BNL ALARA CENTER

Processes and Practices Related to Occupational Dose

ID: 44

REFUELING EQUIPMENT MODIFICATIONS

Keywords: REFUELING EQUIPMENT; OPERATIONAL AND MAINTENANCE TECHNIQUES; REFUELING STUD TENSIONERS; THREAD CLEANERS; REFUELING TOOLS; PLUGS; LIFTING RIGS; ELECTROPOLISHING

Description:

Refueling operations including vessel opening and closing, fuel shuffle, sipping, and inspection have averaged about 43 person-rem per outage on GE BWRs. These options also impact on critical-path time during refueling and therefore impact heavily on total plant costs. A number of hardware improvements are now available which have considerable value for both dose reduction and improvement in plant availability. These include semi-automated reactor pressure vessel stud tensioners; thread cleaners for reactor pressure vessel studs and nuts; improved refueling tools such as jet pump plugs, recirculation plugs, steam line plugs, internal lifting rigs, and other miscellaneous items; automated refueling machines; upgrades of existing refueling systems such as hoist load-sensing mast replacement, video indexing, automatic positioning, TV inspection systems, and frequency drive control systems; multi-strongbacks (a device for handling up to six local power range nomitors); electropolishing of refueling equipment; and fuel pool decontamination equipment. Backfitting of these refuelling improvements has proven beneficial at some plants. However, site specific cost-effectiveness evaluations should be performed.

References and Selected Abstracts:

1. Baum, J.W. and Matthews, G.R., "Compendium of Cost-Effectiveness Evaluations of Modifications for Dose Reduction at Nuclear Power Plants," NUREG/CR-4373. December 1985. (Available from National Technical Information Service, Springfield, VA 22161.)

ABSTRACT. This report is the result of research performed by the United States Nuclear Regulatory Commission, under NRC FIN A-3708, to identify potentially cost-effective methods of dose reduction at nuclear power plants, gather data on promising techniques, and evaluate their cost effectiveness.

Data for this report were gathered from published literature, visits to several U.S. nuclear power plants, information presented at recent technical meetings, and vendors of nuclear equipment and services.

Since each plant is unique in terms of radioactive contamination levels in systems, amount of shielding, equipment layout capital formation, organization, and various operational costs, it should be clear that the results presented here are illustrative only; i.e., plant-specific evaluations are needed to judge effectiveness at any specific site. Sample calculations have been provided to demonstrate cost-effectiveness evaluations methods and to facilitate plant-specific evaluations.

corresponding task of structural analysis usually consists of the following steps: (a) compilation of a specification covering design guidelines, load case, component charateristics, and acceptance ciriteria; (b) preliminary analysis with the help of simple models and former experience; (c) calculations base on suitable methods of dynamic analysis; and (d) structural evaluation and design review. Depending on the severity of base excitation, different theorectical methods can be used to predict the structural response of the refueling machine. While classical methods of linear structural dynamics may be adquate at low levels of excitation, nonlinear effects due to sliding or/and uplift, for example, can no longer be neglected at the high excitation loads currently being considered. Accordingly, several nonlinear dynamics analyses have been performed for refueling machine. The present work summarizes some of their major aspects.