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EXPLOSION AND FIRE RISK ASSESSMENT IN SPACE LAUNCH PAD COMPLEX

Abstract

As confirmed by the Falcon 9 incident that occurred on September 1, 2016, the second damage was caused by the transition to a large fire after the explosion. If a launch vehicle explodes on a launch pad due to an unexpected accident, explosion over-pressure can cause damage to the launch pad ground equipment and results in personal injury. There is not only a fire caused by the explosion but also a large number of causes of fire and explosion in the operation and preparation of launch pad ground facilities. It is necessary to conduct an evaluation analysis on the possibility of fire and explosion through fire and explosion risk analysis, and to use it to suggest the escape time and route of workers in case of fire and to seek damage reduction measures. In this research, ground equipment modeling was performed to estimate and analyze explosion and fire scenarios. An explosive over-pressure analysis is studied by TNT equivalents method using FLACS-Blast and LS-DYNA were performed. Prediction of damage to buildings and ground equipment caused by explosions and safety radius studies were conducted. In the event of an accident, damage impact analysis and evaluation analysis using CFD were performed, and ground safety evaluation of fire safety and safety measures were established. Precise explosion over-pressure analysis using CFD can suggest safety radius and predict ground damage. It is possible to secure safety by estimating the failure time for the initial response of the fire extinguishing system by estimating the failure time of another dangerous object exposed to the fire. It is possible to establish a plan to secure the safety of the most basic human life and is expected to contribute greatly to the safety improvement of the launch pad ground facilities.