5 SEPTEMBER 1979 AND (FOUO 5/79) 1 OF 1

JPRS L/8647

5 September 1979

USSR Report

ENGINEERING AND EQUIPMENT

(FOUO 5/79)

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USSR REPORT

ENGINEERING AND EQUIPMENT

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ABSTRACTS

USSR UDC 629.78.001

DESIGN OF UNMANNED FLIGHTCRAFT. SYSTEMS ENGINEERING AND FLIGHTCRAFT DESIGN

Moscow PROYEKTIROVANIYE BESPILOTNYKH LETATEL'NYKH APPARATOV. SISTEMOTEKHNIKA I PROYEKTIROVANIYE LETATEL'NYKH APPARATOV in Russian, Mashinostroyeniye, 1978 264 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.85K (résumé)]

SHEVEROV, D. N.

[Text] The book deals with optimum design using the EVMLA [computer] and the LA complex, which are treated as subsystems of a complex technical system. The principles of the theory of technical systems are presented. An examination is made of problems of forming models from the standpoint of weight, economy and ballistics, and selection of control parameters. The book is intended for engineers and scientific workers in design offices.

USSR UDC 629.78.017.1

RELIABILITY IN BALLISTIC MISSILE DESIGN. A TEXTBOOK FOR ENGINEERING STUDENTS

Moscow NADEZHNOST' KONSTRUKTSII BALLISTICHESKIKH RAKETOV. UCHEBNOYE POSOBIYE DLYA STUDENTOV VTUZOV in Russian, Mashinostroyeniye, 1978 256 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.162K (résumé)]

KUZNETSOV, A. A.

[Text] This textbook outlines the principles for setting standards in ensuring and predicting reliability in the design of ballistic missiles in the rough planning stage, and it is shown how design reliability is related to the safety factors that are used in strength calculations of structural members. A reliability testing method is described. Efficiency is taken as a criterion of optimum reliability. The textbook can also be used by technical engineering workers engaged in flightcraft planning and design.

USSR UDC 629.78.064.3(088.8)

A HYDROVANE DRIVE

USSR Author's Certificate No 612083, filed 22 Jul 76, published 5 Jun 78

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 1, 1979 Abstract No 1.41.128P (résumé)]

KROTOV, O. A., RASKACHEV, V. L. and SHUKHOV, F. V.

[Text] The invention applies to the design of drives for constant-frequency AC generators used in the power system of a flightcraft. The hydrovane drive, primarily for an AC generator, contains a housing with circulation chamber that accommodates a pump and turbine. The housing also has an rpm sensor connected to an amplifier, a feedback device and a servopiston with a regulating damper connected to the pressure and discharge lines. To improve economy by maintaining the rpm constant during transient conditions, the feeback device is made in the form of a spring-loaded slide valve with its control cavity connected to the pressure line, and a hydraulic accumulator connected through a check valve to the pressure line, and through the slide valve to the amplifier. Figure 1.

USSR UDC 621.039.526

CONCEPTUALIZATION OF A HETERHENEOUS CORE IN FAST REACTORS. ANALYTICAL SURVEY

Obninsk KONTSEPTSIYA GETEROGENNOY AKTIVNOY ZONY V BYSTRYKH REAKTORAKH. ANALITICHESKIY OBZOR in Russian, Obninsk Institute of Physics and Power Engineering, Preprint No OB-63, 1978 38 pp

BELYAYEV, M. V. and VOROPAYEV, A. I.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract No 2U112]

[Text] The merits and the drawbacks of variously locating the zones of internal breeding in fast reactors are analyzed. The special aspects of calculating the physical parameters of such reactors are considered. The first results are shown of experimental studies made concerning the physics of heterogeneous fast reactions with critical fuel assemblies. It is deemed feasible to refine the design of a heterogeneous core for fast reactors.

USSR UDC 621.311.25:621.039.58

USING SPRINKLER SYSTEMS TO REMOVE RADIOACTIVE AEROSOLS AND IODINE FROM THE AIR OF THE FORCED-AIR RECIRCULATION SYSTEMS IN NUCLEAR ELECTRIC PLANTS

Moscow TEZISY DOKLADOV NA NAUCHNO-TEKHNICHESKOM SOVESHCHANII ENERGETIKA I OKHRANA OKRUZHAYUSHCHEY SREDY, MOSKVA 1978 [Abstracts of Reports to the Scientific-Technical Conference on Energy and Environmental Protection, Moscow 1978] in Russian 1978 pp 126-127

KLEMENT'YEVA, YE. M.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3U222 by G. I. Korotkina]

[Text] The equipment in the in-pile loop of newly designed and furbished atomic electric power plants is, according to radiation safety requirements, placed inside protective shells or hermetic boxes capable of retaining the radioactive products which escape during faults in the nuclear reactor. For cooling the equipment located inside hermetic enclosures of an atomic electric power plant there is an air recirculation system. For cooling and purifying the air which recirculates under a protective shell or hermetic box there are provided surface-type heat exchangers, aerosol filters and charcoal-type adsorbers. Here for purifying this air is considered a method of

sprinkling with water which contains chemical additives, this "wet" method being applicable under normal as well as emergency conditions. Results are shown of determinations of the iodine extraction factor, from coolant to vapor phase, and of testing the effectiveness of iodine and its compounds removal from the air phase by such a sprinkler system.

