NUCLEAR REACTOR PHYSICS COURSE FOR REACTOR OPERATORS

Background

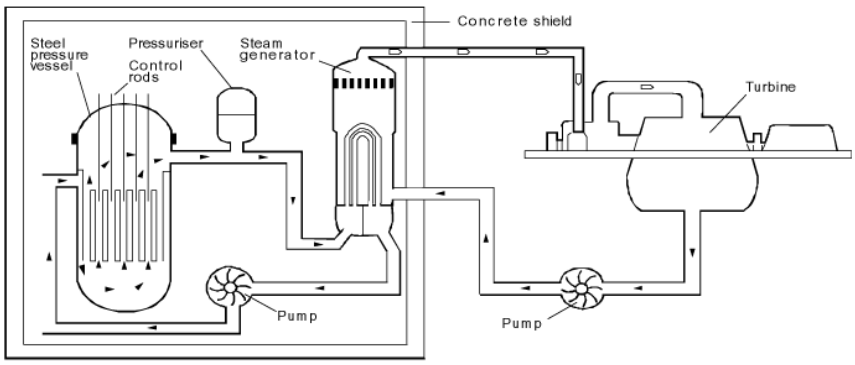
The education and training of nuclear reactor operators is important to guarantee the safe operation of present and future nuclear reactors. Therefore, a course on basic "Nuclear reactor physics" in the initial and continuous training of reactor operators has proven to be indispensable. In most countries, such training also results from the direct request from the safety authorities to assure the high level of competence of the staff in nuclear reactors.

Objectives

The aim of the basic course on *"Nuclear Reactor Physics for reactor operators"* is to provide the reactor operators with a basic understanding of the main concepts relevant to nuclear reactors. Seen the education level of the participants, mathematical derivations are simplified and reduced to a minimum, but not completely eliminated.

Course content

Depending on the request, two separate courses can be given. One being more focussed on the description of the reactor physics in stationary (critical) conditions, whereas the second course treats more the kinetic aspects of reactor operation.

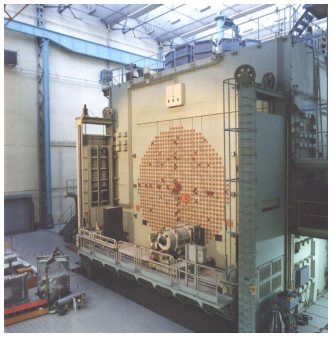


Schematic view of a PWR

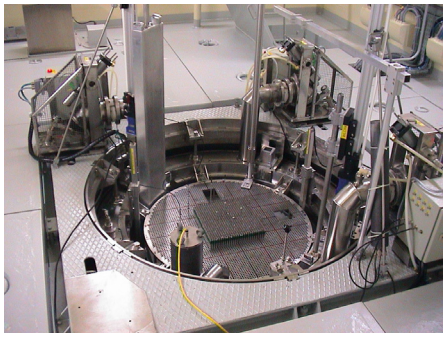
The one-day course on *"Nuclear Reactor Statics for reactor operators"* treats the following subjects: Concept of nuclear fission and energy production, Nuclear chain reaction, Fissile fuel and absorbers, Energy distribution of neutrons in the reactor, Simplified derivation of diffusion equations, Spatial power distribution in the reactor. The one-day course on *"Nuclear Reactor Kinetics for reactor operators"* treats the following subjects: The concept of prompt and delayed neutrons, Neutron multiplication constant, Simplified derivation of point kinetics, Kinetics and control of a nuclear reactor, Temperature feedback effects, Effect of poisoning by fission products on the reactor operation.

Optional laboratory sessions

In addition to the theoretical courses, lab sessions on the BR1 and VENUS research reactors at the SCK•CEN site can be followed covering the following topics: Subcritical approach, Control rod worth determination, Reactor kinetics analysis, Axial Buckling measurement, Prompt Jump analysis, Control rod calibration, Temperature coefficient measurement, Measurement of diffusion length and coefficient.



BR1 reactor



VENUS reactor

Relevant experience

At present, SCK•CEN organizes such a course for the reactor operators of the BR2-reactor (MTR) at the SCK•CEN site and for the reactor operators and operation team heads of the PWRs situated at the DOEL site (Belgium).

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