The study of the HRAM effect in the liquid tank with various speeds

The hydrodynamic ram (HRAM) can be considered one of the most destructive phenomena in fluid reservoirs. In this event, with the penetration of the high velocity projectile into the tank, part of the kinetic energy of the object is transferred to the reservoir and as a result, very tensile stress enters to the body. Also, by creating this event, the pressure of the fluid in the reservoir increases up to several hundred times of the pressure of the atmosphere and the fuel in the tank is sprayed out of the reservoir. This can increase the risk of extreme fire and cause a lot of damage. Also, by creating a quasi-spherical compression wave and reflecting it in the fluid in the reservoir, a powerful compressive pulse is caused in the fluid. Therefore, reservoirs exposed to high-speed fliners should be optimized to reduce the effects of this phenomenon. For the present work, the commercial finite element code AUTODYN has been used to simulate HRAM effects in a mobile fluid tank with different speeds and parameters such as the history of projectile velocity changes in the tank at different speeds and changes in fluid pressure near the entrance point of the flinders. In the studies, it was found that by increasing the velocity of the projectile, the drag coefficient of fluid and the fluid pressure enhances and more force is introduced into the structure.

Keywords: hydrodynamic ram, projectile, reservoir