Advertorial

Hitachi Energy pioneers GOB+ based on its legacy of oil impregnated transformer bushings

Hitachi Energy's existing GOB range of bushings is a global best-seller, with more than 250,000 delivered successfully in the field for more than 50 years

The GOB+ portfolio contains transformer bushings with outstanding technical performance, high design flexibility, short delivery times, easy installation, and low maintenance

GOB+ is Hitachi Energy's latest bushings portfolio, and the newest member of its multi-generational family of Oil Impregnated Paper (OIP) transformer bushings. The GOB+ range is a major improvement on the existing GOB series; it is the next generation of GOB with a broader range, upgraded ratings, and superior features that comprehensively accommodate global standards and market requirements. Hitachi Energy's existing GOB range of bushings is a global best-seller, with more than 250,000 delivered successfully in the last 50+ years. The GOB range is perhaps the world's most commonly used OIP bushing. The upgraded GOB+ portfolio unites the best of prior knowledge and service experience from the original GOB range with the latest advancements in bushing technology.

OIP bushings continue to enjoy a significant market share and constitute the largest installed base worldwide. Given Hitachi Energy's long history of experience in the industry, the products are mature and have proven their reliability and robustness over decades. There are well-established condition assessment routines available for operators and users that comply with global standards. OIP technology demonstrates superior overload capabilities compared to the dry bushings category, as it can better control the temperature of the bushing from the internal oil circulation to a certain extent. GOB+ covers voltages from 36 kV to 245 kV and current ratings up to 3150 A; it has multiple design variants to enable fast customization and is available in different configurations to better serve the market. The GOB+ portfolio contains products with outstanding technical performance, high design flexibility, short delivery times, easy installation, and low maintenance.

Hitachi Energy's newest range of bushings, the GOB+, thus offers several upgraded features:

- An optimized electrical field distribution with a finely graded capacitive insulation
- Partial discharge-free and lowest dissipation factor for stable and long-term performance
- Designed fulfilling and exceeding static cantilever load level II requirement of IEC 60137 with superior thermal performances
- Improved flange design for enhanced robustness

The GOB+ range is a global, modular, competitive, and comprehensive portfolio of OIP bushings that are an upgrade of the GOB range by Hitachi Energy; GOB+ is a superior product with high operational safety.

