Using Dimple Technology to Optimise the Aerodynamics of Heavy Motor Vehicles

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Fuel efficiency and consumption is the most important economic and ecological factor in the transport industry. This study investigates how golf-ball style dents applied on certain areas of a heavy motor vehicle's bodywork can be used to decrease the aerodynamic drag. A Heavy vehicle scaled model was dented on several positions and tested in five wind-tunnel experiments. Validity was ensured by using an anemometer and a honeycomb straw-grid. Accuracy was ensured by properly sealing the wind tunnel and reliability by repeating it 5 times. Simulations were performed on the SolidWorks 2017 program. A normal truck (according to exact real dimensions) was used as a control with a dented and non-dented surface. It was modified and six different trucks were tested. Different variables (frictional force, velocity and pressure) and dent positions were tested at a constant speed of 80km/h. To ensure reliability 86 tests were done. According to wind-tunnel experiments the most successful dent position (1.3m/s) was on the fenders. From simulations, the ultimate design was determined to be by spoiler and rounded hind of the truck both with dents atop. The pressure (100949Pa), air velocity & wake behind the truck is also greatly reduced and also shows a smoother airflow over the truck. Wind-tunnel experiments clearly indicate a reduction in drag. Simulations show that dented surfaces and a rounder design reduces aerodynamic drag. Therefore, heavy vehicles can travel the same distances with less fuel, saving the transport industry a lot of money.

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