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Cryogenics and superconductivity in high-tech industry

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Recent developments of high temperature superconductors (HTS) and cryogenic technologies make application of superconductivity in high tech industry attainable. Modern cryocoolers have enough cooling capacity for the application of ReBCO, which enables conduction-cooled vacuum systems to incorporate superconducting components. HTS tapes are available off-the-shelf from a variety of ReBCO tape manufacturers in lengths over 500m with predictable properties. The orders of magnitude increase in current density allowed by superconductivity enables several new applications, from motors and actuators to plasma containment in fusion, from MRI and NMR to high-voltage power transport.
Here we show the steps taken at VDL ETG to build knowledge and gain engineering experience with superconducting systems. We developed a conduction-cooled cryostat initially used to test different superconducting electromagnets. Based on the experience gained this culminated in a north-south magnet pair reaching 9.8T in the bore.
Building on this we are currently in the process of developing a linear actuator using a superconducting stator demonstrator. We'll discuss the lessons learned and challenges to overcome to finding superconducting applications in high-tech industry.

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