USSR UDC 621.311.25:621.039.7

DEVELOPMENT OF WAYS AND MEANS TO PURIFY THE WASTE FROM ATOMIC ELECTRIC POWER PLANTS OF GASEOUS RADIOACTIVE CONTAMINANTS

Moscow TEZISY DOKLADOV NA NAUCHNO-TEKHNICHESKOM SOVESHCHANII ENERGETIKA I OKHRANA OKRUZHAYUSHCHEY SREDY, MOSKVA 1978 [Abstracts of Reports to the Scientific-Technical Conference on Energy and Environmental Protection, Moscow 1978] in Russian, 1978 pp 128-129

NAKHUTIN, I. YE., SMIRNOVA, N. M. and OCHKIN, D. V.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3U221 by G. I. Korotkina]

[Text] The radiochromatographic method of purifying gaseous wastes from atomic electric power plants has been embodied in the technological procedure for special gas purification in atomic electric power plants with water-moderated water-cooled power reactors and has been practically implemented in operating electric power plants (Novovoronezhskaya, "Loviiza," in Finland, Kol'skaya and Armyanskaya). On the basis of this method the UPAK system is now being developed for atomic electric power plants with uranium-graphite boiling-water channel reactors. For purification of wastes of radioactive iodine there are available several adsorbers using charcoal, in plain or remote operation, with various capacities (AU adsorbers 1500-200-400 m^3/n with grade SKT-3 charcoal, AUI adsorbers with impregnated charcoal. For proper design of gas purification systems systematic data are needed on the composition of wastes, on the operating experience, on the service life of iodine filters, and so on. Recently the FARTOS-2500 filter has been developed with a 2500 m^3/h capacity.

USSR UDC 621.311.25:621.039.58

PROPERTIES OF AEROSOLS IN ATOMIC ELECTRIC POWER PLANTS WITH WATER-MODERATED WATER-COOLED POWER REACTORS

Moscow TEZISY DOKLADOV NA NAUCHNO-TEKHNICHESKOM SOVESHCHANII ENERGETIKA I OKHRANA OKRUZHAYUSHCHEY SREDY, MOSKVA 1978 [Abstracts of Reports to the Scientific-Technical Conference on Energy and Environmental Protection, Moscow 1978] in Russian, 1978 pp 130-132

CHERNYY, S. S. and GRIGOROV, V. P.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3U223 by G. I. Korotkina]

[Text] A study was made in 1974-75 for the purpose of determining the basic physico-chemical and radiational properties of aerosols in air ducts and in rooms of atomic electric power plants with water-moderated water-cooled power reactors. It has been discovered that the concentration of radioactive aerosols in air ducts and rooms of such atomic electric power plants is small, not exceeding $5 \cdot 10^{-13}$ curie/liter, under normal conditions. During periods when the nuclear fuel elements are overloaded their concentration increases and can reach 10^{-11} curie/liter in individual air ducts or rooms. The activity of particles is characterized by a log normal distribution with respect to their aerodynamic dimensions, and the averaged parameters of this distribution under normal conditions are: aerodynamic median diameter 0.9-4.5 μm and standard deviation 1.9-2.6. Under normal conditions the filtering material in D-23 KL filters becomes clogged with inactive dust mainly. The activity of a used filter does not exceed 5.10^{-3} curie after one year in service. On the basis of these results of the study there has been developed the FAR filter with UTSV material for use in atomic electric power plants.

USSR UDC 621.039.542:621.039.548.343/345

STRUCTURAL CHANGES IN AND BEHAVIOR OF GASEOUS FISSION PRODUCTS IN IRRADIATED URANIUM DIOXIDE

Moscow TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU, ALUSHTA 29 V - 1 VI 1978 [Proceedings of the Conference on Reactor Materials, Alushta 29 May - 1 Jun 1978] in Russian Vol 3, 1978 pp 253-275 and 252

SAMSONOV, B. V.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3U247]

[Text] The fundamental difference is shown between gas bubbles in irradiated uranium dioxide and bubbles which form in gas evolution experiments after extraction of irradiated samples from a nuclear reactor. During irradiation the fission gas evolves from a nuclear fuel element in the form of bubbles, 20 Å in diameter, migrating through the crystal by Brownian motion. Furthermore, the open surface of uranium dioxide increases during irradiation. On the basis of these two factors there has been developed a phenomenological model for calculating the gas discharge and the changes in fuel volume in containerized fuel elements. Figures 9; references 15.

USSR UDC 669.017:539.4+546.261

PRECIPITATION HARDENING OF CARBIDE MATERIALS FOR ATOMIC REACTORS

Moscow TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU, ALUSHTA 1978 [Proceedings of the Conference on Reactor Materials, Alushta 1978] in Russian Vol 5, 1978 pp 33-54 and 32

GOMOZOV, L. I., DEDYURIN, A. I. and IVANOV, O. S.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3U248]

[Text] Considered are the mechanisms by which high-temperature stabilization annealing affects carbide materials, and an expression is derived describing the effect of porosity of stabilized materials on their heat resistance. Changes in the dislocation density depending on the test temperature and on the concentration of carbide solid solutions are also analyzed. The dependence of the yield point under compression at 1800-3100°C on the composition of the material is determined for several pseudobinary systems of refractory carbides. Figures 9; references 15.

USSR UDC 621.039.543.4:621.7(047.1)

EXPERIENCE IN DEVELOPMENT OF NUCLEAR FUEL BASED ON METALLIC URANIUM FOR HEAVY-WATER GAS-COOLED REACTORS

Moscow TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU, ALUSHTA 1978 [Proceedings of the Conference on Reactor Materials, Alushta 1978] in Russian Vol 5, 1978 pp 55-58

ASHIKHMIN, V. P., VOROB'YEV, M. A., GUSAROV, M. S., DAVIDENKO, A. S., ZELENSKIY, V. F., IVANOV, V. YE., KRASNORUTSKIY, V. S., PETEL'GUZOV, I. A. and STUKALOV, A. I.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3U245)

[Text] A survey is given of studies concerning the problem of a radiation-resistant uranium fuel for nuclear power reactors, including the KS-150 heavy-water gas-cooled reactor. Considered are the various factors which limit the viability of uranium fuel elements and various ways of suppressing these factors. Particular attention is paid to possible causes of inadequate radiational stability of uranium fuel rods and to the progress which has been made in this area so far. Some most general problems in the technology of nuclear fuel production are discussed. The main data are given on actual use of a developed nuclear fuel in laboratory reactor loops and in the KS-150 industrial heavy-water reactor. The results confirm that this nuclear fuel has an extraordinarily high radiational stability till burnout down to 1.5-2%. The successful solution of a large complex of problems associated with development of a nuclear fuel on the basis of metallic uranium opens up new possibilities for the use of such a fuel in nuclear power reactors. Figures 10; references 25.

