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Manufacturing technologies for cost effective HTS coils and magnet systems

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High-temperature superconducting (HTS) coils and magnet systems are used in various applications today. Despite the great advantages they offer over conventional systems, their commercial success is yet pending. A major obstacle is a high price due to the cost of the HTS tape and the development effort needed to meet very specific requirements.

In various projects, we have developed techniques that open up possibilities for manufacturing magnet systems more cost-effectively. Central to this is accurate electromagnetic modelling and simulation to minimise the HTS tape requirement and allow cheaper lower-grade tape to be used in less demanding areas. We demonstrate how the cold bus can be integrated into large potted double pancake coils to optimise cooling conditions and avoid local hot spots. We have also developed processes for manufacturing non-insulated coils specifically for applications that require high resilience to multiple quenching events and high robustness against mechanical forces and shock.

By combining these techniques, we have developed solutions that significantly enhance the potential of THEVA HTS tapes for a wide range of applications from traditional industries such as aluminium forming, to exotic applications such as levitating magnets, to highly innovative technologies such as magnetic re-entry shields or ion engines for spacecraft.

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