MOLCHANOV, Ye. I., Cand Tech Sci -- (diss) "Study of ~~[illegible]~~ conditions of starting stationary gas turbine plants ~~installations~~." Mos 1958, 13 pp. (Min of Electric (Stations) Power ~~[illegible]~~ USSR. All-Union Order of Labor Red Banner Heat Engineering ~~Tech~~ Sci Res Inst im F.E. Dzerzhinskiy) 120 copies (KL, 21-58, 90)

MOLCHANOV, Ye.I.

[Investigating starting conditions of stationary gas-turbine units. Author's abstract of the dissertation for the scientific degree of a Candidate of Technology] Issledovanie uslovii puska statsionarnykh gazoturbinnykh ustanovok. Avtoreferat dissertatsii na soiskanie uchenoi stepeni kandidata tekhnicheskikh nauk. Nauchnyi rukovoditel' - G.I.Shuvalov. Moskva, Vses.ordena Trudovogo Krasnogo Znameni teplotekhn.nauchno-issl.in-t im. F.E.Dzerzhinskogo, 1958. 12 p. (MIRA 12:10)

(Gas turbines)

S/123/60/000/022/012/013
A005/A001

26.2120

Translation from: Referativnyy zhurnal, Mashinostroyeniye, 1960, No. 22, p. 348, # 123386

AUTHOR: Molchanov, Ye.I.

TITLE: The Problem of Substantiation of the Starting Conditions of Gas Turbine Units

PERIODICAL: V sb.: Usoversh. konstruktsiy i ekspluat. turbin. ustanovok. Moscow-Leningrad, Gosenergoizdat, 1959, pp. 255-261

TEXT: A method is expounded of the substantiation of the starting conditions of gas turbine units according to which the starting instant is determined by the stresses arising in the turbine impeller. Calculations showed that the thermal flux preheating the impeller is directed along the radius and the problem of determining the temperature drops can be reduced to the one-dimensional problem. A formula and graphs are presented for determining the temperature drop between the center and the periphery of the impeller, as well as a formula of the thermal stresses in the latter. It is noted that thermal stresses are smaller in an

√C

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S/123/60/000/022/012/013
A005/A001

The Problem of Substantiation of the Starting Conditions of Gas Turbine Units

impeller produced from steel of the perlite class. The stresses in the impeller of the gas turbine unit ГТ$_2$-600-1.5 (GT-600-1.5) during the starting process were equal to 5,100-5,800 kg/cm^2 which are near the rated stress. The calculation method proposed can be recommended for determining, to a first approximation, the stresses in turbine drum impellers at starting of gas turbine units.

B.I.A.

Translator's note: This is the full translation of the original Russian abstract.

SOV/96-59-3-6/21

AUTHOR: Molchanov, Ye.I., Candidate of Technical Sciences

TITLE: Temperature Distribution in a Gas-Turbine Rotor
(O raspredelenii temperatury v rotore gazovoy turbiny)

PERIODICAL: Teploenergetika, 1959, Nr 3, pp 30-31 (USSR)

ABSTRACT: The 1500-kW gas turbine on which the measurements were made is installed in the Heat and Electric Power Station of the All-Union Thermo-technical Institute. The initial gas temperature was 600°C. A longitudinal cross-section through the set is given in Fig.1. The five-stage gas turbine drives an axial compressor and also a generator through a reduction gear. The turbine rotor is of the solid-forged drum type and has an internal bore 50 mm diameter. It is made of austenitic steel. The turbine speed is 5,000 rpm. Temperature measurements were taken in the bore of the rotor by means of chromel-alumel thermo-couples installed at various points as illustrated diagrammatically in Fig.2. Measurements were made every five minutes whilst the rotor was being heated up; thereafter longer time intervals were used. Temperature changes at various parts of the rotor bore as a function of time are plotted in Fig.3 which also notes the inlet

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SOV/96-59-3-6/21

Temperature Distribution in a Gas-Turbine Rotor

and outlet gas temperatures. A graph of the temperature distribution in the rotor bore during steady thermal conditions is given in Fig.4. Equilibrium is reached some four hours after starting. The results show that the rotor is quite strongly heated and that temperature gradients appear. Thermal expansion of the rotor is considerable but is less than the expansion of the turbine casing. Axial expansion of the casing is in fact about 12 mm whereas under steady conditions the expansion of the rotor is about 4 mm. There are 4 figures.

ASSOCIATION: Vsesoyuznyy Teplotekhnicheskiy Institut (All-Union Thermo-Technical Institute)

Card 2/2

80287

S/170/60/003/04/16/027
B007/B102

24.5200

AUTHOR: **Molchanov, Ye. I.**

TITLE: A Method of Approximate Calculation of Temperature Fields in Cooled Disk Rotors of Gas Turbines

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 4, pp. 99-102

TEXT: A number of experiments with cooled rotors with air conveyance to the front of the disk were made in order to facilitate the calculations of temperature gradients and of the maximum temperature in the disk rotors of gas turbines. Basing on these experiments, a simple method of determining the mentioned parameters with an accuracy sufficient for technical calculations was worked out. The experiments were carried out at the hydraulic integrator designed by V. S. Luk'yanov. The experimental conditions are mentioned. Altogether 228 problems were solved, 132 of them under nonsteady and 96 under stabilized thermal conditions. Evaluation of the results from calculation showed that the radial temperature gradients under nonsteady thermal conditions as well as the temperature in the various points of the disk under stabilized thermal conditions depend linearly on the temperature at the front of the disk.

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S/170/60/003/04/16/027
B007/B102

A Method of Approximate Calculation of Temperature Fields in Cooled Disk Rotors of Gas Turbines

Formula (2) for calculating the radial maximum temperature gradient in the disk in the case of quick starting is written down. The coefficients occurring in this formula are determined from the graphs given in Figs. 1 and 2. The diagrams were plotted for various values of the Biot number on the cylindric surface ($\alpha R/\lambda$). Besides, these coefficients depend on the simplex H/R and on the Biot number at the front face ($\alpha_{front} R/\lambda$). R denotes the outer radius of the disk, H half the thickness of the disk investigated, α the coefficient of heat exchange on the cylindric disk surface and α_{front} the coefficient of heat exchange on the disk front on the radius. λ denotes the heat conductivity coefficient. Formula (3) for calculation of the maximum and minimum temperature in the cooled disk on stabilized thermal conditions is written down. In the case of air conveyance to the front side the minimum temperature occurs in the middle of the disk. The gradient in radial direction can be calculated when maximum and minimum temperature are known. Comparison of the results obtained from formulas (2) and (3) with the respective solutions of the problems by the hydraulic integrator showed that these formulas are quite useful for technical calculations. Maximum divergence is about 5%. Finally, formula (4) for the calculation of the distribution of the temperature gradient along the radius is

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A Method of Approximate Calculation of Temperature Fields in Cooled Disk Rotors of Gas Turbines

S/170/60/003/04/16/027
B007/B102

written down. Heating of the cooling air and cooling air consumption (on the condition that the cooling air is conveyed to the center of the disk) can be estimated when the temperature distribution along the radius is known. The power n of the relative radius $\varrho = r/R$ (r denotes the variable radius) occurring in formula (4) has a considerable influence on the distribution of the tensions and their magnitude. Fig. 4 shows a graph for the determination of n for the case in which formula (4) is used in the calculation of the thermal tensions in the disk on non-stabilized and steady thermal conditions. There are 4 figures.

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ASSOCIATION: Vsesoyuznyy teplotekhnicheskiy institut, g. Moskva (All-Union Heat Engineering Institute, City of Moscow)

Card 3/3

68840
S/096/60/000/04/011/021
E194/E455

24.5200

AUTHOR: Molchanov, Ye.I., Candidate of Technical Sciences

TITLE: An Investigation of Temperature Distribution in a Cooled Gas-Turbine Rotor

22
PERIODICAL: Teploenergetika, 1960, Nr 4, pp 53-56 (USSR)

ABSTRACT: This article gives the results of temperature distribution calculations in the rotor of a gas turbine with various methods of cooling. The calculations referred to the rotor of a two-stage high-pressure gas turbine type GT-700-4. 28 The rotor is an austenitic disc fitted to the end of a pearlitic steel shaft, as shown diagrammatically in Fig 1. The disc was cooled by applying air to its faces and also to the rim between the first- and second-stage blades. The temperature distributions were calculated on a hydraulic integrator by a procedure which has been described by Molchanov in Teploenergetika, 1956, Nr 1 and elsewhere. The boundary conditions for which the calculations were made are tabulated. The first-stage gas temperature was 660°C and the second-stage 616°C; other temperature conditions are stated. It was found that the heat-transfer

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S/096/60/000/04/011/021
E194/E455

An Investigation of Temperature Distribution in a Cooled Gas-Turbine Rotor

coefficient from the faces of the disc is a function of the radius, as will be seen from the graph in Fig 2. The changes with time of the temperature difference between the outside edge and the centre of the disc are plotted in Fig 3. A histogram of maximum temperature drops across the radius of the disc for various values of the heat-transfer coefficient in the blading is given in Fig 4. A similar diagram comparing the maximum temperature drops across the radius of the disc with various values of heat-transfer coefficients from the disc faces is given in Fig 5. Changes in the maximum temperature drop as a function of the method of cooling and temperature of the cooling medium are plotted in Fig 6. Isotherms of temperature distribution in the gas turbine rotor under steady-state conditions, seen in Fig 7, relate to three sets of boundary conditions, which are given in the Table. These isotherms may be used in thermal stress and strength calculations under various conditions. Thus a qualitative picture was

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E194/E455

An Investigation of Temperature Distribution in a Cooled Gas-Turbine Rotor

obtained of the temperature distributions with various types of cooling, and the influence of boundary conditions on the temperature distribution and temperature drops was determined. It was found that changes in the heat-transfer coefficients from the blading and from the disc faces have little effect upon the maximum radial temperature-drop. It was also found that, with the two-stage construction, the application of cooling air to the disc rim between the two stages combined with cooling of the disc faces greatly reduced the radial temperature-drop, both during heating-up and during steady-state running. If only the disc faces are cooled, there is some reduction in the maximum radial temperature-drop during heating-up but a considerably greater drop during steady-state running. It is evidently necessary when designing the cooling systems to investigate the temperature distribution, to avoid dangerous stress conditions. There are 7 figures,

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E194/E455

An Investigation of Temperature Distribution in a Cooled Gas-Turbine Rotor

1 table and 4 Soviet references.

