ENERGY PRODUCTION AT NUCLEAR POWER PLANTS

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The thermal circuits of nuclear power plants depend on the type of reactor, the type of coolant, the composition of the equipment and can be single-, double-, and triple-circuit. In single-circuit schemes, steam is produced directly in the reactor. The resulting steam-water mixture is fed into a drum-separator, from where the separated saturated steam enters the steam turbine. The steam produced in the turbine condenses. Condensate is fed into the reactor by a circulation pump. The single-circuit scheme is the simplest in terms of design and is quite economical. However, the working body at the exit from the reactor becomes radioactive, which places increased requirements for biological protection and complicates the control and repair of the equipment. In two-circuit circuits, there are two independent circuits. The coolant circuit is the first; the contour of the working body is the second. The common equipment of both circuits is a steam generator. The coolant heated in the reactor enters the steam generator, where it gives its heat to the working body, and then returns to the reactor with the help of the main circulation pump. In the first circuit, there is a volume compensator that regulates pressure maintenance in the circuit when the temperature changes at a much higher level than in the second. The steam obtained in the steam generator is fed to the turbine, where it performs work. Then it condenses, and the condensate is fed to the steam generator by the feed pump. The presence of a steam generator complicates the installation and reduces its cost-effectiveness, but prevents the appearance of radioactivity in the second circuit. In the three-circuit scheme, liquid metals, for example, sodium, serve as heat carriers of the first circuit. Radioactive sodium of the first circuit from the reactor is sent to the heat exchanger, where it gives off the heat of the sodium of the intermediate circuit, and is returned to the reactor by a circulation pump. The pressure of sodium in the intermediate circuit is higher than in the first, to exclude radioactive sodium leaks. The sodium of the intermediate circuit gives heat in the steam generator to the working medium of the third circuit. The steam generated in the steam generator enters the turbine, performs work, condenses and is fed to the steam generator by the feed pump. The three-circuit scheme requires large costs, but ensures safe operation of the reactor.