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USSR Report

ENERGY

(FOUO 6/82)

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ENERGY

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ELECTRIC POWER

ATOMIC ELECTRIC POWER STATIONS

Moscow ATOMNYYE ELEKTRICHESKIYE STANTSII in Russian 1981 (signed to press 23 Jun 81) pp 1-3, 231-240

/Collection of articles edited by L.M. Voronin, assisted by A. A. Abagyan, B.B. Baturov, A.P. Volkov, V.M. Gordina, I.Ya. Yemel'yanov, V.S. Konviz, A.K. Kruglov, F.Ya. Ovchinnikov, V.Ya. Sidorov, A. B. Sukhov, and G. N. Ushakov; Annotation, foreword, table of contents, and abstracts: "Atomic Electric Power Stations"/

/Text/ Participating in the preparation of the articles in this collection were the workers from the branch laboratory for the preparation and analysis of informational materials of the VNIIAES /All-Union Scientific-Research Institute of Atomic Electric Power Stations/. The workers were supervised by V. M. Gordina

Annotation

In this, the fourth edition of a collection of articles, attention has been given to a group of problems having to do with the protection of the environment from thermal and radioactive pollutants of atomic electric power stations (AES). The book provides a description of methods for hardening radioactive wastes and a methodology for evaluating the tolerable ejections into the atmosphere. Several articles in the book have to do with the use of computers for automating the monitoring and control at AES's, for training operators, and for preparing operational estimates. As in previous editions, attention is given to generalizing and analyzing the experience of building and operating AES's.

The book is intended for engineering and technical workers at an AES, installation, adjustment and designing organizations.

Foreword

The development of the atomic power industry in the Soviet Union is taking on increasing importance. In the near future nuclear energy sources are to be used not only at the traditional condensation atomic electric power stations, but also at atomic thermal electric power

plants (ATETs) and atomic electric power and heating supply stations (AST).

An important task in the near future is the expansion of the construction of AES's with fast neutron reactors, which make it possible to more fully use the naturally occurring nuclear fuel. In connection with this the number of specialists who are being brought in to work in the atomic power industry, for which the condition of the construction and operating of AES's and also the problems of the further development of the atomic power industry are of practical interest, is increasing.

The first editions (No 1 - 3) of the annual collection of articles "Atomic Electric Power Stations", which were devoted to pressing problems of designing, constructing and operating AES's, received recognition from a broad range of specialists who are engaged in an extensive number of fields within the atomic electric power industry. This edition of the collection of articles has basically retained its topics of concern, which covers a range of problems having to do with the prospects of expanding the use of atomic power for the needs of the power industry, the further improvement of the designs of the AES's and the technical level of their operation. The fourth edition of the collection of articles devotes a great deal of attention to improving the systems that control the technological processes and the comprehensive automation of AES's, and also to the analysis of radiation safety of existing AES's and their influence upon the environment.

The editors of the collection of articles hope that these materials will be useful for the operators, the specialists of the design and adjustment organizations, and the scientific workers and engineers, who are working in the atomic power industry.

The editors will be grateful for critical comments and suggestions on the composition and formulation of the collection of articles. All such comments should be sent to this address: 113114, Moscow, M-114, Shlyuzovaya Nab., 10, Energoizdat.

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Abstracts

UDC 621.311.25

DEVELOPMENT OF ATOMIC POWER INDUSTRY IN THE USSR

/Abstract of article by L.M. Voronin: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article summarizes the results of fulfilling the decisions of the 25th Party Congress and the assignments of the 10th Five-Year Plan for the construction of AES's in the USSR. It also outlines the basic directions for the development of the atomic power industry in the 11th Five-Year Plan.

UDC 621.311.25:621.039

STATUS OF THE NUCLEAR POWER INDUSTRY IN THE WORLD

/Abstract of article by V.M. Gordina, Yu.V. Yegorov, Ye.N. Myagkov; "Atomic Electric Power Stations", 1981, vyp 4./

/Text/ This article reviews the structure of the nuclear power industry in the world (excluding the CEMA nations) as of 1 January 1980. It also presents data on foreign AES's as concerns the growth of capacity, the output of electric power, and the coefficient of capacity use. It also provides information about the standard nuclear steam producing units, which were developed by the leading foreign reactor manufacturing firms.

UDC 621.311.25:621.039

ATOMIC ELECTRIC POWER AND HEATING SUPPLY STATIONS

/Abstract of article by V.L. Kats, Yu.A. Kuznetsov, G.I. P'esikov, and V.P. Tatarnikov: "Atomic Electric Power Stations", 1981, vy 4/

/Text/ This article reviews the basic technical solutions for an atomic power and heating supply station.

UDC 621.039.576:691.328.2

ATETs /atomic power and heating supply station/ WITH BOILING WATER REACTORS IN HOUSINGS MADE OF PRE-STRESSED REINFORCED CONCRETE

/Abstract of article by M.A. Al'tshuller, V.N. Vinogradov, G.E. Gorodetskiy, A.P. Kirillov, A.Ye. Svichar, and Yu.I. Tokarev: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ In recent years a great deal of work has been done to substantiate the feasibility of creating water-cooled reactors in reinforced concrete housings. In this regard it has been demonstrated that all of the advantages of reinforced concrete housings are most fully manifest when they are used with water-cooled boiling water reactors. In this article it is shown that on the basis of the special features and advantages, which are inherent in reinforced concrete housings, they have managed to provide a degree of safety that makes it possible to locate an ATETs with a VK-500 reactor within 2 to 3 kilometers from the borders of the future infrastructure of large cities.

UDC 631.039.51

ESTIMATED-EXPERIMENTAL RESEARCH OF THE EMERGENCY COOLING OF AN RBMK-1500 REACTOR AT MAXIMUM PLANNED EMERGENCY

/Abstract of an article by Yu.M. Cherkashov, Ye.P. Vasilevskiy, V.N. Labazov, A.Ya. Loninov, Yu.S. Molochnikov, O.Yu. Novosel'skiy, L.N. Podlazov, V.B. Pavlov, and V.I. Pushkarev: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article examines the thermohydraulic and neutron-physical processes and analyzes the special features of the behavior of parameters at the maximum and planned emergency (MPA), which is the basis of research on the temperature regime of fuel elements (tvel). The temperature regime of the tvels has been determined for various modifications in the change of the neutron capacity at the MPA and for various laws for the heat exchange coefficients in the process of dehydrating the channel. An important moment in this regard is the selection of values for the heat exchange coefficients in the process of dehydrating the channel of an RBMK-1500 reactor.

UDC 621.1:621.311.2

THE USE OF THE COMBINE OPERATION OF THE EQUIPMENT OF AN AES AND A GAS TURBINE UNIT (GTU) TO COVER THE ALTERNATING PORTION OF THE LOAD SCHEDULE OF A POWER SYSTEM

/Abstract of an article by V.M. Boldyrev, G.Ye. Kelin, and L.F. Feoktistova: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article demonstrates the economic efficiency of using the combined operation of a GTU with the power units of AESs, which are achieved by using the heat of the exhaust gases of the GTU for superheating the saturated steam following the steam generators of the nuclear steam-producing unit with an encased reactor. During the separate operation of the GTU and the AES the heat of the exhaust gases is lost. The combined operation of a 1000 MW AES power unit and several GTU's are cited as the specific equipment to be studied.

