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FAST ALGORITHMS OF REACTOR KINETICS  
WITH FEEDBACKS

ABSTRACT - Experience gained in developing a digital reactivity meter for on-line determination of inserted and instantaneous reactivities, using the temperature feedbacks, showed the possibility of application of the same algorithms to more general problem of solving on-line the reactor kinetics equations with temperature feedbacks for a peaticular reactor type. Two basic principles are used for the purpose. The information is sought only as frequently as it is needed. For an operating reactor, within the class of expected transients, this means that slow sampling rates of the neutron flux of the order of 1 sample per second are sufficient. Thus, if an algorithm of sufficient accuracy is developed using the time steps of the same order, a very efficient computer program, suitable for process computer or even for the microcomputers which are a bit slower, can be realized and used on-line either as a part of the control system or as a part of the protective system in the predictive mode. Thus, the second principle that the integral methods are more suitable for developing approximate methods of solutions than the difference methods originating form the differential equations at medium and large time steps, is applied to the integral form of the kinetics equations with temperature feedbacks. The time sequence of solutions for the neutron flux is by this method reduced to simple recurrence formulas of low order.