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## RECYCLED COMPOSITE USAGE FOR RACE-CAR WING PRODUCTION: EFFECT OF THE SURFACE ROUGHNESS ON AERODYNAMICS

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### ***Introduction***

Wings are the critical parts for the race cars which determine the aerodynamic performance. The main objective of using the wings in a race car is to increase the downforce while running the car at high speeds. The wings used in formula student race cars are generally produced from the sandwich structured composite materials which are mainly composed of a foam core wrapped up with carbon reinforcement.

### ***Materials and methods***

The rear wing of the formula student car was produced with a novel composite material consisting recycled waste tire granules and epoxy (WTG-E). The recycled granules were soaked with epoxy resin and pressed in the mold. The produced wing was compared with the sandwich structured composite wing. The results showed that the new wing was heavier but the total cost the wing is almost halved. In order to understand the effect of the material change on the aerodynamics of the wing, the surface roughness of the both wings were determined experimentally and afterwards using the experimental results both wing were analysed with finite element method within the same boundary conditions.

### ***Results and conclusions***

The analyses revealed that the wing produced with (WTG-E) had lower aerodynamic efficiency than the sandwich wing. However, the loss of the performance is not significant considering the total cost of the wing and the environmental effect of the recycle. But, carbon is an extremely expensive material. With the addition of the resin cost which is mostly epoxies, the total cost of the wing is significantly high.

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