USSR UDC 621.039.51.001

NEUTRON PARAMETERS IN WATER-MODERATED WATER-COOLED REACTORS OF ATOMIC ELECTRIC POWER PLANTS

Moscow TRUDY VSESOYUZNOGO TEPLOTEKHNICHESKOGO NAUCHNO-ISSLEDOVATEL'SKOGO INSTITUTA [Proceedings of the All-Union Scientific Research Institute of Heat Engineering] in Russian No 16, 1978 pp 147-170

YEREMIN, A. N., KULIKOV, V. I., LOMAKIN, S. S., PANFILOV, G. G., GOLUBEV, L. I., KRUGLOV, V. I., FURSOV, V. V., BEREZOVETS, A. M., IGNATENKO, YE. I., KORMILENKO, A. P. and LYUBOV, V. I.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract No 2U131]

[Text] Spectra of neutrons in the cells of a water-moderated water-cooled power reactor are analyzed as a function of the enrichment or the depletion of nuclear fuel, the temerature of the coolant and the concentration of boric acid in the latter. Measurements of the spectral parameters of neutrons within the core of a nuclear reactor have revealed a noticeable spectral nonuniformity, which must be considered in determinations of the volumetric nonuniformity factor of heat generation. References 11.

USSR UDC 621.039.51.133.001.24

CALCULATING THE NEUTRON-PHYSICS CHARACTERISTICS OF A THERMAL REACTOR BY THE VARIATIONAL METHOD

Moscow TRUDY VSESOYUZNOGO TEPLOTEKHNICHESKOGO NAUCHNO-ISSLEDOVATEL'SKOGO INSTITUTA [Proceedings of the All-Union Scientific Research Institute of Heat Engineering] in Russian No 19, 1978 pp 79-93

POBEDIN, V. V. and PTITSYN, V. A.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract No 2U132]

[Text] A method of designing fast reactors is proposed based on the Ritz method. The one-group diffusion approximation and the homogeneous-medium theory of nuclear reactors are used for describing the process of neutron transport from the reactor core. A program for the M-222 computer to calculate the neutron flux density and the distribution of energy released in the core of a fast reactor has been written on the basis of this method. References 12.

USSR UDC 621.039.51.001(47+57)

NEUTRON FLUXES IN CHANNELS OF CONTROLLING IONIZATION CHAMBERS IN ATOMIC ELECTRIC POWER PLANTS

Moscow TRUDY VSESOYUZNOGO TEPLOTEKHNICHESKOGO NAUCHNO-ISSLEDOVATEL'SKOGO INSTITUTA [Proceedings of the All-Union Scientific Research Institute of Heat Engineering] in Russian No 19, 1978 pp 136-146

GOLUBEV, L. I., BEREZOVETS, A. M., YEREMIN, A. N., IGNATENKO, YE. I., INIKHOV, A. G., KRUGLOV, V. P., LOBOV, V. I., LOMAKIN, S. S., PANFILOV, G. G., PETROV, V. I. and FURSOV, V. V.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract 2U134]

[Text] Thermal and epithermal neutron fields are analyzed in channels of the ionization chambers at the Novovoronezhskaya and the Kol'skaya atomic electric power plants. The results demonstrate the feasibility of using these channels for plant requirements as calibrated neutron sources. References 2.

USSR UDC 539.125.52.001

EVALUATION OF DATA OBTAINED BY MEASUREMENTS OF THE NEUTRON FLUX DENSITY IN REACTORS OF ATOMIC ELECTRIC POWER PLANTS

Moscow TRUDY VSESOYUZNOGO TEPLOTEKHNICHESKOGO NAUCHNO-ISSLEDOVATEL'SKOGO INSTITUTA [Proceedings of the All-Union Scientific Research Institute of Heat Engineering] in Russian No 19, 1978 pp 170-186

MOROZOV, A. G.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract 2U133]

[Text] Various situations are considered which occur in the practice of neutron measurements, also methods of estimating the error in each case: by single measurement of the activation rate after a single bombardment, multiple measurement of the activation rate, or multiple neutron bombardment. Shown are, furthermore, methods of determining the confidence intervals for given confidence coefficients. References 5.

USSR UDC 621.311.22-52:681.3

SOFTWARE STRUCTURE IN AUTOMATIC CONTROL SYSTEMS FOR TECHNOLOGICAL PROCESSES IN LARGE POWER UNITS

Moscow TEZISY DOKLADOV NA SOVESHCHANII RABOTY SOYUZTEKHENERGO PO POVYSHENIYU NADEZHNOSTI I EKONOMICHNOSTI ENERGOOBURU DOVANIYA, MOSKVA 1978, ELEKTRO-OBURUDOVANIYE ELELEKTROSTANTSIY I SETEY [Abstracts of Reports to the Conference on Work of the All-Union Power Engineering and Management Trust on Improving the Reliability and the Economy of Power Equipment, Moscow 1978, Electrical Equipment of Electric Power Plants and Networks] in Russian 1978 pp 3-5

