which using the new for the reactor technology approach to substantiation of safe exploitation period for pipes from tenacous materials "Leak before failure" determined exploitaion conditions and permissible number of thermal cycles for pipes loading (start-up and shut-down of reactor) whcih is equal to 200. This number of cycles is enough for reactor work till 2000 year; but incidentally a new kind of the checking (dropwise leak) along all welds of Al pipes and technique suitable for this checking appeared.

All obtained permissions ordered an annual comparative control of metal structures state with prolongation amount of use.

Combined GAN commission that worked at the reactor from September 25 to October 3 may force everybody to become agitated but to their honour worked objectively and without any quibbles. The number of essential comments was made but total conclusion was positive. One of such comments was the state of reactor physical protection which satisfies to not all international and federal demands of nuclear dangerous objects protection. What is why at present time at the reactor the demands to control-pass regime are made more rigid and additional lines of defence as the fence from concrit signalization and another means which decreased the probability of non sanction penetration and influence on protected object are built. Of course, all this cause a number of the additional difficulties and inconveniences for reactor personnel but this is time dictates and we can reconcile ourself to that situation.

On the strength of the work carried out the results of reactor checking by GAN commission and the conclusions presented by specialized organization owing to results of reactor equipment and its systems investigations and testing GAN passport for WWR-M reactor was reregisrated on two year period and it was gave a permission for its operation. Materials for application on receiving of temporary permission are supplemented and in February 1996 it will be again sent to GAN.

Financial problems of the reactor are yet not solved.

THE PIK REACTOR

K. A. Konoplev

The foundation of the Petersburg Nuclear Physics Institute in 1971 year concided in time with understanding by the scientific community the necessity of construction the high neutron flux research reactor and for our credit of construction such reactor exactly in Gatchina. There were more a dozen of the research reactors in the USSR at that time where the experiments on neutron beams were carrying out or could be carried out. In fact the real experimental research in fundamental physics were carried out only in some centers as ITEP, JINR, IAE and of couse, in Gatchina and results obtained in Gatchina looked as very essential. It is possible to speak about importance of Gatchina results very confidently as every two years the comparisons and analysies of obtained results were holded at the advisory meeting headed by academician A.P. Alexandrov.

For the time of PNPI foundation the main fundamental issues of the PIK reactor construction were solved. The question of the discussing were, apart from choosing of the reactor name, the type of the reactor, its power and obtaining the permission of the USSR Government for the reactor construction in Gatchina. It should be mentioned that the choice of the reactor type as a reactor with active core cooling by light water placed in the heavy

water reflector was carried after careful consideration of physical and technological aspects but with some doubt as a such type of reactors did not exist at that time. However really a such type of reactor proved to be the most reasonable for the beam research reactors and practically the all up-to-date projects, as realised (ORPHEE) as are in progress (FRR2, ANS, reconstructed HFIR) concern to the same type. This circumstance enable the our project did not become obsolete by nowadays but the main reason was the absence of the beam reactor with a neutron flux about 10^{15} n/cm^2·s in Russia.

The principal question is a principal but a practical realization of the project was restricted by his large scale for the Academy of Science of the USSR and the last did not make up its mind to advance a proposal for the Council of Ministers. The foundation of independend institute supposed will be connected with including of the construction in the five-year plan of 1971 ÷ 1975 years but nothing happend except discussion and only the firm position of Professor O.I.Sumbaev, the director of the institute at that time, allowed to include the construction in the next five-year plan. Before the Chernoble tragedy it was a success to build a reactor building and reactor itself, to buy and adjust the heat exchangers, pumps, piping, power supply systems and to start the assembling of the control panel area. The Chernobyl tragedy forced the institute reactor specialists,regulatory Authority and designers strongly change the attitude to problems of safety. The technical difficulties of changing of the project and waves of society oppinion pressure against the atomic energy seemed led to conservation of the project but discovery of the high temperature superconductivity and firm support of the researches by the Heard of the Council of Ministers N.I. Ryzkov, firm activity of director of the institute prof. A.A.Vorobyev gave new pulse of energy and finance for construction. It was a time for seaching safety system improving and scrutiny analyse of the reactor system behavior in different cases including of such events as earthquake force up to six point and explosion inside and outside of reactor. The reactor construction was stopped and in contrary in the two upper floors equipment was dismounted for creation of the safety containment. Nevertheless the constuction was not stopped. The all things that did not influence on the safety and in first term the construction of laboratories were continued. The full completing of design and may be the most difficult part of designing - the approval of the project in the Regulation authority was completed only in 1993 year and cost of the project doubled. It should be mentioned that in 1991 year the all technical solution was approved by the all authorities except the Ecological Committee which demanded the consideration of the reactor influence on the environment including social,medical and many other aspects.

The end of 1995 year we met again with a completing a reactor building but already with a reinforced concrete shielding containment at that time. The last concrete piece was laid in the containment by october 1995. The tremendous work restricted another one was completed. It became possible from that time to continue the rooms decoration, staying some time without roofs, and assembling.

The reactor and reflector was not changed but emerged the nessesarity of buying an additional pumps, tube lines, metal constructions and many other things. The dismounted instrumentation system will not be recreated as it will be designed on base of up-to date achivements of computer technology.

At the time being the finance is a main point determins the progress in construction. The cost of construction is approximatly 150 billion rubles. During the last years the institute obtained no more than 10% of required sum. Our attempts to get support from abroad was

not succeed as a creation of such facilities is a national priority and if such object is to be created every country prefer to create it in own country.

The main hopes in completing of the construction are an our government,support of interested scientists and our persistence.

CALCULATION OF PIK REACTOR PERMISSIBLE POWER BY A STATISTICAL TECHNIQUE

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Introduction

Probability technique of reactor limiting - permissible power calculation proposes determination of stationary power, at which the heat technology emergency probability is equal to prescribed value. Under heat engineering emergency is understood the event, concluded in excess by determining heat engineering parameter of limiting value established for it. If the value A is limiting value for determining heat engineering parameter a, then probability of event, at which the determining function $F = A - a$ will have negative value is heat engineering emergency probability [1,2]. In general case the determining function depends on reactor power and on many values, possessing statistical nature, and, if their statistical characteristics are known, basically, it is possible to determine probability distribution of determining function for given reactor power and to determine heat engineering emergency probability. At given emergency probability it is possible to select of power value, at which given condition is satisfied.

In given work the brief description of PIK reactor limiting - permissible power technique calculation by Monte-Carlo technique, developed by authors, is indicated, some questions of heat engineering emergency probability and determining factor choice are discussed and some results of calculations are presented.

Technique of Calculation

We shall propose, that the determining function, responsible for safety of reactor operation, is known function of reactor power and many statistically independent values x_i such as enters reactor regims parameters, geometrical characteristics of fuels and the core, as well as variate factors, connected with reactor features, accuracy of measurement and maintenance regims parameters and errors of the settlement formulas. We allow also, that for each value x_i normalized function of probability density, i.e. law it probability distribution is known. To set any value of reactor power, it is possible to make variate sample of parameters x_i by computer according to the laws of their probability distribution, and, using of value of these parameters, to calculate value of determining function. To make such calculation a plenty time, it can be considered quantity of negative values of determining function and to determine value of reactor heat engineering emergency probability for prescribed value of reactor power.

$$R = n/N \tag{1}$$