ASSOCIATION: Vsesoyuznyy teplotekhnicheskiy institut
(All-Union Thermo-Technical Institute)

4

Card 4/4

S/114/60/000/010/003/007
E194/E484

26.2122

AUTHOR: Molchanov, Ye.I., Candidate of Technical Sciences

TITLE: Calculation of Temperature Distribution and Stress in the Rotor Blading of a Gas Turbine

PERIODICAL: Energomashinostroyeniye, 1960, No.10, pp.19-21

26

TEXT: In addition to being subject to centrifugal and bending forces, gas turbine blades are subject to thermal stresses; to evaluate these it is necessary to calculate temperature fields under various conditions. Calculations of this kind were made using a hydraulic integrator designed by V.S.Luk'yanov. The calculations were based on the assumption that the blade is of constant section and that the temperature and heat transfer coefficients are constant both along the length of the blade and across the section. The method of dividing up blades for the examination is illustrated in Fig.1. For the study of temperature distribution, the blade was divided up into seventeen areas, the investigations corresponded to four temperature conditions equivalent to rapid start, maximum cooling, ignition of combustion chamber and extinction of combustion chamber at full load with maximum temperatures of 600°C and minimum of 20°C. Fig.2 shows a temperature time curve for the bottom part of the blade and the

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Card 1/3

S/114/60/000/010/003/007
E194/E484

Calculation of Temperature Distribution and Stress in the Rotor Blading of a Gas Turbine

fir-tree root. It is found that even under favourable conditions there is a temperature drop in the blade proper only immediately near the root and so the temperature distribution may be considered as a plane problem. Fig.4 shows temperature/time curves at various points in the blade section for two values of heat-transfer coefficient. It will be seen that the value of the heat-transfer coefficient has an important influence on the temperature gradient across the blade section. Blade stresses are, of course, caused by temperature drops and the process of temperature drop formation is illustrated in Fig.5 which gives graphs of the difference between the temperature at the inlet and central parts of the blade section as functions of time. Blade isotherms at the instant of maximum temperature drop are plotted in Fig.6. A procedure for calculating thermal stresses in gas turbine blades has been described elsewhere and the procedure is briefly recalled here. The method was used to calculate the thermal stresses occurring in a blade section and the corresponding

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S/114/60/000/010/003/007
E194/E484

Calculation of Temperature Distribution and Stress in the Rotor Blading of a Gas Turbine

stress diagrams are plotted in Fig.7. It will be seen that tensile stresses of 2000 kg/cm^2 are set up on the convex inlet face of the blade and at the discharge edge. These thermal stresses are of a temporary nature and form a kind of shock load. Data published by the American General Electric Company has shown that thermal shock loads may be an important cause of blade failure. There are 7 figures and 4 references: 3 Soviet and 1 English.

✓C

Card 3/3

MOLCHANOV, Ye.I.; ATENKOV, S., tekhn. red.

[Using the hydraulic analogy method for studying temperature fields in gas turbine units; Conference on Heat and Mass Transfer, Minsk, January 23-27, 1961] Primenenie metoda gidravlicheskoi analogii dlia issledovaniia temperaturnykh polei v elementakh gazovykh turbin; soveshchanie po teplo- i massoobmenu, g. Minsk, 23-27 ianvaria 1961 g. Minsk, 1961. 17 p. (MIRA 15:2)

(Hydraulic models) (Gas turbines)

MOLCHANOV, Ye. I.

"Application of the Hydraulic Analogy Method to Investigations of Temperature Fields in Gas Turbine Elements."

Report submitted for the Conference on Heat and Mass Transfer, Minsk, BSSR, June 1961.

42015
S/262/62/000/022/002/007
E073/E435

108200

AUTHOR: Molchanov, Ye.I.

TITLE: On the problem of thermal fatigue

PERIODICAL: Referativnyy zhurnal. Otdel'nyy vypusk. Silovyye
ustanovki, no.22, 1962, 21, abstract 42.22.140.
(In collection: Teplovyye napryazheniya v
elementakh turbomashin. No.1. Kiyev, AN UkrSSR, 1961,
156-159)

TEXT: A number of authors in the USSR and abroad carried out thermal-fatigue experiments on specimens for the purpose of a qualitative evaluation of the resistance-to-failure under the effect of a cyclically fluctuating temperature, as well as quantitative evaluation of stresses and strains. The author mentions the work of Coffin, who obtained the clearest relation between the number of cycles to failure and the magnitude of plastic deformation. The investigations were made on hollow, cylindrical specimens, held in rigid clamps. Periodic passage of a current through the specimen produced in it tensile-compressive stresses. The author made experiments on cylindrical austenitic steel specimens 100 x 100 mm with an

Card 1/2

On the problem of thermal fatigue S/262/62/000/022/002/007
E073/E435

internal bore of 10 mm diameter. Eight specimens were tested for three values of radial temperature gradients, which corresponded to three levels of stresses and strains. The frequency was 1/360 cps. The test results are presented in the form of a dependence of the number of cycles and deformations on the bore. The magnitude of the deformation was calculated from formulae which are valid for an infinite cylinder on the assumption that the deformation of the material is elastic. The Poisson coefficient was assumed at 0.5. Photographs are also included of failures of specimens which show that the cracks are generated on the internal bore and have a typically fatigue character.

[Abstractor's note: Complete translation.]

Card 2/2

26.2124

25668
S/096/61/000/009/005/008
E194/E155

AUTHOR: Molchanov, Ye.I., Candidate of Technical Sciences

TITLE: Calculation of temperature distribution in gas turbine discs cooled through erection holes in the blade root joints

PERIODICAL: Teploenergetika, 1961, No.9, pp. 65-68

TEXT: This article describes an investigation of the temperature distribution in a disc cooled by passing air through erection holes in the blade root joints. A sketch of the disc is shown in Fig.1, the motion of the cooling air being indicated by arrows. At the disc face the flow of air divides, part moving across the face and cooling it before passing through the blade roots, and the remainder passing through the disc to cool the next stage. The air that has passed through the blade root channels also serves to cool the far face of the disc. Investigations of temperature distribution in the disc during steady-state and transient thermal conditions were made on a hydraulic integrator, using a procedure described by the present author in Teploenergetika No.1, 1956 (Ref.2). The blade and disc were made of austenitic steel. The experimental conditions are described in

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Calculation of temperature S/096/61/000/009/005/008
E194/E155

some detail; 43 variants of boundary conditions were used, in order to determine as fully as possible the temperature distribution during steady-state thermal conditions. Certain transient conditions were also studied. The greatest calculated temperature rise of the cooling air was 67 °C, corresponding to high values of heat transfer coefficient in the slots both to the blade proper and to the face of the disc. Heating of the cooling air is most affected by the heat transfer coefficient in the blade root slots and the temperature of the medium on the far side of the disc. From the results quoted it is found that the greatest radial temperature-drop occurs in the blade, mostly in the root and in the neighbouring part of the blade proper. When the cooling air passes through the ducts in the blade root and is then used to cool the far face of the disc, the axial temperature drop is small and does not seriously affect the disc. A study of transient conditions shows that the axial temperature drop is established very quickly and does not alter much with time. To minimise this temperature drop the temperature of the medium should as far as possible be maintained the same on the two sides of the disc, and cooling air should be passed through the ducts in the blade roots.

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Calculation of temperature S/096/61/000/009/005/008
E194/E155

This measure also greatly reduces the radial temperature-drop in the disc under both steady-state and transient conditions. It is found that at the instant when the radial temperature difference in the disc is at a maximum, the temperature distribution in the disc is very complicated and there are considerable temperature gradients in the blade root. These radial temperature differences can cause thermal stresses in the disc which are superimposed on the stresses due to centrifugal force and so are very undesirable. The instant at which the greatest radial temperature-drop occurs depends on heat exchange in the ducts of the root joints. Thus when cooling air is not passed through the ducts, in the case considered the maximum temperature drop occurred some 4 - 8 minutes after the start of heating. In this case, there were considerable radial temperature-drops in both steady-state and transient conditions. When the ducts were air cooled the maximum temperature drop occurred after 1 - 1.5 minutes and was much smaller than in the previous case. It is concluded that since the most intensive extraction of heat passing from the blade proper to the disc occurs in the upper ducts of the blade root these ducts should be made as wide as possible. It is found that

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25668

Calculation of temperature S/096/61/000/009/005/008
E194/E155

delivery of cooling air to only one face of the disc can lead to considerable axial temperature-drop, causing buckling of the disc even if the air is later passed through ducts in the blade roots. There are 6 figures, 1 table and 2 Soviet references.

