Proposal of a Fully Superconducting Motor for Liquid Hydrogen Pump with MgB_2 Wire

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Abstract—The outline design of a fully superconducting motor for liquid hydrogen pump with a magnesium-diboride (MgB_2) superconducting wire is carried out to present various advantages arising from its prospective performances. The squirrel-cage rotor winding composed of superconducting loops with the MgB_2 wire enables us to operate the motor not only in a slip mode but also in a synchronous rotation mode, and consequently the rotor winding loss can be suppressed drastically. Furthermore, it would be expected that the stator winding loss becomes smaller by using the MgB_2 wire compared with familiar normal metals as typified by a copper. The time evolution of magnetic field distribution around the stator winding is obtained by means of a finite element analysis in order to estimate the AC loss and the primary circuit resistance.

Index Terms—Liquid hydrogen, magnesium diboride, super-conducting motor, transfer line.

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