UDC 621.362.2

POSSIBILITIES FOR THE DIRECT CONVERSION OF HEAT INTO ELECTRIC POWER

/Abstract of an article by A.A. Abagyan, V.M Dmitriyev, and G.N. Ushakov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article examines the possibilities for the direct conversion of heat into electric power in comparison with the traditional machine method of conversion. It provides the basic characteristics of thermoelectric and thermoemission convertors that have been achieved at present. It provides a description of the design layouts and the parameters of the existing thermoelectric and thermal emission generators with atomic sources of heat and the areas in which they are used. The article discusses the primary scientific-technical and engineering problems in creating such generators.

UDC 621.311:621.039

THE CONFIGURATION AND DESIGN SOLUTIONS FOR THE CONSTRUCTION PORTION AND WAYS TO REDUCE THE TIME REQUIRED FOR THE CONSTRUCTION OF AN AES WITH RBMK POWER UNITS WITH A LARGE CAPACITY

/Abstract of an article by L.K. Domanskiy, L.N. Desfonteynes, E.A. Skob: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article discusses the configuration and design solutions for the construction portion and offers suggestions for reducing the amount of time required for the construction of an AES with large capacity RBMK power units.

UDC 621.039.58

STATUS AND PROSPECTS FOR THE DEVELOPMENT OF METHODS FOR MONITORING RADIATION AND EQUIPMENT AT AN AES

/Abstract of an article by L.P. Kham'yanov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article examines the present-day tendencies in the development of methods for monitoring the radiation of AES reactors, their sensitivity and the amount of information that the methods can provide. There is a brief outline of the basic principles of the physical model for the formation of activity of fissionable products in the cooling agent of a VVER-type reactor, on the basis of which a methodology has been developed to evaluate the condition of a reactor's core. As an example attention is given to evaluating the condition of a reactor core for one of the operating periods of the Armenia AES.

UDC 621.039.58

SPACE AND POWER DISTRIBUTION OF RADIATIONS BEYOND THE BIOLOGICAL SHIELDING OF AN AES HAVING VVER-440 AND RBMK-1000 REACTORS

/Abstract of an article by A.I. Glushchenko and Yu.V. Orlov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article outlines the basic results of full-scale research on the radiation situation and the effectiveness of the biological shielding of Soviet AES's, which have been constructed with the use of a broad selection of dosimetric and spectrometric equipment. The results of the research are analyzed by comparing them with design data.

UDC 621.939.564:621.1.018.8

MONITORING THE STEAM CONTENT AND STEAM-AND-WATER CONNECTIONS OF A REACTOR ACCORDING TO READINGS OF THE KGO SYSTEM DETECTORS

/Abstract of an article by A.M. Gryaznov, P.V. Kalinin, V.V. Karnaukhov, Ye.A. Panov. Yu.N. Filimontsev, L.P. Kham'yanov, A.I. Yashnikov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article demonstrates the possibility of using KGO system detectors for monitoring the thermophysical parameters of the cooling agent in the TK of an RBMK reactor. It provides a theoretical definition of the functional relationship of a KGO system signal for ^{16}N upon the capacity of the channel, the expenditure of cooling agent through the channel, the length of the steam-and-water connections from the core to the KGO gauge, and also the temperature and pressure in the discharge collector. A single-value relationship of the volumetric activity of the cooling agent according to ^{16}N upon the steam content at release from the TK is expressed and experimentally confirmed. The article also describes the possibility of construction working nomograms, which bring together the thermophysical parameters of the cooling agent in the TK with a KGO signal according to ^{16}N.

UDC 621.187.12:621.311.25

WATER-CHEMICAL REGIME OF THE AUXILIARY SYSTEMS AT THE KOL'SKAYA AES

/Abstract of an article by V.I. Pashevich, Ye.I. Ignatenko, I.I. Abarovskiy, Z.I. Kopylova, and T.K. Kruglova: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article examines problems having to do with maintaining the water-chemical regimes of the auxiliary systems, the periodicity of chemical monitoring and the corrosion stability of the materials that are used. In addition, the article provides a detailed analysis of the shut-down regime when reloading nuclear fuel and the reasons that affect the speed of corrosion of the reactor's housing, which does not have a stainless surfacing.

UDC 621.311.25.621.039-784.9.002

EXPERIENCE IN DEACTIVATING THE EQUIPMENT OF AN AES HAVING VVER-440 REACTORS

/Abstract of an article by Yu.V. Balaban-Irmenin: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article provides a brief description of various methods for deactivating at an AES and their applicability. It also describes ways to deactivate the removable equipment and steam generators, and also the designs and technology which are used at an AES for decreasing the surfaces of the equipment.

UDC 621.181.7:621.311.25

METHODS FOR ESTIMATING THE ACCELERATION CHARACTERISTICS OF THE MOIST-STEAM TURBINES

/Abstract of an article by Ye.A. Golovach: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article develops a non-linear method for estimating the acceleration characteristics of moist-steam turbines with consideration given to the change in the efficiency, temperature drop and losses in the turbine, and also the loss of vacuum in the condensor. The non-linear method is compared with an approximate linear method for estimating the acceleration characteristics.

UDC 621.311.25:621.039.56

RAISING THE RELIABILITY AND EFFICIENCY OF OPERATING AN AES BY THE TRAINING OF HIGHLY-SKILLED PERSONNEL

/Abstract of an article V.V. Korolev and G.A. Sereda: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ The nuclear power industry at the present stage in the development is characterized by the use of industrial large-capacity reactors, the high technical-economic indicators of which can be provided only when there is a high degree of reliability of the equipment and a high skill-level of the service personnel. To train operations personnel who are highly-skilled for work at present-day AES's a specialized institution of higher learning is being created - the Institute of Atomic Power Engineering. This article deals with some of the problems that have arisen in this area.

UDC 621.039.56:681.142.3

THE USE OF STRUCTURAL-HIERARCHICAL MODELS FOR DIAGNOSING MALFUNCTIONS OF A TECHNOLOGICAL FACILITY

/Abstract of an article N.G. Barykova and Yu.V. Yegorov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article describes the use of the method of structural-hierarchical model for organizing the machine search for malfunctions in the basic equipment of electric power stations. In constructing the model use is made of statistical, a priori and current information regarding the condition of the facility. The fundamental significance of such models is that they can be used to discover ways to identify malfunctions to ensure the timely operational maintenance of equipment.

UDC 621.039.53:539.4:620.1

CONCERNING A COMPREHENSIVE SYSTEM FOR THE OPERATIONAL MONITORING OF THE METAL IN THE EQUIPMENT OF ATOMIC ELECTRIC POWER STATIONS

/Abstract of an article by M.D. Abramovich, A.F. Getman, I.P. Levtonov, and L.I. Trekhtenberg: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article discusses a layout of a comprehensive system for the operational monitoring of the metal in the equipment of an AES. The layout contains the basic groups of parameters, which are subject to monitoring, which determine the condition of the metal and the factors of operational effect upon the metal. The layout also reflects the scientific articles that have to do with the compilation of the control programs, the gathering of information on the results of the monitoring, the processing of data on the condition of the metal and reaching a decision regarding the tolerance of the defects in operation. The layout work-up was performed using the systems approach and a concept of the "metal-AES" system, which characterizes the more general working conditions and the damage to the metal in the equipment in the operating process.