SVISHCH, P. S., ABROSIMOV, B. F., MINCHENKO, V. I., GORELIK, D. M., GALKIN, N. I., ISAYEV, V. A. and LEKONTSEVA, O. D.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract No 2S174 by L. P. Fotin]

[Text] Reliable and efficient operation of thermal power equipment requires that a large volume of input and design data be processed by a computer and stored in its memory. In existing information and computation subsystems all programs are stored in the direct-access computer memory, and external media are used only for storing numerical data files. This restricts the possibilities of expanding the scope of jobs and of improving precision as well as the representativeness of calculations. The software structure in the automatic control system for technological processes installed at the 800 MW unit of the Uglegorskaya state regional electric power plant is design for use on an M-6000 computer and is based on a real-time disk operating system, supplemented with individual systemwide programs and library subprograms. All programs fall into two categories: resident routines in the direct-access computer memory and resident routines on magnetic disks. The data base consists of files either in the direct-access computer memory or on magnetic disks, accessible to all programs of the complex. The proposed structure allows for easy expansion of software.

USSR UDC 621.181-52

LOAD REGULATION ON AN 800 MW POWER UNIT BURNING A MIXTURE OF FUELS

Moscow TEZISY DOKLADOV NA SOVESHCHANII RABOTY SOYUZTEKHENERGO PO POVYSHENIYU NADEZHNOSTI I EKONOMICHNOSTI ENERGOOBORUDOVANIYA, MOSKVA 1978, AVTOMATIKA, TEPLOFIKATSIYA, METALLURGIYA, TOPLIVNO-TRANSPORTNOYE KHOZYAYSTVO [Abstracts of Reports to the Conference on Work of the All-Union Power Engineering and Management Trust on Improving the Reliability and the Economy of Power Equipment, Moscow 1978, Automation, District Heating, Metallurgy, Fuel and Transportation Management] in Russian 1978 pp 6-8

ALTYN, S. V. and LYULCHAK, V. V.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract No 2S177 by G. V. Malevinskiy]

[Text] The TPP-200 boilers at the Uglegorskaya state regional electric power plant burn grade ASh coal mixed with gas (petroleum residue). The solid-fuel regulator maintains the heat rate in the furnace relative to the power setting. A signal indicating the heat rate in the furnace is generated according to the water pressure after the feed-water regulating valve and according to the vapor pressure before the turbine. The gas regulator maintains a given pressure of the fuel gas at the burner inlet, by acting on the main gas valve and its bypass. Adjustments had revealed a mutual interference between the feed-water regulator and the solid-fuel regulator, but this interference was subsequently eliminated by decoupling of the two regulation loops with respect to frequency. All the regulators have been tested and proved out while in service over a long period of time. (Donets Power Engineering and Management Trust).

USSR UDC 621.311.22-52

ADJUSTMENT OF FUNCTIONAL-GROUP CONTROL SYSTEMS IN AN 800 MW POWER UNIT

Moscow TEZISY DOKLADOV NA SOVESHCHANII RABOTY SOYUZTEKHENERGO PO POVYSHENIYU NADEZHNOSTI I EKONOMICHNOSTI ENERGOOBORUDOVANIYA, MOSKVA 1978, AVTOMATIKA, TEPLOFIKATSIYA, METALLURGIYA, TOPLIVNO-TRANSPORTNOYE KHOZYAYSTVO [Abstracts of Reports to the Conference on Work of the All-Union Power Engineering and Management Trust on Improving the Reliability and the Economy of Power Equipment, Moscow 1978, Automation, District Heating, Metallurgy, Fuel and Transportation Management] in Russian, 1978 pp 8-11

LYLAK, V. I., MIKHAL'CHUK, P. D., KOZITSKIY, B. D., MOKRYAKOV, S. YU. and KALINICHENKO, S. N.

[From REFERATIVNYY ZHURNAL, TEPOLENERGETIKA No 2, Feb 79 Abstract No 2S178]

[Text] The original design of the 800 MW power unit at the Zaporozhskaya state regional electric power plant provided for automation of seven functional groups: turbine drainage, oil supply for turbine lubrication and regulation system, heating of flanges and pins of the high-pressure cylinder and the medium-pressure cylinder, the turbine sealing system and the turbine itself. It was decided to additionally automate eleven more functional groups on the turbine side and eight functional groups on the boiler side, based on ZSMNU ("Ukravtomatika") logical control equipment. The originally designed technological control algorithms had to be substantially corrected in the course of development and adjustments. The devices for controlling some functional groups have already been completely adapted for operation. Those for the remaining functional groups are either still being developed or built, or are already being adapted for operation. (Southern Power Engineering and Management Trust).

USSR UDC 621.311.22-52:681.3

STRUCTURAL OPTIMIZATION OF REGULATION SYSTEMS FOR LARGE POWER UNITS

Moscow TRUDY MOSKOVSKOGO ENERGETICHESKOGO INSTITUTA [Proceedings of Moscow Power Engineering Institute] in Russian No 373, 1978 pp 10-18

TEICHMANN, W., Zittau Higher Technical School, GDR

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3S123 by A. L. Zelentsovskiy]

[Text] The use of computers in electric power plant makes possible a transition from parametric optimization (within the framework of a preselected structure) to structural optimization of regulation systems. A predetermined quality criterion is minimized without prior assumptions concerning the structure of the regulation system. Here a linear description in terms of the space of states and a quadratic integral criterion are used. Problems of structural optimization are reduced to an equation of Riccoti type that can be solved by known computer algorithms. When not all the state variables are directly measurable during a technical realization of such a system, a model of the object (its "observer") can be connected in parallel with the latter and used for determining all necessary quantities indirectly. Figures 3; tables 1.

