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L 21[illegible]-65 EWT(1)/EWT(m)/EWT(m)/EPR/FCS(k) Pd-1/Pa-4 WW/JD

ACCESSION NR: AR5000692 S/0264/64/000/010/A038/A038

SOURCE: Ref. zh. Vozdushnyy transport. Svodnyy tom. Abs. 10A241

AUTHOR: Kudryashev, L. I.; Lyalhov, V. K.

TITLE: Analytic study of the effects of variability in thermophysical properties of a fluid during its turbulent nonisothermic flow in pipes

CITED SOURCE: Tr. Kuybyshevsk. aviats. in-t. vyp. 15, ch. 2, 1963, 225-236

TOPIC TAGS: turbulent piped flow, nonisothermic flow, thermophysical property variability, heat exchange calculation, hydraulic drag calculation

TRANSLATION: The report describes a continuation and expansion of previous studies by the authors. Previous reports presented unclear expressions [illegible] corrections relating [illegible] effects of variations in heat conductivity, viscosity, density and heat capacity of a liquid on the patterns of heat emission and hydraulic drag. The present report illustrates [illegible] reducing such corrections to an expression convenient for calculations. Results are compared with experimental data on the [illegible] hydraulic [illegible] and heat exchange in trickling liquids. [illegible]

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L 23358-65
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[illegible] on hydraulic drag in trickling liquids. V. Petrov

SUB CODE: ME, TD ENCL: 00

Card 2/2

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[illegible]

[illegible] AR5005868 [illegible] B002/B003

[illegible] Ref. zh. Mekhanika, Abs. 11B562

AUTHORS: Kudryashev, L. I.; Ignatov, V. P.

TITLE: On the connection between external heat exchange and the internal process of thermal conductivity when a cylinder is placed in an unbound plane-parallel [illegible]

[illegible] Tr. Kuybyshevsk, aviats. in-t, vyp. 1[illegible], ch. 2, [illegible], 253-256

[illegible] heat exchange, thermal conductivity, heat [illegible], [illegible] boundary layer

[illegible] The problem solved is that of heat exchange with a cylinder in- [illegible] constant of [illegible] constant temper- [illegible] al proper [illegible] [illegible] The heat transfer processes in the external medium are described by the ordinary equation of thermal conductivity for solids. A fourth-

[illegible] 1/2

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ACCESSION NR: AR5005868

order boundary condition is assumed on the boundary separating the cylinder from the medium. From the temperature field in the cylinder, obtained under such as- [illegible], the authors seek the heat flux on the boundary separating the cylinder [illegible]. The flux is set equal to [illegible] T [illegible] where [illegible] coefficient of [illegible] cylinder to the current, [illegible] temper- [illegible] dependence of [illegible] medium, and on the cylinder [illegible] in conclusion that this functional dependence can be readily [illegible] applying similarity theory to the [illegible] system of differential equations. A. B. Karasev.

SUB CODE: ME, TD ENCL: 00

APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7"

"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

KUDRYAVTSEV, L. I.; SMIRNOV, A. A.

"Estimation of influence of thermal unsteady state on convective heat-transfer coefficient for spherical bodies in flow at small Reynolds numbers."

report submitted for 2nd All-Union Conf on Heat & Mass Transfer, Minsk, 4-12 May 1964.

Kuybyshev Aviation Inst.

APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7"

"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

KUSKYASHEV, L. I.; KOMEYKO, N. F.

"Application of boundary-layer theory to the determination of heat transfer and resistance coefficients for a constant heat flux along the length of a round tube."

report submitted for 2nd All-Union Conf on Heat & Mass Transfer, Minsk, 4-12 May 1964.

Kuybyshevskiy Aviation Inst.

APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7"

"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

L 16615-65 EWT(1)/EWT(m)/EPF(c)/EPF(n)-2/EPR/EPA(bb)-2/T/FCJ(k)/EWA(1) Pd-1/
Pr-4/Ps-4/Pi-4/Pu-4 ESD(t)/AEDC(a)/BSD/ASD(f)-2/ASD(p)-3 WW
ACCESSION NR: AM4049289 S/0264/64/000/009/A035/A035

SOURCE: Ref. zh. Vozdushny*y transport. Svodny*y tom. Abs. 9A24

AUTHOR: Kudryashev, L. I.; Romeyko, N. F.

TITLE: Application of the boundary layer theory to determinations of drag and heat exchange [illegible] constant heat stresses along the length of a round cylinder

CITED SOURCE: Tr. Kuyby*shevsk. aviats. in-t. vy*p. 15, ch. 2, 1964, 3-24

TOPIC TAGS: two layer flow, turbulent gas flow, gas flow heat exchange, friction drag, [illegible] drag coefficient, boundary layer theory

TRANSLATION: The authors carried out a theoretical analysis of the process of heat exchange during turbulent flow of a gas with variable physical properties in a cylinder. It was assumed that a solution can be obtained, as for the case of constant physical [illegible] some median values, integrated according to temperature, can be accepted [illegible] parameters. The model considered was a two-layer flow. Velocity and [illegible] in the streamline sublayer were assumed to be parabolic or [illegible] means of a polynomial. In the latter case, the condition of equality was

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ACCESSION NR: AR4049289

introduced not only for the absolute values of velocity and temperature at the boundary of the streamline sublayer and the turbulent main flow segment, but also for their [illegible] It was assumed that the distribution of velocity and temperature in the [illegible] main flow segment is expressed by an exponential function with as exponent of [illegible] participating in solutions to the problem were determined for Pr [illegible] and [illegible] The results of friction drag calculations were lower by [illegible] with the Blasius equation The results of heat exchange calculations [illegible] with experimental data obtained by the authors Experimental [illegible] were not described V Popov

SUB CODE ME [illegible] ENCL: 00

Card 2/2

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

L 11516-66 EWT(1)/EPF(n)-2/EWG(m) WW

ACC NR: AT6003067 SOURCE CODE: UR/3181/63/000/015/0003/0024

AUTHOR: Kudryashev, L.I. (Professor, Doctor of technical sciences); Romeyko, N.F.

