Contribution ID: **229** Type: **Contributed Oral**

C2Or2B-01: Bio-LNG cooling of a high power density induction electromotor for electric aircraft propulsion

Tuesday 11 July 2023 11:00 (15 minutes)

A high power density induction electromotor operating in the temperature range of 113 K –120 K and utilizing the cryo-cooling capacity of bio-LNG fuel for thermal management is under development. Incorporating high current density Al conductor operating up to 120 K reduces its electrical resistance to 1/3 of room temperature and thereby increasing the motor's power density. In this paper we present FEM modeling of cooling effects of a turbulent 2-phase flowing liquid natural gas on the motor stators'coils. We modelled effects of various flow rates per slot combined with various energy loss levels on maximum temperature of the stator coils and fluids. Effects of number of cooling channels per slot have also been modelled. Typically maximum temperatures in the coils were around 140 K.

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Session Classification: C2Or2B: Aerospace Applications II: Aircraft