TraFoProtect
Fire protection solution for oil-cooled transformers

Cool down.
Fire Protection by

MINIMAX

RISK

Transformer fire

Power transformers are indispensable components of the electrical power supply system. They convert alternating voltage at different voltage levels and are used in power generation, transmission or distribution in power plants, industrial plants and substations. Large amounts of heat are generated during operation; for this reason, power transformers are usually designed as oil-cooled transformers and located outdoors.

An essential part of oil-cooled transformers is the tank, mostly filled with mineral oil and containing the transformer core and coils. To prevent short-circuits, the coil wires are coated with an insulating material. In addition, a floor pan is installed below the tank in case it is damaged and leaks.

The cooling oil used in the transformer is flammable at high temperatures and presents a considerable fire hazard due to the large quantity used. A defective or aged insulation of the coil wires or a high electrical surge, e.g. as a result of lightning strike, may cause overheating in the transformer and lead to the ignition of the oil. If this situation is compounded by damage to the transformer tank or the oil-carrying lines, spray fires and the ignition of puddles of oil outside the transformer often occur as well.

Spray fire is fed by oil emitted under pressure from a leak on the transformer. Puddles of fire may result in the floor pan, if oil, which has escaped from the transformer tank, collects there and ignites.

Without timely and suitable countermeasures, it is not only the transformer which will be destroyed as a result of overheating. A transformer fire with a high release of heat may also present a considerable hazard for the ambient infrastructure and may even bring it to a halt. Though the Buchholz relay (transformer protection switch) installed as a rule switches off the transformer in case of overheating, it is not able to prevent a fire from breaking out. For this reason, we strongly recommend installing a fixed fire-fighting system.

Conventional deluge systems have been proven to combat transformer fires effectively. On the other hand, they consume comparatively large quantities of extinguishing water and therefore require a correspondingly complex and extensive dimensioning of the system. In addition, discharged water may be contaminated by leaking transformer oil and would need to be collected for later processing. To this end, the floor pan must be dimensioned sufficiently large to ensure that it can collect not only the oil, but also any incident extinguishing water.

A protection plan for transformers, which considerably reduces the extinguishing water consumption compared to conventional deluge systems without being vulnerable to wind exposure in outdoor areas, is therefore extremely desirable, especially for retrofitting. Therefore Minimax offers an appropriate solution: TraFoProtect.

STRUCTURE A

TraFoProtect – the optimised

In structure and function TraFoProtect is similar to a classical deluge system. The system consists of the extinguishing zone, the water supply and the fire detection and extinguishing control system.

Extinguishing zone

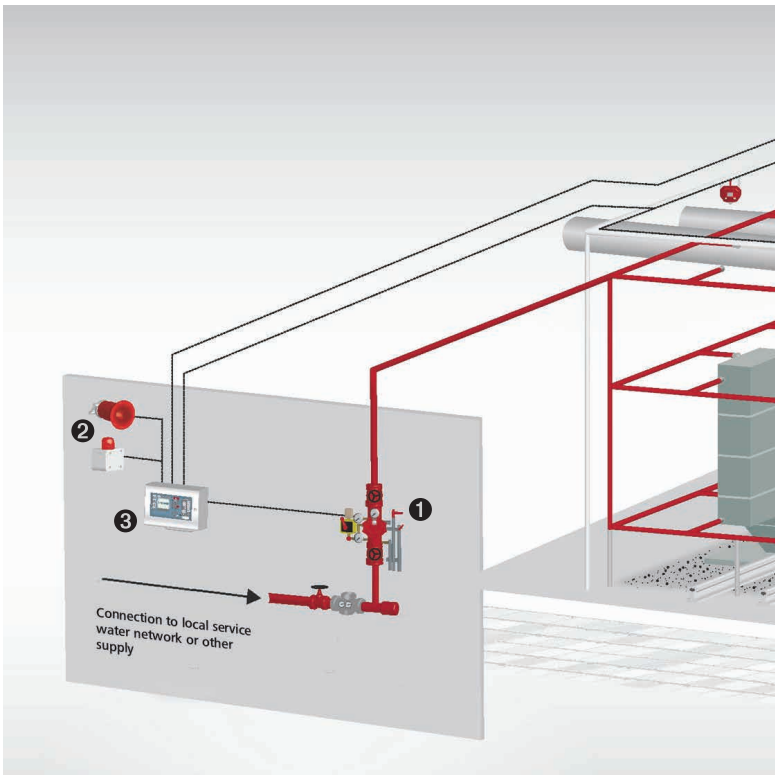
In the extinguishing zone, Type A TraFoProtect nozzles will be installed at several levels and adjusted in line with the transformer requiring protection. If the floor pan of the transformer is not protected by approved devices, such as gravel beds or ignition-proof covers, additional Type C TraFoProtect nozzles can be installed in the floor area.

