~~abstract~~Abstract

This study introduces a method based on real-coded genetic algorithm for designing an elliptical shaped fuel tank~~ shape~~. This method enhances the advantage of the system such as roll stability, and reduces disadvantages like fluid c.g. height and overturning moment. The results are optimized elliptical tanks ~~in~~ with different filling conditions. ~~Effects~~ The effects of these optimized shapes on natural sloshing frequency are investigated, and two experimental and theoretical approaches are compared with each other. Shape ~~optimizing~~ optimization is based on ~~a~~ conventional numerical analysi~~ngs conventionally, .~~ ~~this~~ This ~~paper~~ article presents a new method based on ~~GA which~~GA, which enhances tank rollover threshold. This optimization enhances roll stability, although ~~reduces~~ reducing the natural sloshing frequency in comparison to cylindrical tanks. In contrast, the sloshing frequency of the optimized elliptical tank ~~enhances~~ is enhanced compared with conventional elliptical ~~tanks which~~tanks, which is considered an advantage~~a suitable feature.~~

Introduction

Generally, Rollover accidents are one of the most common types of accident that occur in commercial vehicles carrying fluid~~, generally~~. Since most of the ~~time~~time, these tankers carry~~ing~~ dangerous liquids ~~contents of the liquid~~ such as ammonia, gasoline, and fuel oils, therefore stability of ~~partially-filled~~partially filled liquid cargo vehicles are ~~so~~ of great ~~importan~~importance~~t~~ [1]. Sloshing is a fluid oscillation phenomenon caused by the tank motion. Fluid oscillation depends on the tank geometry, filling conditions, and frequency range inside the tanker [2, 3]. Sloshing frequency and magnitude of sloshing forces are also ~~depends~~ dependent on these parameters [4]. ~~The stable application~~Stability is one of the most important points in design of vehicles used for carrying and storing objects and substances. If the sloshing frequency is close enough to the structural natural frequency, resonance will ~~happens~~ occur [5]. Non-linear dynamic response of a system subjected to harmonic external force, have been studied by interacting lowest fluid sloshing mode with the various modes of structure. Internal resonance and combined resonance profile ~~is~~ are presented as results [6-7]. Nakagawa and Ikeda ~~have been~~ studied theoretically and experimentally non-linear vibrations of a two-dimensional rectangular structure and water sloshing~~, theoretically and experimentally~~ [8]. Aliabadi et al. ~~have done~~conducted a comparison between the numerical analysis, fluid mechanics, and mechanical models. Navier-Stokes equations ~~have been~~were solved ~~by~~ via finite element method to measure accuracy of pendulum model under constant lateral acceleration. Based on these results, both methods ~~approve~~ validate each other under low fuel tank filling. The difference between ranges of frequencies in these two methods is considerable when there is a large amount of fuel in the tank. Mechanical models such as roll plane model have been developed as an alternative approach to the study of fluid sloshing [9]. The mass~~-~~-~~spring damper~~spring damper system and pendulum systems are determined by center of gravity, resulting force and torque, frequency of oscillation, and mass and inertia characteristics of the mechanical system, which is equal to tank fluid slosh [10]. The roll stability of a partially filled vehicle is influenced by both the c.g. height and the magnitude of lateral load transfer. ~~Different~~ A different ~~cross~~ cross-section has been ~~analysed~~ analyzed for optimizing roll stability. The circular cross section ~~have~~ has a high center of mass ~~location~~

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