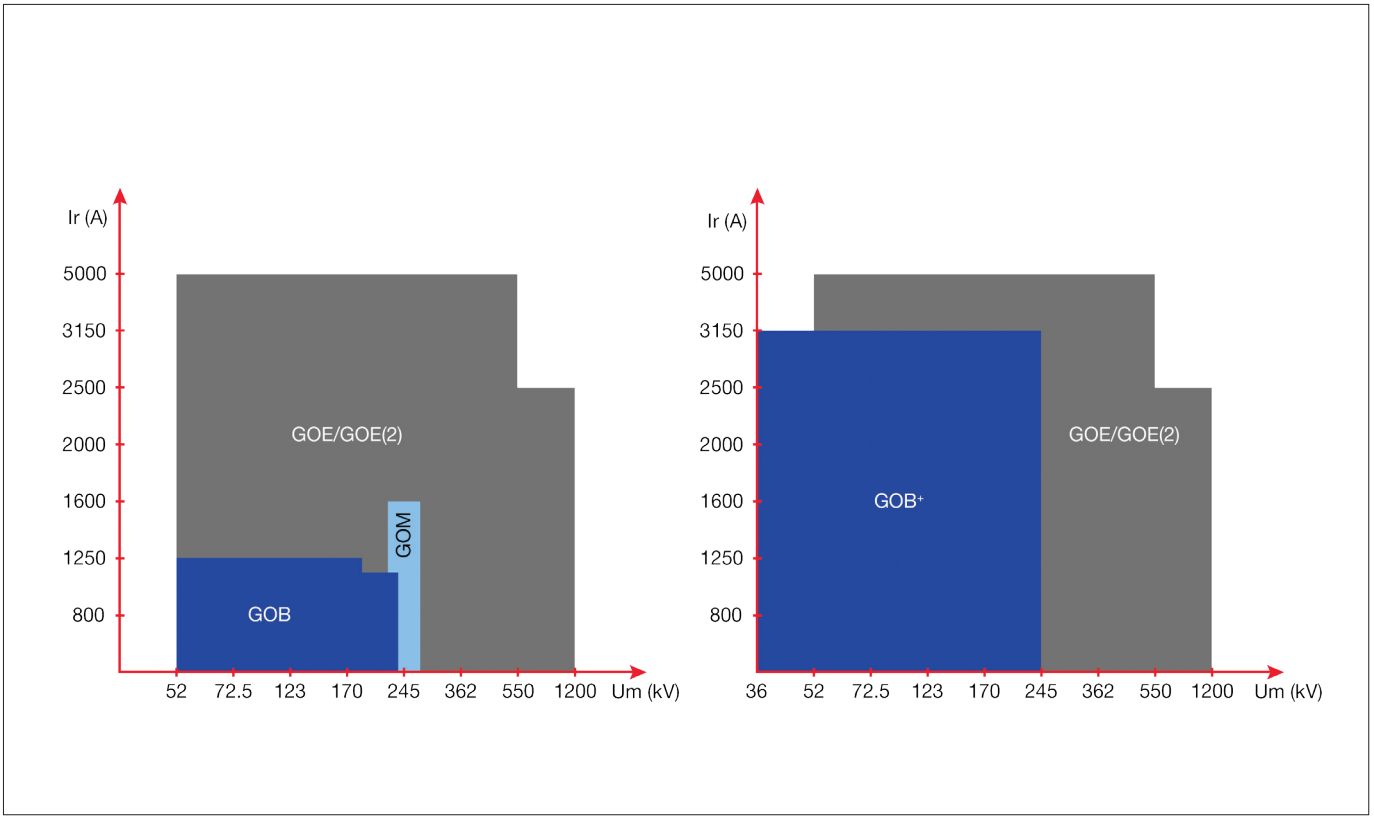

Figure 1. GOB+ 36 kV to 245 kV and up to 3150 A. Left existing OIP transformer bushing offering, right new OIP transformer bushing offering from 2024 incl. GOB+

Technical features of GOB+

The bushing is built up around the conductor tube on which the condenser body is wound. It has a robust sealing system combined with a compression design that ensures no moisture ingress, even under the most severe service conditions. Furthermore, the GOB+ is mechanically stronger than its predecessor with improved cantilever forces, extended creepage distances, and optimized condenser core designs for more homogeneous field stresses that eventually contribute to an extended product lifetime. Additionally, GOB+ incorporates a safety feature in the flange to prevent radial slippage between the flange and insulator during transportation and shipping. GOB+ is permanently fitted with an oil expansion vessel and a large oil-sight prism glass for the oil-level indication that is easy to visualize from a distance.

The GOB+ portfolio has been developed as a modular design-based concept with more than 2800 different selectable configurations, and computer modeling has been used to optimize dielectric, mechanical and thermal stresses. During the de-

