



SIEMENS



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Repair & Retrofit – new life for aged transformers

Repair and retrofitting through TLM™ – Transformer Lifecycle Management™

Answers for energy.



Repair & Retrofit – new life for aged transformers

Transformers are cost-intensive products that require long-term planning. Increasing lifecycles go hand in hand with higher financial and organizational risks. Apart from possible transformer failure itself, delivery times that can often take years pose enormous problems for electricity providers and industrial consumers.

In Europe alone, 60 percent of the installed transformers have been in operation for over 25 years. Moreover, the average life expectancy of a transformer is 25 to 30 years in normal operation. Under these conditions, it is essential to guarantee ongoing reliable operation of the installed base.

If desired, we work together with the customer to examine the transformer's condition in order to subsequently develop the best possible repair strategy.

Repair & Retrofit offers a solution that is both technically and economically efficient. Through repairs, we restore a transformer to its original condition in all respects (current, voltage and impedance).

Retrofitting, on the other hand, involves, e.g., providing the core with new windings and then installing it in the existing housing. This can not only increase performance, but it also allows to adjust the voltage ratio to new requirements.

With Repair & Retrofit, you can:

- extend the lifetime of ageing transformers,
- obtain an economically attractive and technically sustainable solution that meets the highest ecological standards,
- avoid future bottlenecks in transformer availability,
- adapt existing transformers to new grid conditions,
- increase the existing capacity for transformers of all performance classes up to 800 kV/1,200 MVA,
- get everything from a single source, with a single contact for transformers of all manufacturers and performance classes, from disassembly to commissioning.

Repair & Retrofit extends the lifecycle of transformers over a long period of time and increases flexibility for long-term investment planning.

▶
Even severe damage
is reliably repaired.

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Our repair facilities
in Nuremberg have
their own transporta-
tion infrastructure
for transformers.



Nuremberg repair shop – complete transformer expertise in one location



Breathing new life into your transformers

It is usually more economical to repair and fully retrofit a transformer than to purchase a new one with the same life expectancy. The technical features that can be achieved are not significantly different than those of new equipment. In terms of cost, performance and availability, there is every reason to overhaul existing transformers. Siemens can support you in handling all common types of transformers, including autotransformers, reactors, special-purpose transformers (for electric arc furnaces and rectifiers) up to 1,200 MVA at voltages up to 800 kV – regardless of the manufacturer.

In-shop repairs – everything at hand

For more than 100 years, Nuremberg has been a major center of competence for manufacturing transformers. We do not only produce and test transformers here, but we operate our own repair shops tailored to the specific needs of our repair business. Our equipment includes horizontal and vertical winding machines, vacuum furnaces and test bays for type and special-purpose testing. To meet the rising demand for repairs, a new shop with state-of-the-art equipment will be added to the space by 2011 (including a 500-ton heavy-lift crane and a new Vapotherm furnace).

Global accessibility

Our central location in the heart of Europe and excellent transportation connections, including our own railway system, bring the Nuremberg repair facilities within reach of nearly all transformer operators. If you wish, you can rely entirely on the experience of our logistics experts when planning and carrying out your shipment. We pick up transformers on your premises and guarantee safe round-trip transport.

Unique synergies

Once the transformer arrives in the shop, it undergoes a detailed analysis. We check and, if necessary, adjust the range of services specified in the order.

Due to our proximity to in-house transformer production plants, we can quickly resolve complex problems. After the transformer has been repaired or retrofitted, it moves on to the test bay, where we subject it to the same strict quality controls required for new equipment.

The end result is a fully retrofitted transformer whose performance is guaranteed even under the harshest industrial conditions.

Repair & Retrofit by TLM™ – Transformer Lifecycle Management™
helps substantially extend transformer life expectancies.



◀ Our mobile facilities allow even field repairs.

◀◀ Our mobile test bay enables us to conduct reliable performance tests even in the most remote regions.