UDC 621.039.526

THE BASIC WAYS OF IMPROVING THE RADIOCHEMICAL SYSTEMS OF POWER UNITS WITH CHANNEL REACTORS OF THE BOILING-WATER TYPE

/Abstract of an article by I.M. Barbashinov, M.L. Barskiy, and L.I. Ivanov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article examines the radiochemical systems of an AES which has boiling-water channel reactors. It also takes a look at the feasibility and advantages of using perlite steels in all parts of the circuit and the requirements placed upon the system of the cooling agent technology and the systems for processing the liquid and gaseous radioactive wastes, the deactification system. The article provides recommendations for further improving the systems.

UDC 621.311.25:621.039

RESEARCH ON THE EFFICIENCY OF THE EMERGENCY COOLING SYSTEMS OF REACTORS WITH A WATER COOLING AGENT

/Abstract of an article by L.P. Kabanov, S.A. Belyayev, P.L. Makarovskiy, S.P. Nikonov, and V. Reynsh: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article cites data on the comprehensive research on the efficiency of emergency cooling systems of reactors (SAOR), including the VVER and RBMK reactors, based upon the indicators of the structural and functional reliability. The structural reliability of the SAOR was studied using the method of the tree of failures. The indicators of the functional reliability were determined on the basis of the analysis of the temperature regimes of the fuel elements of the VVER and RBMK reactors in the process of an emergency cooling and the use of methods for estimating the thermotechnical reliability. It was demonstrated that in the existing system designs for the emergency cooling of VVER-440 and RBMK-1000 reactors, a high SAOR efficiency is provided.

UDC 621.039.7

MONITORING THE GAS-AEROSOL EJECTIONS AT THE NOVOVORONEZHSKAYA AES AND RESEARCH ON THE INFLUENCE OF ITS OPERATION UPON THE ENVIRONMENT

/Abstract of an article by M.A. Baranov, and V.K. Sedov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article describes the methods for monitoring the gas-aerosol ejections that are now being used on the VVER-440 power units of the Novovoronezhskaya AES. The article also provides information on the outputs of inert radioactive gases (IRG) and aerosols that are eliminated into the environment along with the ventilated air. The article also provides the isotope composition of the radionuclides that are eliminated. The article cites the volume of dosimetric monitoring of the area near an AES and some of the results of monitoring.

UDC 621.039.58

RADIOACTIVE EJECTIONS OF AN AES WITH VVER-440 AND RBMK-1000 REACTORS

/Abstract of an article by V.F. Kozlov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ A comparison of the RBG ejections of series AES's demonstrates that for both the absolute value (curie per 24-hour period) and the relative (curie/MW-year) the actual ejection of a RBMK-1000 reactor exceeds by approximately one order the ejection of two VVER-440 power units. It is entirely possible to stabilize the RBG ejections from one RBMK-1000 reactor at a level not exceeding 36 curie/(MW-year), i.e. nearly 100 curie per 24-hour period. This corresponds to the requirements of the health rules for the designing and operating of an AES. The ^{131}I ejections of RBMK-1000 reactors are of a rather low value, since in contrast to the VVER reactors there is a reduced output of iodide from the nonhermetic fuel assemblies (tvel) into the cooling agent.

UDC 621.039.7

PROBLEMS OF RADIATION SAFETY FOR THE POPULATION AND THE PROTECTION OF THE ENVIRONMENT IN CONNECTION WITH THE OPERATION OF AN AES

/Abstract of an article by D.I. Gusev, N.G. Gusev, A.D. Turkin, and V.D. Turovskiy: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article provides an evaluation of the influence of the gas and aerosol ejections and liquid discharges of AES's upon the formation of a radiation situation in the environment. It provides an evaluation and prognosis of the amounts of radiation for the population. The article also examines the hygiene and ecological problems of safety in the elimination of radioactive wastes from an AES and the disposal of warm water into the cooling tanks.

UDC 621.039.76+502.7+632.15+628.394

EVALUATING THE ANTHROPOGENY POLLUTION OF THE EVIRONMENT WITH ARTIFICIAL AND NATURAL NUCLIDES

/Abstract of an article by A.K. Kruglov, B.N. Laskorin, V.I. Karpov, V.T. Orekhov, V.N. Shesterikov, A.A. Iskra: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article provides a forecast of the possible anthropogeny pollution levels of the biosphere with artificial and natural radionuclides. The article also provides an evaluation of the proposed scales of the influence of ionized radiation upon the population.

UDC 621.039.7

STATISTICAL PROCESSING OF RBG EJECTIONS OF AN AES IN ORDER TO TECHNICALLY ESTABLISH MAXIMUM EJECTIONS

/Abstract of an article by N.G. Gusev and G.G. Doroshenko: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article suggests an approach to establishing working maximums for RBG ejections, based upon the statistical analysis of the actual ejections of an AES in conditions of an established regime of normal operation. It is demonstrated that the distribution of the normal RBG ejections is subject to a normal logarithmic law, which can be described by two parameters - the average geometric value and a standard deviation. This makes it possible to come up with technically sound working maximums of normal ejections, without restricting the field of normal operation.

UDC 621.039.76+502.7

THE ATOMIC POWER INDUSTRY AND THE ENVIRONMENT

/Abstract of an article by B.N. Laskorin, V.I. Zemlyanukhin, V.I. Karpov, M.Ye. Kemerova, N.S. Babayev, V.N. Shesterikov, and V.F. Demin: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article provides an evaluation of the influence of the rapidly developing nuclear power industry upon the environment. It describes the measures aimed at ensuring radiation safety of the nuclear power cycle. A comparison is made of the effects of the nuclear and thermal power engineering upon the biosphere.

UDC 621.039.58

MODELS FOR ESTIMATING THE INDIVIDUAL AND POPULATED DOSES CAUSED BY THE GAS AND AEROSOL EJECTIONS OF AN AES

/Abstract of an article by N.G. Gusev and V.A. Belyayev: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article outlines the models for estimating the individual and populated doses from the constant and one-time radioactive ejections of an AES for all possible methods of effect. An original portion of the research is the model for estimating doses in the food and biological chains, which to a certent extent decreases the traditional difficulties connected with the migration of radionuclides through the links of the various ecological systems.

UDC 621.039.58

A POSSIBLE APPROACH TO THE PROBLEM OF THE QUANTITATIVE COMPARISON AND SELECTION OF SITES FOR AN AES

/Abstract of an article by A.A. Abagyan, A.I. Glushchenko, S.I. Konchev, O.G. Petrov, and L.P. Kham'yanov: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article offers a method for the quantitative evaluation and comparison of sites for AES's, based upon the use of the so-called "isopleth of probability" around an AES, which makes it possible to estimate the "coefficient of quality" of a given site. This method is based upon the results of processing of many years worth of standard weather observations and takes into consideration the distribution of the population near an AES. The algorithm that has been developed has been realized in a computer program called "Meteo".

UDC 621.039.58

REGARDING THE PROBLEM OF STANDARDIZING METHODS FOR MONITORING THE RELEASE OF ARTIFICIAL AND NATURAL RADIONUCLIDES INTO THE ENVIRONMENT

/Abstract of an article L.I. Gedeonov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ The radioactive substances (RAV), created by atomic electric power stations, which enter the environment form fields of increased radiation as compared with the natural situation. The protection of the environment from intolerable pollution requires that norms be established for the release of RAV into the environment for each source. These norms must cover the concentration and amount of the radioactive substances that are formed. This article discusses the need to standardize the methods for monitoring radioactive nuclides in the environment and the methods and conditions of the monitoring.

