Name : Sinchai Chinvorarat

Thesis Title : Stress Analysis of a Y-Branch Pipe Due To Waterhammer by The Finite Element Method

Thesis Advisors : Assist.Prof.Dr.Bundit Fungthammasan , Dr. Siripong Hungspreug , Assoc.Prof.Dr.Thanu Chouychai

Academic Year : 1991

Abstract

The objective of this study is to analyse waterhammer effects caused by the closure of a valve downstream of a Y-branch pipe in a large water supply system for irrigation and power generation. Governing equations for the flow around the Y-branch are developed and the resulting partial differential wave equations for waterhammer are solved by the method of characteristics. The maximum pipe-centerline static pressure obtained is used as a boundary condition for a Finite element analysis of the stress distribution in the Y-branch pipe . The distortion energy theory and the Soderberg's criterion are used to check the loading ability of the system.

A case study is performed by using a computer program specifically developed for waterhammer analysis and a commercial software package called "GTSTRUDL" for the finite element analysis . It is found that for a pipe system consisting 3-m-dia. pipes of 1-cm thickness and 1,000 m in length , a critical case is predicted if both of the downstream valves from the junction are closed concurrently in 4 minutes . The maximum head is predicted at 68 metre

and the fluctuation persists for more than 10 minutes . The pipe system is able to withstand the maximum pressure which is located at the junction.