ORG: None

TITLE: Use of boundary layer theory to determine the resistance and heat transfer coefficients along a round tube with constant heat loads

SOURCE: Kuybyshev. Aviatsionnyy institut. Trudy, no. 15, pt. 2, 1963. Doklady kustovoy nauchno-tekhnicheskoy konferentsii po voprosam mekhaniki zhidkosti i gaza (Reports of the Joint scientific-technical conference on problems of the mechanics of liquid and gas), 3-24

TOPIC TAGS: boundary layer theory, convective heat transfer, hydrodynamic theory, heat transfer coefficient, heat balance

ABSTRACT: The heat balance equation between two cross sections of a tube at a distance dz from each other will be

$$\bar{c}_p \varphi dt = \pi D q_0 dz, \qquad (1)$$

where φ is the mass gas rate, kg/hr; $\bar{t}$ is the mean temperature of the gas stream over the cross section, determined by the expression:

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ACC NR: AT6003067

$$\bar{t} = \frac{\int_0^{r_0} wtr\,dr}{\int_0^{r_0} wr\,dr}, \qquad (2)$$

q_0 is the constant magnitude of the heat flux, kcal/m^2-hr; D is the inside diameter of the tube in meters. Integrating Eq. 1, we get:

$$\bar{t} = \frac{\pi D q_0}{C_p G} z + t_0. \qquad (3)$$

This linear relationship was verified experimentally and fully confirmed (experimental data are shown in two figures). The article proceeds to an extended theoretical development based on the above relationship and a comparison of the results with the work of other authors. It is concluded that, under a constant heat load, the temperature change along the length of the tube is linear. Best results are shown by a method proposed by L. S. Leybenzon for constructing the velocity and temperature profiles in the boundary sublayer; this method does not require a three-layer model of the boundary layer. From a comparison of the experimental data on the resistance coefficients and the hydrodynamic theory of heat transfer, it was established that the choice of an experimental relationship for the velocity distribution leads to the

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ACC NR: AT6003067

requirement that the constant coefficient in the resistance coefficient be reduced by approximately 6%. The investigations are not of a limited character and can be extended, without serious changes, to the region of changes in the Reynolds number greater than 10^5. Orig. art. has: 105 formulas and 6 figures.

SUB CODE: 20/ SUBM DATE: 00/ ORIG REF: 003/ OTH REF: 002

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APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7"

"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

L 14517-66 EWT(1)/EPF(n)-2/EWG(m) - WW

ACC NR: AT6003068 SOURCE CODE: UR/3181/63/000/015/0025/0040

AUTHOR: Kudryashev, L. I. (Professor, Doctor of technical sciences); Berzon, T. Yu.

ORG: None

52

B+1

21,44,55

TITLE: Investigation of complex heat transfer with varying thermophysical properties and in the presence of radiative heat transfer

SOURCE: Kuybyshev. Aviatsionnyy institut. Trudy, no. 15, pt. 2, 1963. Doklady kustovoy nauchno-tekhnicheskoy konferentsii po voprosam mekhaniki zhidkosti i gaza (Reports of the Joint scientific-technical conference on problems of the mechanics of liquid and gas), 25-40.

TOPIC TAGS: hydrodynamic theory, radiative heat transfer, heat transfer coefficient

ABSTRACT: The system of differential equations defining the problem has the form:

$$\left.\begin{aligned} c_p\gamma\frac{\partial\theta}{\partial\tau} &= \operatorname{div}(\lambda\operatorname{grad}\theta), && \text{(a)}\\ \tau = 0,\ \theta_n &= \theta_n(x,y,z), && \text{(b)}\end{aligned}\right\}. \quad (1)$$

$$-\lambda_w\left(\frac{\partial\theta}{\partial n}\right)_w = \pm\alpha_k(T_w - T_f) \pm C_n\left[\left(\frac{T_w}{100}\right)^4 - \left(\frac{T_f}{100}\right)^4\right] \quad \text{(c)}$$

$$\lambda = \lambda(\theta),\ c_p = c_p(\theta),\ \gamma = \gamma(\theta) \quad \text{(d)}$$

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ACC NR: AT6003068

Writing this system in dimensionless variables and applying the pi-theorem, its solution can be obtained in the form:

$$\Theta = \Theta\left(F_0^*, q_1, q_2, q_3, k, Bi_k, St, \frac{T_M}{T_0}\right), \qquad (2)$$

where:

$$\Theta = \frac{\Phi - \Phi_0}{\Phi_M - \Phi_0},$$

Φ is the analog of the temperature, determined by the expression:

$$\Phi = \int_0^{\theta} \lambda(\theta)\, d\theta + \Phi_0;$$

Φ_M and Φ_0 are values of the analog corresponding to the maximum and minimum temperatures T_M and T_0; q_1, q_2, q_3 are dimensionless orthogonal coordinates; St is the Stokes number, determined from the expression:

$$St = \frac{C_n T_0^3}{10^4 \sigma_0},$$

$$k = \frac{2\lambda_1}{\lambda_0^3}(\Phi_M - \Phi_0), \quad F_0^* = \frac{a_0 \tau}{R^2}, \quad Bi_k = \frac{\alpha_k R}{\lambda_0}.$$

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It has been experimentally established that the introduction of a new generalized variable, u, regularizes the process of heating or cooling a body and can therefore be regarded as a sufficiently effective method for the experimental study of complex heat transfer. Introduction of a coefficient for the degree of regularity and its application to the existing experimental data demonstrate the possibility of a simple method for calculating complex heat transfer. Combining the formulations of the problems of internal and external heat transfer, with application of the theory of hydrodynamic and thermal traces, makes it possible to set up a functional relationship for the heat transfer coefficient, taking into account both the internal and the external problem. Orig. art. has: 75 formulas and 1 figure.

