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FOR IMMEDIATE RELEASE

No. 3238

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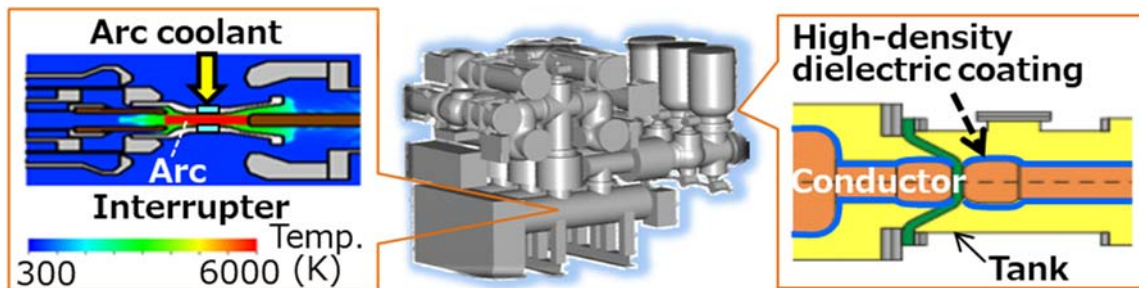
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Mitsubishi Electric Develops New Gas-insulated Switchgear Technologies for Electric Power Applications

Environmental friendly technology reduces use of sulfur fluoride

TOKYO, January 17, 2019 – [Mitsubishi Electric Corporation](http://www.mitsubishielectric.com) (TOKYO: 6503) announced today that it has developed two technologies for gas-insulated switchgears: an arc-cooling technology that achieves a 25 percent improvement in the interruption of electrical current in sulfur-fluoride (SF₆) gas-insulated switchgears used in high-voltage power systems, and a high-density dielectric coating technology that improves insulation performance by 30 percent in high-voltage conductors. The two technologies will contribute to the further miniaturization of switchgears and help to reduce the use of SF₆ gas, which has global-warming potential that is 22,800 times greater than that of CO₂.



Arc-cooling technology

High-density dielectric coating technology for high-voltage conductors

Fig. 1 System components

Key Features

1) *Arc-cooling technology for interrupter improves current-interruption performance by 25 percent*

- High-pressure gas generated with a unique coolant effectively cools and then extinguishes the conductive arc (conductive plasma) during current interruption.
- Current flow through the arc is reduced by the arc's change into insulated gas, thereby improving current interruption by 25 percent compared to conventional non-coolant method.

Details:

The interrupter has two pairs of electrodes that remain closed when electric power is supplied. When the electrodes are opened the current cannot be interrupted immediately due to the conductive arc. In conventional method, the arc is extinguished by flowing the arc with gas to lower its temperature. Mitsubishi Electric's new arc-cooling technology uses a unique coolant to generate a high-pressure gas jet to effectively cool and then extinguish the arc (Fig. 2).

2) *High-density dielectric coating technology improves dielectric performance by 30 percent*

- The high-density dielectric coating technology densifies the dielectric coating layer on high-voltage conductors and thereby improves dielectric performance by 30 percent compared to operation without this dielectric coating layer.

Details:

In the switchgear, compressed SF₆ gas is injected between a metal high-voltage conductor and a grounded tank. If the conductor's metal surfaces are not coated, surface roughness of even just several μm can lead to electric discharges and thereby diminish the dielectric performance of the SF₆ gas. Mitsubishi Electric's new dielectric coating technology inhibits such discharges for improved dielectric performance. In addition, densifying the dielectric coating layer suppresses discharges due to air in the dielectric coating layer (Fig. 3).

3) *Downsizing enables reduced use of SF₆ gas*

- Improved current interruption achieved with the new arc-cooling technology enables the number of interrupters to be reduced from two to one.
- The new high-density dielectric coating technology suppresses discharges from the conductor surfaces, making it possible to reduce the size of the SF₆ gas tank.

