OptaSense® Distributed Acoustic Sensing (DAS) Systems for the Power Network

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ABSTRACT

Today's power cable monitoring solutions are limited in their ability to rapidly detect and accurately locate faults. Distributed Acoustic Sensing (DAS) which has revolutionised the protection of Oil & Gas assets provides a real time monitoring profile of the buried cable accurate to 10m. This technology allows the operator to optimise the usage and reduce repair downtime in the cables, whilst maximising the network lifetime and minimising cost. This paper discusses the application of OptaSense® DAS within the power network to monitor issues such as short-circuit detection and localisation and compares DAS with traditional methods.

KEYWORDS

Distributed Acoustic Sensor (DAS) System, Fibre Optics Cable in Export or Subsea Power Cables and Offshore Wind Farm (OWF), Time Domain Reflectometry (TDR).

AUTHOR NAMES & AFFILIATIONS

Kuljit SINGH, MIET (UK), kuljit.singh@optasense.com, has more than 8 years of experience in providing fibre optics asset management solutions (using DTS) in the Power Transmission and Distribution Networks. He continues to be involved actively in development of new application including for the Offshore Wind Farm application. His first 20 years of work experience has been involved in developing market solutions using Power Semiconductors.

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has two decades of experience at the forefront of acoustic sensing and since the inception of OptaSense 2008 has led fibre sensing product development and operational implementation. He is responsible for the initial early adoption of Distributed Acoustic Sensing in the Oil and Gas sector, helping a wide range of clients implement Leak prevention strategies with the aim of Zero Pipeline Incidents.

Chris has a PhD in Physics and is Chartered Member of the Institute of Physics (CPhys, MInstP).

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has worked in fibre optic sensing for the last 5 years, concentrating on new applications of the technology. Alastair has a PhD in Materials Science and conducted research in a variety of fields including alloy development, electrochemistry and nanomaterials before moving to fibre optic sensing. He has about 40 patents and patent applications in his name.

INTRODUCTION

In today's increasingly competitive environment, network operators must optimise the efficiency of the grid and maximise the lifetime and availability of deployed assets: as a result it is essential to understand the condition of the network at every point. Achieving and delivering power demands requires certainty clear understanding about what is really happening in the asset, because the integrity of the network is only as robust as the weakest point.

OWF SUBSEA CABLES ISSUES

At the time of cable layout designing stage, the cables are rated to thermal calculations based on [1] load on cable [2] thermodynamic properties of cable and thermal Dissipation of Surrounding Environment. However, there are several factors which can lead to higher heat dissipation caused by cable overheating, such as faults in cables/connectors which will result in cable failures. Rapid resolution of a fault condition is essential to minimize lost production and avoidance of operational penalties.

Current cable fault detection techniques take a considerable amount of both time and expense: it is a costly process which can cost the OWF operators a lost/loss revenue of £90,000 per day [3] . OWF Export and Inter-array Power Cables have the highest failure and claimant rate at 80% of insurance claims for this industry [3] and a quick response for fault location and repair time is essential to reduce the running and insurance cost.

FIBRE OPTICS SENSING TECHNOLOGY

Fibre Optic Sensing has been used in power networks for a number of years to detect hotspots and help operators