

# SIEMENS

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*Ingenuity for life*

Customer Services for Transformers

## SITRAM DRY

Stationary transformer drying and moisture monitoring



Preventive Maintenance

- Temperature and moisture monitoring
- Cartridge replacement and regeneration service
- Flexible hose connections improve reliability during cartridge change out
- Cabinet version certified for a protection class of IP 55

### Introduction

The insulation materials on all power transformers will degrade with time in service. Insulation aging depends on several different factors including the original insulation material, oil temperature, moisture content, oxygen content, particle contamination and acids from oil and paper aging.

Moisture content has a significant impact on transformer life expectancy, especially on the aging of the solid insulation.

Conventional methods of removing moisture, e.g. oil treatment plants, have focused on rapidly drying out transformer oil; however, 98% of the moisture is actually stored in the cellulose insulation.

The rate of drying depends on the rate of water diffusion from the insulation into the insulating oil, which is a very slow process.

The SIEMENS SITRAM DRY online oil dehydration system removes moisture from the insulation through disturbing the moisture equilibrium between the insulating oil and the paper insulation so that moisture diffuses from the wet insulating paper to the dried insulating oil, slowly removing the moisture from the solid insulation.

### Features

The system has a modular construction and is well-suited for transformers of varying ages, manufacturers and ratings (from distribution to generatorstep-up transformers); these include:

- Continuous online removal of moisture from solid insulation, based on a molecular sieve technology
- Easy to install on any energized transformer

### Benefits

- Extends expected lifetime
- Little maintenance

### Scope of work / deliverable

- Installation of SITRAM DRY
- Supervision of modules
- Exchange of cartridges
- Moisture level in oil below 5 ppm
- Integration into ISCM (Integrated Substation Condition Monitoring) (optional)



### Technical details

SITRAM DRY utilizes an advanced molecular sieve absorbent material. As the oil is circulated through SITRAM DRY by a small pump motor, the sieve material contained in the cylinders absorbs the moisture. Moisture diffusion will slow down as the moisture content of the insulating paper converges to its equilibrium with the dried insulating oil.

The SITRAM DRY system is capable of reducing transformer oil moisture levels from 50 ppm to less than 5 ppm. This process not only reduces the aging rate of the cellulose, but it also improves the dielectric strength of the insulation oil and can increase transformer reliability and life expectancy. Transformers can be operated with a significantly reduced risk of failure and on higher load cycles.

### Modular product concept

SITRAM DRY has a modular product concept which is adaptable easily on individual requirements. Three basic designs are available: a frame version, a cabinet version, and the SITRAM DRY SMART version. In the frame version, SITRAM DRY is mounted in an open steel frame together with optional moisture sensors.

The cabinet version, certified for IP 55, is the right choice if you want both ease of installation and protection of the drying system from external influences. Unlike the frame and cabinet versions, the SITRAM DRY SMART version is mounted on rollers, making it easier and more flexible to use at different locations.

### Benefits for new transformers

SITRAM DRY installed on a new or refurbished transformer can maintain the moisture content at the original 0.5% factory level. The system can significantly extend the expected life of a transformer at a fraction of its replacement costs. Typically, molecular sieve cylinders should not require replacement for several years.

### Benefits for older or wet transformers (>2% moisture in the insulation)

Legacy transformers generally have higher moisture content, so the target is to reduce the moisture content of the insulating paper to an acceptable level and then maintain that level. The amount of time required to dry out the unit will vary with the size, moisture content and operational temperature variation.

Siemens will develop a moisture reduction plan which shall include a dry-out period and an estimated number of cylinder replacements. The time period is typically between 10 and 24 months.

### Comprehensive service

SITRAM DRY is a definite robust system and it only needs little maintenance effort. Thanks to the humidity sensors at the inlet and the outlet, the degree of saturation of the cartridges can very precisely be determined. The exchange of the cartridges is easy due to the quick couplings. With our services around transformer drying you decide by yourself whether and on which scale you step in.

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