If the system is activated, the extinguishing water is evenly sprayed by all nozzles installed in the extinguishing zone. Since the spray patterns and the arrangement of the TraFoProtect nozzles are optimally adapted to the geometry of the transformers, a considerably smaller consumption of water is required than in conventional deluge systems.

If the TraFoProtect is triggered early, for example by means of the Buchholz protective relay, the transformer is cooled from the outside to prevent further overheating. If a fire breaks out, causing damage to the transformer tank, spray fires and puddle fires are extinguished effectively with TraFoProtect, in addition to cooling the transformer. In doing so, the primary aim is to suppress the fire and to prevent a spreading of the fire to the infrastructure in the vicinity of the transformer.

Water supply

TraFoProtect offers many different options to keep the cost of the water supply low. Due to the low consumption of water resulting from the use of the TraFoProtect system, the installation can be fed in many cases directly from a local service water network. Alternatively, TraFoProtect can often use the already existing water supply of a conventional sprinkler or hydrant system or



Type A TraFoProtect nozzles are the most commonly used extinguishing nozzles in TraFoProtect systems. They generate an even, full-cone spray pattern. Using different nozzle inserts, 90° or 120° spray angles can be realised and the extinguishing water throughput can be varied per nozzle, to ensure optimal adjustment to the geometry of the transformer requiring protection.

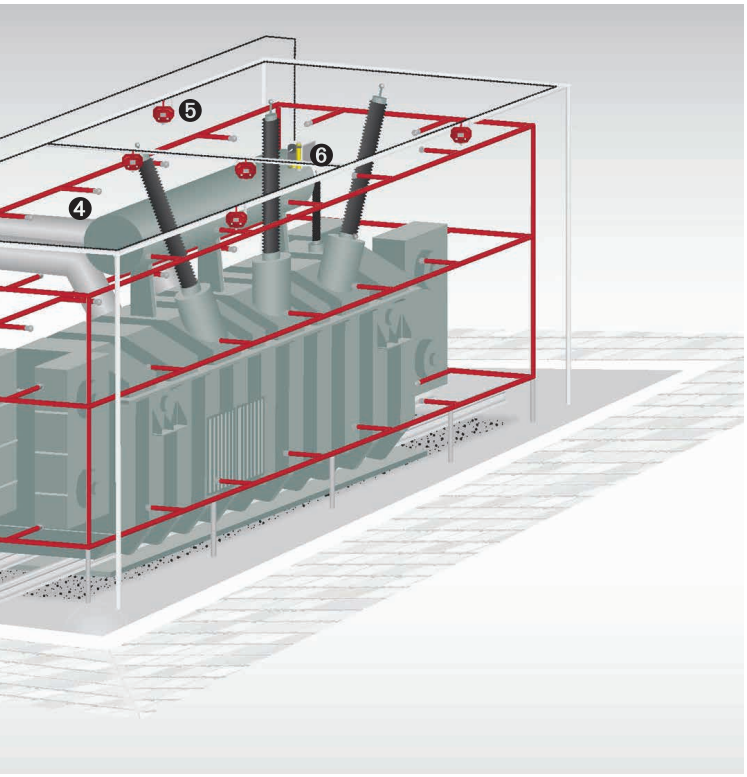
❶ Deluge valve set
❷ Alarm buzzer with strobe light
❸ Fire detection control panel

ND FUNCTION

deluge system

can be connected to the public drinking water system subject to appropriate safety devices. If these options are not available, the TraFoProtect is fed by means of a storage tank with automatic water make-up and a pump system, structured similarly to a conventional deluge system, however in a smaller dimension due to the reduced water consumption.

Additional safety is provided by the fire brigade supply, which allows for the supply of extinguishing water even in the event of a power failure at the pumps of the main water supply.



Fire detection and control technology
The TraFoProtect activates the extinguishing system by means of tried and tested Minimax fire detection and extinguishing control technology. This ensures optimal compatibility of electrical and mechanical system components. This prevents unnecessary coordination efforts and interface problems between various trades.

Fire detection is usually done by means of UniVario flame and heat detectors that emit a signal to the FMZ 5000 fire detection and extinguishing control panel in the event of a fire. The panel then activates the deluge valve. At the same time audible and visual alarms are triggered and forwarded to a permanently manned station to alarm, for example, the fire brigade.