USSR UDC 621.311.22-52

DEVELOPMENT OF AN ADAPTIVE CONTROL SYSTEM FOR LARGE POWER UNITS IN ELECTRIC POWER PLANTS

Moscow TRUDY MOSKOVSKOGO ENERGETICHESKOGO INSTITUTA in Russian No 373, 1978 pp 19-25

ROTACH, V. YA., KUZISHCHIN, V. F., ZVER'KOV, V. P., SHAVROV, A. V. and BUTYREV, V. P.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3S119 by A. L. Zelentsovskiy]

[Text] An adaptation algorithm using an M-6000 control computer has been developed for automatic regulation systems and will become part of the automatic control system for thermal processes in 800 MW power units of the Zaporozhskaya state regional electric power plant. The algorithm contains four modules. One module corrects the setting parameters of an automatic regulation system as the load on a power unit changes, ensuring that these setting will be changed in accordance with its given functional relation to the

load (consumption of fuel oil). The other three modules correct the setting parameters in a closed cycle, accounting for the effect of relatively slow unforeseen changes in the dynamic characteristics of the power unit. Figures 1; references 3.

USSR UDC 621.438

LIGHT-WEIGHT GAS TURBINE SETS IN ELECTRIC POWER PLANTS

Moscow TRUDY VSESOYUZNOGO TEPLOTEKHNICHESKOGO NAUCHNO-ISSLEDOVATEL'SKOGO INSTITUTA [Proceedings of the All-Union Scientific Research Institute of Heat Engineering] in Russian No 16, 1978 pp 60-69

KUKHTO, N. K. and KOSHEVOY, P. S.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract No 2S148]

[Text] High-power gas turbine sets have been developed on the basis of serially produced marine engines, for use in mobile electric power plants. Here the results are shown, namely the characteristics of these sets rated for 4, 10 and 12 MW respectively. An analysis is made of their major deficiencies, revealed during operation and during overhaul after an engine had been operated for its guaranteed 20,000 hour service life. The feasibility of producing such sets with greater unit capacity is indicated. Figures 3; references 2.

USSR UDC 621.165:62-52(088.8)

A TURBINE POWER REGULATION

USSR Author's Certificate No 565282 filed 14 Mar 75, published 20 Oct 77

ALEKSANDROVSKIY, G. G., ZHORNITSKAYA, T. YA., ZIMICHEV, YU. I., BENIN, V. L., RED'KO, YU. P. and SMILYANSKIY, I. I., Kharkov Turbine Plant and Kharkov Polytechnic Institute

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3S150 P by A. Sh. Leyzerovich]

[Text] Nearest to the described invention in terms of engineering execution is a turbine power regulator which contains a power setter and a power pick-up, limiting amplifiers, an integrator and a summing amplifier. The aim of this invention is to simplify the scheme. It is achieved by connecting the outputs of the power setter and pickup to the inputs of the first limiting amplifier, connecting the second output of this amplifier through the second limiting amplifier and the integrator in series to the second input of the summing amplifier, and connecting the first output of the first limiting amplifier to the first input of the summing amplifier. Figures 1.

USSR UDC 621.165:621.182-546(088.8)

AN AUTOMATIC REGULATION SYSTEM FOR A POWER UNIT

USSR Author's Certificate No 585300 filed 29 Mar 76, published 24 Dec 77

ITEL'MAN, YU. R., MIKHAYLOVA, I. P., FEYGIN, S. I., DAVYDOV, N. I. and MELAMED, A. D., All-Union Trust for Organization and Rationalization of Regional Electric Power Plants and Networks

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3S124 P]

[Text] For improving the performance of a power unit under an isolated load, under either sliding or nominal vapor pressure, a real differentiating device is added into the automatic regulation system, which contains a fast-acting regulator of turbine speed, stabilizers of driving and driven boiler parameters, a regulator of vapor pressure before the turbine and position regulators for the turbine valves. A signal at the output of this differentiator precludes counteraction of the speed regulator and of the pressure regulator, thus ensuring the possibility of pulling the power unit into speed and power regulation. Figures 1.

USSR UDC 621.165-52(088.8)

PROTECTION OF A TURBINE AGAINST RUNAWAY OF THE WHEEL

USSR Author's Certificate No 596724 filed 23 Jun 76, published 13 Feb 78

GOLOVACH, YE. A.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 2, Feb 79 Abstract No 2S70 P by A. Sh. Leyzerovich]

[Text] A known method of protecting against runaway of the wheel is to close the valves and to increase the generator load in response to a signal indicating that wheel speed and acceleration have exceeded permissible levels, with delayed transfer of the electric motors for plant auxiliaries from the generator to a standby voltage supply in response to a signal indicating that the generator has been disconnected from the line but before the wheel has reached its maximum speed. The time it reaches its maximum speed is almost independent of the fraction of power dumped, however, which makes this mode of protection less effective. According to the scheme proposed here, one fixes the fraction of power dumped at the instant the generator is disconnected from the line and one increases the delay in transferring the electric motors from generator to standby as this fraction is increased.

USSR UDC 697.1:536.2

HEAT ENGINEERING EVALUATION OF DESIGN SOLUTIONS TO THE PROBLEM OF COMBINING ROOFS WITH 'JALOUSIE'-TYPE PROTECTIVE SCREENS AGAINST THE SUN

Moscow NAUCHNYYE TRUDY TSENTRAL'NOGO NAUCHNO-ISSLEDOVATEL'SKOGO I PROYEKTNOGO INSTITUTA TIPIZATSII I EKSPERIMENTAL'NOGO PROYEKTIROVANIYA ZHILISHCHA [Scientific Transactions of the Central Scientific Research and Planning Institute for Standardization and Experimental Design of Housing] in Russian No 3, 1978 pp 67-69

CHAPLITSKAYA, V. L. and DONTSEVA, T. M.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 3, Mar 79 Abstract No 3S230]

[Text] The results are shown of a study of combination roofs and "jalousie"-type protective screens against the sun, installed on buildings in Baku, also the basic experimental relations characterizing the heat engineering characteristics of these structures. Figures 1; tables 1; references 2.