ASSOCIATION: Vsesoyuznyy teplotekhnicheskiy institut
(All-Union Heat Engineering Institute)

Card 4/5

34340
S/170/62/005/003/003/012
B108/B104

26.2124

AUTHORS: Molchanov, Ye. I., Khenven, A. R.

TITLE: Calculation of temperature fields in a vane of a gas turbine cooled through mounting apertures

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 5, no. 3, 1962, 45 - 50

TEXT: The temperature field of a gas turbine vane cooled through holes at its root was calculated on a hydraulic integrator (design from V. S. Luk'yanov). The vane was one of 80 from the first stage of a two-stage gas turbine working at a gas temperature of 760°C. The fields both along and across the vane were calculated for steady as well as for non-steady conditions at different heat transfer coefficients and cooling air temperatures. The calculations were made for a section over which the radial flow of heat need not be considered. It is stated that in experimental study the cooling air should have a temperature as low as possible since then estimates of the coefficients of heat transfer in the different parts of the vane will be the most accurate. There are 4 figures, 1 table, and 3 Soviet references.

X

Card 1/2

Calculation of temperature... S/170/62/005/003/003/012
B108/B104

ASSOCIATION: Vsesoyuznyy teplotekhnicheskiy institut imeni F. E. Dzerzhinskogo, g. Moskva (All-Union Institute of Heat Engineering imeni F. E. Dzerzhinskiy, Moscow)

SUBMITTED: September 19, 1961

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X

S/032/62/028/002/019/037
B139/B104

AUTHORS: Plotkin, Ye. P., and Molchanov, Ye. I.

TITLE: Application of thermocolors to measure the temperature of machine parts

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 2, 1962, 203 - 205

TEXT: The authors used thermocolors developed by the Kafedra tekhnologii lakov i krasok Moskovskogo khimiko-tekhnologicheskogo instituta im. Mendeleyeva (Department for the Technology of Varnishes and Colors of the Moscow Institute of Chemical Technology imeni Mendeleyev) and produced by the "Svobodnyy trud" Plant in Yaroslavl', to determine the temperatures at which a change in color occurs after long-time heating. A plate 45 mm long, 0.5 mm thick and of varying width made of stainless steel and provided with a thermocolor coating, was heated with about 100 a a-c. The temperature field was checked by a thermocouple soldered to the back of the plate. The boundary line of color change during long-time heating shifted toward lower temperatures. For 30 min heating, the

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Application of thermocolors... S/032/62/028/002/019/037
B139/B104

temperature of color change of various colors is 50 - 100°C lower than that for short-time heating. For a longer time of heating, the transition temperature stabilizes and becomes practically constant when heating for 2 - 6 hrs. Thermocolors age under the action of light. The majority of thermocolors change at temperatures of up to 400°C, two types change their colors at 400 - 650°C, but at 650°C the color change from white into pale violet is hardly noticeable. There are 2 figures and 1 Soviet reference.

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ASSOCIATION: Vsesoyuznyy teplotekhnicheskiy institut (All-Union Institute of Heat Engineering)

Card 2/2

S/114/63/000/001/002/007
D262/D308

26 2170

AUTHORS: Molchanov, Ye.I., Candidate of Technical Sciences, and Plotkin, Ye.R., Engineer

TITLE: Temperature and stress states of rotor ГТ-25-700 (GT-25-700) at starting-up and steady working conditions

PERIODICAL: Energomashinostroyeniye, no. 1, 1963, 19-22

/B

TEXT: The article presents the results of an investigation into the temperature fields and stresses in the rotor and blades of the seven-stage air-cooled gas turbine GT-25-700. The temperature distribution on the rotor and blade surfaces under steady working conditions is calculated using the hydraulic integrator designed by V.S. Luk'yanov, and the thermal stress distributions on the working blade surface for various times of the load increase (instantaneous, 2 min, 5 min) are evaluated and represented graphically. The air cooling system is also analyzed. Conclusions: By increasing the load-rise time thermal stresses can be lowered considerably and from point

Card 1/2

Temperature and stress states ... S/114/63/000/001/002/007
D262/D308

of view of the rotor and blade strength, this time should be 5 - 8 min. Air tapped past the regenerator at 290°C, is recommended for this cooling turbine. There are 7 figures and 3 tables.

Card 2/2

ACCESSION NR: AT4010246 S/3052/63/000/003/0181/0192

AUTHOR: Plotkin, Ye. R. (Moscow); Molchanov, Ye. I. (Moscow)

TITLE: Experimental investigation of the temperature field and evaluation of the stress in gas turbine blades operating at varying speeds

SOURCE: AN UkrSSR. Institut mekhaniki. Teplovy*ye napryazheniya v elementakh konstruktsiy; nauchnoye soveshchaniye. Doklady*, no. 3, 1963, 181-192

TOPIC TAGS: turbine, gas turbine, turbine blade, turbine operation, turbine blade temperature, turbine blade stress

ABSTRACT: Turbine blades were tested in a variable temperature field when starting and at varying gas turbine speeds, using thermocouples for measurement. Four stages of operation were studied: 1. Starting of the cold engine and acceleration to idling speed. 2. Increase of the load (after 7 min) for 3 min. 3. Decrease of the load (14 min after starting) to idling speed in 2 min. 4. Switching off the combustion chamber while the turbine is running at idling speed (20 min after starting). Besides, the combustion chamber was switched off while running under load. Results are shown in graphs. Analysis shows that starting or changing the load after five minutes or more does not lead to accidents, even with large turbine blades. Orig. art. has: 9 figures.

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ACCESSION NR: AT4010246

ASSOCIATION: INSTITUT MEKHANIKI AN UkrSSR (Mechanics Institute AN UkrSSR)

SUBMITTED: 00

DATE ACQ: 17Jan64

ENCL: 00

SUB CODE: PR, AP

NO REF SOV: 006

OTHER: 000

Card 2/2

ACCESSION NR: AT4010247 S/3052/63/000/003/0193/0200

AUTHOR: Plotkin , Ye. R. (Moscow); Molchanov, Ye. I. (Moscow)

TITLE: Thermal stresses in a turbine blade with fluctuations in gas temperature

SOURCE: AN UkrSSR. Institut mekhaniki. Teplovy*ye napryazheniya v elementakh konstruktsiy; nauchnoye soveshchaniye. Doklady*, no. 3, 1963, 193-200

TOPIC TAGS: thermal stress, turbine, turbine blade, gas turbine, turbine gas temperature, thermodynamics

ABSTRACT: During the operation of gas turbines, conditions of periodically varying gas temperature are frequently encountered. Such conditions may be caused by instability of combustion chamber work or may arise at turbine load changes. Gas temperature oscillations with a frequency of 1.5 - 3.0 to 60 cycles/sec. and amplitudes in excess of 20% of the mean gas temperature can be provoked by instabilities, while load changes are accompanied by lower frequencies with a period of several seconds and even minutes and amplitudes up to several times the difference between initial and final temperature values. Gas temperature oscillations cause corresponding temperature oscillations in turbine rotating and stationary (guide vanes) blades, particularly along the

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ACCESSION NR: AT4010247

thin edges. As a result of non-uniform heating of the blades, temperature gradients arise and, consequently, thermal stresses appear. It is of great interest to establish the influence of gas temperature oscillations on the strength of blades working at high temperature and stress levels. A method based on simplifying assumptions allows the investigation of transient temperature distributions in order to establish the influence of various factors such as blade profile, heat exchange conditions, physical properties of blade material, and the period and amplitude of gas temperature oscillations. The main simplifying assumption is that the basic heat flow occurs in a direction normal to the blade surface, but the heat flow along skeletline is small and can be neglected. Such an assumption is equivalent to a separate consideration of blade profile sections as plates of corresponding thickness $\delta = 2h$, as shown in Fig. 1 of the Enclosure. In the differential equation used to express the heat exchange, a harmonic law is assumed for the gas temperature change. It is further assumed that the film coefficient α, the specific heat c and the specific gravity γ of the blade material, and the temperature distribution coefficient ψ are constant values, where

$$\psi = \frac{t_g - t_s}{t_g - t_m}$$

ACCESSION NR: AT4010247

t_g = gas temperature,
t_m = mean plate temperature,
t_s = plate surface temperature.

