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Aerodynamic Design of a Locomotive Fairing CHAD STUCKI, DANIEL MAYNES, Brigham Young Univ - Provo — Rising fuel cost has motivated increased fuel efficiency of freight trains. At cruising speed, the largest contributing factor to the fuel consumption is the aerodynamic drag. As a result of air stagnation at the front of the train and substantial flow separation behind, the leading locomotive and trailing railcar experience greater drag than intermediate cars. This work introduces the design of streamlined nose fairings to be attached to freight locomotives as a means of reducing the leading locomotive drag. The aerodynamic performance of each fairing design is modeled using a commercial CFD software package. The K-epsilon turbulence model is used, and fluid properties are equivalent to atmospheric air at standard conditions. A selection of isolated screening studies are performed, and a multidimensional regression is used to predict optimal-performing fairing designs. Between screening studies, careful examination of the flow field is performed to inspire subsequent fairing designs. Results are presented for 250 different nose fairings. The best performing fairing geometry predicts a nominal drag reduction of 17% on the lead locomotive in a train set. This drag reduction is expected to result in nearly 1% fuel savings for the entire train.

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