On The Analysis of a Contact Friction Composite-To-Metal Joint

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 Contribution

We introduce a method to anchor fiber reinforced composites with a rectangular profile in a friction-type wedge. The challenge is to obtain sufficient pullout force without the use of crimping. A FEM model has been used to perform geometrical parameter analysis, resulting in an optimal wedge geometry. This anchoring system is applicable to any kind of FRP material and has been evaluated numerically and with actual pullout tests.

Model

The model consists of two aluminum wedges placed on each side of the FRP material. Initial external pressure is applied with the help of an outer case. Boundary conditions allow for the vertical displacement of the top wedge and the horizontal movement of the FRP strip. The tilt angle influences the pressure distribution in the Al/FRP interface. By optimizing the geometry it is possible to achieve as uniform as possible pressure distribution, while at the same time allowing the wedges to further slide and increase pullout force.

FE analysis

FE analysis has focused on investigating the effect of tilt angle, overlap length and response of the model. The resulting geometry dimensions have been used to analyze the pressure distribution in the interface during pullout.

References


Test Setup

A test rig is used for model validation. Several wedge configurations can be tested and compared compared to numerical results. Pre-clamping pressure and strain levels can be monitored during the test. Preliminary test results have achieved pullout values lower the ones estimated with the FE model.

Future Work

- Use experimental methods to evaluate assumed material properties.
- Match FE results and experimental ones.
- Expand to a 3D modell to check through thickness stresses.
- Use DIC to evaluate wedge displacement and stress in the FRP strips.
- Expand to fatigue testing.

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