The solution implies that t_m follows a simple harmonic oscillation with a phase shift against the gas temperature oscillation. The relative amplitude of plate temperature oscillations and the phase shift angle depend on the parameter $KT = \frac{\alpha\gamma}{c\gamma\lambda}T$, where T is the period of gas temperature oscillations. The analysis shows that even at a relatively high film coefficient α = 1116 W/m^2-°C, where W stands for Watts, gas temperature oscillations with a period of less than 0.5 sec have little influence on the blade temperature. It is concluded that gas temperature oscillations of high and medium frequency (10cps and more) behind the combustion chamber do not endanger the strength of gas turbine blades. Low frequency (1.5 to 3 cps) gas temperature oscillations behind the combustion chamber signficnatly influence the temperature of very thin edges (approximately 0.5 mm) only, where the oscillation amplitude can reach 15% of the gas temperature oscillation amplitude. Transient processes arising from load changes have a greater influence on the blade temperature distribution. The edge temperature practically follows the gas temperature. However, increasing the edge thickness considerably reduces the relative amplitude of temperature oscillations.

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ACCESSION NR: AT4010247

The mean temperature of the central, thicker portion of a blade section changes little at gas temperature oscillations, at least at periods up to 20 seconds. When approximate solutions obtained by the above-mentioned method were compared with exact solutions produced with the aid of a hydraulic integrator, no significant discrepancies were found. An exact solution has been obtained for the case of a working blade of a GT - 12 - 3 turbine at gas temperature oscillations and at film coefficient $\alpha =$ 893 W/m^2 -°C. Solutions have been obtained for the transient blade temperature field at gas temperature oscillation periods of 3, 12, 30, and 120 seconds. Thermal stresses have been computed for the case of gas temperature oscillations form 300 to 500C at a period T = 120 sec, corresponding to real conditions at idling turbine during tuning for operation. For a non-uniformly heated bar, the expression for thermal stress is:

$$\sigma_z = E\left\{\frac{\int_F E\beta t\,dF}{\int_F E\,dF} + y\frac{\int_F E\beta t y\,dF}{\int_F E y^2\,dF} + x\frac{\int_F E\beta t x\,dF}{\int_F E x^2\,dF} - \beta t\right\}.$$

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ACCESSION NR: AT4010247

where E and β are modulus of elasticity and coefficient of linear thermal expansion, respectively, and x and y - coordinates of cross-section points with respect to the main thermoelastic bending axes. The results of stress calculations are shown in Fig. 2 of the Enclosure. Maximum stresses occur at the trailing edge reaching the value $\sigma_{\gamma} = \pm 11183$ N/cm^2. On the basis of the computations, it was concluded that considerable temperature and thermal-stress oscillations can arise in the blades of a working gas turbine as a result of gas temperature oscillations, and, consequently, the blade life can be substantially decreased. Orig. art. has: 6 figures and 7 formulas.

ASSOCIATION: Institut mekhaniki akademii nauk UkrSSR (Institute of Mechanics, Academy of Sciences, UkrSSR).

SUBMITTED: 00	DATE ACQ: 17Jan64	ENCL: 02
SUB CODE: PR	NO REF SOV: 008	OTHER: 000

Card 5/7

ACCESSION NR: AT4010242

ENCLOSURE: 01

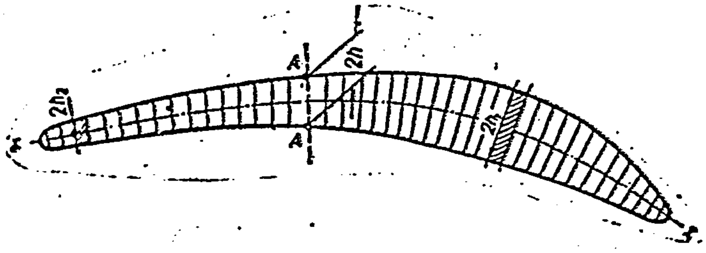

Fig. 1 - Gas turbine blade profile divided in strips to the profile for approximate thermal analysis

Card 6/7

ACCESSION NR: AT4010247

ENCLOSURE: 02

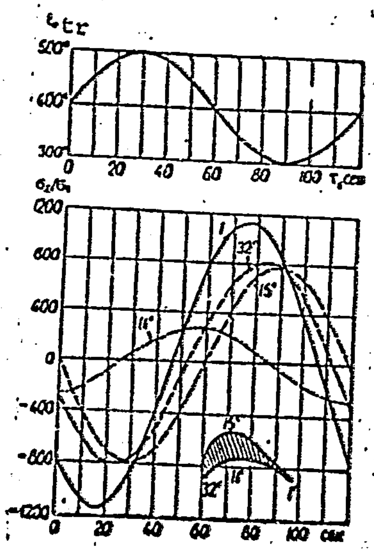

Fig. 2 - Gas Temperature and Turbine Blade Dimensionless Radical Thermal Stress σ_x Oscillations vs. Time. σ_1

σ = 9.81 $\frac{N}{cm^2}$ (N = Newton)

Card 7/7

ACCESSION NR: AP4037636 S/0096/64/000/006/0028/0032

AUTHOR: Plotkin, Ye. R. (Candidate of technical sciences); Molchanov, Ye. I. (Candidate of technical sciences)

TITLE: Temperature field of a gas turbine blade under transient conditions

SOURCE: Teploenergetika, no. 6, 1964, 28-32

TOPIC TAGS: turbine blade, turbine blade test, turbine blade temperature, gas turbine

ABSTRACT: The principal factors affecting the equilibrium of the temperature field under transient conditions are presented from the standpoint of theory and experiment. Calculation error resulting from approximating assumptions was evaluated through comparison with exact solutions obtained by the method of hydraulic analogy. It was found that the error in estimating the greatest temperature difference occurring in the blade under transient conditions is relatively small, and that for real values of the coefficient of heat transfer to the surface and the coefficient of heat conductivity of the blade metal ($\alpha > 200$ w/m²-deg; $\lambda < 40$ w/m-deg) this error does not exceed 20-30%. (At a low rate of heat

Card 1/3

ACCESSION NR: AP4037636

transfer from the gas to the blade and a high heat conductivity of the metal, the error could be large.) The assumptions permit the temperature field of each segment of the blade cross-section to be calculated as the field of an equivalent plate with a thickness 2h, corresponding to the thickness of the given segment, and with corresponding boundary conditions. By examining the change in mean temperature of the plate under transient conditions, simple relations can be obtained for various particular cases. For instance, for an instantaneous change in gas temperature from t_0 to t^*_g

$$\theta = 1 - e^{-k\tau} \qquad (1)$$

and for a gradual change of t_g from t_0 to t^*_g for the time τ^*

$$\theta = \frac{\tau}{\tau^*}\left(1 - \frac{1 - e^{-k\tau}}{k\tau}\right), \text{ for } \tau \leq \tau^*$$

and

ACCESSION NR: AP4037636

$$\theta = 1 - \left(\frac{1 - e^{-k\tau^*}}{k\tau^*}\right) e^{-k(\tau - \tau^*)}, \text{ for } \tau \geq \tau^* \qquad (2)$$

Conclusion: The degree of influence of the transient duration depends on the intensity of the heat exchange to the surface of the blade. An increase in this duration reduces the maximum nonuniformity of the blade temperature. Orig. art. has: 5 formulas and 8 figures.

ASSOCIATION: Vsesoyuzny*y teplotekhnicheskiy institut (All-Union Power Engineering Institute)

SUBMITTED: 00 DATE ACQ: 22Jun64 ENCL: 00

SUB CODE: SD, PH NO REF SOV: 005 OTHER: 003

Card 3/3

PLOTKIN, Ye.R.; MOLCHANOV, Ye.I.

Fluctuations of temperature and thermal stresses inside a turbine blade with pulsating gas temperature. Inzh.-fiz.zhur. 6 no.2:25-30 F '63. (MIRA 16:1)

1. Vsesoyuznyy teplotekhnicheskiy institut imeni F.E. Dzerzhinskogo, Moskva.
(Thermodynamics) (Gas turbines)

MOLCHANOV, Ye.I., kand.tekhn.nauk; PLOTKIN, Ye.R., kand.tekhn.nauk

Temperature distribution in the zone of the neck connection of the cooled blade of a gas turbine. Teploenergetika 10 no.6:58-61 Je '63. (MIRA 16:7)

1. Vsesoyuznyy teplotekhnicheskiy institut.
(Gas turbines)

PANIN, V.V. ; MOLCHANOV, Ye.I.; PLOTKIN, Ye.R.

Heat processes during the solidification of ingots following electric slag refining. Izv. vys. ucheb. zav.; chern. met. 6 no.9:83-87 '63. (MIRA 16:11)

1. TSentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya.

PLOTKIN, Ye.R., kand. tekhn. nauk; MOLCHANOV, Ye.I.

