# Taking Shark Skin for a Spin! Can Shark-Denticle-Inspired Vortex Generators Reduce Heavy Vehicle Fuel Consumption?

Rofail, Lily (School: Presbyterian Ladies' College, Sydney)

The high fuel consumption rates of heavy combination trucks are unsustainable and damaging to the environment. When travelling at the recommended speed on interstate highways, most of a truck's fuel consumption is used to overcome drag. In a similar, but different medium, sharks have denticle adaptations that use vortex generation to reduce drag in water. The author tested her hypothesis that shark denticle-inspired vortex generators (SDIVG) can be used on truck and trailer bodies to reduce drag. A model truck was tested under seven different aerodynamic conditions in a boundary layer wind tunnel at 0° and 10° yaw angles. The SDIVG significantly reduced the drag coefficient when used alone by 2.1% and 2.5% (p-value <0.01)and by an extra 3.5% and 2.0%(p-value <0.01) when added to other modifications on the model truck at 0° and 10° yaw angles respectively. Moreover, using the combination of SDIVG on the boat tail of a truck fitted with a cab roof deflector reduced overall drag by 27.6% and 28.0% (p-value <0.01) at 0° and 10° yaw angles respectively. The application of SDIVG to existing drag reduction strategies would result in billions of litres of fuel saved per year, reducing costs and importantly, reducing the environmental impact of heavy combination trucks. Further, it will facilitate the efforts toward zero carbon, as the reduction in drag or optimisation of truck aerodynamics will make the implementation of alternative sources of fuel (electric or hydrogen) more feasible.

**Awards Won:**