UDC 621.039.58

SELECTION OF A METHOD FOR ESTIMATING THE DISPERSAL OF RADIOACTIVE ADMIXTURES RELEASED INTO THE ATMOSPHERE BY AN AES

/Abstract of an article by A.I. Glushchenko, D.L. Laykhtman, G.A. Natanzon, O.G. Petrov, and L.P. Kham'yanov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article analyzes the pluses and minuses of the presently used methodologies for estimating the dispersal of admixtures in the atmosphere and provides recommendations for the selection of the best methodology. As the analysis demonstrates, any methodology which is to evaluate the radiation situation around an AES must take into consideration the specific features of the local weather conditions near the site of the AES.

UDC 621.039.7

RADIATION POLLUTION OF WATER

/Abstract of an article by L.I. Gedeonov, V.A. Blinov, L.M. Ivanova, and I.M. Tsarikovskaya: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article provides a brief description of the sources of radioactive pollution. It provides data on the content of radionuclides in the waters of the Dunay River up to the year 1976. It is shown that from 1971 through 1976 the main source of artificial radioactive substances into the Dunay River was the global fallout of products from nuclear explosions. The article cites the results of observations of the change in the content of long-lived radionuclides in the waters of the Baltic Sea. The article reports on the discovery of a seasonal factor in the changes in the concentration of ^{90}Sr in the northern part of the Atlantic Ocean and provides an explanation for the causes of the phenomenon.

UDC 621.311.25:621.039:621.3.06

EXPERIENCE IN THE DESIGNING OF AUTOMATED CONTROL SYSTEMS FOR ATOMIC ELECTRIC POWER STATIONS

/Abstract of an article by V.K. Sedov, B.F. Busygin, O.V. Yeliseyeva, V.A. Mikhaylov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article discusses the specific directions being taken in the development of automated control systems of atomic electric power stations having VVER reactors.

UDC 621.039.566

AUTOMATED CONTROL SYSTEM TP FOR THE FIRST SECTION OF THE KOL'SKAYA AES

/Abstract of an article by A.P. Volkov, A.S. Dolgov, S.V. Zinov'yev, Ye.I. Ignatenko, Yu.P. Katasonov, Yu.V. Kolomtsev, Ye.F. Mel'nikov, V.R. Reznik, B.A. Trofimov: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article outlines the problems associated with the TP automated control system (ASU TP) for the VVER-440 power unit. It provides a list of the functions performed by the ASU TP and presents the improvement measures that have been carried out and that are planned for execution.

UDC 621.311.25:621.039:681.3:681.5

DEVELOPMENT OF COMPREHENSIVE AUTOMATED SYSTEMS WITH A CONTROL COMPUTER AT SOVIET ATOMIC ELECTRIC POWER STATIONS WITH CHANNEL REACTORS

/Abstract of an article by Yu.D. Proferansov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article examines the stages in the development of comprehensive automated systems with control computers with channel reactors. It describes the special features of the composition of functions and the structure of the systems, which have been adopted at different stages. On the basis of the experience that has been accumulated the structure of a promising system is offered.

UDC 621.039.566

EXPERIENCE IN THE OPERATION OF AUTOMATED CONTROL SYSTEMS FOR THE TECHNOLOGICAL PROCESSES AT THE KOL'SKAYA AES

/Abstract of an article by A.P. Volkov, Ye.I. Ignatenko, Yu.V. Kolomtsev, Ye.F. Mel'nikov, and B.A. Trofimov: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article outlines the experience of operating automated control systems for the power units of the Kol'skaya AES, at which equipment for measuring the neutron flow "Iney", the ARM-4 capacity regulator, and the APT automatic turbine starter are in use. The article examines the basic shortcomings of the ASU TP and ways to do away with them.

UDC 621.039.562:681.142.3

EXPERIENCE IN THE USE OF AEM FOR DETERMINING THE PHYSICAL-TECHNICAL CHARACTERISTICS OF THE POWER UNITS OF THE BILIBINSKAYA ATETs

/Abstract of an article by V.K. Abalakin, Ye.V. Dashkovskiy, N.I. Logosha, G.Ye. Soldatov, and F.T. Tukhvetov: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article reviews the programs for using a computer to estimate the physical characteristics of the reactors now in use at the Bilibinskaya ATETs. It provides a detailed outline of the methodology for monitoring the field of the release of energy in reactors using a computer. The article also studies the efficiency of using computers to estimate the thermotechnical reliability of the core. There is a brief description of the layout of a specialized information and measuring system (IIS) and the program for computer processing of the results of experiments using the IIS.

UDC 621.311.25:621.039.62-5 (001.24+001.8)

ESTIMATING AND ANALYZING THE TECHNICAL-ECONOMIC INDICATORS IN AN ASU TP OF A POWER UNIT WITH A VVER-440 REACTOR

/Abstract of an article by N.N. Borisova, L.P. Zhidkova, N.F. Komarov, V.K. Litvinov, V.N. Ruzankov, V.I. Sen'kin, and A.A. Spirina: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article outlines the procedure for estimating the actual and standard technical-economic indicators of a power unit with a VVER-440 reactor. It provides an enlarged structural diagram of the esimate. It describes the methods for gathering, processing and monitoring the reliability of the initial information. An analysis of the thermal economy of the equipment is performed by comparing the actual and standard indicators. The information is provided to personnel in the form of a blank form.

UDC 621.039.564.3

REGARDING THE PROBLEM OF THE TOPOLOGICAL OPTIMIZATION OF THE NETS FOR PROCESSING AND TRANSMITTING DATA WHEN DEVELOPING THE ASU-ATOM

/Abstract of an article by V.P. Gal'berg: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article examines some optimization problems that arise in developing the ASU of an industrial association (ASU-ATOM), in particular the evaluation of the economically optimal structure for placing the computer centers and the means for transmitting data.

UDC 621.039.562:681.142.3

AUTOMATED EXCHANGE OF INFORMATION BETWEEN THE COMPUTERS OF ATOMIC ELECTRIC POWER STATIONS AND SCIENTIFIC CENTERS

/Abstract of an article by I.Ya. Yemel'yanov, A.D. Zhirnov, V.V. Postnikov, Ye.A. Starostin: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article describes possible layouts for the control of AES's using two computer complexes - an internal and an external, which are joined together using the "Akkord" system. The article demonstrates the need to organize an automated system for the exchange of data for these complexes.

UDC 621.311.25:621.039+/681.3.06/

ORGANIZING THE DEVELOPMENT OF SOFTWARE FOR A FUTURE AES CONTROL SYSTEM

[Abstract of an article by V. N. Okhotin, G.P. Komarov, V.V. Zonov, and V. A. Zhil'tsov: "Atomic Electric Power Stations," 1981, vyp 4]

/Text/ In connection with the proposed use of direct digital control (PTsU) by the executive organs (the electric motor and the cut-off and regulating fittings, etc.) in future systems for controlling an AES with the use of modern layout solutions, a distribution structure of the control digital computers (TsVM), the newest mathematical methods for controlling, the highly-reliable devices, the telecoded exchange and transmittal of data, the reflection and technical documenting and other technical means for the automation and combining with a facility, this article discusses the technology for developing software (MO) according to the methodology for the creation of large technical systems (BTS). The development of a set of programs is examined as the routine process of designing. In determining the criteria for efficiency the following obtain: the basic component of designing is the subprogram as a manufactured article; the degree of complexity is the total number of commands; the outlays are in the estimate per command; the labor productivity of the programmers (algorithm compilers) is in the number of commands per day per man. This article examines the outlays by type of work in relation to the number of collectives engaged in a single project, questions having to do with organizing the collective and the coordination of its work. The article also provides a possible net schedule for the development of a set of control programs of the future AES control system.