Temperature field of gas turbine blades in nonsteady operation. Teploenergetika 11 no.6:28-32 Je '64. (MIRA 18:7)

1. Vsesoyuznyy teplotekhnicheskiy institut.

L 15807-65 EWT(m)/EWP(w)/EWP(v)/EWP(k) Pf-4 AEDC(b)/AEDC(a)/SSD/BSD/
ASD(f)-2/AS(mp)-2/ASD(p)-3 EM
ACCESSION NR: AP4047993 S/0096/64/000/011/0072/0074

AUTHORS: Plotkin, Ye. R. (Candidate of technical sciences); Molchanov, Ye. I. (Candidate of technical sciences)

B

TITLE: Heat transfer to the surface of gas turbine blades 26

SOURCE: Teploenergetika, 11 no. 11, 1964, 72-74

TOPIC TAGS: turbine blade, turbine blade cooling, heat transfer, heat transfer coefficient

ABSTRACT: In order to obtain surface heat transfer coefficients for gas turbine blades under actual operating conditions, a guide blade in the second stage of the gas turbine installation described previously by Ye. R. Plotkin and Ye. I. Molchanov ("Teploenergetika" No. 9, 1962) was instrumented with six thermocouples. These thermocouples measured the temperature distribution along the centerline of the blade profile. The temperature profiles and the temperature of the inlet air were recorded as a function of time during turbine start-up (0-3800 r.p.m. in 100 seconds, inlet air temperature peak 1200C at 35 seconds) and turbine shutdown. The experimental results were used to determine the heat transfer coefficient along the blade profile by solving the transient heat transfer problem using a hydraulic integrator. The blade profile was divided into 32 sections (see Fig. 1 on the

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L 15807-65
ACCESSION NR: AP4047993

Enclosure) whose heat capacity was modeled by the area of the containers in the hydraulic model ω_i, and the thermal resistance $R_{i,j}$ between sections was modeled by the hydraulic resistance $\rho_{i,j}$. It was found that the maximum heat transfer coefficient occurred at the leading edge of the blade and was as high as 1300 w/m^2K. The average $\alpha_{av} = \frac{1}{L}\int_L \alpha dL$ was determined as a function of time and is shown in Fig. 2 on the Enclosure. The heat transfer coefficient was also determined theoretically using boundary layer theory and finding the transition region with the help of nomograms. The results were low compared with the theoretical results. However, assuming a turbulent boundary layer along the whole profile, they gave a heat transfer coefficient which was close to the experimental value. Orig. art. has: 6 figures.

ASSOCIATION: Vsesoyuznyy teplotekhnicheskiy institut (All-Union Heat Technology Institute)

SUBMITTED: 00 ENCL: 02

SUB CODE: PR, TD NO REF SOV: 004 OTHER: 001

Card 2/4

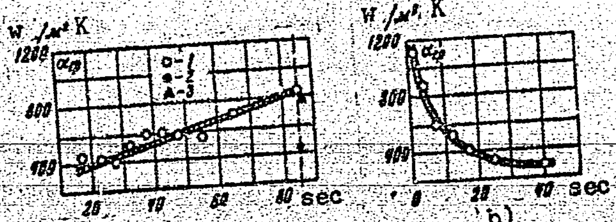
L 15807-65
ACCESSION NR: AP4047993

ENCLOSURE: 01

Fig. 1. Sectioning of the blade profile

L 15807-65
ACCESSION NR: AP4047993

ENCLOSURE: 02



a)

b)

Fig. 2. Change of α_{av} as a function of time during transient operation of the turbine. a - during starting; b - after combustion chamber shut-down 1 - results of processing the experimental data on the hydraulic integrator; 2 - calculations based on the TsKTI method; 3 - calculations based on a fully turbulent boundary layer.

Card 4/4

L 37665-65 EWT(m)/EWP(w)/EWP(v)/T-2/EWP(k) Pf-4 EM
ACCESSION NR: AP5003580 S/0114/65/000/001/0004/0007 21 B

AUTHOR: Molchanov, Ye. I. (Candidate of technical sciences); Plotkin, Ye. R. (Candidate of technical sciences); Goncharenko, Z. F. (Engineer)

TITLE: Investigation of the temperature fields in a gas-turbine rotor blade cooled by forcing air through clearances in its root fit 16 26

SOURCE: Energomashinostroyeniye, no. 1, 1965, 4-7

TOPIC TAGS: rotor blade, gas turbine, blade temperature distribution

ABSTRACT: The results are reported of a theoretical investigation of the temperature fields in the root and body of a rotor blade in the first stage of a GT-25-700 gas turbine. The distribution of local values of the heat-transfer coefficient along the blade surface and in the blade root is calculated. The temperature field was determined on a hydraulic simulator which comprised 107 elements; it was found that the highest radial temperature gradient occurs in the

temperature field was determined [illegible] elements; it was found that the highest radial temperature gradient occurs in the

Card 1/2

L 37655-65

ACCESSION NR: AP5003580

0

shank region of the blade and that the temperature is distributed nonuniformly in the blade root. With 177C cooling air, the shank region temperature difference was 85C. The effect of the clearance size on the blade temperature distribution is also evaluated. With higher initial temperatures, the temperature distribution in the blade root and rotor fastening teeth is more uniform. A better temperature distribution occurs in the design where a rectangular shim is used in the blade fastening (as in airborne gas turbines). Orig. art. has: 6 figures, 3 formulas, and 1 table.

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: PR

NO REF SOV: 006

OTHER: 001

Card 2/2

MOLCHANOV, Ye. M.

24-2-2/28

[illegible]: [illegible]koronko, Ya. M. and Isakhanov, G.V.

[illegible]: Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures. (Nauchnoye soveshchaniye po voprosam prochnosti elementov turbomashin pri vysokikh temperaturakh).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, No.2, pp. 165-167 (USSR)

ABSTRACT: A scientific conference was held in Kiev between September 28 and October 2, 1957 on problems of strength of elements of turbo-machinery at elevated temperatures which was convened by the Institute of Metalloceramics and Special Alloys (Institut Metallokeramiki i Spetssplavov), the Institute of Structural Mechanics (Institut Stroitel'noy Mekhaniki) and the Institute of Thermal Power (Institut Teploenergetiki) of the Ac.Sc., Ukrainian SSR (AN Ukrainskoy SSR). [illegible] people participated representing scientific [illegible] establishments and works of Moscow, Leningrad, Khar'kov, Minsk, Kuybyshev, etc. In his opening [illegible] Corresponding Member of the Ac.Sc. Ukraine [illegible] pointed out the importance of the problem of high temperature strength of components of turbo-machinery

Card 1/9

[illegible] Conference on the Strength of [illegible] Machines at Elevated Temperatures

A number of papers were read on the [illegible] heat conductivity and thermo-elasticity [illegible] investigation of the temperature field [illegible] Ya. P. Dybun reported on the theoretical and [illegible] investigations of the steady state and non-steady state thermo-conductivity in turbine rotors of [illegible] designs including investigations on [illegible] of rotors produced by the Kirov and Neva Works, the "Ekonomayzer" Works and others, carried out at the Institute of Thermal Power, Ukrainian Ac.Sc. [illegible] the temperature fields they used the method of [illegible] investigation of non-steady state thermal conductivity by means of high frequency heating, the method of electro-thermal analogy by means of "ЭГДА" [illegible] They obtained a solution of the problem of non-steady state thermal conductivity of a hollow cylinder of finite length with a relatively general law of the changes of the temperature and the heat transfer coefficients. The Institute, jointly with the [illegible] Gas Turbine Construction Works, developed [illegible]

Card 2/9 cooling the discs by blowing cooling air [illegible]

24-2-27/24

Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures.

Engineering Works imeni Lenin (Leningrad).
The representative of the Leningrad Metal Works,
Engineer I. M. Shibalov conveyed information on the tests
of equipment for heating individual elements of the
BK-25-1 turbine during starting.

[illegible]

24-2-27/28

Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures.

"Technique of High Temperature Tests Applied by VNIITS" and that of Ye. N. German (VIAM) "On Certain New Methods [illegible] High Temperature Metalloceramic Materials" and [illegible] Filatova; A.V. Ryabchenkov [illegible]

24-2-27/28

Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures.

duration disruption tests, the character of the disruption of the projections provided for fixing the discs and the character is described of the material of the disc before and after fracture. In his paper "Fatigue Testing of Turbine Blades and Materials at Normal and Elevated Temperatures" I. I. Papchenko (TsKTI) dealt developed by TsKTI for generating blade of loads of various oscillation

Card 8/9 [illegible]

MOLCHANOV, YE. V.

PARFENOV, A.P., MOLCHANOV, Ye.V.

Effect of condensation field of ultra high frequency waves of barrier properties of live tissues. Klin.med., Moskva no.4: 84-86 Ap '50. (CLML 19:3)

1. Of the Department of General Physiotherapy and Health Resort Therapy (Head -- Prof. A.P.Parfenov) of the Naval Medical Academy, Leningrad.

MOLCHANOV, Ye.V.; SHVARTS, Z.S.; PETROVA, G.P.; CHERNAVINA, L.F.; TARASENKO, T.I.

Sixtieth birthday of Professor Aleksandr Prokhorovich Parfenov. Vop. kur., fizioter. i lech. fiz. kul't. 26 no.6:563-564 N-D '61. (MIRA 15:1)

(PARFENOV, ALEKSANDR PROKHOROVICH, 1901-)

MOLCHANOV, Yevgeniy Vissarionovich; RYNKEVICH, V.S., red.; ONOSHKO, N.G., tekhn. red.

[Sea baths] Morskie kupaniia. Leningrad, Medgiz, 1963. 30 p. (MIRA 16:7)

(BATHS, SEA)

MOLCHANOV, Yu. A.

BASS, M.G., inzhener; KARAGODIN, V.L., inzhener; MOLCHANOV, Yu.A., inzhener; MALITSKIY, S.I., inzhener; KHAZANOV, V.Ye., inzhener; USHAKOV, V.S., inzhener.