SUB CODE: 20/ SUBM DATE: 00/ ORIG REF: 006/ OTH REF: 001/SOV REF: 000

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L 14519-66 EWT(1)/EWT(m)/EWP(m)/EPF(n)-2/EWG(m)/EWA(d)/FCS(k)/EWA(1) WW/JD

ACC NR: AT6003085 SOURCE CODE: UR/3181/63/000/015/0185/0189

AUTHOR: Kudryashev, L.I. (Professor, Doctor of technical sciences); Astrelin, B.N.

ORG: None

TITLE: Effect of the unsteady state on the coefficient of heat transfer in flow around a spherical body in the region of very small Reynolds numbers

SOURCE: Kuybyshev. Aviatsionnyy institut. Trudy, no. 15, pt. 2, 1963. Doklady kustovoy nauchno-tekhnicheskoy konferentsii po voprosam mekhaniki zhidkosti i gaza (Reports of the Joint scientific-technical conference on problems of the mechanics of liquid and gas), 185-189

TOPIC TAGS: convective heat transfer, Reynolds number, heat conduction, heat transfer coefficient, unsteady flow

ABSTRACT: The problem is formulated using the following differential equation for heat conduction (applicable to the spherical problem):

$$\frac{\partial t}{\partial \tau} = a\left(\frac{\partial^2 t}{\partial r^2} + \frac{2}{r}\cdot\frac{\partial t}{\partial r}\right). \quad (1)$$

The boundary conditions are the following:

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$$\tau = 0,\ t = \theta_w - \theta_f = t_w; \qquad (2)$$

where θ_w is the initial temperature of the particle; θ_f is the stream temperature at the start of the process. After an extended mathematical treatment, the authors arrive at a formulation which, it is stated, makes it possible to take into account the effect of the unsteady state on the heat transfer coefficient in flow around a very small spherical body. This effect is extremely substantial, since even an average result leads to a twofold increase in the heat transfer coefficient compared to the value for a steady-state Nusselt regime. Orig. art. has: 21 formulas.

SUB CODE: 20/ SUBM DATE: 00/ ORIG REF: 002/ SOV REF: 000/ OTH REF: 000

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

L 14665-66 EWT(1)/EWP(m)/EWT(m)/ETC( )/EWG(m)/EWA(d)/T/ETC(m)-6/EWA(1)
ACC NR: AT6003091 JD/WW/JW/DJ SOURCE CODE: UR/3181/63/000/015/0225/0236

AUTHORS: Kudryashov, L. I. (Professor, Doctor of technical sciences); Lyakhov, V.K.

ORG: Kuybyshev Aviation Institute (Kuybyshevskiy aviatsionnyy institut); Joint Scientific-Technical Conference on Problems of the Mechanics of Liquid and Gas (Kustovaya nauchno-tekhnicheskaya konferentsiya po voprosam mekhaniki zhidkosti i gaza)

TITLE: Analytic investigation of the effect of variable thermophysical properties of a fluid in turbulent nonisothermal motion in tubes

SOURCE: Kuybyshev. Aviatsionnyy institut. Trudy, no. 15, pt. 2, 1963. Doklady kustovoy nauchno-tekhnicheskoy konferentsii po voprosam mekhaniki zhidkosti i gaza (Reports of the Joint scientific-technical conference on problems of the mechanics of liquid and gas), 225-236

TOPIC TAGS: transport property, thermodynamic property, turbulent flow, heat transfer, Nusselt number, Reynolds number

ABSTRACT: Semi-empirical methods are given for incorporating variable thermophysical properties in nonisothermal turbulent flows of various fluids. The mean thermophysical property is defined by

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ACC NR: AT6003091

$$\bar{\varphi} = \frac{\int_{t_w}^{t_v} \varphi\, dt}{t_v - t_w}$$

where subscript v refers to conditions at the laminar sublayer. In general, the viscosity varies exponentially with the temperature

$$\varphi = \varphi_w \exp[-\bar{n}(t - t_w)],$$

and, as a convenient approximation, the following relationship is introduced

$$\left(\frac{\bar{\varphi}}{\varphi_f}\right)^m = \left(\frac{\varphi_f}{\varphi_w}\right)^n$$

where subscript f refers to a mean heat-content temperature for the fluid. The variation of the index n/m is tabulated for various fluids, and it is found to change from a positive to a negative value as one goes from conditions of cooling to heating thermal transfer. A semi-empirical analysis yields for n and m

$$n = m\left\{\left[0{,}5 + 0{,}1\,\frac{t_v - t_w}{t_f - t_w}\lg\frac{\varphi_f}{\varphi_w}\right]\frac{t_v - t_w}{t_f - t_w} + k - 1\right\}$$

where the nondimensional temperature term is obtained from the turbulent flow heat transfer analysis

$$\frac{t_v - t_w}{t_f - t_w} = \frac{1}{1 + \Phi},$$

$$\Phi = \left[0{,}4\,Re_f^{0.13}\left(\frac{\mu_f}{\mu_w}\right)^{0.066}\left(\frac{\rho_f}{\rho_w}\right)^{0.066} - 0{,}8\right] \times Pr_f^{-\frac{2}{3}}\left(\frac{\mu_f}{\mu_w}\right)^{\frac{1}{3}}\left(\frac{C_{pf}}{C_{pw}}\right)^{\frac{1}{6}}\left(\frac{\lambda_f}{\lambda_w}\right)^{\frac{1}{3}}.$$

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ACC NR: AT6003091

These last two expressions are then applied to a number of flow situations. These include: heat transfer and skin friction for air at Pr $\simeq$ 0.7; liquids such as oils under cooling and heating heat transfer; skin friction of liquids; and, finally, to conditions of near critical heat transfer conditions. All the results correlate well with experiments performed in tubes with the various fluids mentioned above. Orig. art. has: 29 equations, 9 figures, and 1 table.