UDC 621.311.39+621.311.165-52

PROBLEMS IN THE COMPREHENSIVE AUTOMATION OF PROCESSES AT AN AES

/Abstract of an article by A.V. Naumov: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article deals with the importance of performing theoretical research in the field of AES automation and outlines the practical tasks which must first be solved.

UDC 621.039.566

AUTOMATED REGULATION OF THE CAPACITY OF LARGE POWER REACTORS

/Abstract of an article by V.N. Sarylov, F.F. Voskresenksiy, P.T. Potapenko, and V.G. Dunayev: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article examines the problems of estimating the use of rhodium direct charge detectors as neutron gauge for the system that automatically regulates the integral capacity of an RBMK reactor of the Chernobyl'skaya AES. The flow of the ionized chambers of the standard regulating system is adjusted according to the readings of the internal reactor monitor taking into consideration the spatial redistribution of the neutron flow. The article provdes the results of estimates of the transfer processes of regulation at different perturbations. The article also deals with the situations in which the neutron flow gauge are out of order.

UDC 621.039.562

SYSTEM-RELATED PROBLEMS IN CREATING AN EXPERIMENTAL MEASURING COMPLEX FOR THE LENINGRAD AES

/Abstract of an article by P.A. Gavrilov and M.N. Mikhaylov: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article provides a list of the functions, requirements and the justification for the selection of a structure. It examines in detail the problems of organizing the communications channels with sources of the signals and other systems. The article also deals with the special features of an experimental measurement complex.

UDC 621.311.25:621.039.56

ECONOMIC EFFICIENCY AND POSSIBLE WAYS TO IMPROVE THE CONTROL SYSTEMS OF POWER UNITS WITH VVER REACTORS

/Abstract of an article by A.V. Naumov, B.F. Busygin, V.A. Mikhaylov, and O.S. Gorelova: "Atomic Electric Power Stations", 1981 vyp 4/

/Text/ This article provides a brief analysis of existing automated control systems for the technological processes of VVER-440 power units at the Novovoronezhsakaya AES; it also provides information on the planned specific directions for their further improvement. The article also provides evaluations of the economic efficiency.

UDC 621.039.564.3

RADIATION ERROR OF THE PRIMARY TEMPERATURE GAUGES USED IN AES CONTROL SYSTEMS

/Abstract of an article by S.O. Slesarevskiy, M.N. Korotenko, V.S. Lyubarskiy, V.P. Pavlenko, V.A. Snigerev, S.S. Stel'makh, and A.V. Tkachenko: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ This article provides a classification of the errors of the thermoelectrical convertors which operate in the zone of ionized radiation. Differentiation is made in the factors by the extent of their influence upon the error in temperature measurement. An evaluation is made of the influence of the heat exchange on the radiation error of the thermoelectric convertors. The article also provides a discussion of the results of experiments that have been made. The radiation error of the primary gauges is classified as systematic.

UDC 621.039.564.3

AN EVALUATION OF THE LOWER LIMIT OF THE NEEDED COMPUTER CAPACITY OF A POWER STATION COMPUTER CENTER FOR AN AES WITH RBMK REACTORS

/Abstract of an article by V.P. Gal'berg: "Atomic Electric Power Stations", 1981, vyp 4/

/Text/ A limited amount of direct control over the distribution of the release of energy for the core and the limited computer possibilities of a unit system for the centralized control leads to the necessity of performing timely and precise neutron-physical estimates (NFR). To determine the necessary capacity of a station computer center a statistical approach is recommended, which is based upon the theory of mass servicing systems (SMO). It is demonstrated that the necessary computer capacity for carrying out NFR for one RBMK power unit is approximately .02 to .05 million operations per second.

8927
CSO: 1822/58

ELECTRIC POWER

TASKS OF POWER WORKERS IN 1982 DETAILED

Moscow ELEKTRICHESKIYE STANTSII in Russian No 1, Jan 82 pp 2-3

[Article: "Tasks of Power Workers in 1982"]

[Text] The development of the power industry in 1982 will be carried out on the basis of a new power-generation program established by the "Basic Directions for the Economic and Social Development of the USSR in 1981-1985 and the Period to 1990" and in conjunction with the plan for the development of the USSR's economy in 1981-1985 adopted by the sixth session of the tenth convocation of the USSR Supreme Soviet. The labors of power-industry workers in 1982 must be directed toward the accelerated development of nuclear and hydroelectric power plants and the supply of electric and thermal power to the economy at a rate determined by the specified scale of industrial production and energy conservation in all sectors of the economy.

The Soviet economy has continued forward in its development. In the first year of the 11th Five-Year Plan, national revenues increased by 3.4 percent in comparison with 1980, while the volume of industrial production rose by 4.1 percent.

Within the structure of electric-power production, a further increase has taken place in the relative share of power production due to nuclear power plants, with a certain reduction in that portion due to thermal electric-power stations. This is in accordance with the resolution adopted by the 26th CPSU Congress for the development of the power industry.

The amount of power generated by all electric power stations rose by 36 billion kWh over the last year, or 2.8 percent, including an 18.2 percent increase at AES's and 1 percent at TES's. Out of the 1,330 billion kWh produced by all electric-power stations in 1981, KES's and TETs's produced 1,063 billion kWh (79.9 percent), GES's produced 181 billion kWh (13.6 percent) and AES's 86 billion kWh (6.5 percent).* The production of electric power at AES's and GES's in 1981 was equivalent to the reduction of conventional (fossil) fuel consumption by approximately 85 million tons. More than 92 percent of all electric power was generated by electric-power stations in the USSR Ministry of Power and Electrification.

* Henceforth we will present preliminary estimates with respect to the execution of tasks for 1981.

The production of thermal power by centralized sources amounted to 2,315 million Gcal. It rose by 55 million Gcal in comparison with 1980, with a further increase in that portion of thermal power supplied by centralized sources. The output of thermal power from TETs's likewise increased. It amounted to 1,170 million Gcal, including almost 900 million Gcal from USSR Minenergo TETs's.

More than 10 million kW of new capacities were commissioned at the country's electric power stations in 1981, approximately 4 million kW of which were commissioned at GES's and AES's. New capacities were introduced at the Leningrad AES, which reached its design output--4 million kW--and is now the largest AES in the USSR. New turbogenerators were commissioned at the Sayano-Shushenskaya GES and at the Cheboksarskaya, Nizhne-Kamskaya, Kurpsayskaya and other hydroelectric stations.

The following were introduced at thermal electric-power stations: two 500-MW power units at the Ekibastuz GRES-1 and the first 300-MW power units at the Azerbaijan GRES, the Zuyevskaya GRES-2 and at other GRES's and TETs's.

