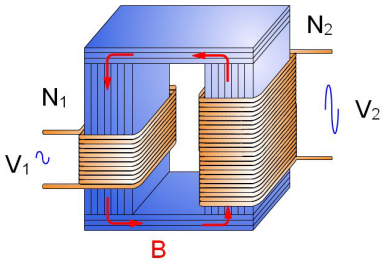
SPECIAL HAZARDS
PROTECTION

AUTOMATIC FIREFIGHTING SYSTEMS IN TRANSFORMERS

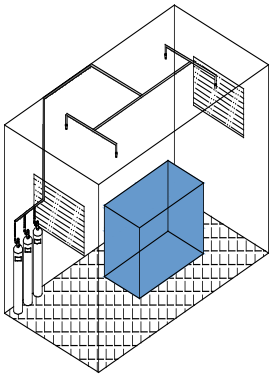
SIEX CO_2 SIEX INERT

Hazard type

OPERATION OF A TRANSFORMER



PROTECTION OF A ROOM WITH A BATTERY SYSTEM CYLINDER



Transformers are electromagnetic devices which can increase or decrease the electric voltage and current. The most important application is in medium and long range electrical power transmission.

In case of fire, the value of losses depend no only on the material value of the equipment, but also on the indirect consequences:

- Power cuts in large urban areas.
- Power cuts at public facilities such as hospitals, shopping centres, etc.
- Loss of production at companies or entire industrial estates.
- Expenses incurred as the result of time spent on re-launching all the systems affected.

Given the importance of the transformers and their cost, the need arises for the installation of fixed fire protection systems.

There exist a large variety of electrical transformers, with different classifications depending on:

- Structure: dry or oil-filled
- Location: outdoors, indoors, underground, etc.
- Primary voltage: 12,000 to 220,000 volts
- Voltage systems: single phase, 3-phase, 3-phase-6phase, 3-phase-12-phase, 3-phase-single phase.

Among the transformers, oil-filled ones are a particularly high fire hazard, since this oil has a relatively low flash point and therefore a risk of fire with a considerable release of smoke.

Whatever the type of transformer, prevention is always essential. SIEX will advise on how to protect this risk in the most effective way.

The most frequent fire sources in these devices vary according to the type of transformer:

OIL-FILLED TRANSFORMERS.

The main coolants used to avoid heating of the transformer are air and mineral oil. Oil has better thermal conductivity and higher specific heat. Its function is twofold: it acts both as an insulator and as a coolant. However, inflammation of the oil is what usually leads to a fire.

The transformer is a machine requiring very little maintenance. The part that requires most attention is the oil. Mineral oils tend to age and oxidize and these alterations reduce their electrical and technical properties. The oil is affected by temperature, humidity, and contact with oxygen in the air. The main advantages of oil-filled transformers over dry ones are: lower cost, less noise, higher resistance to surges and overloads, and the fact that they can be installed outdoors and work in polluted atmospheres.

According to UNE the minimum flash point of transformer oil is 140 ˚C. For this reason, a well or reservoir must be provided under each transformer with sufficient capacity for all the transformer oil. This well should have fire grids or flame arresters to prevent flames reaching the transformer housing and damaging it.

OIL-FILLED TRANSFORMERS

DRY TRANSFORMERS.

A dry transformer is one in which the magnetic circuit and windings are not immersed in an insulating liquid. This is the main advantage they have over oil-filled transformers. The materials used in their construction (epoxy resin, quartz and alumina powder) are self-extinguishing, and do not produce toxic or poisonous gases. They decompose from 300 ˚C upwards and the fumes they produce are very faint and non-corrosive. In the event of and external fire (close-by), when the resin reaches 350 ˚C it burns with a very weak flame which self-extinguishes approximately 12 seconds after the heat source is removed.

DRY TRANSFORMERS

HAZARD FACTORS

- Inflammation of cooling oil

- Short-circuits caused by overvoltage and overload

- Refits in the room

SPECIAL ATTENTION

Inside the transformer, apart from the metallic structures, there are components such as laminated paper, varnished fabrics, and ducts lined with fabrics and varnishes. All these parts are potential fire sources, as well as being highly flammable.

Siex recommendations

GENERAL CONSIDERATIONS

At Siex, we have extensive experience in protecting both oil-filled and dry-type transformers. The main solution we use for this type of risk is CO2.

WHICH AGENT TO CHOOSE?

This is the main question an installer asks when confronted with the protection of transformers. It will depends on various factors such as:

- Location of the transformers (outdoors, in a transformer room or an open space in an industrial bay)
- Likelihood of people normally being present near the transformers
- Type of transformer
- Storage space for the bottles, etc.

