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Wed-Mo-Po3.12-04 [99]: Comparative Analysis of a Linear Electric Motor using Superconducting and Conventional Conductor Coil

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Regarding a linear motion and forces the linear electric motors have a number of advantages over ordinary motors, the most obviously the lack of an intermediate gearbox to convert rotational motion into straight line motion saves energy. Essentially linear electric motors with conventional conductor (copper) coils are designed to produce high force at low speeds and the demand for these devices has increased for many industrial applications due they are directly coupled to the machine load, saving space, simplifying machine design and removing potential sources such as balls-crew systems, belts, etc. Actually, numerous industrial applications require even greater strength forces in compact size machines, so it is of interest to analyze, explore the efficiency and sustainability of using superconducting coils for these linear electric motors (LEM). This work contributes in determining the performance evaluation and comparison between conventional and superconducting coils used in LEM, also contributes in determining the increase of strength forces of these devices while using superconductor coils instead of conventional conductive material such copper. The work highlights the techno-economic aspects of using superconductive materials in the LEM coil. Moreover, the work shows the design characteristics and the electromagnetic analysis performance with finite element simulations and the experimentation results are presented. A small prototype (100W) of LEM with tubular characteristic was designed and manufactured; of the same size and characteristics was manufactured the LEM with superconducting material, this to determine and compare its output forces in both motors. Such comparison is necessary to justify the use of superconducting material both technically and economically in the LEM.

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