The installed capacity of electric-power stations at the end of 1981 exceeded 277 million kW, of which more than 232 million kW (84 percent of total installed capacity at electric-power stations) was incorporated into the USSR's Unified Power System. The production of electric power by these stations amounted to about 1,175 billion kWh (88.3 percent of the country's total output).

The extent of new transmission lines of 35-kV capacity and greater was increased by almost 25,000 km and reached 793,000 km.

Great new tasks in the development of our country's economy have been set for 1982--the second year of the 11th Five-Year Plan. National revenues will increase by 2.6 percent in comparison with 1981. The volume of industrial production will grow by 4.7 percent.

In accordance with the approved State plan for the economic and social development of the USSR for 1982 and the recently adopted resolutions of the CPSU Central Committee and the USSR Council of Ministers on the economical expenditure of resources, the production of electric and thermal power for 1982 has been set at 1,365 billion kWh (based on the envisioned conservation of 48 billion kWh and 124 million Gcal in the economy), and the output of thermal power from centralized sources will be 2,365 Gcal. Of this, the electric-power stations of the USSR Minenergo will generate 1,259 billion kWh (92.2 percent) and 925 million Gcal (39.1 percent).

The increase in the production of electric power in 1982 with respect to the volume of production in 1981 will amount to 35 billion kWh, or 2.6 percent. This will be insured through the generation of power at AES's and GES's. The absolute production of electric power by thermal electric-power stations is being kept at the 1981 level and is envisioned on the order of 1,063 billion kWh. The production at nuclear power stations will be 107 billion kWh (8 percent) and 195 billion kWh (14.6 percent) at hydroelectric plants.

The increase in the output of thermal power will amount to 66 million gCal, or 3 percent. The utilization of secondary and low-grade discharge heat will increase in 1982 to 140 million Gcal (about 120 million Gcal were utilized in 1981).

In 1982, as previously, the demand for electric power in agriculture and in municipal economies will increase at a most rapid pace.

Out of 126 billion kWh to be used in agriculture, provisions have been made to expend 96 billion kWh on production needs. This will make it possible to increase to 4,250 kWh the electric power available to workers in agriculture. There will also be an increase in the expenditure of electric energy for the municipal needs of the village, which will amount to more than 300 kWh per village inhabitant (a rise of 6 percent). Provisions have been made to expend 970 kWh per urban resident in 1982. This figure includes an increase in interapartment consumption to 365 kWh (an increase of 3 percent).

The extent of electrification of the workers' labor in industry will increase by 2 percent in comparison with 1981.

In the country's eastern regions (to the east of the Urals), provisions have been made to generate 390 billion kWh in 1982, as opposed to 375 billion in 1981. This increase of 4 percent will increase the eastern regions' share of production to 28.6 percent. The fastest rates of increase in the production of electric power in 1982 will come about due to the assimilation of capabilities introduced in 1981 and the introduction of others in 1982--in the Uzbek SSR (by 3.5 percent), in the Kazakh SSR (by 12.6 percent), in the Azerbaijan SSR (by 10 percent) and in the Kirghiz SSR (by 3.6 percent).

An increase in capital investment (with expected implementation in 1981) of 8 percent and a 15 percent increase in the volume of construction and installation work is provided for in the plan for capital construction in the electric-power industry for 1982, drawn up on the basis of the primary directions for the development of the industry resulting from the resolutions of the 26th CPSU Congress.

The amount of capacity to be commissioned is determined on the basis of:

the assurance of the planned volume of energy;

the degree of construction readiness of power-production facilities by the end of 1981;

the creation of the necessary degree of readiness by the end of 1981, in particular, for the introduction of not less than 5 million kW at AES's in 1983;

an increase in power-system reserve capacity in 1982 to 8.5-9.0 percent, and the commissioning of 34,000 km of transmission lines rated at 35 kV and greater. This will include more than 10,000 km from capital investment in the agricultural sector. In this case, primary attention will be devoted to the commissioning of high-capacity lines that insure the delivery of power from electric-power stations and increase the reliability of power-system operation.

Based on the execution of the above-mentioned tasks, the commissioning of capacities throughout the country on the whole will amount to 8.5 million kW, including 8.1 million kW throughout the USSR Minenergo.

Provisions have been made to introduce the following: 1 million-kW power units at a number of AES's; the last two 200,000-kW units at the Kurpsayskaya GES; the first unit at the Shamkhorskaya GES; seven 78,000-kW units at the Cheboksarskaya and Nizhne-Kamskaya GES's; and others.

The installed capacity of all the country's electric-power stations is approximately 285 million kW, including 56 million kW at GES's, 17 to 18 million kW at AES's, 195 million kW at TETs's and 10 million Kw at diesel and other types of electric-power stations.

The expenditures per ruble of commercial product and the profits from industrial activity are a combined indicator of electric-power production efficiency. In 1982, these indicators were determined throughout the USSR Minenergo based upon accepted volumes and the structure of electric-power generation, the output of thermal power, the structure of the fuel supply to electric-power stations, the established unit expenditures of conventional fuel per kWh at the station's busbars (324 g) and per Gcal of heat released from TETs collectors (172.1 kg) and the introduction of fixed industrial capital. Expenditures per ruble of commercial production in 1982 will be 79.81 kopecks, an increase of 0.77 percent in comparison with 1980. This will insure revenues on the order of 4.75 billion rubles.

Capital productivity amounts to 25.4 kopecks with a value of fixed capital at year's end of almost 89 billion rubles. A reduction of capital productivity of 7 percent in comparison with 1980 is associated with the increase in the cost per kW of commissioned electric-power station capacity brought about by a doubling of the share produced by more expensive nuclear and hydroelectric power stations, as well as an increase in the share of thermal electric-power stations under construction in regions of Kazakhstan and Siberia and designed to burn low-grade coal.

The capital available per industrial production worker amounts to more than 140,000 rubles and will increase by 11.3 percent in comparison with 1980. Labor productivity for this period will likewise increase by 2.8 percent.

Soviet power engineers have entered the 11th Five-Year Plan armed with an efficient program of actions formulated in the resolutions of the 26th CPSU Congress. The most important tasks for the power engineers are the guarantee of a reliable supply of quality electric and thermal power to the economy, an increase in the efficiency of power production and the creation of the necessary reserve capacities in power systems. Particular attention must be devoted to the timely introduction of capacities at electric-power stations and networks and to the sharp increase in the utilization of capacities on hand at electric-power stations, without allowing, in particular, the "cut-off" of newly introduced capacities.

The accelerated development of nuclear power stations in the country's European sector and thermal electric-power stations, particularly in regions of concentrated construction in Siberia, Yakutiya and Kazakhstan, is of the greatest significance. This requires the creation of a stable construction-and-installation work force and the further increase in the construction industry's level of mechanization, the most rapid introduction of high-speed flow-type construction and the guaranteed commissioning in 1982 of capacities at construction industry installations being built to support the construction of nuclear power plants and power-production installations in the Ekibastuz, Kansko-Achinsk and Western Siberian fuel and power complexes.

At this modern stage of our economy's development, when the maximum conservation of material resources in the national economy is being examined with good reason as a most important State undertaking and the task of conserving all types of energy resources advances to the forefront, the duty of all power workers is not only to utilize carefully fuel and electric and thermal power at enterprises in the power systems but also to increase control over the conservation of energy resources on the part of consumers in order to insure the conservation of electric and thermal power to the degree stipulated in the plan for 1982.