USSR UDC 629.78.062.2

REDUNDANT SYSTEMS FOR FLIGHTCRAFT CONTROL

Moscow IZBYTOCHNYYE SISTEMY UPRAVLENIYA LETATEL'NYMI APPARATAMI in Russian, Mashinostroyeniye, 1978, 145 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.196K (résumé)]

YEPIFANOV, A. D.

[Text] Fundamental problems of the theory of redundant control systems are presented. Vector-matrix equations are given for measurement and conversion of redundant information. Principles of design and recommendations are given on use of digital computers in redundant control systems. The book is intended for engineers and other specialists engaged in the design of flightcraft control systems.

USSR UDC 629.78.076.8

LANDING SPACECRAFT ON PLANETS

Moscow POSADKA KOSMICHESKIKH APPARATOV NA PLANETY in Russian, Mashinostroyeniye, 1978 159 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 1, 1979 Abstract No 1.41.59K (résumé)]

BAZHENOV, V. I. and OSIN, M. I.

[Text] An investigation is made of the problems encountered by developers of landers and descent vehicles in studying their design and mode of motion. Methods are given for parametric calculations of various types of descent vehicles, the problem of finding their optimum parameters is formulated, and methods of physical modeling are described. The analytical methods presented in the book for studying the dynamics of a soft landing are completely applicable to practical engineering calculations with respect to accuracy and degree of difficulty. The book may be of use to spacecraft designers, scientists interested in studying the problems of descent and landing, and also graduate and undergraduate students majoring in the pertinent areas.

USSR UDC 629.78.076.6

PERIODIC SPATIAL OSCILLATIONS OF A SATELLITE RELATIVE TO A CENTER OF MASS

Moscow PROSTRANSTVENNYYE PERIODICHESKIYE KOLEBANIYA SPUTNIKA OTNOSITEL'NO TSENTA MASS in Russian, Preprint No 118, Institute of Applied Mathematics, Academy of Sciences USSR, 1978 53 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.36 (résumé)]

SARYCHEV, V. A., SAZONOV, V. V. and MEL'NIK, N. B.

[Text] The authors consider periodic solutions of a sixth-order system of differential equations describing the motion of an artificial satellite relative to a center of mass in a keplerian elliptical orbit. For weakly elliptical orbits a class of symmetric periodic solutions is indicated that coincide on a circular orbit with periodic Lyapunov solutions and satisfy simple boundary conditions. A detailed description is given of an algorithm for numerical calculations by which these solutions are continued into the region of large values of eccentricity of the orbit and amplitude of the generating solutions.

USSR UDC 629.78.076.6

CONCERNING THE PROBLEM OF STABILITY OF A CASE OF REGULAR PRECESSION OF A SOLID IN A CENTRAL GRAVITATIONAL FIELD

Moscow TEMATICHESKIY SBORNIK NAUCHNYKH TRUDOV. MOSKOVSKIY AVIATSIONNYY INSTITUT [Thematic Collection of Scientific Works. Moscow Aviation Institute] in Russian No 460, 1978 pp 13-17

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.37 by T. A. Ye.]

MARKEYEV, A. P.

[Text] An examination is made of the motion of a dynamically symmetric solid relative to a center of mass in a central newtonian gravitational field. In a circular orbit, a solid may undergo three kinds of regular precession: conical, hyperbolic and cylindrical. For these three kinds of motion, the axis of symmetry of the solid occupies a fixed position in the orbital coordinate system. In particular, in the case of cylindrical precession the axis of symmetry is perpendicular to the plane of the orbit of the center of mass, and the solid rotates relative to the axis of symmetry with an arbitrary angular velocity of constant magnitude. A detailed analysis is made of the stability of cylindrical precession. Figure 1; table 1; references 7.

USSR UDC 629.78.062.2

SPACECRAFT CONTROL

Moscow UPRAVLENIYE KOSMICHESKIMI APPARATAMI in Russian, Nauka, 1978 191 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.195K]

SMIRNOV, G. D.

[Text] A description is given of the space-time and statistical characteristics of outer space, the problems of ground support for space missions are defined, and algorithms are described for analysis and implementation of decisions in spacecraft control. The book is made up of five chapters: 1) Outer space and spacecraft motion; 2) General characteristics of the spacecraft control system; 3) Jobs handled by spacecraft. Design peculiarities of vehicles; 4) Makeup and designation of major elements in the command guidance complex; 5) Processing and analysis of operational information. Decision making.

USSR

UDC 629.78.076.8

MOTION OF AN UNCONTROLLED BODY IN THE ATMOSPHERE

Moscow DVIZHENIYE NEUPRAVLYAYEMOGO TELA V ATMOSFERE in Russian, Mashinostroyeniye 1978 168 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 1, 1979 Abstract No 1.41.58K (résumé)]

YAROSHEVSKIY, V. A.

[Text] The method of averaging is used in studying the motion of an uncontrolled body about a center of mass in the atmosphere. Approximate formulas are given for the case of motion of an ideal axisymmetric body, relating probable values of the amplitude of oscillations to the conditions of entry into the atmosphere. An examination is made of motion of a body with low aerodynamic and mass asymmetry, and the basic principles governing this motion are determined. Particular attention is given to investigation of the resonance phenomenon in the nonlinear formulation. A brief examination is made of the particulars of motion of a body that does not have axial symmetry. The book is written for science workers and engineers engaged in the study of dynamics of spacecraft and rockets.