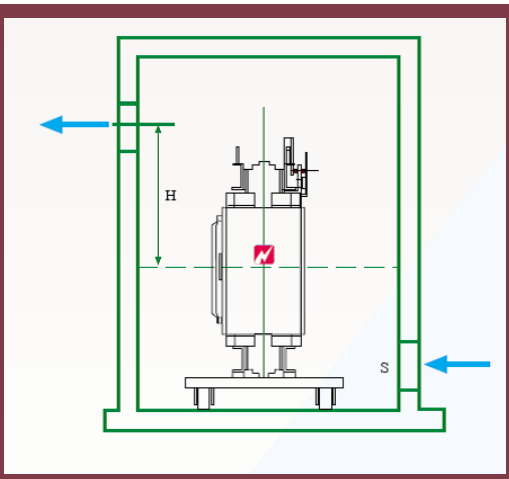
In the case of a transformer room with few openings or openings with an automatic closing system at the time of discharge, the options are expanded and CO2 total flooding can be used, or inert agents (total flooding) can be used.

CONDITIONING FACTORS

One of the fundamental requirements in these rooms is **VENTILATION.**

To prevent excessive and harmful overheating, it is necessary to dissipate the thermal energy produced by the transformer during operation. Since natural ventilation is generally insufficient, fans can be installed to increase airflow in the room.

It is particularly important to analyze these openings, as they limit the types of extinguishing agents that can be used for these risks.



Our Systems

SIEX CO_2

Its low cost, high cooling and smothering capacity and density make it ideal for the protection of transformers, whether dry or oil-filled.

Provides its own pressure	to unload it from the cylinder where it is stored inside the transformer room.
Gas discharge	can penetrate and spread throughout all areas of the burned area inside the device.
Does not conduct electricity	Can be used on fires involving live electrical equipment.
No deja residuos	eliminating the need to clean the agent after unloading.

Systems can be designed for both total flooding and local application. With CO_2, unlike other gases, it is possible to have designs with openings in the enclosures. It is therefore an ideal solution for protecting transformer rooms, as all such rooms must have ventilation ducts.

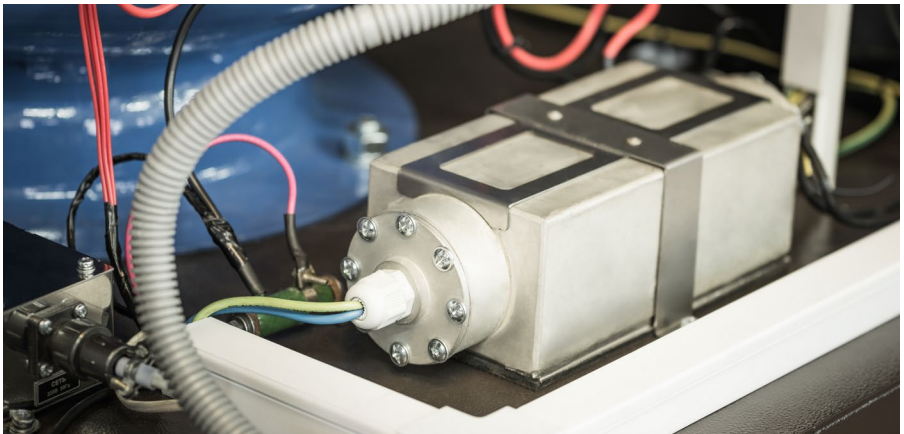
CO_2 is 1.5 times denser than air and tends to settle in the lower levels of the room. The amount of CO_2 that can leak through the lower openings is greater than for the upper openings. So normally the openings in transformers are located in the upper part of these enclosures.

SIEX INERT

Inert gases allow for harmless action that protects these special devices without damaging their components or affecting their operation. Rooms must be sealed, which also prevents reignition. Siex offers a complete range of permitted gases: Our wide range includes:

Ideal for occupied areas
Obtained form the atmosphere
Low-cost agent
Excellent visibility for evacuation
Chemically neutral
Storage pressures of 150, 200 y 300 bar
Long pipe runs

INERT-SIEX™ 01 – Argon.
INERT-SIEX™ 55 – 50% Argon and Nitrogen.
INERT-SIEX™ 100 – Nitrogen.
INERT-SIEX™ 541: 52% N_2 + 4 % Ar + 8% CO_2.



Our commitment

CHOICE OF SYSTEMS

SIEX has the widest range of products and systems to suit different needs, both as regards pressures and extinguishing agents.

COMPETITIVE PRICE

Optimizing all of our processes make us more and more competitive worldwide.

SPECIALIZED ENGINEERING

Our highly qualified staff ensure the best service for customers both as regards technical advice on the choice of system, and solving any problems that might arise after installation. Backed up by our extensive experience and a track record of successful projects.

INNOVATION

At the forefront of innovation in every product we develop, ensuring the technical features offered.

QUALITY GUARANTEE

All products meet the highest quality requirements and internationally recognised official approvals.

OTHER SPECIAL HAZARDS PROTECTED BY SIEX:

- WIND GENERATORS
- ELECTRIC GENERATORS
- TRANSFORMERS
- DATA CENTERS
- SOLAR ENERGY
- OIL AND GAS
- TELECOMMUNICATION
- TURBINES
- ARCHIVES AND LIBRARIES
- HOTELS
- HOSPITALS
- EDUCATIONAL FACILITIES
- STEEL INDUSTRY
- MACHINE TOOLS
- PAINT SPRAY BOOTHS
- ELECTRICAL PANEL ROOMS
- CLEAN ROOMS
- PRINTING INDUSTRY
- TIMBER INDUSTRY
- OFFSHORE PL

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