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OPTIMAL DESIGN OF AN AIRBAG SYSTEM AS A CAPSULE DECELERATOR FOR LOW GRAVITY EXPERIMENT IN KOREA DROP TOWER

Abstract

A drop test facility was constructed at Green Tower in Asan, Korea, which was established to vent combustion gas from household waste incinerators. The drop capsule for low-gravity environment testing is 200 to 300 kg, with a maximum experimental height of 110 m, which can simulate low-gravity of approximately 4.2 s. An airbag was used to minimize the impact force applied when the capsule touches the floor of the facility. The airbag system reduces the primary impact force of the capsule by the pressure dispersion of the airbag, and reduces the secondary dynamic load by emitting internal gas to delay the deceleration time of the capsule. In this paper, a dynamic model for the airbag system was created to minimize the impact force applied to the bottom of the test facility by dropping capsules, and to minimize the weight of the airbag system. The airbag system was optimized with the weight of the capsule (200–300 kg), the diameter of the airbag (2–8 m), and the diameter of the internal gas exhaust pipe (0.2–0.8 m) as variables. LS-DYNA analysis program were used for cross-checking. The developed dynamic model did not match the LYNDA analysis results with the initial collision process, but the deceleration process of the capsule was well matched. The design results were verified through a drop test.