calculation

ABSTRACT: The results are presented of a theoretical determination of the friction coefficient and wear of materials at high sliding speeds, taking into account changes in the reaction R which result from various physical factors always present in the motion of real contacting bodies. A material point M, with a mass m, subjected to the action of a constant vertical load P, is assumed to be moving at a constant speed V along an absolutely rigid sinusoidal surface with the sine wave length l much greater than the sine amplitude a ($l > 200\,a$). The forces acting on M during its motion along various portions of the sinusoidal surface,

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ACC NR: AT6030384

and the resulting changes in R are analyzed, and formulas are derived for their calculation. Because of the waviness from irregularities and other surface defects, R varies for a body moving at high sliding speeds under a constant load. This results in a nonstationary friction process in which the friction force T is zero on some portions of the surface because the reaction R is zero and the contact is absent, while on other portions, the friction force is a function of a specific load at a constant speed and, in a jump-like motion with increasing speed, the mean integral friction force within the limits of a single sine wave approaches zero. The wear of materials is also nonuniform. On some portions of the material there is no wear at all; on other portions the wear is a function of the specific load at a constant speed; and on the portion of the jump-like motion, wear occurs in the form of individual smears. Thus, in determining the friction coefficient and wear of materials at high sliding speeds, it is necessary to take into account the nature of the nonstationary friction process caused by the waviness, form irregularity, and other defects of the contact surfaces. In work where friction is useful (e.g., braking), it is necessary that the friction linings follow the surface waviness, and V should be lower than the V_{1cr} speed, i.e., a critical speed below which a material point M follows the shape of the sinusoidal surface. The values of V_{1cr} can be raised by decreasing the moving mass of the body to which the load P is applied, and also by

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decreasing the waviness and the surface form irregularities, which can be achieved by increasing the parameter $1/a^{1/2}$. In the case of random waviness, the calculation should be made by assuming a minimum value for the $1/a^{1/2}$ parameter, which ensures that $V < V_{1cr}$. For working conditions where friction is harmful, the highest efficiency is achieved at sliding speeds $V > V_{2cr}$, where V_{2cr} is a critical speed at which material point M experiences a jump-like motion along the sinusoidal surface. Orig. art. has: 8 figures and 26 formulas. [W. A. 28] [BN]

SUB CODE: 21, 11/ SUBM DATE: 22Feb66

ACC NR: AT6030385 SOURCE CODE: UR/0000/66/000/000/0091/0097

AUTHOR: Goryunov, V. M.

ORG: none

TITLE: Investigation of friction under nonstationary high-speed operating conditions

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 91-97

TOPIC TAGS: metal friction, high speed friction, friction coefficient, metal wear, wear resistance

ABSTRACT: The surface temperature and friction and wear characteristics of 30KhGSA low-alloy steel, EI696 stainless steel, Gatfield steel, molybdenum-cobalt-bronze and several other metal alloys have been investigated in friction at sliding speeds above 220 m/sec. Some experimental results are given in the original. According to modern theory, wear results from tensile stresses in the surface layer of a friction material induced by contact interaction. At high sliding speeds, when the metal surface layers are at a very high temperature, wear can be significantly affected by the magnitude and sign of the

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ACC NR: AT6030385

acceleration. This explains the appreciably greater wear of metals with increasing speed than with decreasing speed. It is possible that the tensile stresses in the friction surfaces increase substantially in the former case and decrease in the latter. It is probable that a similar effect can appear and be detected at very high acceleration (hundreds m/sec^2). Additional experiments, however, are required to verify the above hypothesis. L. A. Chatynyan and Ye. V. Belova participated in the work. Orig. art. has: 5 figures and 1 table.
[W. A. 28]
[BN]

SUB CODE: 21, 11/ SUBM DATE: 22Feb66/ ORIG REF: 007/ OTH REF: 001

Card 2/2

AUTHOR: Korovchinskiy, M. V.

ORG: none

TITLE: Fundamentals of the theory of thermal contact at local friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 98-145

TOPIC TAGS: metal friction, friction heat, friction heat theory

ABSTRACT: An attempt is made to develop a general theory of thermal contact with friction for the case when the contact region is relatively small compared with the characteristic dimensions of the contacting bodies. Following an extensive review of research in the field carried out by 26 Soviet and 43 foreign authors, the general problem of the thermal contact between friction bodies is formulated under the assumption that the friction heat source is a system formed by very thin surface layers of the contacting bodies which are directly adjacent to elements of the actual contact area and which constitute a single whole with these elements. Tentative solutions are derived for various partial problems in the entire range of Peclet numbers for stationary, quasi-stationary and nonstationary modes of contact. Experimental determination of the contact temperatures and applications of the existing theory to purely engineering problems are not discussed since such problems represent quite independent special sections in the science of friction. Orig. art. has: 4 figures and 173 formulas. [W. A. 28] [MS]

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ACC NR: AT7003425 SOURCE CODE: UR/0000/66/000/000/0146/0157

AUTHOR: Chichinadze, A. V.