Collector with driven in sheet-piled walls. Gor.khoz.Mosk. 31 no.9:38-40 S '57. (MIRA 10:9)

(Moscow--Sewers, Concrete)

-KARAGODIN, V.L., inzh.; MOLCHANOV, Yu.A., inzh.

City ponds and water reservoirs. Gor.khoz.Mosk. 34 no.3:29-32 Mr '60. (MIRA 13:8)

(Moscow--Ponds)

MOLCHANOV, Yu.A., inzh.; OSTAL'TSEV, P.P.

Advanced structures for municipal engineering installations.
Gor.khoz.Mosk. 36 no.6:17-19 Je '62. (MIRA 15:8)
(Moscow—Municipal engineering)

MOLCHANOV, YU. D.

AUTHOR: Brovchenko, V. G., and Molchanov, Yu. D. 120-2-19/37

TITLE: A low Noise Level Pre-amplifier. (Predusilitel' s Malym Urovnem Shumov.)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1957, No.2, pp. 67 - 70 (USSR).

ABSTRACT: A low noise pre-amplifier built for use with ionisation chambers and with proportional counters is described (Refs. 1 and 2). The first stage of the amplifier is a "cascade" using two grounded cathode 6Ж1П in parallel connection and a grounded grid parallel connected double triode 6Н15П. The noise level of the pre-amplifier is determined mainly by the anode current fluctuations in the input stage and is 2μV for a pass band 50kc/s to 1.1Mc/s, input capacity of about 11pF and V_a of 75V. The pre-amplifier gain is 140 with the pass band 5Mc/s to 600cps. The further two stages of the pre-amplifier consist of a pentode connected 6Ж1П and of a double triode 6Н15П; a heavy current feed back is applied. The anode supply is stabilised, DC is used for the heater chain; the total gain of the last three stages is 170 with feed back and about 4000 without feed back. The whole arrangement is very stable, has a very good linearity and has been giving [illegible]

Card 1/2

120-2-19/37

A Low Noise Level Pre-amplifier.

very good service in high precision physical instrumentation for the last three years. The circuit diagram of the pre-amplifier is given. There are 2 references, 1 of which is Slavic.

SUBMITTED: August, 21, 1956.

AVAILABLE: Library of Congress.

Card 2/2

MOLCHANOV, Yu. D. and BROVCHENKO, V. G.

"Time Analyzer for Fast Pulse Series"

report submitted for the IAEA conf. on Nuclear Electronics, Belgrade, Yugoslavia 15-20 May 1961

S/120/61/000/006/013/041
E035/E414

AUTHORS: Brovchenko, V.G., Molchanov, Yu.D.

TITLE: A time selector for the analysis of a train of pulses

PERIODICAL: Pribory i tekhnika eksperimenta, no.6, 1961, 74-77

TEXT: The selector was designed for the measurement of the time distribution of pulses in series of pulses. Its parameters are as follows: minimum channel width 25 µsec; gap between channels ~ 2.5 µsec; resolving time ~ 3×10^{-8} µsec. Fig.1 and 2 show a block diagram of the selector together with the corresponding voltage waveforms. The time distribution is measured with the aid of a differentiating capacitor storage system which is periodically discharged by pulses from the channel generator. The time between two discharges is equal to the width of the selector channel. The change in the potential across the capacitance in the time between two discharges is proportional to the number of pulses entering the device in this time. The curve connecting the maxima of the latter potential represents the desired distribution and is photographed from the oscilloscope screen. The statistical accuracy of the measured distribution curves is determined by the number of pulses recorded in the

Card 1/2

S/120/61/000/006/013/041
E035/E414

A time selector ...

selector channel, i.e. the rate of input pulses, the width of the channels and the speed of recording the pulses. The main advantage of the selector is the high speed of signal recording and the simple circuitry employed. Detailed circuits are reproduced. There are 5 figures and 2 references: 1 Soviet-bloc and 1 non-Soviet-bloc. The reference to an English language publication reads as follows: Ref.1: F.J.M.Farley, Rev. Scient. Instrum., v.29, 1958, 595.

ASSOCIATION: Institut atomnoy energii AN SSSR
(Institute of Atomic Energy AS USSR)

SUBMITTED: April 25, 1961

Card 2/2

L 10619-65 EEO-2/EWT(1)/EEC-4/EED-2/EWA(h) Pn-4/Peb/Pl-4 ASD(a)-5/RAEM(t)/
ESD(dp)/AFMDC/RAEM(c)/ESD(c)/AFETR/ESD(gs)/ESD(t)
ACCESSION NR: AP4044662 S/0120/64/000/004/0005/0019

AUTHOR: Brovchenko, V. G.; Molchanov, Yu. D.

B

TITLE: Low-noise impulse amplifiers for spectrometry

75

SOURCE: Pribory* i tekhnika eksperimenta, no. 4, 1964, 5-19

TOPIC TAGS: amplifier, impulse amplifier, low noise amplifier, spectrometry, nuclear radiation detector

ABSTRACT: Based on modern Soviet and Western periodical sources, a review of low-noise amplifiers is presented which consists of these sections: terminology of noise; fundamental formulas for noise calculations; first-tube operating conditions (grid current, equivalent resistance, noise); first-tube type (Soviet 6N23P, 6S3P, 6S15P tubes); first stage of the preamplifier; negative feedback type (negative current-feedback, charge amplifier); passband (effect of integration and differentiation on the signal-to-noise ratio); input capacitance

Card 1/2

L 30619-65

ACCESSION NR: AP4044662

4

(dynamic capacitance depending on the feedback); stability of operation (gain in stability for 6S3P, 6Zh9P, 6Zh11P, 6S15P Soviet tubes); front rise time of a charge amplifier; electron-tube preamplifiers (H. J. Dubrau's floating-grid circuit, B. V. Fefilov's circuit with subminiature 6N16B tubes); transistorized preamplifiers; preamplifiers with field-effect transistors. The conclusion notes the desirability of further research in the stability of operation and design of electronic equipment. "The authors wish to thank G. A. Otroshenko for his/her help in the work, A. A. Markov for a useful discussion, and B. M. Gokhberg for his attention to the work." Orig. art. has: 14 figures.

ASSOCIATION: Institut atomnoy energii (Institute of Atomic Energy)

SUBMITTED: 25Apr64 ENCL: 00

SUB CODE: EC, NP NO REF SOV: 023 OTHER: 016

Card 2/2

ACC NR: AP6034218 (A,N) SOURCE CODE: UR/0120/66/000/005/0037/0039

AUTHOR: Vorotnikov, P. Ye.; Zubov, Yu. G.; Molchanov, Yu. D.; Udod, A. A.; Yan'kov, G. B.

ORG: Institute of Atomic Energy, GKAE, Moscow (Institut atomnoy energii GKAE)

TITLE: A nanosecond-pulse ion source

SOURCE: Pribory i tekhnika eksperimenta, no. 5, 1966, 37-39

TOPIC TAGS: ion source, particle acceleration, ion accelerator, NANOSECOND PULSE, ELECTROSTATIC GENERATOR

ABSTRACT: Test results of a pulse ion source for an electrostatic accelerator are
presented. The testing apparatus was constructed on the basis of P. Ye. Vorotnikov
calculations (see Fig. 1). Using a relatively low-power high-frequency source
(I $\approx$ 60 μa) and applying phase ion focusing, a very economical source of ion current
pulses of approximately 2 nsec duration, a pulse current of $\sim$1.5 ma, and a repeti-
tion rate of approximately 4 Mc can be obtained. The ion energy spread was found to
constitute 400 ev, and the ion current utilization factor was about 25%. The authors
thank V. G. Brovchenko who helped in developing the measuring procedure. Orig. art.
has: 5 figures and 2 formulas.

UDC: 621.384.62

Card 1/2

ACC NR: AP6034218

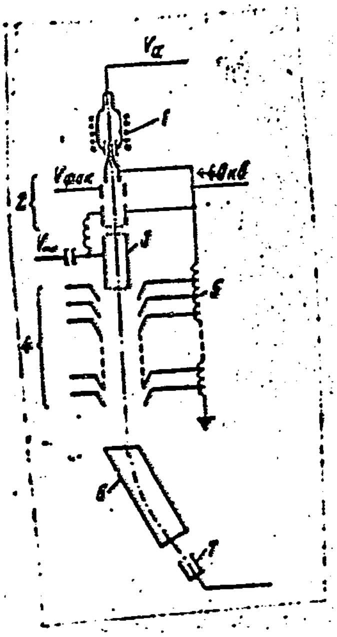


Fig. 1. Schematic diagram of the pulse ion source

1 - High-frequency ion source; 2 - focussing system; 3 - bunching electrode; 4 - accelerating tube consisting of 16 conical electrodes; 5 - voltage divider; 6 - magnetic separator; 7 - ion collector.

SUB CODE: 20/ SUBM DATE: 14Oct65/ ORIG REF: 002/ OTH REF: 001/

Card 2/2

ACC NR: AP6022011 SOURCE CODE: UR/0120/66/000/003/0137/0138

AUTHOR: Brovchenko, V. G.; Molchanov, Yu. D.

