tion damage to reactor shells when special annealing is applied to them to revive the cold-resistance of ferrite-pearlitic steels.

Issues of radiation cold-brittleness, as one of the most important factors determining the operability and reliability of structural materials, are of great importance in the case of emergency shutdown of the reactor. In this case, as a result of a sharp drop in temperature, the cold-brittle fracture threshold transition occurs and metal failure can occur without much work - the metal becomes unreliable.

The present work is devoted to the issues of creating specially protected underground nuclear power plants, as well as the improvement of structural materials, types of reactors, the prolongation of the operating life of the PPU, and the removal of the radiation impact on the population and the environment.

REFERENCES:

1. Bomko VA, Karnaukhov IM, Lapshin VI The power amplifier is the basis of the atomic energy of the 21st century: a review. Kharkov: Preprint NSC KIPT, 2001.-50 p.
2. Muratov O.E. Underground nuclear thermal power stations of increased safety // Energy: Economics, Technology, Ecology, 2002, N11, p. 9-14.
3. Balandin Yu.F., Gorynin IV, Zvezdin Yu.I. Structural materials of nuclear power plants. Moscow: Energoatomizdat, 1984. - 280 p.

REAGENTLESS METHODS OF WATER TREATMENT AT TPPS AND NUCLEAR POWER PLANTS

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The main share in the generation of electricity in Russia comes from steam turbine power plants that use organic fuel (coal, gas, fuel oil), and nuclear power plants that use nuclear fuel. At the same time, the most developed coolant for Thermal Power Plants and Nuclear Power Plants is natural water from surface or underground water sources, which are subject to the following requirements:

1. Low corrosive aggressiveness.
2. High heat capacity and thermal conductivity.
3. Low viscosity.
4. Small cross section for the capture of thermal neutrons.
5. Chemical, temperature and radiation resistance.
6. Poor activation.
7. Non-combustibility, non-toxicity, explosion safety.
8. Low cost.

Disadvantages of water as a coolant are as follows:

1. High cross section for the capture of thermal neutrons.
2. Radiolysis - decomposition under the influence of ionizing radiation.

3. Relatively high activation.
4. Corrosion aggressiveness.
5. Low boiling point.

Advantages of natural water as a coolant include:

1. Cheapness and prevalence in nature.
2. Low viscosity.
3. High heat capacity.
4. Relative simplicity and mastery of cooking.
5. Non-combustibility, non-toxicity, explosion safety.
6. Good heat transfer properties.

Natural water contains various impurities in its composition. For this reason, it can not be used for energy purposes without prior chemical treatment. Chemically treated water in power engineering is required for various purposes: filling and feeding the circuits of nuclear power plants, for steam boilers, evaporators, steam converters and so on. Traditional water treatment schemes consist, as a rule, of two independent and sufficiently isolated stages. This is due to the fact that natural waters contain in their composition impurities removed at different stages and classified according to their degree of dispersion into:

1. coarsely dispersed impurities;
2. colloid-dispersed impurities;
3. ion-dispersed impurities.

In connection with the different degrees of dispersion of water impurities, water treatment methods are conventionally divided into preliminary and final.

In the first stage of treatment, called pre-cleaning, coarse-dispersed and colloidal impurities are removed from the water. Removal of coarse impurities is achieved by sedimentation. In this case coarse impurities are precipitated and the water is filtered on clarifying (mechanical) filters. Flotation methods also apply to methods for removing coarse impurities.

To purify water from colloidal impurities, volumetric coagulation, reverse osmosis, electrophoresis, water clarification in hydro- and multicyclones are used.

To the precipitation reagent methods of water pre-treatment belong liming, soda lime, magnesian de-silification.

Colloidal-dispersed impurities are discharged from water by organizing a special reagent coagulation process. With coagulation, other positive effects are also achieved - reduced alkalinity and deferrization (since chemical reagents are introduced into the treated water).

The second stage of water treatment is final. At this stage, true dissolved impurities are removed from the water either by softening methods (removal of stiffness cations) or by demineralization methods (removal of cations and anions, including silicic acid) by filtering water through ion-exchange resins (ion exchangers) or by thermal distillation or joint technologies - thermal desalination with post-treatment on ion exchangers. At the final stages of purification, membrane-based (non-reagent) water purification methods combined with ion exchange are also used. The water is degassed, i.e. deaeration and decarbonisation occur.

Membrane water treatment - advanced water treatment technologies are reverse osmosis, nanofiltration, ultrafiltration, microfiltration of water that every year intensively supplant obsolete traditional water treatment technologies and filters.

Membrane water treatment plants are a product of high technologies, based on natural process of water filtration. The main filter element of such an installation is a semipermeable membrane (cartridge). This membrane has a porous structure.

Under the influence of external pressure, the initial water, squeezed through the pores of the membrane, is divided into two streams: filtrate (purified water) and concentrate (concentrated solution of impurities). The filtrate is supplied to the consumer, and the concentrate is drained into the drain. The nature of the delayed impurities depends on the size of the membrane pore. Impurities, the size of which exceeds the membrane pore size, can not physically penetrate the membrane.

Membrane methods of water purification are classified by the membrane pore size in the following sequence:

- Microfiltration of water (membrane pore size 0.1 - 1.0 μm);
- ultrafiltration of water (membrane pore size 0.01 - 0.1 μm);
- nanofiltration of water (membrane pore size 0.001-0.01 μm);
- reverse osmosis (membrane pore size is about 0.0001 μm).

All complex schemes of water purification, regardless of the requirements for the quality of treated water, are made up of typical elements. Thus, in the first stage, if the quality of the treated water requires it, water clarification devices are used, in which coagulation is carried out together with liming, magnesia desulfuration and filtration through mechanical filters. For the softening of water in the second stage, cationization schemes are used-sodium cationization, hydrogen-cationization or sodium-hydrogen-cationization, hydrogen cationization with "hunger" regeneration of filters, etc. When desalinating water, cationization schemes are used in conjunction with anionizing schemes. The most varied combinations of these elements are the preparation of water of any required quality.

REFERENCES:

1. The main methods of water treatment for filling and replenishing the contours of TPPs and nuclear power plants: http://tesiaes.ru/?p=10098
2. Industrial and household membrane water purification.:,http://superfilter.ru/membranes.htm
3. Matveev A.S., Science.: http://portal.tpu.ru/SHARED/m/MATVEEV/science