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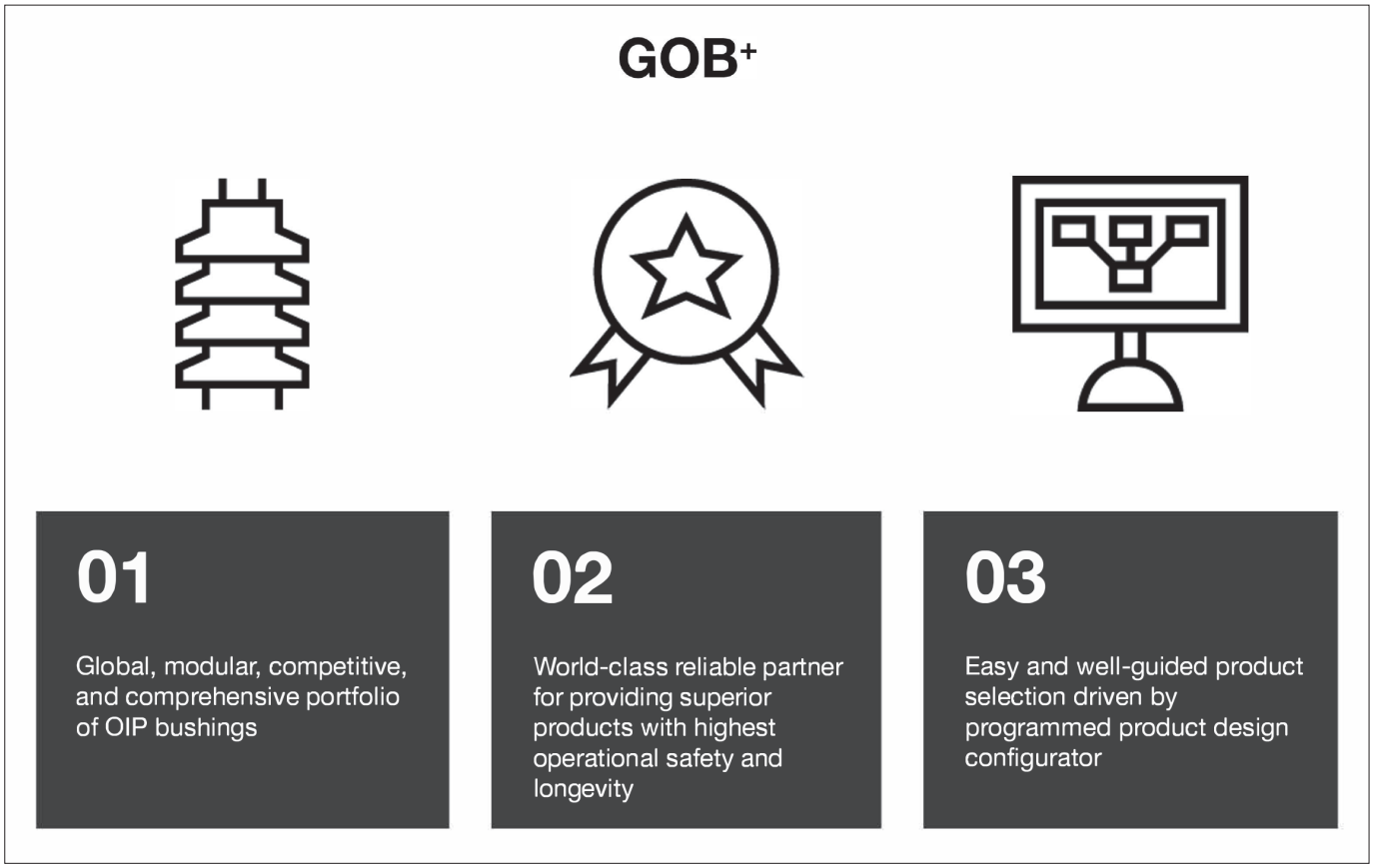

Figure 2. GOB+ to increase your value creation

velopment stage of the product, the GOB+ range's dimensions were considered to be compatible with those of existing bushing brands; this was done to facilitate easy replacement and less inventory and handling by users.

The process of developing the new GOB+ range necessarily included meeting both global industry standards and market requirements. Therefore, and as a matter of course, numerous tests were performed. The full qualification of the GOB+ platform is based on more than 56 different type-tests that were performed in accredited external laboratories.

Reviving the full-width conductive layer design

To keep the GOB+ platform future-ready and capable of meeting the operators' future requirements of digitalization and monitoring, it is designed and manufactured only with full-width conductive layers. This is in contrast to other brands and older designs where partial conductive layers are integrated into the design to make the product easier to manufacture and slimmer in its dimensions. Full-width conductive layers enable a better and more accurate reading of small capacitance changes in the condenser core, as minor changes in the insulation of partial conductive layer designs may be undetectable. This full-width conductive layer design enables future bushing monitoring and the detection of minute changes, which greatly helps avoid failures and downtime.