USSR

UDC 629.78.015:533.1

SPEED OF SOUND IN BINARY MIXTURES OF NITROGEN WITH HELIUM AND METHANE AT HIGH PRESSURES

Moscow EKSPERIMENT I TEKHNIKA VYSOKIKH GAZOVYKH I TVERDOFAZOVYKH DAVLENIY [Experiment and Technology of High Gas and Solid-Phase Pressures] in Russian 1978 pp 118-122

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.61 (résumé)]

PITAYEVSKAYA, L. L. and KANISHCHEV, B. E.

[Text] The speed of sound is measured in binary mixtures of nitrogen with methane and helium in the pressure range of 200-4000 bars at a temperature of up to 200°C. The density of mixtures of nitrogen with methane is measured at 50°C. The adiabatic compressibility and C_p/C_v of the given mixtures are calculated on the basis of P-V-T data obtained by the authors. Tables 4; references 10.

USSR UDC 629.78.015.532.526

STABILITY OF A LAMINAR BOUNDARY LAYER IN THE CASE OF THREE-DIMENSIONAL PERTURBATIONS

Kiev MATEMATICHESKIYE METODY ISSLEDOVANIYA GIDRODINAMICHESKIKH TECHENIY [Mathematical Methods of Studying Hydrodynamic Flows] in Russian 1978 pp 14-18

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.57 (résumé)]

NIKISHOVA, O. D.

[Text] A numerical method is used in the linear formulation to study the problem of stability of a laminar boundary layer with respect to three-dimensional perturbations when the boundary has weak longitudinal concavity and transverse curvature. It is shown that transverse curvature appreciably alters the range of unstable frequencies. Figures 4; references 8.

USSR UDC 629.78.015:533.1

NONEQUILIBRIUM GAS FLOWS AND OPTIMUM SHAPES OF BODIES IN A HYPERSONIC FLOW

Moscow NERAVNOVESNYYE TECHENIYA GAZA I OPTIMAL'NYYE FORMY TEL V SVERKHZVUKOVOM POTOKE in Russian, Moscow State University, 1978 115 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.59K (résumé)]

LEVINA, V. A. and CHERNOGO, G. G.

[Text] The collection contains papers dealing with flow around bodies with consideration of physicochemical processes, as well as studies on flows of a relaxing gas. Results are given from research on supersonic flow around bodies with consideration of intense blow-in from their surface in the presence of combustion and nonequilibrium chemical reactions, on flows in a nozzle and on initiation of detonation in a mixture of ozone with oxygen. Consideration is also given to problems of determining the optimum shapes of supersonic flightcraft. The collection is intended for scientific workers, graduate and undergraduate students interested in problems of modern physical gas dynamics and aerodynamics.

USSR UDC 629.78.015:536.24

THE SHAPE OF AN AXISYMMETRIC BODY THAT IS OPTIMUM WITH RESPECT TO CONDITIONS OF CONVECTIVE HEAT TRANSFER AND TURBULENT FLOW MODES

Moscow NERAVNOVESNYYE TECHENIYA GAZA I OPTIMAL'NYYE FORMY TEL V SVERKHZVUKOVOM POTOKE [Nonequilibrium Gas Flows and Optimum Shapes of Bodies in a Hypersonic Flow] in Russian 1978 pp 5-27

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.68 by T. A. Ye.]

KOCHANOV, V. G., LEVIN, V. A. and PYULYUGIN, N. N.

[Text] An examination is made of the problem of the optimum shape of an axisymmetric body with respect to the minimum total convective heat flux over the lateral surface. Laws of heat flux similarity are established that enable scaling to geometrically similar bodies. Variational problems are solved for the body of minimum heat flux with different combinations of radius, length, midsection and volume of the body. A comparison is made with the numerical results of other studies, and the heat fluxes to the optimum bodies are compared with those to bodies of simple shape. Good agreement with the results of other studies shows that the given simplified functionals for determining heat flux can be used to solve the variational problem on the trajectory of motion of a body. Figures 15; references 17.

USSR UDC 629.78.015:533.1

INFLUENCE OF RADIATION ON 'ILLUMINATION' OF AN INJECTION LAYER WITH HYPERSONIC FLOW AROUND A BLUNT BODY

Moscow NERAVNOVESNYYE TECHENIYA GAZA I OPTIMAL'NYYE FORMY TEL V SVERKHZVUKOVOM POTOKE [Nonequilibrium Gas Flows and Optimum Shapes of Bodies in a Hypersonic Flow] in Russian 1978 pp 40-50

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.60 (résumé)]

PILYUGIN, N. N. and TIKHOMIROV, S. G.

[Text] An examination is made of hypersonic flow of an inviscid thermally non-conductive radiating gas around an axisymmetric blunt body. Another gas (oxygen) is injected through the surface of the body at a given velocity. Nonequilibrium processes of collisional dissociation and photodissociation of O_2 molecules are considered in the injected gas layer. The complete system of equations describing such flow is written out. Approximate analytical solutions are found for the system of gasdynamic equations in the injection layer for limiting cases. Gas concentration [and] temperature profiles

are determined on the critical line as a function of the parameters of the problem. A relation is found for the radiant heat flux at a critical point of the body as a function of its size and the speed of sound with and without consideration of "illumination" of the injection layer. Figures 3; references 16.

USSR UDC 629.78.018.1(088.8)

PERFORATED WORKING SECTION FOR A WIND TUNNEL

USSR Author's Certificate No 453959, filed 8 Jan 73, published 7 Aug 78

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.78P by T. A. Ye.]

BERTYN', V. R. and PODMAZOV, A. V.

