Engineering a Superior Bumper Reinforcement System with a Piezoelectric Force Sensor in High Energy Collisions

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In this experiment an actual automotive bumper was tested against another vehicle bumper and the impact with and without interventions measured by a PCB Piezotronics 208C03 Force Sensor. A 2.5 meter drop tower was constructed and a 100 kilogram concrete slab was attached to another automotive bumper to create an impact bumper. Collisions were replicated from a vertical free drop from consistent heights. The interventions included a D3O Recoil pad, an Airtech Recoil pad, a customized Compression spring shock device, Stacked Styrofoam, Stacked Bubble Cushion wrap, and the Original Bumper Covers. This project was designed to develop a series of prototypes to further investigate. A decrease in peak impact energy was found with most interventions. Currently, there are not any shock absorbing areas before impact on the vehicle frame, so an up armored bumper may help prevent severe damage to the frame of the car. Ultimately, the goal of this experiment is to demonstrate interventions that would help lower the amount of significant damage to the vehicle and with further development, possibly help reduce injuries or save lives