

Sloshing of Cylindrical Tank due to Seismic Acceleration

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Abstract: *Cylindrical tanks are subjected to the seismic loads in certain countries, for example in Japan. The sloshing of these tanks is very important to consider the integrity of the containers. This phenomenon, however, is an interaction of structure and the fluid, namely oil, and is difficult to be analyzed using computer simulation codes. Owing to the FSI capability of Abaqus and Fluent via MpCCI, the phenomenon has been within the range of simulation. Authors tried to analyze the sloshing using the real seismic acceleration at Hachinohe earthquake in Japan and report the result.*

Keywords: *Fluid-Structural Interaction, FSI, Sloshing, cylindrical tank, earthquake, MpCCI*

1. Introduction

In Japan there are a lot of earthquakes in a year, and may be a disaster with remarkable damages in every 2 or 3 years. Accordingly, any plants of refinery, petrochemical, chemical and so on in Japan are designed and constructed to endure these seismic loads. In these plants, as the equipment called “pressure vessels” are usually operated under high pressure and high temperature, their designs are determined to have sufficient integrity for these operating loads rather than for the seismic loads, except in their supporting parts. On the other hand, cylindrical tanks containing oil, especially crude oil, are usually operated under atmospheric pressure and temperature, and the integrity is determined by the seismic loads. This design allows thin wall thickness, and the interaction with the contained fluid may be more easily to occur. In the event of earthquake, the interior liquid may slosh resulting in the damage of the wall or roof of the cylindrical tank, or resulting in the spilling of the fluid which may cause a disastrous fire.