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 013/ OTH REF: 004

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

L 14656-66 EWT(1)/EWP(m)/EWT(m)/ETC(f)/EPF(n)-2/EWG(m)/EWA(d)/ETC(m)-6/EWA(1)
ACC NR: AT6003094 JD/WW SOURCE CODE: UR/3181/63/000/015/0253/0256

AUTHORS: Kudryashev, L. I. (Professor, Doctor of technical sciences); Ignatov, V. P.

ORG: Kuybyshev Aviation Institute (Kuybyshevskiy aviatsionnyy institut); Joint Scientific-Technical Conference on Problems of the Mechanics of Liquid and Gas (Kustovaya nauchno-tekhnicheskaya konferentsiya po voprosam mekhaniki zhidkosti i gaza)

TITLE: On the relationship between the external and internal heat transfer processes during overflowing of a cylinder by an infinite plane-parallel flow

SOURCE: Kuybyshev. Aviatsionnyy institut. Trudy, no. 15, pt. 2, 1963. Doklady kustovoy nauchno-tekhnicheskoy konferentsii po voprosam mekhaniki zhidkosti i gaza (Reports of the Joint scientific-technical conference on problems of the mechanics of liquid and gas), 253-256

TOPIC TAGS: heat transfer, uniform flow, Nusselt number, temperature distribution, thermal conduction, unsteady process

ABSTRACT: A theoretical analysis was made to establish a relationship between the

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ACC NR: AT6003094

external heat transfer and internal conduction over a cylinder of radius R in an infinite fluid. The governing equations, initial, and boundary conditions of the problem are given by

$$\frac{\partial t_1(r,\tau)}{\partial \tau} = a_1\left[\frac{\partial^2 t_1(r,\tau)}{\partial r^2} + \frac{1}{r}\frac{\partial t_1(r,\tau)}{\partial r}\right]_{(\tau>0;\ 0<r<R)};$$

$$\frac{\partial t_2(r,\tau)}{\partial \tau} = a_2\left[\frac{\partial^2 t_2(r,\tau)}{\partial r^2} + \frac{1}{r}\frac{\partial t_2(r,\tau)}{\partial r}\right]_{(\tau>0;\ R<r<\infty)};$$

$$t_1(r,0) = t_0;\ t_2(r,0) = t_c$$

$$\frac{\partial t_1(0,\tau)}{\partial r} = 0;\ t_1(0,\tau) \neq \infty;$$

$$\frac{\partial t_2(\infty,\tau)}{\partial r} = 0;$$

$$t_1(R,\tau) = t_2(R,\tau);\ -K_1\frac{\partial t_1(R,\tau)}{\partial r} = -\frac{\partial t_2(R,\tau)}{\partial r}$$

where the initial fluid temperature t_c is less than the initial cylinder temperature t_0. After some algebraic manipulations, the solution of the above system yields the following expression for the heat transfer coefficient

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ACC NR: AT6003094

$$Nu = \frac{\alpha \cdot D}{\lambda_2} = \frac{8 \cdot K_\lambda^2}{\pi R} \cdot b \cdot (K_a^{\frac{1}{2}};\ K_\lambda;\ F_{01}).$$

$$b = \int_0^\infty \frac{J_1^2}{\mu[\psi^2(\mu) + \psi^4(\mu)]} \cdot e^{-\mu^2 F_{01}} \cdot d\mu;$$

$$K_\lambda = \frac{\lambda_1}{\lambda_2};\ K_a = \frac{a_1}{a_2};\ F_{01} = \frac{a \cdot \tau}{D^2}.$$

The connection between the internal conduction and external forced convection can then be shown through the functional expression

$$Nu = \Phi(F_0;\ Re;\ Pr;\ K_a;\ K_\lambda).$$

Orig. art. has: 17 equations.

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 002

Card 3/3

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

L 16933-66 EWT(1)/EWT(m)/EWT(n)-2/EWA(1) JD/WW

ACC NR: AT6003100 SOURCE CODE: UR/3181/63/000/015/0295/0298

AUTHOR: Kudryashev, L.I. (Professor; Doctor of technical sciences); Veselov, V.P.; Grekov, A.V.

