Turboelectric propulsion systems are considered as a critical enabler to low-carbon emission in aircraft industry. Unlike hybrid-electric and all-electric systems, these systems do not use batteries for propulsive energy during any phase of flight. Since batteries with high power capacity and specific power required for commercial aircraft are unlikely to be developed within the 30-year time frame, turboelectric systems are the only feasible option at this point of time. Out of several motors available for driving the distributed propeller fans, brushless doubly-fed reluctance machines (BDFRM) are seen as one of the more attractive ones, primarily because of use of partially rated power converter, brushless operation and low rotor losses. However, BDFRM suffers from low torque and power density due to its inherent structure of poor coupling between the two stator windings. A third stator winding, known as tertiary winding, can be introduced in the same stator slots to achieve better coupling by utilizing more harmonics. This presentation describes the brushless doubly fed machine with this additional stator winding, termed as brushless triply fed reluctance machine (BTFRM) and shows the enhancement in torque density as compared to a BDFRM.

A Trade Study On Motor Types For Large HVAC Systems With Integrated Motor-Compressors

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Typically, HVAC systems consume a significant amount of energy in both commercial and domestic buildings. The major part of energy consumed in a HVAC system lies in compressor motor, which usually is a high-speed motor. Efficiency of the motor and cost effectiveness of motor & drive system are two major factors deciding the motor type to be used in this application for compressor manufacturers. Again, the cost of the motor and VFD system is a factor decided by few inputs including motor material cost, mechanical integrity required in manufacturing, power factor and drive switching frequency. Since the HVAC motors are not continuously run at rated power, the integrated part load value (IPLV) is considered here instead of rated efficiency. This presentation discuss different trade-offs of using permanent magnet synchronous motor(PMSM), induction motor, switched reluctance motor and PM assisted synchronous reluctance motor for designing a 100kW, 16500rpm compressor motor to run in a hermetic refrigerant environment.