ORG: Atomic Energy Institute, GKAE, Moscow (Institut atomnoy energii GKAE)

TITLE: A low noise preamplifier with a short signal rise time

SOURCE: Pribory i tekhnika eksperimenta, no. 3, 1966, 137-138

TOPIC TAGS: preamplifier, electronic circuit, spectroscopy

ABSTRACT: A fast, low-noise stable preamplifier circuit is presented which is intended for use in the spectroscopy of intensive, low-energy charged-particle fluxes and for counting the number of rare events in the background of weak but often interfering signals. The preamplifier consists of two sections with negative feedbacks. The first section is in the form of a charge amplifier circuit. The first section has a transmission coefficient of 1/5 pf, and the second section has a gain of 7. A dynamic capacitance of 900 pf is at the input of the preamplifier. The signal rise time at the output of the preamplifier depends on the capacitance of the detector at its input. The intrinsic rise time of the preamplifier is equal to 15 nsec at a signal amplitude level of 0.1 to 0.9, and the root-mean-square value of noise is 11 keV. Orig. art. has: 2 figures.

SUB CODE: 09/ SUBM DATE: 12Apr65/ ORIG REF: 001

UDC: 621.375

Card 1/1

KOCHO, V.S., prof., doktor tekhn. nauk; GRANKOVSKIY, V.I., inzh.; MOLCHANOV, Yu.D., inzh.; PLOSHCHENKO, Ye.A., inzh.

Heating open-hearth furnaces of 500 ton capacity with hot coke gas. Biul. TSNIICHM no.1:11-15 '58. (MIRA 11:5)

(Open hearth furnaces)

Molchanov, Yu. D.

130-58-2-6/21

AUTHORS: Kocho, V.S., Doctor of Technical Sciences, Professor, Grankovskiy, V.I., Molchanov, Yu.D. and Ploshchenko, Ye.A.

TITLE: Open-hearth Furnace Operation on High-calorific Value Low-pressure Gas (Rabota martenovskikh pechey na vysokokaloriynom goryachem gaze nizkogo davleniya)

PERIODICAL: Metallurg, 1958, Nr 2, pp 9 - 12 (USSR).

ABSTRACT: Blast-furnace gas is normally added to coke-oven gas for firing open-hearth furnaces to improve flame quality. The low calorific value of blast-furnace gas, however, lowers the theoretical flame temperature and an investigation has been carried out by the imeni Voroshilova (imeni Voroshilov) metallurgical works together with the Kiyevskiy politekhnicheskiy institut (Kiev Polytechnical Institute) of furnace firing without the addition. The authors mention this work in which pure coke-oven gas was used with the addition of turbine air into the side of the gas port and describe the adoption of practice with reduced (halved) quantities of blast-furnace gas which followed the completion of the first part of the work. On 250 and 500-ton furnaces, the blast-furnace gas consumptions were 3 000 and 4 500 m^3/hour, respectively, the coke-oven gas consumptions remaining unchanged and the specific fuel consumption being equivalent to the decrease in blast-furnace

Card1/3

130-58-2-6/21

Open-hearth Furnace Operation on High-calorific Value Low-pressure Gas

gas consumption. By increasing the port cross-sections, an equally high temperature (about 1 350 °C) was obtained for gas and air checkers. The slag pockets filled less rapidly, a higher furnace temperature and increased heat flows were obtained with the new practice: measurements with VNIIT-designed probes on a 500-ton furnace are shown graphically. Three experimental heats were carried out on a 500-ton furnace without blast-furnace gas and the averages of the main operating results for this and ordinary operation are tabulated (Table 1): the authors discuss these briefly and point out that there seems to be an optimal gas pre-heat temperature. They consider the functioning of the gas checkers with pure coke-oven gas. A failure of the lining of the gas ports on a 500-ton furnace led to the combustion products losing enough heat to prevent overheating of the gas checkers and the furnace was worked on coke-oven gas continuously for 1 1/2 months. The operating results show (Table 2) mean decreases of 0.7 hours and 21.8 kg/ton for tap-to-tap time and consumption of standard fuel, respectively. The authors recommend the coke-oven gas firing of furnaces without blast-furnace gas, the cross-sectional area of the gas ports being reduced to reduce the flow of combustion products

Card2/3

130-58-2-6/21

Open-hearth Furnace Operation on High-calorific Value Low-pressure Gas

by 20 - 30% and high-pressure air being supplied to the sides of the gas ports; blast-furnace gas should still be supplied during reversals.
There are 1 figure and 2 tables

AVAILABLE: Library of Congress

Card 3/3 1. Open hearth furnaces-Operation 2. Coal gas-Applications

MoLcHANoV, Yu.D.

SOV/133-59-9-8/31

AUTHORS: Kocho, V.S., Doctor of Technical Sciences,
Babiyev, M.P., Grankovskiy, V.I., Ploshchenko, Ye.A.
and Molchanov, Yu.D., engineers

TITLE: An Investigation of the Operation of a 250 Ton Open
Hearth Furnace Fired with Coke Oven Gas

PERIODICAL: Stal', 1959, Nr 9, pp 796-802 (USSR)

ABSTRACT: Possibilities of firing open hearth furnaces with a low
pressure hot gas of a high calorific value without
carburization are discussed. Literature data are quoted
indicating that autocarburization of gas can be obtained
by preheating the gas to a temperature at which
decomposition of methane, with the partial formation of
higher hydrocarbons and carbon particles, takes place.
Experience in firing a 250 ton open hearth furnace with
preheated coke oven gas of the usual pressure instead of
a mixture of coke oven and blast furnace gas is described.
For this purpose the cross-sectional area of the outlets
from dog houses was reduced from 0.45 to 0.22 m^2 and the
gas port was lowered. Compressed air in an amount of
3000 to 3500 m^3/hr was introduced through the back faces
of the dog houses. The above measures permitted

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increasing the velocity of the gas-air mixture from the
dog house to 100 to 120 m/sec. The pressure in the
gas vertical flue increased to the atmospheric pressure
and at maximum thermal loads to 10 mm H_2O. The
temperature of the upper checkers of gas regenerators
was maintained at 1200 to 1250°C. The consumption of
oil remained the same as on firing with mixed gas.
During the melting period, the flame was covering the
bath satisfactorily but during the refining period at
low thermal loads the length of the flame was insufficient.
In this case, an improvement can be obtained by decreasing
the coefficient of excess air to 0.9 to 1.0. Changes in
the operating indices of the furnace on transfer to
firing with hot coke oven gas are given in tables 1 and 2.
The preliminary results obtained indicated that, in
respect of productivity and fuel consumption, the
furnace operation was satisfactory. Further investigation
of the problem of heating open hearth furnaces with a
hot low pressure gas of a high calorific value and, in

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particular, the development of an optimum furnace
design is recommended. There are 6 figures, 2 tables
and 10 references, 8 of which are Soviet and 2 English.

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KOCHO, V.S., doktor tekhn.nauk; GRANKOVSKIY, V.I., kand.tekhn.nauk;
NAYDEK, V.L., inzh.; MOLCHANOV, Yu.D., inzh.; PIORO, Ch.K., inzh.

Comparative analysis of thermal processes in 500-ton open-hearth furnaces in two metallurgical plants. Stal' 22 no.1:23-27 Ja '62. (MIRA 14:12)

(Open-hearth furnaces)
(Heat—Transmission)

KOCHO, V. S., doktor tekhn. nauk; GRANKOVSKIY, V. I., kand. tekhn.
nauk; MAYDEK, V. L., insh.; MOLCHANOV, Yu. D., insh.;
KUDRYAVAYA, M. A., inzh.

Measuring the flow of combustion products in open-hearth furnaces. Met. i gornorud. prom. no.1:59-62 Ja-F '63. (MIRA 16:4)

1. Kiyevskiy politekhnicheskiy institut (for Kocho, Grankovskiy, Maydek). 2. Cherepovetskiy metallurgicheskiy zavod (for Molchanov, Kudryavaya).

(Gas flow) (Open-hearth furnaces)

L 38204-66

ACC NR: AP6022007 SOURCE CODE: UR/0120/66/000/003/0121/0125

30
B

AUTHOR: Brovchenko, V. G.; Molchanov, Yu. D.; Stroganov, Ye. A.

ORG: Institute of Atomic Energy, GKAE, Moscow (Institut atomnoy energii GKAE)

TITLE: Measuring current impulses by magnetic belts

9W

SOURCE: Pribory i tekhnika eksperimenta, no. 3, 1966, 121-125

TOPIC TAGS: electric measurement, electric pulse measurement, electric measuring instrument

ABSTRACT: Two "magnetic-belt" circuits are examined: (1) With an integrating belt and (2) With a differentiating belt and subsequent signal integration. The "magnetic-belt" is actually a type of current transformer that measures not only the value but also the shape of a current impulse by providing the output signal proportional to the emf integral. Formulas for sensitivities of both the circuits are set up; when the flat portion of a square signal is important, circuit 2 has the advantage because of its higher sensitivity threshold; with considerable external noise, both circuits are equal. Formulas were verified by some experiments carried out with a rectangular-cross-section ($r = 1.35$ cm, $S = 0.325$ cm^2) ferrite torus ring having suitable windings. "In conclusion, the authors wish to thank G. A. Otroshchenko for a useful discussion and help in calculations." Orig. art. has: 3 figures and 24 formulas. [03]

SUB CODE: 09 / SUBM DATE: 12Apr65 / ORIG REF: 009 / OTH REF: 003/ ATD PRESS: 5044

UDC: 621.317.31.014.33

Card 1/1

MOLCHANOV, Yuriy Leonidovich; MANUKHIN, V.L., nauchnyy red.;
GRIBAKIN, D.V., red.; GURDZHIYEVA, A.M., tekhn. red.

