

Protection of outdoor transformer

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Key questions

Why is fire
protection
so
important?



Where is
the
hazardous
area?

Key arguments

Transformer fire can be disastrous for people, economy and environment.

A transformer contains up to 50 tons oil. Burn or leakage of such an amount of oil is a serious environmental hazard.

Normally fire appears because of a short-circuit in the transformer winding system. The consequence is that it will significantly increase the heat, create gas and internal pressure in the oil system.

This high pressure can damage the pipe connection, gasket or seals in the radiators and cause oil leakage.

Transformer without fire protection



Click above to start video

Requirements and Standards

- There is no standard test procedure for fire protection of transformers and the requirements for fire protection of transformers are unclear and may vary between countries.
- **NFPA 15** is a standard for:
Water Spray Fixed Systems for Fire Protection
- According to paragraph 1-3-2 :

Water spray protection is acceptable for the protection of hazards involving each of the following groups:

-(2) Electrical hazards such as transformers, oil switches, motors, cable trays, and cable runs

Requirements and Standards

continued

According to NFPA 15:

7.4.4.1* *Transformer protection shall provide complete water spray impingement on all exposed exterior surfaces.*

7.4.4.2 *Where there is insufficient space to install water spray nozzles underneath transformers such that the water spray cannot directly impinge upon the bottom surfaces, it shall be permitted to protect the surfaces underneath the transformer by horizontal projection or by nozzles directed to cool the area below the transformer projections.*

Prevention of fire in Taiwan Province of China

- WM was released at a temperature of 45°C for cooling the oil therefore preventing any risk for high pressure in the oil piping.
- We installed micro nozzles in a row. They are released automatically, without shut down of the main power.



Typical oil cooled transformer


Power plant Poland



Background for the test

- EXPO 2010
- 30 m. underground power station with several transformers

以人为本 科学施工 构建和谐
——500千伏静安(世博)输变电工程建设巡礼



- 世界一流的超大容量全地下变电站
- 当今国内开挖最深的逆作法项目
- 逆作法施工集成创新的典范工程

上海建工集团第二建筑工程有限公司
2007年8月

Transformer in the test facility in Shanghai

- The ceiling and one side of the facility are open



Structure of piping installation



Nozzle arrangement



Pump unit with 3 high pressure PAH 63 Danfoss and Position of oil pit



Design Data

- Open Nozzle 7-01-56-5-12-00, flow rate 11,9 L/Min.
- Micro nozzle 1934, flow rate 2,38 L/Min. with 0,5 m, spacing and 0,5 m height.
- Local Application nozzles were used in the top and micro nozzles were installed in an adapter and welded to a pipe to protect the oil pool in the bottom of the transformer.



Fire Test in open air

- 6 MW spray fire at top
- 4X2 MW fire under transformer



Fire Test in open air

continued

- After 10 seconds



Result:

- Water consumption 258 l/min.
fire extinguished after 33
seconds.



Oil transformer test



Click above to start video

**Thank you
Question?**