NOLTR 63-134

THE USE OF A KNOCK-OFF TUBE AS A QUICK PRESSURE-RELEASE MECHANISM

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ABSTRACT: The reactor-vessel containment work currently being conducted at the Naval Ordnance Laboratory is dependent largely upon ability to monitor the internal pressure-time histories of dynamically loaded model reactor vessels. These histories are determined through the use of tourmaline piezoelectric gages mounted on the internal walls of the vessel. The need for a calibration system that will accurately relate the output of the piezoelectric gages to known pressures is manifest. Inherent to a piezoelectric gage calibration system is a quick pressure-release mechanism that can release the pressure of a confined fluid very rapidly. The rapid release will produce transient loadings on the gages of the same order of magnitude as those obtained in the model reactor vessels.

This report presents an analysis of the use of a knock-off tube as a quick pressure-release mechanism. An equation relating the pressure-release time to the initial conditions of the calibration system has been derived and verified, within certain limitations, for select choices of the initial conditions that are compatible with requirements of the NOL Reactor-Vessel Containment Program (NOL-285).

A method for selecting a safe, workable knock-off tube that will give a required pressure-release time is presented, followed by a brief discussion of a universal knock-off tube for use in this Program.

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The work of this program was carried out under Task NOL-285, NOL Reactor-Vessel Containment Program, and completed in August 1963. An objective of the Task is to determine the elastic and plastic response of idealized model reactor vessels to internal simulated excursion loading as a function of vessel material, size, configuration, and constraint. The magnitude and time duration of the simulated excursion loading is monitored via tourmaline piezoelectric pressure gages. The report presents a study of the utility of a knock-off tube as a quick pressure-release mechanism for a hydraulic piezo-electric gage calibration system. This material was submitted in fulfillment of the thesis requirements for the M.S. degree in Mechanical Engineering at the University of Maryland.

The mention of names of proprietary products in this report constitutes neither an endorsement nor criticism of these products by the United States Government or by the Naval Ordnance Laboratory.

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