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Wed-Mo-Po.03-02: Real-Time Thickness Monitoring of HTS Coated Conductors in Reel-to-Reel Processing

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High-temperature superconducting coated conductors (HTS CCs) are essential components in advanced technologies such as high-field magnet, fusion, power transmission, and medical imaging. However, non-uniform thickness along their length and width can severely affect the performance of HTS magnets. Despite the importance of maintaining thickness uniformity, no system currently exists to continuously measure the thickness of HTS CCs during reel-to-reel (R2R) processing. This limitation poses significant challenges for quality control and efficient large-scale manufacturing.

To address this issue, we developed a continuous R2R thickness measurement system that employs a highprecision confocal laser sensor. The system provides real-time thickness measurements with an accuracy of $\pm 1 \mu m$ while generating detailed 3D thickness profiles. Although it is currently optimized for moderate processing speeds, ongoing upgrades, including the implementation of a damping mechanism, will enable high-speed operation of up to 600 meters per hour, making the system suitable for industrial-scale production.

This innovative system overcomes key challenges in HTS CC manufacturing by enabling continuous, real-time thickness monitoring and significantly improving quality control. Its integration into automated production lines ensures high-quality fabrication of high-performance HTS magnets, paving the way for broader adoption of HTS technologies in critical applications.

Keywords: HTS CCs, Thickness measurement system, Reel-to-reel, Confocal laser sensor

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