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Wed-Af-Po3.21-08 [74]: Evaluation of various Nb-rod-method Cu-Nb/Nb₃Sn wires designed for practical React-and-Wind coils

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The bronze-processed Cu-Nb/Nb₃Sn wires, composed of the Nb-rod-method Cu-Nb reinforcing stabilizer around the Nb₃Sn filament bundle, have superior mechanical strength at both low temperature and room temperature after Nb₃Sn creation heat-treatment. Therefore, in react-and-wind (R&W) process, the Cu-Nb/Nb₃Sn wires are able to be handled easily with applying strains not to exceed the irreversible strains that the characteristics deteriorate due to cracks of mechanically brittle Nb₃Sn filaments. Moreover, the non-Cu-Jc values of Cu-Nb/Nb₃Sn wires have been remarkably enhanced by applying the high tin bronze and the appropriate pre-bending treatment. In this study, we discuss improved acceptable values of tensile stress and bending strain for the various Cu-Nb/Nb₃Sn wires in the R&W process and the R&W magnet operations. Additionally, we propose some specific designs of Cu-Nb/Nb₃Sn wires applicable to practical R&W coils, and describe their advantages against the conventional wires such as NbTi wires and wind-and-react (W&R) process Nb₃Sn wires.

Primary authors: Mr SUGIMOTO, Masahiro (Furukawa Electric Co., Ltd.); Mr TSUBOUCHI, Hirokazu (Furukawa Electric Co., Ltd.); Mr II, Hideki (hideki.ii@furukawaelectric.com); Mr KATAYAMA, Kota (Furukawa Electric Co., Ltd.); Mr ASAMI, Daisuke (Furukawa Electric Co., Ltd.); Prof. AWAJI, Satoshi (Tohoku University)

Presenter: Mr SUGIMOTO, Masahiro (Furukawa Electric Co., Ltd.)

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