In general, oil-cooled transformers are equipped with a Buchholz relay. This device detects the formation of gas in the oil chamber of the transformer in the event of overheating and then initiates the shut-down of the transformer. The Buchholz relay can also be connected to the FMZ 5000 to ensure that the TraFoProtect is triggered as early as possible.

❹ TraFoProtect nozzles
❺ Fire detectors
❻ Buchholz relay

Type C TraFoProtect nozzles can be installed optionally in TraFoProtect systems in the level floor area under the transformer to specifically burning puddles in the floor pan. The fan-shaped spray pattern with a spray angle of 180° is typical for this type of nozzle.

SOLUTION

TraFoProtect

TraFoProtect is an optimised deluge system, which consumes considerably less water than conventional deluge systems. This means that the system and the floor pan to collect the extinguishing water can be designed in a rather small dimension; this is a considerable advantage especially for retrofitting. Moreover, the operator of a plant can significantly reduce costs after the fire, because there is less extinguishing water contaminated with transformer oil to be disposed of professionally and recycled. In this way TraFoProtect also contributes to environmental protection.

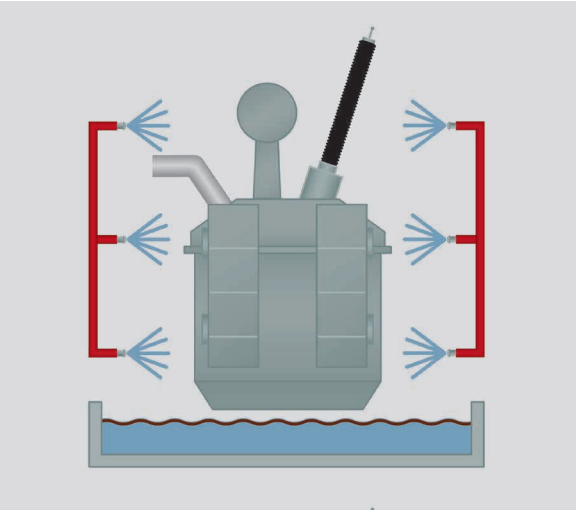
The suitability of TraFoProtect for controlling and suppressing fires on oil-cooled transformers has been proven in numerous fire and extinguishing tests conducted on realistic model constructions. Since it is to be assumed that the transformers will be installed in outdoor areas, the relevant wind exposures were simulated and taken into account in the protection plan. The effectiveness of TraFoProtect is proven also for outdoor use.

The components and design parameters as well as system efficiency are UL listed. Moreover, an performance test for TraFoProtect carried out by DMT GmbH & Co.KG is available. The TraFoProtect design manual is UL listed and contains all essential parameters for a technical design of the extinguishing system. This means that the system meets the requirements of the relevant NFPA 15 and TS 14816 directives.

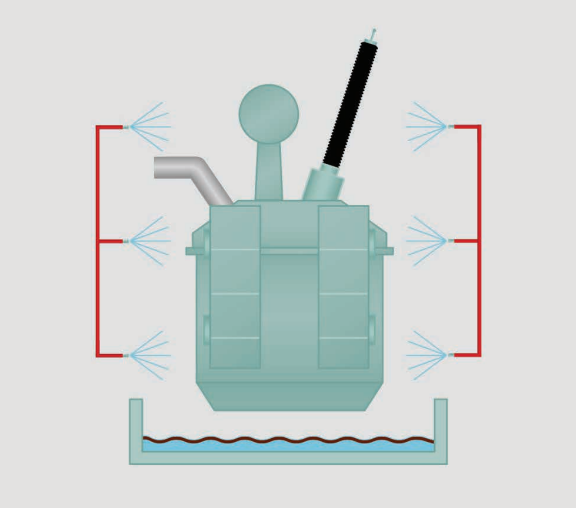
BENEFITS at a glance

Why TraFoProtect?

- Prevents extended business interruptions in the wake of uncontrolled transformer fires
- UL listed and successful DMT GmbH & Co. KG performance test; proven efficiency also under wind exposure
- Considerably lower extinguishing water consumption than in conventional deluge systems
- Low cost for water supply; in many cases it is possible to connect the system to the local service water supply
- The floor pan to collect extinguishing water can be designed in smaller dimensions than in the case of conventional deluge systems
- Ideal for retrofitting
- Less extinguishing water contaminated with oil means less recycling costs – a contribution to environmental protection



Transformer protection with a conventional deluge system



Transformer protection with TraFoProtect

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