9512
CSO: 1822/85

FUELS

TRENDS, OUTLOOK IN AUTOMATED COAL EXTRACTION

Kiev BEZLYUDNAYA VYEMKA UGLYA in Russian 1980 (signed to press 30 Oct 80)
1-2, 178-188

[Annotation, table of contents and abstracts from book "Automated Coal Extraction: Collection of Scientific Works," Ukrainian SSR Academy of Sciences, Institute of Geotechnical Mechanics, Izdatel'stvo "Naukova dumka", 600 copies, 188 pages]

[Text] This collection presents the results of theoretical and experimental studies to create technical means of automated coal extraction from thin steep beds. Considerable attention is focused on one of the new trends in mining machine construction, creation of mechanized timbering based on rubberized-core pneumatic shells. Production plans and design solutions are suggested which are aimed at improving the reliability of the mechanized complexes. The basic trends are presented for the development of technology of stoping operations and the creation of means of comprehensive mechanization in working steep beds of the Donbass in 1980-1990.

It is designed for scientific and engineering-technical workers engaged in problems of comprehensive mechanization with automated coal extraction.

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Technology of Working

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UDC 622.063.46:622.03-118:622.238

Basic Scientific and Technical Problems of Working Thin Steep Beds of the Donbass, Poturayev, V. M., pp 3-12.

This work substantiates the need for working thin steep beds and presents the dynamics for extracting coal from these beds according to the Ukrainian SSR Ministry of the Coal Industry in the period from 1971 to 1977, and the level of mechanization of the stoping operations. It outlines the basic scientific and technical tasks associated with creating highly productive mechanized complexes which guarantee the possibility of extracting coal without the constant presence of people in the face.

Three tables, two bibliographic entries.

UDC 622.063.46:622.274

Mechanized Complex for Working off Thin Steep Beds Based on Pneumatic Timbering, Chervonenko, A. G.; Guzchenko, V. T.; and Koval', A. V., pp 12-19.

Substantiation for the basic plan of a complex of machines for finishing off thin steep beds is presented. The basic results are presented from test-stand and theoretical studies of a kinematic plan of pneumatic timbering.

Two illustrations.

UDC 622.063.46:622.285

Study of Stability of Movement of Mechanized Pneumatic Timbering with Change in Gypsometry of Bed, Koval', A. V.; Guzchenko, V. T.; Gavril'chenko, I. K.; and Malyarenko, Ye. D., pp 19-27.

Results are presented from studies on stability of movement of mechanized pneumatic timbering with regard for the elastic properties of the support and base construction components with a change in gypsometry of the bed. Recommendations are made for selection of the longitudinal rigidity and a number of timbering sections in which bed gypsometry does not have an influence on the stability of timbering movement.

Three illustrations, one table.

UDC 622.281

Study of the Process of Shifting in Pneumatic-Cylinder Timbering, Gavril'chenko, I. K.; and Agapov, M. D., pp 27-35.

A calculated plan is selected and substantiated for sections of pneumatic-cylinder timbering. Analytical relationships are obtained and studied for determining the stresses of advance of the pneumatic timbering section. A numerical calculation is presented for the stresses of section advance.

Six illustrations, one table, two bibliographic entries.

UDC 622.063.46:622.285

Stability of Movement of Mechanized Timbering, Koval', A. V., pp 35-39.

Questions are examined of the stability of movement of mechanized timbering with regard for the elastic properties of the basic construction components. In the example of mechanized pneumatic timbering developed in the Ukrainian SSR Academy of Sciences, Institute of Geotechnical Mechanics. It is shown that elastic deformations in a beam caused by stresses of advance can result in a loss of movement stability.

Two bibliographic entries.

UDC 622.063.46:622.285

Test-Stand Test of Mechanized Pneumatic Timbering, Chervonenko, A. G.; Tsaregorodtsev, Ye. A.; Gurin, I. A.; Kharchenko, N. N.; and Malyarenko, Ye. D., pp 40-45.

Experimental data are obtained on the performance capacity of a kinematic plan of timbering. The stresses of advance are defined and a dependence is established for the stress of advance of sections on their quantity. The time of filling and emptying of the pneumatic cylinders of the timbering sections is defined.

Four illustrations.

UDC 621.867.84

Determination of Length of the Vibration Section of Transport Pipeline of Chamber Laying Machine, Voloshin, A. I., pp 45-51.

A calculated plan is suggested for the movement of the filling material when loading from a chamber into the transport pipeline. Calculations are presented for the relationships of determining the parameters of movement of the filling material in the function of its physical-mechanical properties and parameters of the filling machine. Graphic relationships are presented for the study of movement of the flux of filling material in the chamber vibration filling machine.

Four illustrations, four bibliographic entries.

UDC 622.016.62:622.285

Technique of Theoretical Study of Dynamic Processes of Selection of Efficient Parameters of Pneumatic System and Pneumatic Cylinder Timbering, Belobrov, V. I.; and Smirnova, O. I., pp 51-58.

A technique is derived for theoretical study of dynamic processes and selection of efficient parameters of a pneumatic system of pneumatic cylinder timbering. A system is compiled of differential equations for determining the time of filling and output of compressed air from the pneumatic system with regard for the change in the volumes of the cylinders, their rigidity, the regimes of air efflux. This system makes it possible to determine the efficient lengths and diameters of the pipelines in a pneumatic system.

Three illustrations, two bibliographic entries.

UDC 622.232.472

Calculation of the Forces of Cutting, Traction and Rate of Advance of Face when Finishing off Coal Beds by Cable Saws, Belobrov, V. I., pp 59-80.

A technique is suggested for computing the forces applied to the links of the cutting tool, the total force developed by the friction tool, and the thickness of the coal chip to be cut by each link and by the entire cutting tool in one cycle and any duration of time. Numerical results are presented for calculations of the indicated parameters with different plans and lengths of the working stroke of the cutting tool, as a function of the force of preliminary tension of the cutting tool by a long-stroke cable saw.

Six illustrations, seven tables.

UDC 622.063.46:622.28

Testing of Special Pneumatic Timbering, Litvinov, Yu. G.; Gudz', V. P.; and Shevchik, N. P., pp 80-83.

Results are presented of industrial tests of experimental samples of multiple-chamber pneumatic chocks PM-2 and PM-3.

Results of the conducted experiments on the pneumatic chocks of the PM type confirm the effectiveness of the new type of mining timbering made of soft shells and made it possible to establish the advantages as compared to the series-manufactured pneumatic cylinder set chocks of the type PK.

UDC 622.063.46:622.28

Study of Reliability of Soft Shells of Pneumatic Timbering, Nikolenko, N. A.; and Rakhutin, G. S., pp 84-90.

Soft shells are used as the load-bearing elements in pneumatic chocks and experimental samples of mechanized pneumatic timbering.

In testing the manufactured shells, as well as the shells which were used in different mining-geological conditions of mines of the Ukrainian Donbass for 1-4 years, the number of breakdowns was set, and their causes were defined. A number of technological and design solutions are suggested which are aimed at improving the reliable operation of the soft shells.

Two illustrations.

UDC 622.063.46:622.285

Outlook for Use of Long-Dimensional Shells of Tubular Shape in Automated Extraction, Stepanovich, G. Ya.; Il'in, A. I.; Nikolenko, N. A.; and Oreshkov, V. V., pp 90-95.

