The challenge
Private power generation is fast-progressing and poses a challenge for existing systems and for their operators. Currently, most distribution system operators are convinced that the best solution for this development is on-load regulated distribution transformers. Thanks to their regulation feature, they ensure that on both the high and low voltage sides, the voltage range of 230V ±10% is addressed in accordance with DIN EN 50160.

Even if the decision for a regulated transformer has been made, there are various options to choose from. There are models with tap changers or booster solutions, as well as transformers that do not require mechanical tap changing and are electronically regulated instead.

“We are highly satisfied with our FITformer® REG. It helps us to stay within the voltage range and does not cause any additional losses.”
Alexander Eberle, technical plant manager (Gemeindliche Werke Hengersberg)

The solution
Siemens offered the Gemeindliche Werke Hengersberg a model of the new FITformer® REG 2.0. With their first experience with the offering, the customer was able to regulate the voltage in the power system in accordance with the DIN standard.

A key point in the decision making process for the customer was that other regulated distribution transformers on the market have losses that are twice as high compared to the off-load regulated predecessor models. For the Siemens solution, however, the focus was not only to implement a technically excellent solution but also to optimize economic efficiency. Regulation losses have been compensated for in the design of the core-and-coil assembly, because losses are not just an ecological issue, they cost power suppliers money.

FITformer REG 2.0 regulated distribution transformer and SiCAM CMIC control unit from Siemens.

This makes the FITformer® REG currently the only regulated distribution transformer on the market that does not cause additional losses and already meets the strict requirements of the European Commission’s Ecodesign Directive, without needing to use the 20 percent losses permissible for regulated distribution transformers. This European-wide regulation goes into effect July 2015 and defines a framework for the requirements of energy consumption relevant products to reduce CO2 emissions and improve energy efficiency, including a 20 percent increase for transformers.

www.siemens.com/energy/transformers
Special technical features

1. No maintenance
With the FITformer® REG, which can be regulated under load on the low voltage side, Siemens has a solution that is just as unlikely to fail as a conventional distribution transformer and is also maintenance-free. For instance, all moving parts have been eliminated from the transformer oil.

2. Adjustment in three steps
The development engineers also discovered that regulation at a certain voltage level involves many switching movements in the transformer, increasing the likelihood of faults and negative effects for the operator. Therefore, the FITformer® REG switches only when not switching would violate the allowed voltage range. In this way, no unnecessary negative reactions can occur with the regulation loop of the medium-voltage transformer and there is no unnecessary load on regulation components.

3. Access to control elements
On the FITformer® REG, the power and the control units are physically separated with the power components in the unit coupled with the transformer tank. The secondary equipment is housed in a separate control unit, which can be installed anywhere in the substation; thus ensuring that the control elements are accessible. Manual, automatic and remote modes can be selected locally, enabling regulation in manual mode or from a remotely-connected control center.

The advantages of the FITformer® REG at a glance:
- Addresses voltage range problems
- Low loss (losses acc. to Ecodesign Directive)
- No maintenance (no moving parts in the oil)
- No regulation loop with medium-power transformers thanks to fewer switching operations
- Use of proven control elements from Siemens portfolio
- Compact size allows for easy replacement

Use of the intelligent transformer substation

A regulated distribution transformer is just one of many components needed to implement an intelligent distribution system as part of a larger smart grid. The wider aim is an active distribution system with an intelligent transformer substation as a key location. These intelligent transformer substations contribute to active load management in the distribution system and enable automatic and fast-fault elimination in case of outages by monitoring and ensuring power quality.

In complimenting the investment in a regulated distribution transformer, the medium-voltage substation, the low voltage, and the remote terminal unit continue to play important roles within an intelletigent substation. Use of an intelligent transformer within a substation allows for the management of the low-voltage distribution network and handling of meter data, compensation for reactive power and harmonics, regulation of the distribution transformer, and coordination of infeed and load. Monitoring and control of the distribution substation from the medium-voltage side for fault location and automatic supply recovery is also possible. Moreover, measurement data and indications from the medium-and low-voltage levels are also provided. With increased information, the network control center is able to execute switching operations remotely, and with load flow control, losses can be reduced and distributed power infeed can be managed.

“We are working on defining further measurement points and thus using our FITformer® REG even more economically in the future. The FITformer® REG is a real alternative for us instead of the planned cabling.”

Alexander Eberle, technical plant manager (Gemeindliche Werke Hengersberg)

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