



Integrated Smart Sensing

On-line condition monitoring for power cables



Power network integrity

FOR CABLES AND UMBILICALS

Ensuring maximum throughput across an extensive network of power cables can be challenging. Within a single network, cables vary by type, installation and operating environment, making them susceptible to numerous risks that can result in cable failure.

Unfortunately, most fault detection solutions provide alerts after an electrical or mechanical fault has occurred, making pinpointing the root cause of the fault a time-consuming and costly process.

The OptaSense Integrated Smart Sensing (ISS) system provides a solution that allows you to monitor the condition of your network and pinpoint the root cause of cable failure in real time.

Using Distributed Acoustic Sensing (DAS) technology, the OptaSense ISS system transforms existing fiber optic cables into an array of virtual microphones that detect, classify and locate issues along the power cable, as well as threatening events near the asset that can result in power failure.

**LOCATE SHORT CIRCUITS
±10M ACCURACY**

The system integrates multiple power cable condition monitoring capabilities from a single distributed fiber optic system, including detecting and locating power cable faults, preventing third-party cable damage, avoiding costly cable breakdowns, and monitoring assets during seismic events.



Our system at a glance

- Detect multiple faults / damages / failures, and their severity
- Monitor every point along the asset and surrounding vicinity
- Sensitive to small degradations and cable defects
- Accurate location of cable degradations / defects
- Applicable to a wide range of onshore and subsea power cables
- Applicable on multisegment systems with different cable types
- On-line visualization tools and displays
- Lower installation costs

Detect and locate power cable faults

After experiencing a short circuit, locating the fault is normally a manual, time-consuming process that delays repairs—leaving assets offline and idle. The OptaSense ISS system monitors for ground strain, temperature changes and shock waves to detect and accurately locate short circuits in real-time.



INTEGRATED SMART SENSING

MONITOR NETWORK
AT EVERY POINT

How it works

During a short circuit, physical energy flows into the surrounding earth, resulting in ground heave, which places strain on the fiber. The system detects this strain to locate faults within 5-10m of the occurrence on subsea cables, underground cables or cable tunnels. The system also identifies changes in temperature caused by the impact of transient strain at the time of an electrical power surge.

To further pinpoint a fault location, the system detects shock wave ripples, or negative pressure pulses, caused by the transient power dissipation that propagates both upstream and downstream from the short circuit location.

Prevent third party cable damage



Some power networks in high-risk environments contain power cables that are more susceptible to accidental damage or sabotage. The OptaSense ISS system allows operators to detect, locate and classify potential third-party interference (TPI) events, such as manual or mechanical excavation and theft.

Protecting offshore assets

Damage to subsea cables and umbilicals presents a great risk to offshore wind farms and oil and gas platforms. The OptaSense system provides operators the opportunity to safeguard these assets by identifying external threats, such as third-party boats, anchors and fishing nets, before a damaging event occurs.

With a detection range spanning (DISTANCE) out from the power cable, the OptaSense system provides real-time alerts when potential threats approach the vicinity of the asset—ensuring operators have the time necessary to implement effective preventative measures.

Safeguarding onshore assets

Two Underground power cables and overhead transmission lines are most susceptible to third-party damage and theft—resulting in prolonged outages, unstable operating conditions and added restoration costs.

Underground cable damage is commonly attributed to unintentional mechanical digging along major road networks. They are also impacted by copper cable theft, another epidemic affecting utilities and communities nationwide. However, copper is not the only metal criminals target. Aluminum conductors installed on overhead transmission lines and steel sections from transmission towers are also vandalized and sold as scrap metal.





Avoid costly cable breakdowns and installations

Although mechanical damage to power cables will result in immediate failure, less severe damage caused by other factors may go unnoticed—eventually leading to failure and energy supply disruption. Whether it's the direct result of incorrect system design, inappropriate installation or power overloading, OptaSense Integrated Smart Sensing allows you to limit installation and service costs, while obtaining higher performance, reliability, and asset life.


Conventional condition monitoring for power cables often involves a manual, periodic inspection process. For applications spanning large areas and longer distances, this process can become over-complicated, bulky, unreliable and costly to maintain.

Offshore condition monitoring

To prevent mechanical failures and improve reliability in offshore environments, the OptaSense ISS system provides early detection of vortex induced vibration (from steady ocean current) and free span over uneven seafloor, which can result in subsea cable and umbilical exposure—making them more susceptible to damage.

Onshore condition monitoring

In onshore environments, this system enables condition monitoring on overhead assets including galloping of lines due to wind, insulator failure on critical lines and partial discharge in cables and joints, as well as cable sag and wind monitoring. Other capabilities also include circuit-breaker, transformer, cable and insulator condition monitoring.



Monitor assets during seismic events

Natural seismic disturbances, such as landslides and earthquakes, have destructive effects on the power system. And, are unpreventable.

The OptaSense system alerts operators within seconds of a seismic occurrence, by providing reliable, on-line notifications and acoustic signals that pinpoint damaged areas by intensity—enabling rapid dispatch, investigation and repairs.

Turning big data into big insights

INTERACTIVE VISUAL DISPLAYS AT YOUR FINGERTIPS



Big data allows operators to achieve in-depth, rapid insights that strengthens decision-making, improves operations and accelerates productivity. But today, many operators struggle to derive more value from big data.

Big data is only as good as the data discovery tools that optimize its visualization. The OptaSense Integrated Smart Sensing system is powered by a dynamic platform that processes large volumes of data that is delivered seamlessly to on-line, interactive visual interfaces that can be accessed from your desktop or in the palm of your hand.

On-line visualization tools and displays

Our system delivers big value from your big data through interactive tools and visual displays.

Big data visualization goes mobile

OptaSense Integrated Smart Sensing allows operators to take advantage of big data and the mobile workforce by placing data discovery tools in the palm of their hands—speeding insights and improved collaboration.

Power network integrity is only as robust as its weakest point. Detect, classify and locate faults along every point of your power network, as well threatening events near the asset that can result in power failure with OptaSense Integrated Smart Sensing.

To learn more about our on-line asset condition monitoring contact one of our local OptaSense experts or visit us online at www.optasense.com/power-utilities.



With Optasense
INTEGRATED SMART SENSING
and rapid deployment of DAS
WE LOCATED THE FAULT
WITHIN 4 HOURS OF ARRIVAL,
SAVING £90,000 OF REVENUE PER DAY.



Project: Offshore Windfarm
Location: Scotland
Distance: 15 km

While operating on an offshore windfarm in Scotland, midway between the Galloway and Cumbrian coasts, our client experienced a short circuit on a main export cable approximately 15km in length, of which 13km was located subsea. Until the fault could be located and repaired, 80MW of offshore power would be sitting idle.

Existing Time Domain Reflectometry (TDR) methods using a high voltage pulse generator indicated the fault was 2km offshore. A repair in this location would cost the operator £8M, in addition to placing the wind turbines offline for up to 6 months—accruing a potential loss of revenue of £90,000 per day. Locating a fault using the TDR technique is a lengthy process with a lower location accuracy of +/- 300m on a 15km cable.

As with many export and inter-array subsea power cables, the export cable had an existing fiber optic cable integrated within the structure—meaning the rapid deployment of DAS was possible. OptaSense experts mobilized quickly, arriving onsite within 24 hours and locating the fault within 4 hours of arrival.

The location of the discharge noise, which was caused by the generator, was determined in minutes. OptaSense verified that the fault was actually located onshore, eliminating up to eight weeks of offshore repair time at £10K per day and lost revenue for the operator. By determining that the fault was onshore we eliminated the additional need and high cost for vessels and ROV's.

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