ORG: None

TITLE: Use of an EI-12 to solve problems of unsteady state heat conduction in metals with varying thermophysical properties, in the presence of convective and radiative heat transfer

SOURCE: Kuybyshev. Aviatsionnyy institut. Trudy, no. 15, pt. 2, 1963. Doklady kustovoy nauchno-tekhnicheskoy konferentsii po voprosam mekhaniki zhidkosti i gaza (Reports of the Joint scientific-technical conference on problems of the mechanics of liquid and gas), 295-298

TOPIC TAGS: convective heat transfer, radiative heat transfer, heat conduction, metal, integrated electronic device, integration

ABSTRACT: The article gives the details of solutions using an electronic grid type integrator. The problem is stated in the following manner. The symmetrical problem of heat conduction in a sphere reduces to the following system of equations in dimensionless variables, including the differential heat conduction equation

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ACC NR: At6003100

$$\frac{\partial\theta}{\partial F_0} = (1 + k\Theta)\frac{1}{\rho^2}\frac{\partial}{\partial\rho}\left(\rho^2\frac{\partial\theta}{\partial\rho}\right), \text{ для } 0 < \rho < 1,\ F_0 > 0, \qquad (1)$$

with the boundary condition of the third order

$$-\left(\frac{\partial\theta}{\partial\nu}\right)_w = a^*(\Theta_w)\Theta_w \text{ для } F_0 > 0 \qquad (2)$$

and the initial condition

$$\theta = 1;\ \text{для } 0 \leqslant \rho \leqslant 1;\ F_0 = 0, \qquad (3)$$

where $\theta = \Theta(\rho, F_0)$ is the analog of the dimensionless temperature; F_0 is the Fourier number; w is the boundary of the sphere; ν is a normal to the sphere; and

$$a^*(\Theta_w) = (a_1 l + a_2 l^2 + a_3 l^3 + a_4 l^4)\Theta_w;\ l = \sqrt{1 + k\Theta_w} - 1,$$

k, a_1, a_2, a_3, a_4

are variable parameters. A table shows results of calculation based on use of an EI-12 grid integrator compared to a solution using an IPT-5 machine. The results agree in a satisfactory manner. Orig. art. has: 9 formulas, 1 figure, and 1 table.

SUB CODE: 09,20,12/ SUBM DATE: 00/ ORIG REF: 002

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L 14661-66 EWT(1)/EWP(m)/EWT(m)/EPF(n)-2/EWA(d)/ETC(m)-6/EWA(1) JD/AH/GG
ACC NR: AT6003109 SOURCE CODE: UR/3181/63/000/015/0361/0369

AUTHORS: Kudryashev, L. N. (Professor, Doctor of technical sciences); Shmerkovich, V. M.

ORG: Kuybyshev Aviation Institute (Kuybyshevskiy aviatsionnyy institut); Joint Scientific-Technical Conference on Problems of the Mechanics of Liquid and Gas (Kustovaya nauchno-tekhnicheskaya konferentsiya po voprosam mekhaniki zhidkosti i gaza)

TITLE: On the theory of film condensation of vapors moving slowly inside a horizontal tube

SOURCE: Kuybyshev. Aviatsionnyy institut. Trudy, no. 15, pt. 2, 1963. Doklady kustovoy nauchno-tekhnicheskoy konferentsii po voprosam mekhaniki zhidkosti i gaza (Reports of the Joint scientific-technical conference on problems of the mechanics of liquid and gas), 361-369

TOPIC TAGS: vapor condensation, heat transfer, temperature distribution

ABSTRACT: A simple theory was devised to predict vapor condensation inside horizontal tubes in a slowly moving fluid. It is assumed that α (external

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condensate) > α (internal condensate) > α (internal convection), where α is the thermal conductivity. The governing equations are given by

$$\left.\begin{aligned} &\gamma \sin\theta + \mu \frac{d^2 w_x}{dy^2} = 0 \\ &\frac{dw}{dx} = 0 \\ &\frac{d^2 t}{dy^2} = 0 \end{aligned}\right\},$$

with boundary conditions

$$y = 0 \quad w_x = 0; \quad t = t_w;$$

$$y = \delta \quad \frac{dw_x}{dy} = 0; \quad t = t_s .$$

This leads to an expression for the local heat transfer

$$\alpha_x = \sqrt[4]{\frac{r\gamma^2\lambda^3}{2\mu\Delta t D}} \cdot \frac{\sin^{\frac{1}{3}}\theta}{\left[\int_0^{\theta} \sin^{\frac{1}{3}}\theta d\theta\right]^{\frac{1}{4}}}$$

and a mean Nusselt number of

$$\overline{Nu}_a = \frac{4}{3\sigma}\sqrt[4]{\frac{GaPrk}{2}} \left[\int_0^{\theta} \sin^{\frac{1}{3}}\theta d\theta\right]^{\frac{3}{4}}$$

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ACC NR: AT6003109

where the integrals can only be obtained numerically. As a concrete example the integration limit is obtained for the flow geometry given in Fig. 1.

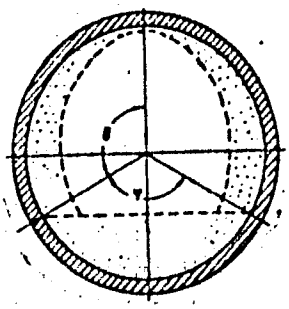

Fig. 1.

Orig. art. has: 33 equations, 2 figures, and 1 table.

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 002

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EWT(1) EWP(w)/EWT(m)/EPA(s)-2/EWA(d)/EWG(v) EPF(n)-2 EPR/T EWP(t)
Pe-5 Ps-4 Pt-10 Pu-4 Ww
AT5002507 0000 64 000 000 0258 0266

Kudryashev, L. I., Veselov, V. P.

TITLE: Simulation of processes of non-stationary heat conduction in metals with variable ... al characteristics during convective and radiant heat exchange

Analogovyye metody i sredstva resheniya kravevykh zadach (Analog methods ... boundary value problems) ... Naukova dumka ...

... heat conduction, heat exchange, convection, radiation, electrosimulation, ... transfer, analog computer, boundary ...

