

SF₆ Gas-free Vacuum Circuit Breakers Supporting Sustainable Infrastructure

Expanding F-gas*1 regulations prompt our foray into a new market

- Related Material Issues
- Realization of a carbon-neutral society
- Realization of a safe, secure, and convenient society

History of VCBs at the Meiden Group

The Meiden Group has consistently developed innovative products leading the world in vacuum circuit breaker (VCB) technology. In the late 1970s, we began developing circuit breakers using SF₆ gas as the insulating medium and vacuum interrupters, and were the first company in the world to commercialize circuit breakers and switchgears for special high voltages (72/145 kV), and in the 1980s we successfully developed a 204 kV switchgear.

Subsequently, in response to the designation of SF₆ as a greenhouse gas (GHG) in the Kyoto Protocol from the 1997 COP3*2, we shifted our development efforts to provide an eco-friendly option.

Against this backdrop, in 2004, Meidensha developed and began delivering an SF₆ gas-free 72/84 kV Ecotank-type VCB with dry air insulation, ahead of its competitors. In 2021, we completed a 145 kV Ecotank-type VCB, making us the first company in the world to commercialize and market an Ecotank-type VCB with a voltage exceeding 100 kV. Currently, our SF₆ gas-free VCBs have accumulated a delivery record of more than 4,000 units to electric power companies in Japan and abroad.

*1 F-gases (fluorinated gases) are synthetic gases which have extremely high global warming potential and can also lead to PFAS contamination, such as SF₆, C₂F₆, etc.
*2 Third Conference of the Parties to the United Nations Framework Convention on Climate Change

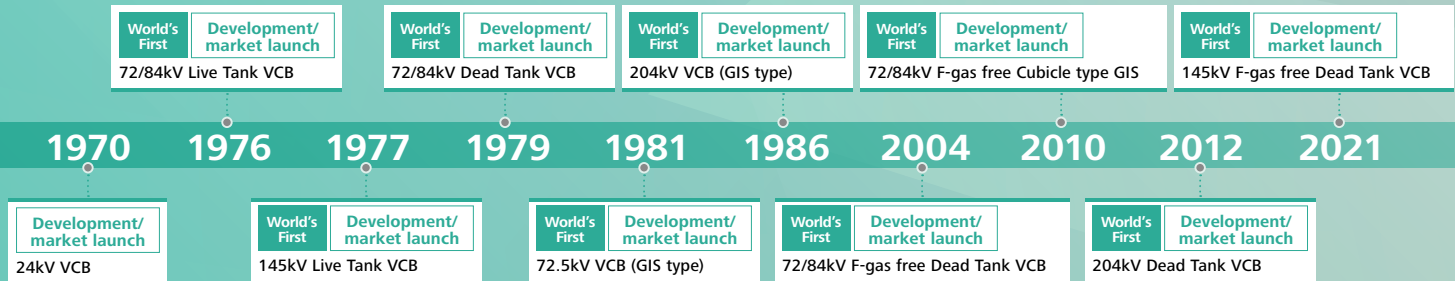
Addressing Needs for Even Higher Voltages

Following North America, Europe is now restricting the purchase of equipment that uses SF₆ gas, accelerating the replacement of this equipment. Therefore, expectations are rising for higher voltage and higher capacity VCBs using dry-air insulation, which has an extremely low environmental impact. In addition to the existing 72.5 kV and 145 kV models, we have launched a 123 kV Ecotank-type VCB in 2025, and intend to complete development up to a 168 kV model by the end of the Medium-term Management Plan 2027 and bring it to market. Subsequently, we will work on the development of 245 kV models to quickly respond to the market's need for higher voltages.



123 kV Ecotank-type VCB

VCB's Track Record of World-firsts



Since the establishment of MEIDEN AMERICA SWITCHGEAR, INC. in 2020, the Meiden Group has sold a cumulative total of over 1,500 SF₆ gas-free VCBs in the U.S. and Canadian markets, achieving steady growth. This success is due in part to stricter environmental regulations. The California Air Resources Board (CARB) is phasing out equipment using SF₆ gas beginning in 2025, and the New York State Department of Environmental Conservation (NYSDEC) has proposed similar regulations.

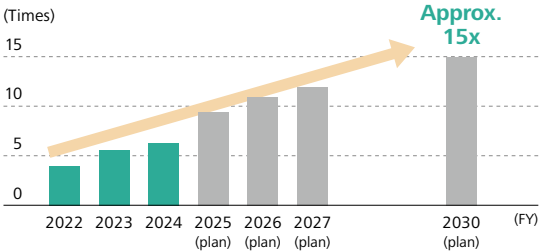
In response to these changes in the market environment, we expect demand for eco-friendly VCBs to further increase in the future, and we are planning to expand our product lineup under our Medium-term Management Plan 2027. We will achieve

further growth in the North American market through innovative technological capabilities and eco-friendly products.

Cumulative orders received
Over 2,000 units

Total number of customers
Over 100 companies

VCBs Sold in North America (vs. FY2021)



Growth Strategy in North America

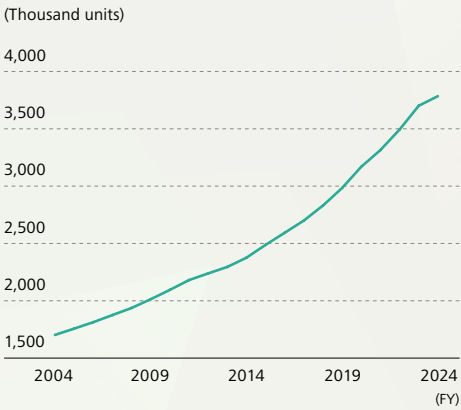
TOPICS

Expanding Sales of Vacuum Interrupters

Meidensha's vacuum interrupters (VIs) have a rich history of more than half a century, beginning with research from 1965. In 1974, we successfully developed ceramic interrupters with our proprietary technology, resulting in products that were miniaturized, mass-produced, and cost-efficient. So far, we have produced a cumulative total of over three million units, and boast world-leading technology levels. In recent years, demand for VIs for reclosers (switchgears for distribution lines) that make it easy to interrupt fault currents and reclose circuits has been increasing in the U.S. as a result of enhanced distributed power supplies and the shift to micro-grids. Combined with the environmental superiority of not using SF₆ gas, our VIs have an excellent opportunity to expand sales.



Vacuum Interrupters Produced (Cumulative)



Cultivation of New Markets: Expanding Sales of VCBs for Europe

During the period of Medium-term Management Plan 2027, the Meiden Group will work to cultivate new markets, specifically by expanding VCB sales in the European market.

Europe consumes more than three times the amount of electricity that Japan does, making it an enormous market, and with the ban on the use of gases with a GWP* of 1 or higher taking effect in 2028, there is an urgent need to comply with environmental regulations. At this time, there are only a limited number of competing manufacturers of VCBs, and we intend to harness our competitive advantage to make our foray into the European VCB market.

Even more noteworthy is the possibility of expanding global sales of zero-GWP circuit breakers, starting with Europe.



Live Tank circuit breaker

Since Live Tank circuit breakers are the mainstream outside of Japan and North America, F-gas free Live Tank VCB to be developed for Europe is expected to grow sales in other regions as well.

Through this strategy, we aim to achieve sustainable growth with environmental regulation compliance in tandem with market expansion.