Flexibility is a top priority: on-site testing under the harshest conditions

On-site repair

Vast distances or poor transportation connections sometimes make it necessary to perform repairs on site. Siemens has developed a mobile repair facility for this purpose. The container-sized module provides all necessary equipment for analyzing a transformer's condition, improving performance and conducting electrical tests.

Inspection and assessment

We examine the condition of a transformer on the basis of its behavior and any errors that may occur. If necessary, we take paper samples to determine the degree of polymerization (DP).

Treating the insulating oil

The condition of the transformer oil has an enormous effect on winding ageing and the electrical efficiency of the overall system. Siemens offers a wide range of services for analyzing, cleaning and regenerating the transformer oil:

- Analysis
- Gas chromatography, physiochemical tests, 2FAL determination
- Filtration
- Filling in a vacuum

- Regeneration
- Degasification
- Inhibition/passivation through additives
- Stationary drying with SITRAM® DRY

On-site maintenance and repair

The repair module is equipped for all typical maintenance and repair tasks:

- Maintenance of tap changers
- Continuous drying of the core-and-coil assembly during operation
- Seal replacement
- Fixing of leaks
- Modification and/or repair of the cooling system
- Painting
- Replacement of windings
- Replacement of the core
- Mounting the core-and-coil assembly after replacing the entire insulation
- Drying/pressing the core-and-coil assembly

Electrical tests

With the mobile test bay, we can test single-phase and three-phase transformers for all performance and voltage classes.

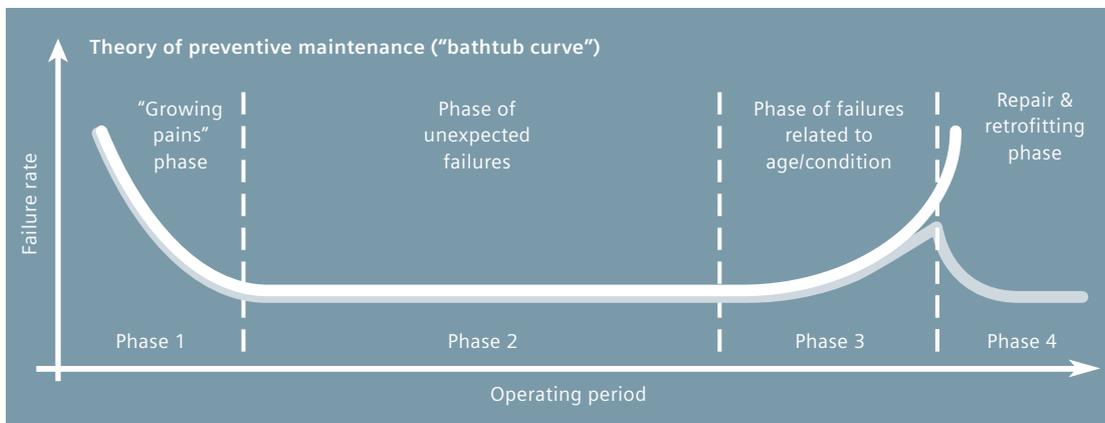


Experienced teams ensure smooth service inhouse or on-site. Interferences of running operations are reduced to a minimum.

Repair & Retrofit

Siemens has over 100 years of experience in the transformer manufacturing business. The capacity of our global installed base is more than one million MVA – the equivalent of 25,000 distribution transformers and around 1,000 power transformers including furnace transformers, rectifiers and all other kinds of transformers for industrial applications.

We have remained true to our roots: from the early days of our first transformer plant to the founding and later take-over of Trafo-Union AG and even the recent expansion of our testing and maintenance capacities, Nuremberg has been, and still remains, the focal point for our transformer expertise. This applies not only to our own transformers, but also to the transformers of all manufacturers and all voltage and performance classes.



Up to now, the typical lifecycle of a transformer has been characterized by three distinct phases: commissioning/start-up phase, normal operation and ageing phase. Thanks to Repair & Retrofit, you can correct signs of ageing early on and return to normal operation.

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