ORG: none

TITLE: Heat dynamics of external friction

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 146-157

TOPIC TAGS: metal friction, external friction, high temperature friction, friction coefficient, friction coefficient calculation, metal wear

ABSTRACT: A theoretical study is presented on heat dynamics in external friction. Equations are derived for determining the friction and wear characteristics of materials working under conditions of a significant increase in temperature of brake components. Formulas are derived for calculating the effect of the change in the coefficient of expansion on the rate of linear wear, i.e., the change in the number of heat cycles which leads to failure of the material. Formulas are also derived for calculating changes in the hardness of a friction material, depending on the degree of its heating with friction. Orig. art. has: 5 figures

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and 56 formulas. [W. A. 28] [MS]

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ACC NR: AT6030386 SOURCE CODE: UR/0000/66/000/000/0158/0162

AUTHOR: Kanayev, A. A.; Veyler, S. Ya.

ORG: none

TITLE: Effect of friction conditions on the elastokinetic phenomena in pressure working of metals

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 158-162

TOPIC TAGS: metal working, cold pressure metal working, metal friction, metal relaxation

ABSTRACT: The effect of friction conditions and the rate of reduction on relaxation processes in cold-pressure worked metals has been investigated. Solid and tubular rods of copper and brass were cold drawn with a reduction of up to 30%; drawing was done with and without lubrication. Relaxation of the deformed metal was found to be greatly dependent on the axial stress which, in turn, was significantly affected by the shear resistance of the metal at the contact friction surfaces. Hence, in pressure working of metals, metal relaxation can be controlled by changing the boundary conditions on the friction

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surfaces. Analysis of the experimental data also showed that the above relationships for the relaxation process in drawing of rods are also valid in drawing thick-walled tubes as well as in deep drawing of metal. Orig. art. has: 3 figures. [W. A. 28] [BN]

SUB CODE: 21, 11/ SUBM DATE: 22Feb66/ ORIG REF: 004/ OTH REF: 001

Card 2/2

ACC NR: AT6030387 SOURCE CODE: UR/0000/66/000/000/0163/0167

AUTHOR: Kanayev, A. A.; Veyler, S. Ya.

ORG: none

TITLE: Effect of lubricating media on shear stress in the contact zone of a deformed metal and tool

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 163-167

TOPIC TAGS: metal friction, metal drawing, friction coefficient, shear stress

ABSTRACT: The purpose of the study was to investigate the effect of the deformational properties of metal and of the physical and chemical properties of the lubricating media (for short lubricants) on the rheological properties of the system: deformed metal-lubricants. In a discussion of previous studies on the subject, the authors state that the basic difference in the relative distribution of stresses exists in two extreme cases, namely, dry deformation (e.g., drawing) and ideal lubrication. In lubricated drawing higher normal stresses arise, while in the case of dry drawing, the increase in axial stresses (coefficient

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of friction) is higher. The authors studied experimentally the dependence of the drawing force on the speed of drawing. The experiments consisted of drawing molybdenum or copper wires (Φ 0.25 mm) through a 0.29 mm hole of a diamond drawing plate with or without lubrication with the use of different weights to produce different speeds of drawing. The experiments indicated that there exists a minimum drawing stress σ_{min} for each variation of the experiment. First, σ_{min} increases with initial small increases in the drawing speed, but finally attains a maximum value which is independent from the drawing speed; it was also found that σ_{min} depends on the nature of the lubricant. The dependence $V = f(\sigma)$ contains implicitly the dependence $V = f(\tau)$, where τ is the shearing stress. The observed difference between the extreme values of τ, which depend on the nature of the lubricating medium, indicate that there are minimum and maximum values of τ which characterize the rheological properties of the friction layer. The existence of τ_{min}, strictly defined for each friction pair: deformed metal-lubricant, makes it possible to assume that some friction layers have tixotropic properties at shear velocities near zero. This tixotropic property is caused by very narrow separating spaces between the solid phase (fillers, wear products) of the lubricant, filled with the liquid phase. The increase in τ results in an increase in the relaxation rate of the elastic stresses in the lubricating layer, which brings about weakening of the adhesion between the dispersed particles

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and results in their dislocation. This process results in a decrease in the quasi-solid behavior of the above-mentioned separating spaces and results in a quasi-hydrodynamic behavior of the lubricating medium which is different from the true hydrodynamic conditions in which the friction surfaces are completely separated by the lubricant. This study of the drawing speed is also important for other metal machinings in which the initial shear speed is relatively small, e.g., in press stamping. The existence of τ_m — the minimum stress necessary for producing the plastic shear deformation — is explained by the existence of a certain stagnation zone which can be observed in some metal treatment processes, e.g., rolling, up-setting or indentation. The drawing stress σ_{min} decreases in the case of repeated runs which seems to be connected with a relaxation of normal elastic stresses in the deformed metal. Orig. art. has: 2 figures. [W. A. 28]
[BN]

SUB CODE: 21, 11/ SUBM DATE: 22Feb66/ ORIG REF: 006

ACC NR: AT7003426 SOURCE CODE: UR/0000/66/000/000/0168/0172

AUTHOR: Garkunov, D. N.; Markov, A. A.