Analytical studies are conducted of different designs of long-dimension shells of tubular shape. An optimal design is selected for the shell for mechanized pneumatic timbering. Results are presented of test-stand, and mining tests of large-timber shells.

Two illustrations, four bibliographic entries.

UDC 622.232.75:622.236

Studies of Energy-Intensity of Breaking up Large Coal with Cutters of Different Geometry of the Front Surface, Sveshnikov, I. A.; Virovets, L. N.; Zabolotnyy, S. D.; and Bespalov, S. F., pp 95-98.

Results are presented from studying the energy-intensity of breaking down strong coals by cutters with different geometry of the front surface with cutting velocity to 1 m/s which is characteristic for chip extraction. Recommendations are made for developing new chip tools for breaking down strong coals.

One illustration, one table, three bibliographic entries.

UDC 622.063.46:622.03-118:622.232.8

Current State and Basic Technical Directions for Development of Technology of Stoping Operation and Creation of Means of Comprehensive Mechanization in Working Steep Beds of the Central Region of the Donbass for 1980-1990, Dokukin, A. V., pp 99-106.

A brief analysis is made of the condition of the mechanized extraction of steep beds in the central region of the Donbass according to extent and drop in the beds.

The basic technical directions are presented for the development of technology of stoping operations and creation of means of comprehensive mechanization in the working of steep beds of the Donbass in 1980-1990. The basic works are examined from the Institute of Mining imeni A. A. Skochinskiy which were done for mechanization of steep beds.

UDC 622.831

Heading Finishing Off of Steep Beds of the Donbass, Poturayev, V. N.; Glushko, V. T.; Yalanskiy, A. A.; and Kurnosov, A. T., pp 107-119.

An examination is made of the features of manifestation of mining pressure when finishing off steep explosive coal beds by bands for descent. Results are presented from studying the interaction of lateral rocks with the timbering of the heading units, means of controlling the mining pressure and improving the heading extraction.

Five illustrations, three bibliographic entries.

UDC 622.063.46:622.03-118

New Directions of Technology of Working Steep Beds of the Donbass, Lipkovich, S. M.; Bratishko, A. S.; Kucher, A. T.; and Tsyapa, N. A., pp 119-123.

It is suggested that thin and average thickness steep beds be finished off with the use of a diagonal system of working which makes it possible to improve the planning of mining operations and the technical-economic indicators in working steep beds.

Three illustrations, four bibliographic entries.

UDC 622.063.46:622.03-118

New Technological Solutions for Automated Extraction of Thin and Average Thickness Steep Beds, Sapitskiy, K. F.; Dorokhov, D. V.; and Bondarenko, Yu. V., pp 124-131.

New technological plans of automated coal extraction are presented in the first case by suspended impulse hydraulic monitors, and second with the use of the energy of sudden discharges of coal and gas. These plans are in the draft of the mine of the future for working thin steep beds.

Three illustrations, one table.

UDC 622.063.46:622.831.325.3

Effect of Extracting Thin Beds and Filling Worked Space with Parameters of Degasification of Converged Beds, Myaken'kiy, V. I., pp 132-136.

An analysis is made of the effect of extracting thin beds and filling the worked space on degasification of the interfering mass of mining rocks and the converged coal beds, and the change in gas balance of the extracting sections.

A decrease is noted in the radii of degasification and increase in the gradients of gas pressure with an increase in the effective output of the excavated bed.

One table, eight bibliographic entries.

UDC 622.063.46:622.83:622-03-118

Control of Mining Pressure by Pneumatic Timbering on Thin Steep Beds, Stepanovich, G. Ya., pp 136-145.

Studies are made of the working characteristics of pneumatic timbering in a comparison with other types of means of timbering and controlling mining pressure. It is substantiated that the pneumatic soft force element belongs in design to the extension-type timberings, and in working characteristics to timberings of constant and increasing resistance. It is proven that pneumatic timbering is a means of controlling mining pressure. A physical model is presented of the nature of interaction of special pneumatic timbering with the lateral rocks and the near-face part of the emission-dangerous coal bed.

Two illustrations, four bibliographic entries.

UDC 622.063.46:622.285

Study of Aerodynamic Parameters of Stoping Faces with Mechanized Pneumatic Timbering, Gretsinger, B. Ye.; and Borovskiy, A. V., pp 145-149.

An analysis is made of the results of studying aerodynamic resistance and the coefficient of aerodynamic resistance of stoping faces with pneumatic timbering for steep coal beds. Recommendations are presented for improving the parameters of these timberings with regard for the aero-gas-dynamic factors.

Three illustrations, two bibliographic entries.

UDC 622.063.46:622.272.413/417:622.285

Selection of Technological Plan of Filling with Use of Mechanized Timbering, Kolokolov, O. V.; and Kuz'menko, A. M., pp 149-158.

Factors are examined which influence the operation of mechanized timbering when the lateral rocks collapse and a method is substantiated for controlling mining pressure with the use of pneumatic-cylinder mechanized timbering.

One illustration, one table, three bibliographic entries.

UDC 622.831.325.622.063.46:622.232

Study of the Effect of Stoping Operations with Combine Extraction on Intensely-Deformed State of Near-Face Section of Coal Bed, Zorin, A. N.; Kashtanov, A. I.; Svetlichnyy, V. N.; and Tuchin, V. A., pp 158-162.

Results are presented of experimental data for measuring the amount of deformation of coal mass during combine extraction. A study is made of the dynamics of change in the state of the coal bed in the near-face section when the stoping face approaches it.

Three illustrations.

UDC 622.831.24

Certain Practical Solutions of Controlling the Parameters of Manifestation of Mining Pressure, Shapoval, N. A., pp 162-167.

The possibility is established of practical control of the parameters of development of mining pressure: the amount of displacement of the lateral rocks, stratification, load on the timbering , spacing of collapse of the roofing, amount of distance from the longwall face to the line of the cut, as well as the strain on the near-face section of the bed by using technology for controlling mining pressure in a regime of limiting roofing spans.

Two illustrations.

UDC 622.063.46-118:622.012.2

Preparation of Steep Beds on Ventilation Levels of Mines of the Central Region of the Donbass, Strizhiboroda, S. K., pp 167-170.

This article indicates the basic advantages of preparing extraction sections with the making of minus ventilation drifts on 45 sections of 11 mines of the central region of the Donbass. An expedient trend in reconstructing mining is simultaneous preparation of series of beds on a minus ventilation level.

One illustration, one table.

UDC 622.063.46:622.83:622.285

Question of Timberwork and Control of Mining Pressure in Automated Coal Extraction, Orlov, A. V., pp 170-174.

Complication of mining-geological conditions because of the transition of work to deep levels is noted. The need for developing and creating effective means of timbering and controlling mining pressure is indicated. A basic technological plan is suggested for extracting coal by coal saws with timbering of the stoping face and control of mining pressure by liquid.

One illustration, seven bibliographic entries.

UDC 622.063.46:622.83

Possibility of Controlling Condition of Near-Face Part of Coal Bed in Automated Coal Extraction, Ivanov, V. S., pp 174-177.

This work examines questions of controlling the condition of the near-face section of the coal bed by changing the parameters of the technological processes associated with intensity of extraction work.

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CSO: 1822/104 END