Details:

A gas-insulated switchgear incorporates an SF₆ gas tank, which also contains an interrupter and high-voltage conductor. Conventional designs required two interrupters to conform to Japan's JEC-2300 standard and the IEC 62271-100 international standard. However, Mitsubishi Electric's new gas-insulated switchgear requires only one interrupter thanks to the new arc-cooling technology for improved current-interruption performance. In addition, incorporation of a dense coating layer in the high-voltage conductor improves dielectric performance and thereby allows the distance between the conductor and the grounded enclosure to be shortened, which enables a smaller enclosure to be used. As a result, reducing the number of interrupters and tank size enables less SF₆ gas to be used.

Background of Development

A switchgear supplies current stably when a power system is operating normally, but if an abnormality occurs, the switchgear interrupts the fault current to protect the transformers and other important equipment. SF₆ gas achieves excellent current-interruption and insulation performance in high-voltage gas-insulated switchgears to contribute to the stable supply of electric power. However, the 24th Conference of the Parties to the Nations Framework Convention on Climate Change (COP24) identified SF₆ gas as a key target for reduction due to its high potential for contributing to global warming.

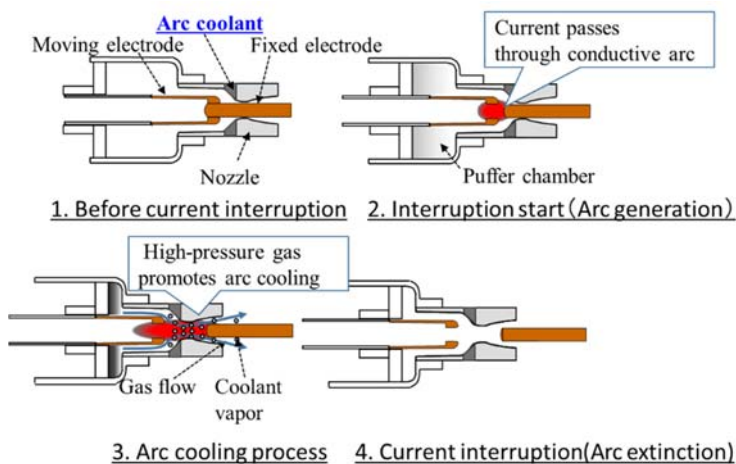


Fig. 2 Improved current interruption performance using arc coolant

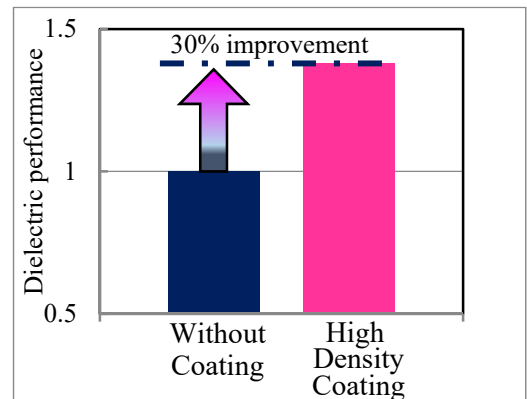


Fig. 3 Improved SF₆ gas insulation performance (without coating equals 1.0)

Patents

Pending patents for the arc-cooling technology announced in this news release number 8 in Japan and 6 overseas in 22 countries, and for the high-density dielectric coating technology for high-voltage conductors number 2 in Japan and 1 overseas in 5 countries.

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About Mitsubishi Electric Corporation

With nearly 100 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Embracing the spirit of its corporate statement, Changes for the Better, and its environmental statement, Eco Changes, Mitsubishi Electric endeavors to be a global, leading green company, enriching society with technology. The company recorded consolidated group sales of 4,444.4 billion yen (in accordance with IFRS; US\$ 41.9 billion*) in the fiscal year ended March 31, 2018. For more information visit:

www.MitsubishiElectric.com

*At an exchange rate of 106 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2018