ORG: none

TITLE: Study of the atomic deposition of copper in the friction pair: electrolytic chromium-bronze

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 168-172

TOPIC TAGS: metal friction, bronze, chromium, copper transfer

ABSTRACT: As the friction pair: electrolytically deposited chromium — a highly resistant bronze is very often used for important, heavily loaded joints, especially in aviation, the previously discovered atomic deposition of copper on bronze surfaces was studied. The phenomenon was observed on bronzes: BrAZhMts - 10-3-15 and BrB-2, in friction with chromium-plated steels lubricated with AMG-10 oil or TsIATIM-201 grease. Both chromium-plated and bronze friction parts suffered very little wear. The chromium surface has no copper, but was oxidized. The phenomenon was explained by the existence of the contact difference of potentials (CDP). It was found that metals or alloys can be arranged in a series

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ACC NR: AT7003426

by the value of CDP; their relative position depends on the nature of the lubricant. The friction of BrAZhMts bronze specimen against steel or chromium-plated steel was compared on an AYe-5 friction machine. It was found that the coefficient of friction between the bronze and the chromium plated steel was approximately twice as low as that of the bronze-steel pair. The copper deposit seems to function as a solid lubricant and seems to be spread on the bronze surface. Orig. art. has: 5 figures. [W. A. 28] [BN]

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ACC NR: AT6030388 SOURCE CODE: UR/0000/66/000/000/0173/0178

AUTHOR: Artem'yev, B. P.

ORG: none

TITLE: Antiseizure properties of phosphated surfaces covered with solid lubricant

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 173-178

TOPIC TAGS: metal friction, solid lubricant, high temperature lubricant, molybdenum disulfide, phosphating, phosphated steel

ABSTRACT: For the purpose of investigating the best conditions for use of molybdenum disulfide as a solid lubricant under extreme conditions of high temperature and pressure, an experimental study was conducted to compare the antiseizure properties of MoS_2 films deposited either directly on metal (ShKh-6 steel balls) or after phosphating. The experiments were conducted on a shell four-ball friction apparatus; in all cases (i.e., balls untreated, covered with MoS_2 film, or phosphated and covered with MoS_2 film), TS-145 oil was used for lubrication. The results indicated the expediency of using phosphating prior to the application of the MoS_2 film to enhance the antiseizure effect of the solid lubricant. The MoS_2 film was applied according to the industrial formula used at ZIL and MZMA plants: MS_2 — 2 parts; preparation SBG — 20 parts; isopropanol — 100 parts. Orig. art. has: 2 tables and 1 figure. [W. A. 28] [BN]

SUB CODE: 21, 11/ SUBM DATE: 22Feb66/ ORIG REF: 013/ OTH REF: 021

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ACC NR: AT7003427 SOURCE CODE: UR/0000/66/000/000/0179/0185

AUTHOR: Slobodyannikov, S. S.

ORG: none

TITLE: Mathematical modeling of the carrying capacity of slide bearings

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 179-185

TOPIC TAGS: lubrication, metal friction, mathematical model, slide bearing

ABSTRACT: By the method of analogy between viscous flow of the lubrication layer and flux of electricity in a conductor, the author attempts to obtain certain theoretical quantitative information on the carrying capacity of real slide bearings, taking into account some side factors. Based on this concept a mathematical model of a bearing in the form of a network of ohmic resistances is derived. Such a model is valuable because it is supposed to imitate the butt-end flow of the lubricant and the effect of grooves on the carrying capacity of the lubrication layer. The experimental study confirmed the assumed analogy, and reliable information was obtained in the form of solutions of analytical

ACC NR: AT7003427

equations. Orig. art. has: 4 figures and 21 equations. [W. A. 28] [BN]

SUB CODE: 11/ SUBM DATE: 22Feb66/ ORIG REF: 004/ OTH REF: 002

ACC NR: AT7003428 SOURCE CODE: UR/0000/66/000/000/0186/0194

AUTHOR: Chichinadze, A. V.; Baumgarte, A. E.; Khodorov, F. S.; Apalenov, Yu. G.; Braun, E. D.

ORG: none

TITLE: Modeling of the wear of materials sliding on the ground

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazochnym materialam. Novoye v teorii treniya (Recent developments in the theory of friction). Moscow, Izd-vo Nauka, 1966, 186-194

TOPIC TAGS: mathematical model, friction, friction wear

ABSTRACT: The authors find that theoretical modeling of the friction and wear of solid materials against the ground should be developed on the basis of the molecular mechanical theory of friction, deriving from it necessary and sufficient similarities. In actual service, the wear of solid materials against the ground is a result of fatigue destruction because of plastic deformations. This kind of wear has been adequately modeled by means of using an elastic-abrasive surface and methods developed at the Division of Friction Theory of IMASh. Orig. art. has: 3 figures and 3 tables. [W. A. 28] [BN]

SUB CODE: 11/ SUBM DATE: 22Feb66/ ORIG REF: 013/ OTH REF: 002