» Company Profile

Introduction of SuperPower Inc.

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1. INTRODUCTION

We are located in Schenectady County, New York, USA, and are responsible for research, development, and manufacturing of High Temperature Superconductor (HTS) wires, as well as research and development of production and application technologies. In February 2012, we became a member of Furukawa Electric Group from Philips Corporation, and since then we have been supplying superconducting wires for superconducting cables and high field magnet (for MRI, NMR, etc.) as a top runner in HTS wire providers, while dispatching expatriates from Furukawa Electric.

Currently, we are a small company with 47 employees, including 6 Japanese expatriates, 2 expatriates from Hungary (Furukawa Electric Institute of Technology), 7 American engineers, and 1 Italian engineer, but we aim to grow several times in size in the next 5 years and are engaged in global and dynamic work as a member of Furukawa Electric Group.

2. FEATURES OF SUPERPOWER'S HTS WIRES

Our HTS wires are manufactured by depositing multilayer thin films on 30 μm or 50 μm thick Hastelloy alloy tapes. Precise orientation control during crystal growth of Rare-Earth Barium Copper Oxide (REBCO) thin films, which are high temperature superconductors, is important for their performance. We manufacture high performance HTS wires by forming a biaxially-textured buffer layer using Ion Beam Assisted Deposition (IBAD) and depositing a superconducting film on it using Metal Organic Chemical Vapor Deposition (MOCVD) method. The width of the wire can be 2 mm, 4 mm, 6 mm, or 12 mm based on the customer's requirements, and the thickness of the copper stabilizing layer is 20 μm as a standard, but can range from 5 μm to 50 μm (Figure 1).

We have released a new product (product code HM) with high performance in low temperature and high magnetic field operating environments starting in 2022. Most recently, the product has been recognized for its performance in ultra-high field magnetic applications required for a plasma demonstration reactor project for compact

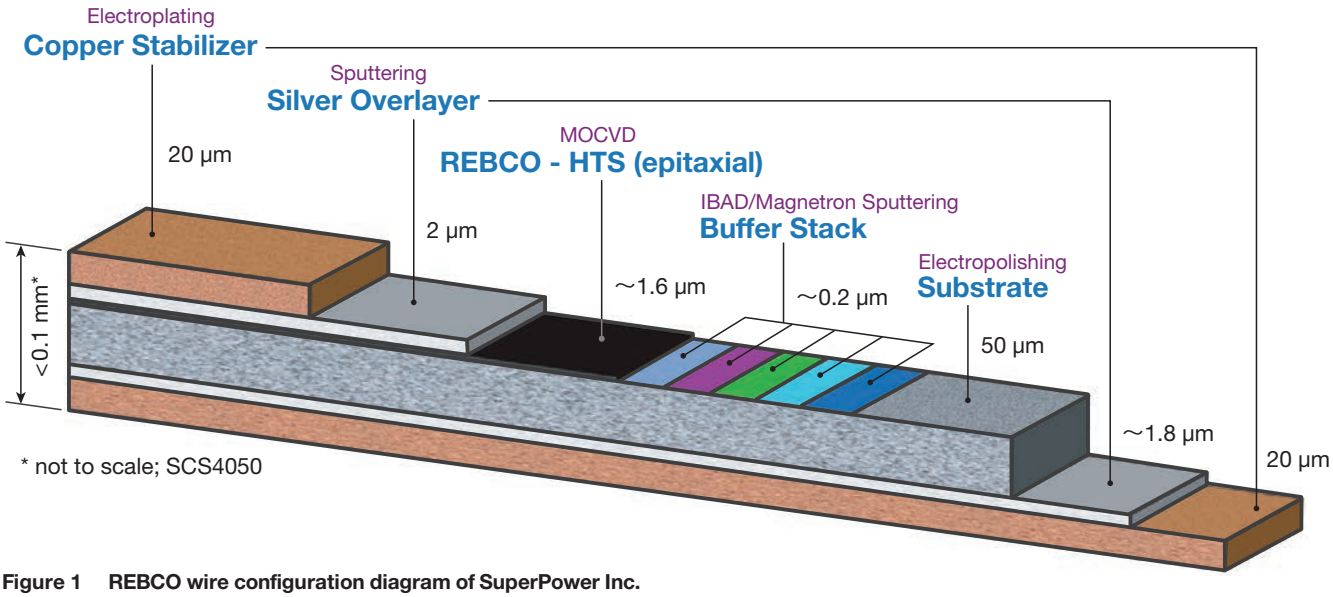

Figure 1 REBCO wire configuration diagram of SuperPower Inc.