[Text] The invention applies to the field of experimental aerodynamics, specifically to perforated working sections of transonic and supersonic wind tunnels. A perforated working section of a wind tunnel is known that has panels with perforated holes. However, such working sections give rise to acoustic interference that induces additional optical interference in the field of the shadow camera in the form of a fluctuating network of perturbation lines. In the proposed perforated working section for wind tunnels, a grid is installed in the perforation openings on the flow side flush with the surface of the working section to prevent the large-scale disturbances that lead to unsteady optical and acoustic interference in the working section of the wind tunnel. Figure 1.

USSR

UDC 629.78.015.4

STRENGTH AND STABILITY OF SHELLS. PROCEEDINGS OF THE SEMINAR OF KAZAN' PHYSICOTECHNICAL INSTITUTE, KAZAN' AFFILIATE OF THE ACADEMY OF SCIENCES USSR

Kazan' PROCHNOST' I USTOYCHIVOST' OBOLOCHEK. TRUDY SEMINARA KAZANSKOGO FIZIKO_TEKHNICHESKOGO INSTITUTA KAZANSKOGO FILIALA AKADEMII NAUK SSSR in Russian No 9, 1977 189 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.154K (résumé)]

[Text] The collection includes works presented at the scientific seminar on shell theory of Kazan' Physicotechnical Institute, Kazan' Affiliate of the Academy of Sciences USSR. Research by the authors of the papers deals with urgent problems of the theory, strength, stability and oscillations of shells, interaction of shells with the medium and so forth. The results of experimental research are given in addition to theoretical data. The material is of interest to scientific workers, graduate students, engineers and undergraduate students studying the theory and calculation of thin-walled structural elements.

USSR

UDC 629.78.015.4

STABILITY OF ELLIPSOIDAL AND SPHEROIDAL SHELLS OF REVOLUTION UNDER UNIFORMLY DISTRIBUTED EXTERNAL PRESSURE

Kazan' PROCHNOST' I USTOYCHIVOST' OBOLOCHEK. TRUDY SEMINARA KAZANSKOGO FIZIKO-TEKHNICHESKOGO INSTITUTA KAZANSKOGO FILIALA AKADEMII NAUK SSSR [Strength and Stability of Shells. Proceedings of the Seminar of Kazan' Physicotechnical Institute, Kazan' Affiliate of the Academy of Sciences USSR] in Russian No 9, 1977 pp 5-16

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.155 (résumé)]

BAKIROVA, A. Z. and SURKIN, R. G.

[Text] The paper gives a survey of literature on investigation of the stability of ellipsoidal and spheroidal shells subjected to uniformly distributed external pressure. Linear and nonlinear solutions are considered. Theoretical results are compared with experimental data. References 28.

USSR UDC 629.78.015.4

OPTIMIZATION OF SHELLS OF REVOLUTION OF VARIABLE THICKNESS

Kazan' PROCHNOST' I USTOYCHIVOST' OBOLOCHEK. TRUDY SEMINARA KAZANSKOGO FIZIKO-TEKHNICHESKOGO INSTITUTA KAZANSKOGO FILIALA AKADEMII NAUK SSSR [Strength and Stability of Shells. Proceedings of the Seminar of Kazan' Physicotechnical Institute. Kazan' Affiliate of the Academy of Sciences USSR] in Russian No 9, 1977 pp 57-63

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.156 (résumé)]

MALAKHOV, V. G.

[Text] The problem of determining the variable thickness of a shell of minimum mass with strength limitations is reduced to a nonlinear programming problem. An algorithm of the method of linear approximation is used that is simplified by additional assumptions on the nature of the stressed state. Examples are given of solutions of linear and physically nonlinear problems for thin shells of revolution of appreciable slope under the action of an axisymmetric normal load. Figures 8; table 1; references 9.

USSR UDC 629.78.015.4

STRENGTH OF A CYLINDRICAL SANDWICH SHELL REINFORCED BY A STIFFENING RING

Kazan' PROCHNOST' I USTOYCHIVOST' OBOLOCHEK. TRUDY SEMINARA KAZANSKOGO FIZIKO-TEKHNICHESKOGO INSTITUTA KAZANSKOGO FILIALA AKADEMII NAUK SSSR [Strength and Stability of Shells. Proceedings of the Seminar of Kazan' Physicotechnical Institute, Kazan' Affiliate of the Academy of Sciences USSR] in Russian No 9, 1977 pp 64-69

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.157 (résumé)]

GALIMOV, N. K. and SERAZUTDINOV, M. N.

[Text] An examination is made of the problem of determining the stressed and strained state of a cylindrical sandwich shell freely supported around the edges and reinforced by a stiffening ring located in the center of the span. A uniform transverse load is applied to the reinforcing ring, which is made of the same material as the outer layer. An algorithm is constructed for solving the problem, and an example is given that illustrates the influence of the ring on the stressed and strained state. Figures 4; references 4.

USSR

UDC 629.78.015.4

ON A REFINED THEORY OF ANISTROPIC MULTILAYER SHELLS

Kuybyshev VIBRATSIONNAYA PROCHNOST' I NADEZHNOST' DVIGATELEY I SISTEM LETATEL'NYKH APPARATOV [Vibration Strength and Reliability of Flightcraft Engines and Systems] in Russian No 5, 1978 pp 123-130

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 3, 1979 Abstract No 3.41.158 (resumé)]

KARTASHOV, G. G. and STEPANENKO, N. D.

[Text] Fundamental equations are derived for oscillations and for the stressed and strained state of shells made of composition materials. An examination is made of a discrete-homogeneous anisotropic shell of arbitrary shape and variable thickness. It is assumed that layers are arranged equidistantly to the middle, inner and outer surface of the shell. Consideration is taken of transverse shear and flattening of the normal. Rotational inertia is taken into account in the equations that describe natural oscillations. The resultant equations can be taken as the initial equations in studying the strength and oscillations of shells made of composition materials. Figures 3; references 7.

CSO: 1861

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