



Electrical Power Cable Tray Protection

Riyadh, Kingdom of Saudi Arabia

Project Overview

At the Princess Nourah Bint Abdulrahman University, AP Sensing's Linear Heat Detection (LHD) solution is monitoring the underground electrical cable galleries of the campus. This women-only higher education institution is located in Riyadh, Kingdom of Saudi Arabia. It is one of the world's biggest universities for the next generation of women with an 8 million m² campus composed of state-of-the-art educational facilities for up to 60,000 students.

Since 2011, AP Sensing has been monitoring the cable trays of several medium-voltage (typ. 33 kV) electrical power distribution cables located in the underground electrical cable galleries. Due to line-of-sight issues of traditional thermography services, it is difficult to achieve a full survey that covers inaccessible tunnel areas containing power cables. For this reason, the client selected AP Sensing's LHD solution. Our system completely monitors the cable trays of all MV electrical power cables every minute of the day with automatically-generated alarms to instantly alert facility managers and provide the location of a potential fire or hotspot for further action.

Utilizing four LHD units located in the underground utility tunnels, a total of 64 km of fiber optic sensing cable was deployed to detect hotspots along the power cable trays. AP Sensing's fiber optic LHD technology ensures a continuous electrical power supply to all critical parts of the university including

the hospital, laboratories, academic and residential blocks on the campus.

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Background

- One of the world's largest university campuses, spanning 8 million m²
- Aging 33 kV power cables in underground tunnels require constant monitoring
- Traditional thermography could not cover inaccessible areas
- Tunnels require constant monitoring



Solution & Benefits

- AP Sensing's LHD System monitors 64 km of power cables in real time
- Seamless integration ensures automated alarms and efficient control
- SmartVision software enables quick hotspot detection and improved safety

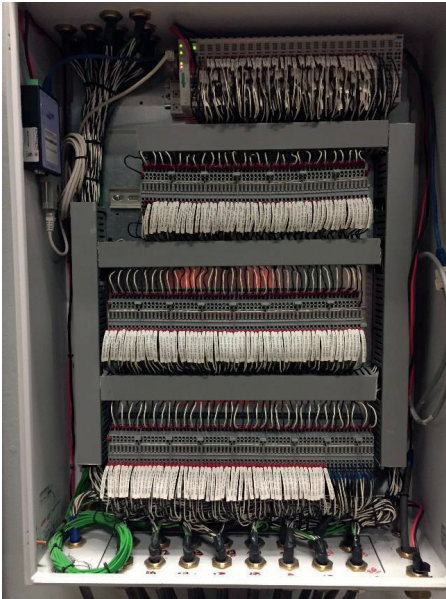


Figure 1: Relay wiring

the hospital, laboratories, academic and residential blocks on the campus.

The Sensor Cable

Each cable tray accommodates up to two power cables. In this underground utility tunnel, multiple cable trays are stacked vertically and horizontally. For each cable tray, a fiber optic sensing cable is laid above and along the length of the MV power cable. The lightweight, flexible fiber optic sensing cable is 4 mm in diameter. The sheer volume of densely-packed power cables represents a challenge for monitoring: Some of the original power cables are approaching half-life, and avoid exceeding the designed operating power rating only with constant monitoring.

Seamless Integration

An initial, challenging project requirement was the full integration of the LHD system with the Distributed Control System (DCS) at the university campus. However, the final design of the LHD system required each LHD unit to send alerts to the Fire Alarm Control Panel (FACP) using volt-free relay contacts, and that alarms reset via the same FACP with electrical inputs.

This complex wiring exercise of more than 300 relay contacts was carefully implemented and maintained. To further improve the operator's control, all LHD systems were connected to an industrial server PC located in the central control room and controlled remotely.

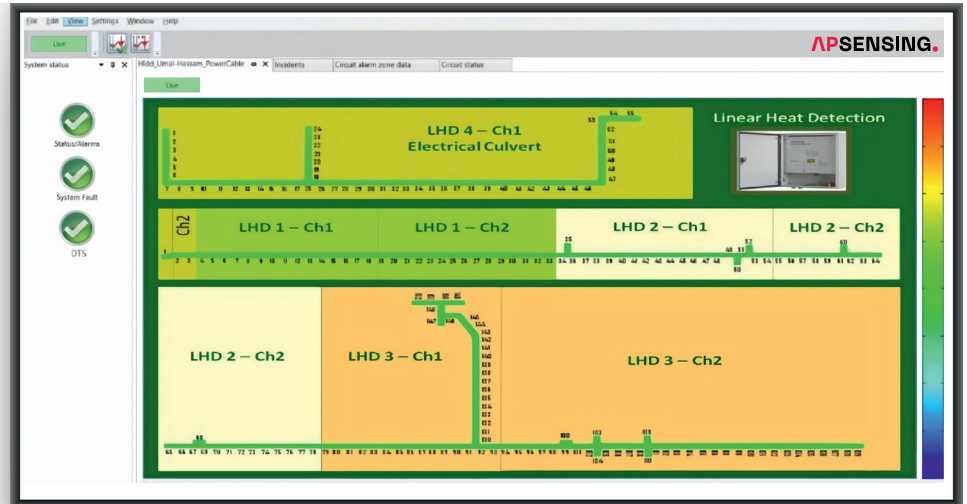


Figure 2: Visualization display for the campus MV cable tunnel and galleries

Although volt-free relay contacts were the most suitable choice because this represents an easy upgrade path for the facility management system at the campus, all LHD systems are already using intranet for communication with the industrial server PC, and can be equipped with classic or modern communication protocols like Modbus TCP/IP, OPC or DNP3 to easily accommodate a requirement or change in the future.

SmartVision

The LHD monitoring system has received continued maintenance and upgrades. Our SmartVision asset visualization software introduced an intuitive, visualized display to quickly alert facility managers to MV cable hotspot locations. Complete with automatic alarm generation and management from SmartVision, the system ensures the campus' electrical power cables are in peak operating condition.

Conclusion

With technical expert training, including a refresher training in 2016, the regional operations and maintenance service provider further facilitates its operation and maintenance efforts and continues to demonstrate confidence in AP Sensing technology.

Our LHD products are engineered for high reliability, having a MTBF of 33 years with the lowest failure rates in the industry. All voltage-free relays used are solid-state without mechanical moving parts; a self-monitoring LHD system design ensures overall system reliability.