[*] SuperPower Inc.

fusion reactors (power generation), which is considered a trump card for carbon neutrality, and has begun to be supplied exclusively to Tokamak Energy in the UK (press release[1)] on January 12, 2023). We have also gained a good reputation for our ability to manufacture and supply HTS wires whose characteristics are optimized based on the customer's application and operating environment (temperature and magnetic field) (Figure 2).

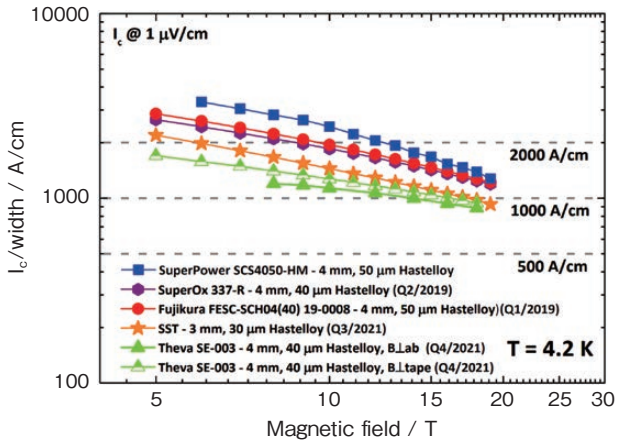

Figure 2 Comparison of HTS wire characteristics in the magnetic field from various companies. (T=4.2 K) University of Geneva (2023/3/8)

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3. ABOUT THE DEVELOPMENT OF MANUFACTURING AND PRODUCTION TECHNOLOGIES

Aiming to make the transition out of the HTS wires research and development department to the manufacturing department, in June2020, the company relocated to a new factory to enhance the utility environment, to restructure the facility layout, and to prepare for future expansion (Figure 3, 4). Currently, we are in the process of expanding our facilities after the relocation, and expect to achieve an annual production capacity of 700 km of HTS wires by the end of 2024. We are planning the next

Figure 3 Outside view of the new factory.

Figure 4 Inside view of the new factory.

capacity expansion to meet the growing demand for ultra-high field magnet applications, such as for the compact fusion.

In the area of production technology development, under the slogan of “Making superconductivity a familiar technology,” we are working to develop quality, consistency, productivity, and low cost by taking advantage of our strength in the MOCVD process and refining the buffer process (Figure 5-7).

Figure 5 IBAD equipment.

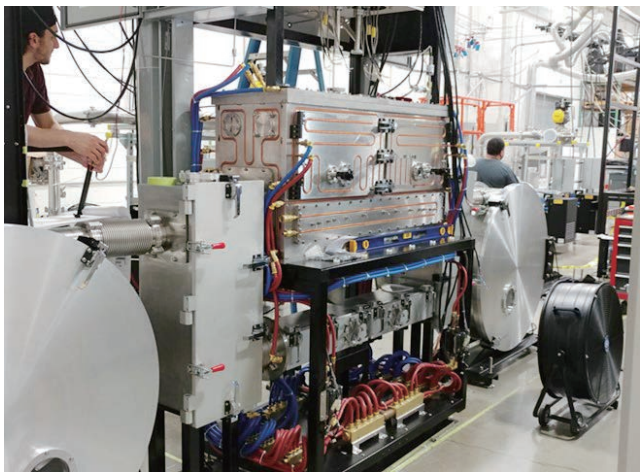

Figure 6 MOCVD equipment.

Figure 7 GENBA (On-site) meeting scene.

4. CONCLUSION

Schenectady County is adjacent to Albany, the capital of New York State, and is the historic town where Thomas Edison founded General Electric (GE) in 1889, and where American electrical and electronic products have been introduced to the world. The origin of SuperPower Inc. is also GE's superconducting magnet development division, which developed MRI in 1983. In 1880, Thomas Edison lit a light bulb using bamboo fibers imported from Kyoto, and in 1884, Furukawa Electric, which later went on to make electric cables for all of Japan, began operations in the hopes of "Brighten Japan." One hundred and forty years have passed since then, and we cherish the ties that have brought the two companies together through the technology of high temperature superconductivity, and we will continue to thrive to contribute to "Brighten the world."

REFERENCES

1) Furukawa Electric HP > News Release > Tokamak Energy and Furukawa Electric Strengthen Relationship to Promote Fusion Energy (Referred on Feb. 20, 2024)
https://www.furukawa.co.jp/en/release/2023/kenkai_20230112.html