BNL ALARA CENTER

Processes and Practices Related to Occupational Dose

ID: 66

SNUBBER REDUCTION

Keywords: SNUBBER; SEISMIC LOAD; DYNAMIC LOAD; SNUBBER REDUCTION; THERMAL STRESS FATIGUE; PIPE SUPPORT SYSTEM; SEISMIC LIMIT STOP; COMPONENT RELIABILITY; EQUIPMENT MODIFICATION; REPLACEMENT ALARA

Description:

Nuclear power plants coming on line since the late 1970s tend to have a large number of snubbers and struts on piping systems to provide protection against seismic and other dynamic loads. Considerable effort has been expended by industry to reexamine ASME code requirements, regulatory standards, and design practices for piping to identify those items that could lead to the identification and removal of unnecessary snubbers. Several industry studies have been conducted which provide a summary of efforts in snubber reduction. Criterion is recommended for snubber reduction which will minimize the total expected snubber-related costs of a plant, including economic radiation exposure, and safety.

References and Selected Abstracts:

1. Munson, D.P, Marianyi, J., Chexal, V.K, and Srinivasan, R., "Snubber Reduction for Enhanced Plant Reliability," Transactions of the American Nuclear Society, Vol. 52, pp. 599, June 15, 1986.

2. Bier, V.M., "Assessing the Costs, Risks, and Benefits of Snubber Reduction: A Comprehensive Framework: Interim Report," Report EPRI-NP-5854, p. 87, June 1988. (Available from Research Reports Center, Box 50490, Palo Alto, CA 94303.)

ABSTRACT: The objective of this work is to develop a decision model for balancing the completing concerns of seismic safety, thermal stress fatigue, and plant operating costs. This model takes into account information on the seismic margins of contemporary nuclear power plant piping systems as a basis for estimating the potential for snubber reduction.

3. Landers, D.F. and Pace, R.M., "Snubber Reduction Program," Report No. EPRI-NP-5184M, May 1987. (Available from Research Reports Center, Box 50490, Palo Alto, CA 94303.)

ABSTRACT: The report contains historical information leading to an understanding of why such a large number of snubbers are used in commercial nuclear power plants in the United States and outlines recent and anticipated criteria changes which can bring about a reduction in the number of snubbers. The report also describes the development of a data base which contains basic snubber data for many nuclear power plants. Current utility snubber-reduction programs, available snubber-reduction information, and examples from piping systems assembled specifically for this study are summarized. Anticipated changes to plant documentation which are a necessary part of a

snubber reduction program are described. Finally, recommendations are made to keep the data base and the procedures current with industry practice.

4. Leung, J.S.M, Anderson, P.H. and McLean, J.L., "A Simplified Piping Support System with Seismic Limit Stops," Report EPRI-NP-6442, July 1989. (Available from Research Reports Center, Box 50490, Palo Alto, CA 94303.)

ABSTRACT: An innovative method has been developed for providing seismic support to nuclear power plant piping. The method, called the Simplified Pipe Support System (SPSS), is based on the concept of permitting free thermal expansion but limiting seismic displacement through the use of pipe support stops with large clearances (Seismic Stops). These Seismic Stops are simple passive supports and are intended to replace the active snubbers that are currently used through the nuclear industry.

The development program reported here consisted of establishing a practical analytical method for determining the global nonlinear impact response; characterizating the local impact behavior; evaluating its applicability to current ASME Code criteria; demonstrating the concept through full-scale shake table testing; and lastly; verificating analysis methods by comparison to test data and to analyses of actual piping systems.

The simplified analytical methodologies were incorporated into computer programs RLCA-GAP and SHELL, which lead to solutions of global and local impact responses, respectively. Results of the demonstration testing and correlations of SPSS with finite element analysis results have clearly established the feasibility and benefits of applying the Seismic Stop supports to nuclear power piping. The simplificity of SPSS designs significantly reduces the cost of nuclear piping via lower hardware costs and lower maintenance requirements. The passive characteristic provides inherent improvement in system reliability. Personnel safety is also enhanced by eliminating the operating inspection and testing now required for snubbers.