ABSTRACT: The authors consider the problem of heat conduction in a solid body with variable thermal properties, the object being to calculate the convective and radiant heat exchange. It is assumed that the coefficient of heat exchange depends only on the ... This assumption permits the problem to be solved by means of an IPT-6 analog computer. The thermodynamic equations

$$C_p(T)\,\psi(T)\frac{\partial T}{\partial \tau} = \operatorname{div}\{\lambda(T)\operatorname{grad} T\}, \quad \tau = 0; \quad T_{\text{нач}} = T_{\text{нач}}(x, y, z),$$

$$-\lambda(T_w)\left(\frac{\partial T}{\partial n}\right)_w = \alpha_c(T_w - T_f) + \frac{C_n}{10^8}(T_w^4 - T_f^4).$$

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ACCESSION NR: AT5002507

are set up and by means of Storm's condition, Fourier's law, and the Bio-Stark criterion, these equations are finally transformed into a system of the form

$$\frac{\partial\theta}{\partial F_\theta^0} = (1 + k\theta)\left(\frac{\partial^2\theta}{\partial\varrho^2} + \frac{2}{\varrho}\frac{\partial\theta}{\partial\varrho}\right),$$

$$F_\theta^0 = 0; \quad \theta_{\text{нач}} = \theta_{\text{нач}}(\varrho),$$

$$-\left(\frac{\partial\theta}{\partial\nu}\right)_w = \left(\frac{\partial\theta}{\partial\varrho}\right)_{w\,\text{ст}} = \sum_{i=0}^{3} a_i f_i(k, \theta_w).$$

This system can be approximately solved using Lagrange polynomials and the IPT-5. The [illegible] particular case are presented in the paper. This method should be capable of [illegible] similar problems. For the particular [illegible] the cascade [illegible] estimate the accuracy of the [illegible] figures [illegible] formulas.

ASSOCIATION: none

SUBMITTED: 06Sep64 ENCL: 00 SUB CODE: DP, TD

NO REF SOV: 002 OTHER: 000

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

[illegible]

ACCESSION NR: AT4045649 S/2943/64/000/002/0309/0317

AUTHOR: Kudryashev, L. I.; Veselov, V. P. B+1

TITLE: Modeling of processes of nonstationary thermal conductivity in metals [illegible] variable thermophysical characteristics of the [illegible] heat

[illegible] po metodam matemat[illegible]

[illegible] Matematicheskoye [illegible]

[illegible] modeling and electrical [illegible]

[illegible]

[illegible] TAGS: nonstationary heat exchange [illegible] radiation [illegible] modeling, similarity theory

ABSTRACT: In a previous paper of the author et al. (Trudy* Kuyby*shevskogo [illegible]onnogo instituta, #12(1961)), a method was developed for modeling of pro[illegible] of a nonstationary heat conductivity by convection at variable thermophysi[illegible] material characteristics. For calibration of the electrical models, the analy-

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ACCESSION NR: AT4045649

tical solution of the linear problem was compared with the solution obtained by [illegible] In the present paper, the authors [illegible] edure in which the [illegible] gradually extended [illegible] the results of [illegible] in addition, [illegible] also considered. Orig. art. has: 3 figures, 2 tables, 12 equations.

ASSOCIATION: None

SUBMITTED: 07Dec62 ENCL: 00

SUB CODE: TD, IE NO REF SOV: 002 OTHER: 000

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[illegible]

[illegible] Tkachev, [illegible]

[illegible]

[illegible] Kraya Tekhnika, [illegible]

[illegible] transfer, heat transfer [illegible]

[illegible] of the vibrations [illegible] experimental [illegible]

[illegible] of the experimental data obtained [illegible] of the [illegible] formula was established

$$Nu = 2.3\, Re^{\frac{\theta}{V_1}} \cdot \frac{\theta}{V_1}$$

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ACCESSION NR: AP5005534

The formulated theoretical model made possible the approximate integration of the [illegible] differential equations which describes the problem [illegible] has [illegible] and 3 figures. [AC]

ASSOCIATION: none

SUBMITTED: [illegible]Mar64 ENCL: 02 SUB CODE: TL

OTHER: [illegible] [illegible] PREC: 3188

Card 2/4

APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7"

"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

KUDRYASHEV, L.I.; KUDRYASHOVA, N.L.

Approximate solutions of nonlinear problems of nonstationary heat conductivity using Academician's L.S. Leibenzon's integral relations. Izv. vys. ucheb. zav.; av. tekh. 8 no. 4: 18-28 '65 (MIRA 19:1)

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L 11834-66 EWT(1)/EWP(m)/EWT(m)/ETC/F/EPF(n)-2/FCS(k)/EWA(1)/EWA(d)/EWG(m)

ACC NR: AT6001373 JD/WW/GS SOURCE CODE: UR/0000/65/000/000/0298/0305

AUTHOR: Kudryashev, L. I.; Smirov, A. A.

ORG: Kuybyshev Aviation Institute (Kuybyshevskiy aviatsionnyy institut)

TITLE: Calculation of the effect of the thermal unsteady-state on the coefficient of convective heat transfer in flow past a spherical body in the region of small Reynolds numbers

SOURCE: Teplo- i massoperenos. t. 1: Konvektivnyy teploobmen v odnorodnoy srede (Heat and mass transfer. v. 1: Convective heat exchange in an homogeneous medium). Minsk, Nauka i tekhnika, 1965, 298-305

TOPIC TAGS: convective heat transfer, fluid flow, Reynolds numbers

ABSTRACT: The article gives a general mathematical treatment of the subject without experimental data. It has been demonstrated that the problem of heat transfer for very small Reynolds numbers can be reduced to the problem of steady state heat conduction through a sphere whose radius is infinitely small, that is, the problem reduces to the solution of the following differential equation:

$$\frac{\partial^2 \theta}{\partial r_1^2} + \frac{2}{r_1}\frac{\partial \theta}{\partial r_1} = 0, \qquad (1)$$