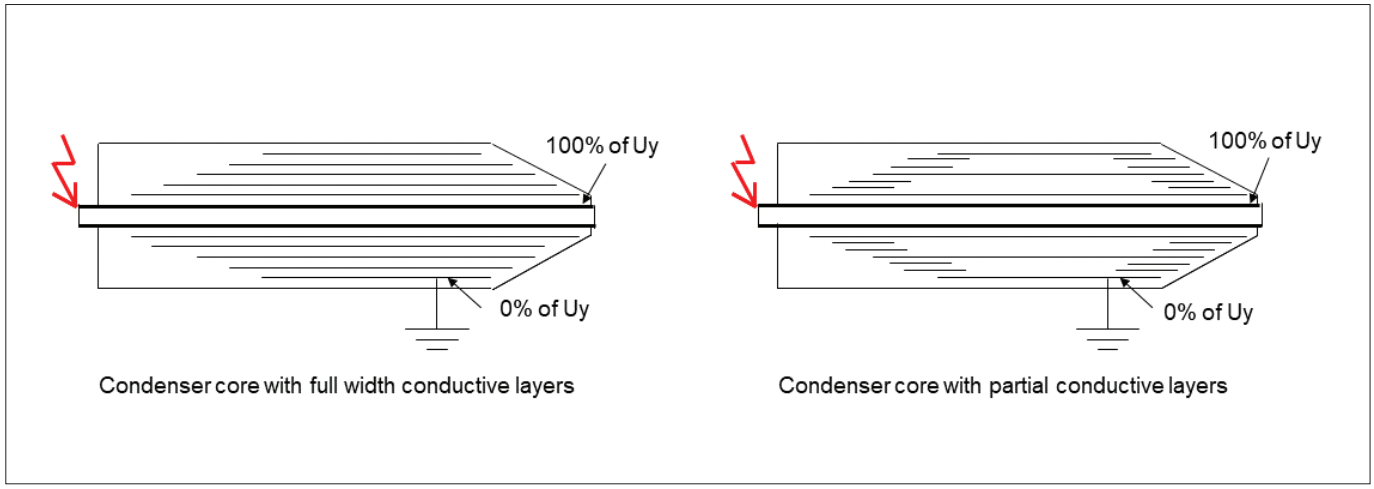

Figure 3. Schematic figure of different condenser core designs

The GOB+ range can be used to upgrade existing bushings or new installations, and these can be executed effectively by Hitachi Energy's certified and highly experienced global service team

Convenient bushing replacements and upgrades

The GOB+ range can be used to upgrade existing bushings or for new installations, and these can be executed effectively by Hitachi Energy's certified and highly experienced global service team. Hitachi Energy guarantees the best dimensional fitting of GOB+ to other bushing brands and Hitachi Energy's legacy portfolio of GOB, GOM and GOE types (smaller bushings). GOB+ is also customizable on request. The company also facilitates easy and well-guided product selection, driven by Hitachi Energy online products configurator COMPAS.

The history of GOB

The GOB line of bushings, covering system voltages from 52 kV to 170 kV, was first introduced in 1967. The original GOB design has two versions: with and without the oil expansion vessel. The main design feature of the range is its facility for length compensation, which is accomplished by the conductor tube in order to lower design complexity. Prior to the introduction of the newest generation portfolio, two major modifications were made to the product over the years. The shed profile on the air side insulator was updated in 1984. Both the aerodynamic and alternative anti-fog profiles with deep under-ribs were replaced with an alternating profile. This offered increased creepage distance length without compromising on performance in adverse weather conditions like heavy rain or ice while continuing to deliver the benefits of self-cleaning that were available with the open profile. The spring-supported and self-earthing type test tap that was in use until 1999 was replaced by a model that was connected to the condenser core by a soldered cable and equipped with a multi-contact grounded via the tap lid. Alongside, several production-related upgrades have been implemented from time to time.

A reliable partner of the global transformer industry

Hitachi Energy is a trusted global leader in the transformer industry, offering a complete range of transformer components, insulations, and services. Transformer manufacturers or operators can benefit from the company's 24/7 customer connect helpdesk. Rapid, local, on-site support is available in over 25 countries through Hitachi Energy's service organization, which is reputed as the world's largest. By connecting remotely with the company's service experts, the necessity for on-site visits can be reduced, which allows for significant cost and time savings.

Learn more about GOB+

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Authors

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After his M.Sc. exam in Mechanical Engineering from the Royal Institute of Technology in Stockholm, Roger joined Hitachi Energy, former ABB, in 1993. In 2002, Roger joined the components business and has been working with high-voltage bushings since then. Roger covered various positions in manufacturing management, engineering, and Research & Development of high voltage products for over 30 years, being the author of several technical publications and inventor of patent applications.

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With over 25 years of experience at Hitachi Energy (formerly ABB), Jens holds a PhD in Chemistry from Queensland University of Technology, Australia, and a master's degree in Material Science from Osnabrück University, Germany. He has an impressive track record of over 40 international inventor patent applications and about 25 esteemed international journal contributions to his credit.