NEW DETECTION SOLUTIONS FOR HVDC CONVERTER STATIONS

A high-voltage, direct current (HVDC) electric power transmission system (also called a power superhighway or an electrical superhighway) uses direct current for the bulk transmission of electrical power, in contrast with the more common alternating current (AC) systems.

For long-distance transmission, HVDC systems may be less expensive and suffer lower electrical losses. For underwater power cables, HVDC avoids the heavy currents required to charge and discharge the cable capacitance each cycle. For shorter distances, the higher cost of DC conversion equipment compared to an AC system may still be justified, due to other benefits of direct current links.

HVDC facilitates power transmission between unsynchronised AC transmission systems. Since the power flow through an HVDC link can be controlled independently of the phase angle between source and load, it can stabilise a network against disturbances due to rapid changes in power. HVDC also allows transfer of power between grid systems running at different frequencies, such as 50 Hz and 60 Hz. This improves the stability and economy of each grid, by allowing exchange of power between incompatible networks.

HVDC is a key enabler in the future energy system based on renewables, and it is truly shaping the power distribution grid of the future. The utilisation of such plant is not without risk and considering our dependency on electricity, maximising uptime and quickly detecting undesirable event, such as fires, is of paramount importance.

Fire & Gas Detection Technologies Inc (FGD), has been working with a multinational company to develop products specifically tailored to their needs and utilisation in HVDC converter stations.

Fire Risk: In high-voltage direct current transmission (HVDC) converters and flexible AC transmission systems (FACTS), a rare malfunction could lead to an interruption of the load current path. This situation may create an undefined current path, potentially resulting in an arc, which could ignite a fire in the affected module. To mitigate the impact on the unaffected parts of the inverter, flame detectors should be used to identify the failure and promptly shut down the system.

Triple IR detectors are virtually immune to false

alarms and can have extremely long detection distances to some fire types. There are, however, wide performance variations from brand to brand as no two triple IR detectors are the same.

A triple IR detector has three sensors, each sensitive to a different IR wavelength. The IR radiation emitted by a typical hydrocarbon fire is more intense at the wavelength accepted by one sensor, usually around 4.5 microns, than the other two. The IR energy detected at 4.5 microns relates to the products of combustion of the hydrocarbon fire – the main component being carbon dioxide (CO_2).

For this application, our standard FlameSpec IR3 detector was modified with a unique set of parameters specifically to detect arc flash fires. The FlameSpec IR3-CSxE detects fires very quickly at distances up to 20 metres, the detector offers alarm and fault relays that can be configured as normally open or normally closed when under power.

Other Risks: Electrical modules can cause arcing as an early indication of failure. Unfortunately, triple IR detectors cannot detect electrical arcs, and we therefore had to modify the FlameSpec UV-IR detector for this application.

The FlameSpec UV-IR CSxE detector is essentially a fast-acting UV detector capable of detecting AC or DC electrical arcs quickly. This unit was also modified to ignore some switching events that would be considered part of normal plant operation. The FlameSpec UV-IR-CSxE detects also offers alarm and fault relays that can be configured as normally open or normally closed when under power.

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FIRE & GAS DETECTION TECHNOLOGIES INC.

True Innovation in Flame Detection

When Every Second Counts...

- IR3, UV-IR flame detection
- HD cameras & on-board recording
- Highest false alarm immunity
- ATEX●IEC Ex●FM●SIL2
- FM3260 / EN54-10
- 5 years warranty

- Oil & Gas
- Energy transition
- Offshore wind
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