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where

$$\theta = \frac{t - t_\infty}{t_w - t_\infty}; \quad r_1 = \frac{r}{r_0}.$$

here t_w is the maximum temperature in the problem under consideration; t_∞ is the temperature of the surrounding medium; r_0 is the radius of the sphere. With the boundary conditions:

$$r_1 = 1, \quad \theta_w = \frac{t - t_\infty}{t_w - t_\infty} = 1, \tag{2}$$

$$r_1 = \infty, \quad \theta_w = 0 \tag{2a}$$

the solution of Equation (1) has the form:

$$\theta = \frac{1}{r_1}. \tag{3}$$

The present article presents a method for solution of the problem by which equations are obtained which determine the coefficient of convective heat transfer taking into account the effect of the thermal unsteady state. Equations (1) and (2) above are particular cases of this situation. The final solution derived at in the article establishes clearly the effect of a change in the Fo number on the heat transfer coefficient. Orig. art. has: 48 formulas.

SUB CODE: 20/ SUBM DATE: 31Aug65/ ORIG REF: 001/ OTH REF: 002

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L 15983-66 EPF(n)-2/EWA(h)/EEC(k)-2/EWT(1)/FBD/ETC(f)/T/EWP(k)/EWT(m)
ACC NR: AP6005468 SOTB/IJP(c) WG/WW SOURCE CODE: UR/0368/66/004/001/0012/0019

AUTHOR: Kudryashev, L. I.; Belostotskiy, B. R.; Zhemkov, L. I.; Vekshin, V. S.
ORG: none

TITLE: Approximate solution for the problem of nonstationary heat exchange in the active element of a laser 21,44,55 B

SOURCE: Zhurnal prikladnoy spektroskopii, v. 4, no. 1, 1966, 12-19

TOPIC TAGS: laser pulsation, laser optics, heat transfer, solid state laser

ABSTRACT: The processes of nonstationary heat exchange which takes place during the operation of a pulsed laser are mathematically analyzed. The active element of the laser is assumed to be a solid cylinder with a ratio of length to diameter of approximately 10. The problem is described by a system of four equations. This system of equations is simplified by assuming that the coefficient of thermal conductivity, specific heat and density of the active element are independent of temperature. The system is solved by the variational method for an isolated cycle of laser operation. A formula is derived for the temperature field inside the active element

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ACC NR: AP6005468

in the case of continuous laser operation assuming an arbitrary number of cycles with a constant prf. Expressions are derived for the basic factors which determine heat exchange of the active element: thermophysical characteristics, pumping duration and power, the length of a cycle, the pulse repetition frequency and the total operating time of the laser. Equations are given in dimensionless form which may be used in practical engineering problems for analyzing various operating cycles of pulsed lasers and the dimensions of active elements. Orig. art. has: 1 figure, 45 formulas.

SUB CODE: 20/ SUBM DATE: 29Jun65/ ORIG REF: 005/ OTH REF: 000

Card 2/2

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

ACC NR: AT7000387

SOURCE CODE: UR/0000/66/000/000/0452/0466

AUTHOR: Kudryashov, L. I.; Veselov, V. P.

ORG: Kuybyshev Aviation Institute (Kuybyshevskiy aviatsionnyy institut)

TITLE: Investigation of unsteady state heat conductivity processes and of complex heat transfer by the methods of electrical modelling, and evaluation of the error

SOURCE: Teplo- i massoperenos, t. 6: Metody raschota i modelirovaniya protsessov teplo- i massoobmena (Heat and mass transfer, v. 6: Methods of calculating and modeling heat and mass transfer processes). Minsk, Nauka i tekhnika, 1966, 452-466

TOPIC TAGS: heat conductivity, model theory, electronic simulation, conductive heat transfer

ABSTRACT: The mathematical relationship between the temperature, the time, and the coordinates at a given point of a body, for a given physical phenomenon, is described by the heat conductivity equation

$$c_p(T)\gamma(T)\frac{\partial T}{\partial t} = \operatorname{div}[\lambda(T)\operatorname{grad} T]. \qquad (1)$$

The law of interaction between the surrounding medium and the surface of the body is described by boundary conditions of the III type

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$$\left[-\lambda(T_w)\frac{\partial T}{\partial n}\right]_w = \alpha(T_w - T_f) + \frac{c_n}{10^8}(T_w^4 - T_f^4). \qquad (2)$$

The initial condition is determined by postulation

$$T_{\text{init}} = T_{\text{init}}(r) \qquad (-R \leqslant r \leqslant +R) \qquad (3)$$

The calculations presented show that the error in the results from electrical modelling in the solution of the non-linear problem of unsteady state heat transfer with complex non-linear boundary conditions does not exceed 5%. Orig. art. has: 45 formulas and 4 figures.

SUB CODE: 20/ SUBM DATE: 08Jun66/ ORIG REF: 007

Card 2/2

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

ACC NR: AP7000152 SOURCE CODE: UR/0250/66/010/011/0835/0839

AUTHOR: Kudryashev, L. I.; Belostotskiy, B. R.; Kudryasheva, N. L.

ORG: Leningrad Optical-Mechanical Society (Leningradskoye optiko-mekhanicheskoye ob"yedineniye)

TITLE: The use of variational methods in studying the temperature regime of the active media of pulsed lasers

SOURCE: AN BSSR. Doklady, v. 10, no. 11, 1966, 835-839

TOPIC TAGS: pulsed laser, laser material, laser theory, temperature characteristic

ABSTRACT: The methods of calculus of variations first proposed by Academician L. S. Leybenzon (Izv. AN SSSR, Ser. geoyr. i geofiz., 6, 1939) in deriving approximate solutions of the heat problem, were used in the study of the temperature regime of the active media of pulsed lasers under the assumption that the thermophysical characteristics of the active medium and the pumping and cooling (between discharges) times remain constant at all times. Orig. art. has: 22 formuals.