[Trade is the way to peace and friendship] Torgovlia - put' k
miru i druzhbe. Leningrad, Ob-vo po rasprostraneniiu polit. i
naucnn. znanii RSFSR, 1961. 58 p. (MIRA 15:3)
(Russia—Commerce)

MOLCHANOV, Yu. M.

Molchanov, Yu. M. - "The influence of various temperatures of the tempering medium on the mechanical properties of metals", Sbornik nauch. statey studentov (Rost. n/D. in-t inzhenerov zh.-d. transporta, Issue 18), Rostov na Donu, 1949, p. 23-27.

SO: U-4110, 17 July 53, (Letopis 'Zhurnal 'nykh Statey, No. 19, 1949).

S/0000/63/000/000/0011/0017

ACCESSION NR: AT4033979

AUTHOR: Prosvirin, V. I.; Molchanov, Yu. M.

TITLE: Modification of the polycaproamide structure by heat treatment

SOURCE: Geterotsepny*ye vy*sokomolekulyarny*ye soyedineniya (Heterochain macromolecular compounds); sbornik statey. Moscow, Izd-vo "Nauka," 1963, 11-17

TOPIC TAGS: polymer, polymer structure, polycaproamide, polycaproamide structure, heat treated polymer, heat treated polycaproamide, quenched polymer, quenched polycaproamide, polymer structural analysis

ABSTRACT: A structural analysis of polycaproamide (I) was carried out to study the effects of heat treatment and quenching on polymer properties and structure. Cast specimens (diam., 20 mm; heated to 240C; slow-cooled at 1C/min) were used for the microstructural, microhardness and X-ray analysis and molded specimens (from grains, 160C, 100 kg/cm^2) for thermal analysis. All test pieces were heated in a CO$_2$ atmosphere. Crystallization of 1 tends to significant supercooling. The crystallization temperature drops by 3-4C for the range 1-15C/min., when the rate of cooling is increased by 7C/min. Crystallization in a supercooled state significantly affects the microstructure. An exothermic effect attributable to low-temperature crystallization in

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ACCESSION NR: AT4033979

view of increased mobility of paraffin groups, is observed when partially crystallized polymer (I) is heated (60-110C). Rapid cooling can stabilize the high temperature structure of the polymer's crystalline lattice. Analysis of microhardness curves points to a markedly heterogeneous structure, the presence of widely varying local microhardness and the presence of various structural elements. Orig. art. has: 4 graphs, 1 table and 1 illustration.

ASSOCIATION: Institut avtomatiki i mekhaniki AN LatvSSR (Institute of Automation and Mechanics AN Latv. SSR)

SUBMITTED: 28Apr62 ENCL: 00

SUB CODE: OC, MT NO REF SOV: 013 OTHER: 011

Card 2/2

ACCESSION NR: AT4040799 S/2685/63/000/002/0077/0086

AUTHOR: Molchanov, Yu. M.

TITLE: Effect of hydrostatic stress on the structure of polycaprolactam

SOURCE: AN LatSSR. Institut avtomatiki i mekhaniki. Prevrashcheniya v splavakh i vzaimodeystviye faz, no. 2, 1963, 77-86

TOPIC TAGS: polycaprolactam, polymer, polymer microhardness, polymer structure, hydrostatic polymer prestressing, pressure level effect, prestressing temperature, cooling rate, pressure related structure modification

ABSTRACT: Samples of polycaprolactam extruded at 300 kg/cm^2 and 230C were prestressed briefly under high pressure, then hydrostatically compressed for 60 min. at pressures of 5600, 10300, 16300, and 22400 kg/cm^2 and temperatures of 20, 110, 190, and 230C. The material was cooled at rates of 1.5 or 70°/min. Measurements of microhardness and microstructural analysis indicated that hydrostatic compression increases microhardness substantially, the peak increase (from average levels to 30 kg/mm^2) occurring for 60 min. at 230C, 22400 kg/cm^2 and 1.5°/min. It was noted that spherulites in the material break down into thin fibrillic strands as temperature or pressure increases and that further increases in these factors cause breakdown of these fibrillic structures. Orig. art. has: 13 graphs and 8 photomicrographs.

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ACCESSION NR: AT4040789

ASSOCIATION: Institut avtomatiki i mekhaniki AN LatSSR (Institute of Automation and Mechanics, AN LatSSR)

SUBMITTED: 00	DATE SEL: 15Jul64	ENCL: 00
SUB CODE: MT	NO REF SOV: 005	OTHER: 001

Card 2/2

S/2685/63/000/002/0087/0095

ACCESSION NR: AT4040800

AUTHOR: Molchanov, Yu. M.; Ozolin', Ya. K.

TITLE: Effect of extrusion conditions on the properties of a graphite plastic

SOURCE: AN LatSSR. Institut avtomatiki i mekhaniki. Prevrashcheniya v splavakh i vzaimodeystviye faz, no. 2, 1963, 87-95

TOPIC TAGS: graphite containing plastic, plastic resistivity, plastic wear characteristic, plastic hardness, plastic permanent set, extrusion pressure effect, extrusion temperature effect, pressure preheating effect, plastic extrusion, graphite, phenolformaldehyde resin

ABSTRACT: Effects of pressure and temperature conditions during extrusion were analyzed by testing samples of a graphite plastic used for spacers in the current collectors of electric trolleys. The composition included 85% graphite dust, 13% phenolformaldehyde resin # 18 and 2% technical urotropine. The mixture was kept for 30 min. at 180C, then extruded at that temperature under pressures ranging from 300 to 1600 kg/cm^2. Preheating was under pressure, but the material was cooled in an unstressed state. Peak Brinell hardness of 16 kg/mm^2 was obtained when extruding at 700 kg/cm^2. Minimal permanent set and specific

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ACCESSION NR: AT4040800

resistance values were indicated for extrusion pressure of 670 kg/cm^2. The optimal extrusion period was 10-30 min. Heating under pressure resulted in much improved hardness values compared to unstressed heating. The best wear characteristics corresponded to peak hardness levels. Orig. art. has: 10 figures.

ASSOCIATION: Institut avtomatiki i mekhaniki AN LatSSR (Institute of Automation and Mechanics AN LatSSR)

SUBMITTED: 00 DATE SEL: 15Jul64 ENCL: 00

SUB CODE: MT NO REF SOV: 003 OTHER: 000

Card 2/2

L 59229-65 EWG(j)/EWP(e)/EWT(m)/EPF(c)/EWP(i)/EPR/EWP(j)/T/EWP(b) Pc-4/
Pr-4/Ps-4 WW/RM/WH

ACCESSION NR: AP5016800

UR/0374/65/000/003/0115/0119
678:539.375

31
B

AUTHOR: Molchanov, Yu. M. (Riga); Ozolin', Ya. K. (Riga)

TITLE: Increasing the wear resistance of parts made from graphito-plastic

15 16

SOURCE: Mekhanika polimerov, no. 3, 1965, 115-119

TOPIC TAGS: plastic wear resistance, graphito-plastic, cast plastic, polymerization temperature, compression molding

ABSTRACT: The authors investigated the influence of the compression molding conditions on the physical and mechanical properties of graphito-plastics. Particular attention was paid to the relationship between the microstructure of the material and its wear resistance. Tests showed that the hardness of graphito-plastics is affected significantly by the magnitude of the operating pressure and the method of heating up to the polymerization temperature (heating under pressure enhances the mechanical properties of the plastics). The optimum operating pressure is around 700 kg/cm^2. A reduction below 10 min. in the soaking time (under pressure) results in a sharp drop in mechanical characteristics and an increase in electrical resistance. It appears that small particle-size graphito-plastics with an even graphite distribution

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L 59229-65

ACCESSION NR: AP5016890

result in the best stabilized plastic samples. Orig. art. has: 5 figures.

ASSOCIATION: none

SUBMITTED: 12Oct64 ENCL: 00 SUB CODE: MT

NO REF SOV: 005 OTHER: 000

dm

Card 2/2

MOLCHANOV, Yu.S., inzh.

Marine reactors with various types of coolants. Sudostroenie 27
no.4:64-69 Ap '61. (MIRA 14:3)
(Nuclear reactors) (Atomic ships)

MOLCHANOV, Yu.S., inzh.

Investigating turbine stage operations with wet steam (from "Escher Wiss. Mittelung," no.1, 2, 3, 1960; "Schweizerische Bauzeitung," no.22, 1959). Sudostroenie 28 no.7:73-76 Jl '62. (MIRA 15:8)

(Steam turbines, Marine)

MOLCHANOV, [illegible] Ivan.

Performance of a two row velocity stage during operation on low speeds. Sudostroenie 30 no.12:17-19 D '64. (MIRA 18:6)