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## **Development of design for large scale conductors and coils using MgB<sub>2</sub> for Superconducting Magnetic Energy Storage Device.**

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MgB<sub>2</sub> wires have been commercially available and developed its superconducting characteristics continuously in the last decade. This attracts researchers especially in the field of superconducting magnetic energy storage (SMES) coil applications in terms of its relatively high critical temperature, which enables us to use liquid hydrogen for cooling the coils. The MgB<sub>2</sub> wires are sensitive to bending strain like Nb<sub>3</sub>Sn both before/ after heat treatment to produce MgB<sub>2</sub> material inside the wires. Due to the sensitivity, to design the large scale conductors and coils for SMES system, the careful investigations of applied strains during manufacturing process are absolutely needed. Regarding the production technique for superconducting coils, the two methods are generally introduced, which are wind-and-react (W&R) and react-and-wind (R&W). The W&R method is that the conductor fabrication by which the wires are twisted with or without mandrel and coil winding process are performed before heat treatment, while the R&W method is that the coils are wound with heat-treated wires and conductors. The fabrication for large-scale conductors and coils have been reported by a few groups, however, the suitable design parameters such as conductor dimension, twist pitch, appropriate margin of bending strain, etc. for getting better performance of the device have not been cleared.

The aim of our investigation is to show the design parameters for conductor and coil fabrication with the strain below the acceptable level and demonstrate the validity of the design through the several tests using test coils cooled by refrigerator.

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