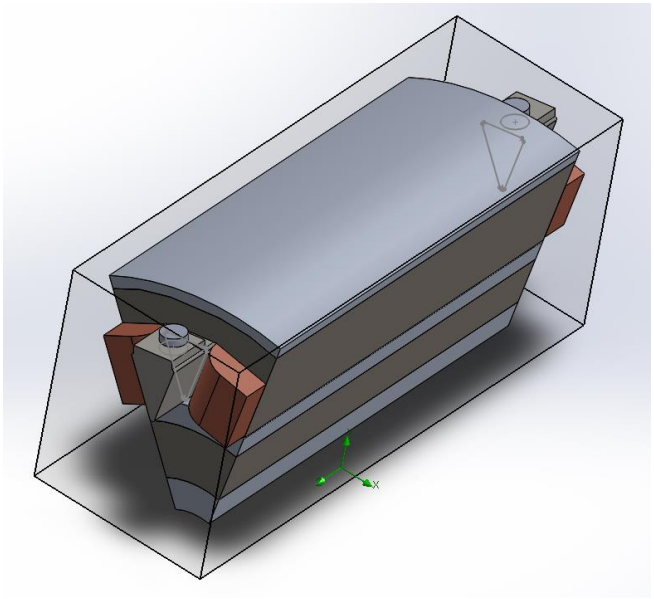
COOL-TIEd – COOLing Topologies for Integrated Electric drives

The concept developed is the identification of a cooling solution in which the power converter, the motor winding and core share the same thermal paths. The basic idea is the introduction of a novel cooling element at direct contact with the windings, the hottest element in the stator heat generation. The same element will cool stator winding and magnetic core but can be also the cooling plate for the needed power electronics. This solution improves the performance of the power conversion from Efficiency, Compactness and Compatibility point of views.

IPC Codes

H02N

H99Z



Keywords

- Cooling
- Integrated Drives
- Electric Traction System
- Electric Machines
- Tooling Machines
- EMC

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Technology Transfer and Industrial Liaisons Area

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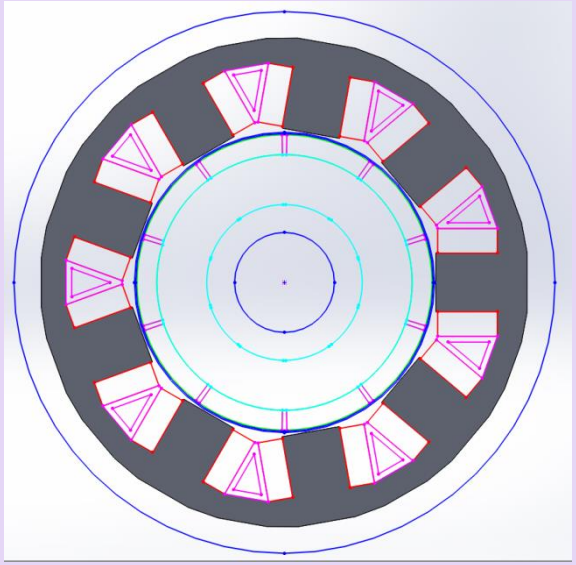


Description

This technology proposes a new cooling solution applicable to electric machines in general. The idea is to use the void space between coils, in a simpler motor design, applying a thermal conductive (and electrically insulated) material e.g. SiC.

The particular topology here proposed permits to apply the COOL-TIE optimizing the empty volumes of the electric machine, sharing its thermal capabilities among the power converter, the motor winding and the magnetic core. The COOL-TIE is designed caved in order to permit the circulation of the cooling thermal fluid vector.

The thermal fluid vector helps to absorb the energy from the intercepting plates and then transfers the greatest part of that heat to the water out of the electric machines.

This solution allows to improve the performance of the machine as well as its efficiency. Reducing the temperature, the machine is able to produce more power increasing the thermal dispersion and making coils able to work at lower temperatures.

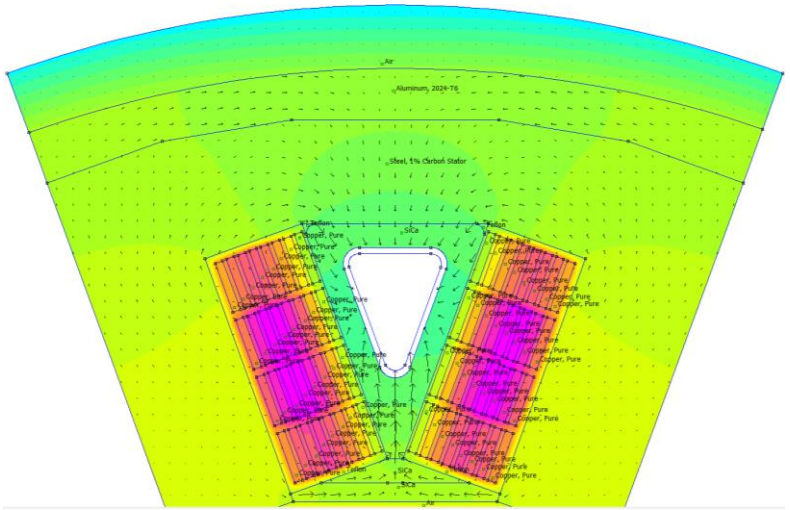
These novel elements also open to a realistic possibility to integrate the Power Electronics inside the electric machine. The COOL-TIE in fact is designed to host the PE as well.

Applications

- Traction drives
- High speed tooling drive
- Wind mills drives
- Compressor drives
- Integrated drive solutions

Advantages

- Higher heat exchange
- Simplified construction
- Integration capabilities
- Lower cost
- Lower EMC problems



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