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The design of a new explosive DC breaker using electromagnetic forming technology

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In this paper, a new explosive DC breaker switch, which the electromagnetic forming (EMF) technology is used to burst aluminum cylinder in order to cut off the high DC current, is designed. The switch is upgraded from the explosive DC breaker switch of the Laboratoire National des Champs Magnétiques Intenses in France which a closed aluminum cylinder full of water is destructed by high pressure H₂ which originates from aluminum wire fuse reacting with the water when the 450uF/10kV capacitor bank power supply is output into the aluminum wire.

The EMF coil powered by pulsed capacitor bank is a replacement for an aluminum wire fuse and its power supply, and the coil is installed outside the aluminum cylinder (an empty cylinder without water). The pulse magnetic field by the EMF coil will induce an eddy current on the wall of the aluminum cylinder and high pulse electromagnetic force will burst aluminum cylinder in a very short time. Compared with the French DC breaker, the EMF DC switch is miniaturization, easy maintenance and the aluminum cylinder is also easy machining. The EMF coil and aluminum cylinder with optimized distance and fashion of the fracture can meet the requirement of DC breaker with maximum pulse current 120 kA and isolation voltage in the fracture up to 20kV.

Reference

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Primary author: Dr DING, tonghai (Huazhong university of science and technology)

Co-authors: Mr ZHANG, bing (Huazhong University of Science and Technology); Mrs WANG, lei (Huazhong University of Science and Technology); Prof. LI, liang (Huazhong University of Science and Technology); Dr CAO, quanliang (838765339); Mr HUANG, wei (Huazhong University of Science and Technology); Prof. HAN, xiaotao (Huazhong University of Science and Technology); Mr LI, xuehuan (Huazhong University of Science and Technology); Prof. PAN, yuan (Huazhong University of Science and Technology)

Presenter: Dr DING, tonghai (Huazhong university of science and technology)

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