SUB CODE: 20/ SUBM DATE: 14May66/ ORIG REF: 004

Card 1/1

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

L 12202-66 EWT(1) WW

ACC NR: AP6003179 SOURCE CODE: UR/0147/65/000/004/0018/0028

AUTHORS: Kudryashev, L. I.; Kudryashova, N. L.

ORG: none

64
B

TITLE: Approximate solutions of nonlinear problems of nonstationary thermal conductivity using the integral relations of academician L. S. Leybenzon

SOURCE: IVUZ. Aviatsionnaya tekhnika, no. 4, 1965, 18-28

TOPIC TAGS: boundary value problem, thermal conduction, ordinary differential equation, linear equation, integral relation, specific heat

ABSTRACT: An attempt is made to solve approximately problems of nonstationary thermal conductivity under boundary conditions of the first and third kind by using L. S. Leybenzon's integral relations (L. S. Leybenzon. Izv. AN SSSR, ser. geograf. i geofiz., No. 6, 1939). In the case of boundary conditions of the first kind, the problem is written as:

$$\frac{\partial\theta}{\partial Fo} = \operatorname{div} A(\theta) \operatorname{grad} \theta,$$

$$Fo = 0,\ \theta_0 = \theta_0(q_1, q_2, q_3),$$

$$\theta_w = 0,$$

$$\theta = \theta(\theta),$$

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ACC NR: AP6003179

$$\theta = \frac{t - t_0}{t_m - t_0}, \quad A(\theta) = \frac{a}{a_0}.$$

The dimensionless thermal conductivity coefficient

$$A(\theta) = 1 + k_1\theta + k_2\theta^2 + \ldots + k_n\theta^n.$$

Thus,

$$\frac{\partial}{\partial \mathrm{Fo}} \int_{v_1} \theta dv_1 = \int_{F_1} \left(\frac{\partial \theta}{\partial n_1}\right)_w dF_1,$$

which is an integral relation of Leybenzon. This shows that under boundary conditions of the first kind the nonlinear problem is linearized relative to the new variable θ. The approximate solution of the problem under boundary conditions of the third kind is sought in the form

$$\theta' = c[1 - B\varphi(q_1, q_2, q_3)],$$

which yields

$$\theta' = c_0[1 - B\varphi(q_1, q_2, q_3)] \exp\left(-\int_0^{\mathrm{Fo}} x'(\mathrm{Fo})\, d\mathrm{Fo}\right).$$

The application of the method is illustrated by examples of the cooling of a sphere. Orig. art. has: 79 formulas.

SUB CODE: 20, 12/ SUBM DATE: 14Feb64/ ORIG REF: 007/ OTH REF: 003

Card 2/2 ef

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"APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000827130003-7

ACC NR: AT6003086 SOURCE CODE: UR/3181/63/000/015/0191/0196

AUTHOR: Kudryashev, L.I. (Professor, Doctor of technical sciences); Kitov, K.N.

ORG: None

TITLE: The reduced heat transfer coefficient under the conditions of the external problem, taking chemical transformations into account

SOURCE: Kuybyshev. Aviatsionnyy institut. Trudy, no. 15, pt. 2, 1963. Doklady kustovoy nauchno-tekhnicheskoy konferentsii po voprosam mekhaniki zhidkosti i gaza (Reports of the Joint scientific-technical conference on problems of the mechanics of liquid and gas), 191-196

TOPIC TAGS: convective heat transfer, chemical reaction, heat of dissociation, heat transfer coefficient, lime

ABSTRACT: The article is an attempt to determine the reduced heat transfer coefficient for the process of the dissociation of limestone and for the process of sintering clinker minerals. Following a mathematical development, the article arrives at the following expression for the reduced heat transfer coefficient for the dissociation of limestone:

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ACC NR: AT6003086

$$\alpha_n = \frac{q \cdot d \cdot \gamma_M \cdot \bar{K}}{18\Delta t \sqrt[3]{\frac{q_0}{r}}} \qquad (12)$$

where α_n is the reduced heat transfer coefficient (taking into account the mechanism of dissociation), kcal/m^2-hr-^{o}C; q is the total amount of heat expended in heating the material and in the dissociation; d is the mean particle diameter of the material, m; γ_M is the density of the material, kg/m^3; K is a reaction rate constant; Δt is the mean logarithmic temperature difference; q_0 is the amount of heat necessary for completion of the dissociation reaction, kcal; and, r is the heat of dissociation of limestone, kcal/kg. Further calculation yields an expression for the desired correction, that is, the coefficient taking into account the dissociation of the limestone:

$$\xi = \frac{q \cdot d \cdot \gamma_M \cdot \bar{K}}{18\alpha_0 \Delta t \sqrt[3]{\frac{q_0}{r}}} \qquad (16)$$

A similar calculation is carried through for the sintering of clinker materials. It is concluded that chemical transformations basically change the heat transfer problem. Calculation of heat transfer in this case must take into account the reduced heat transfer coefficient,

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whose structure is determined by the rate of the chemical transformations. Orig. art. has: 23 formulas.

SUB CODE: 20,07/ SUBM DATE: 00/ ORIG REF: 004/ SOV REF: 000/ OTH REF:000

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Kucherov, V.G.

KUDRYASHEV, L.I

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