Air Connect Engineering (Thailand) Co., Ltd

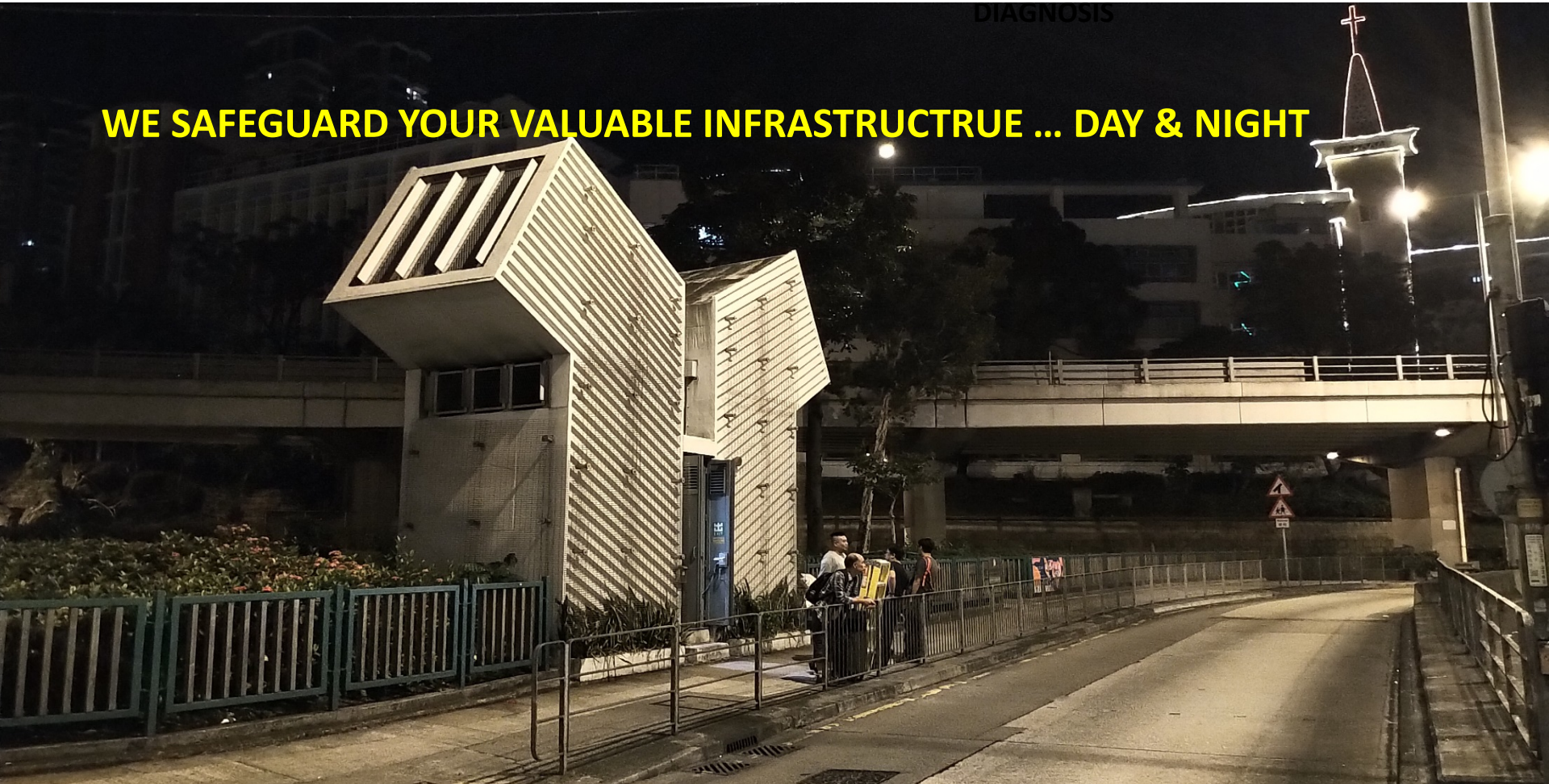
Air Connect Engineering (Thailand) Co., Ltd

OUR VALUE PROPOSITIONS TO CLIENTS

CONDITION BASED MAINTENANCE (CBM)
PREVENTIVE
SELF-CHECK / SELF-DIAGNOSIS

VS

SCHEDULED MAINTENANCE
REACTIVE
MANUAL CHECK / MANUAL DIAGNOSIS



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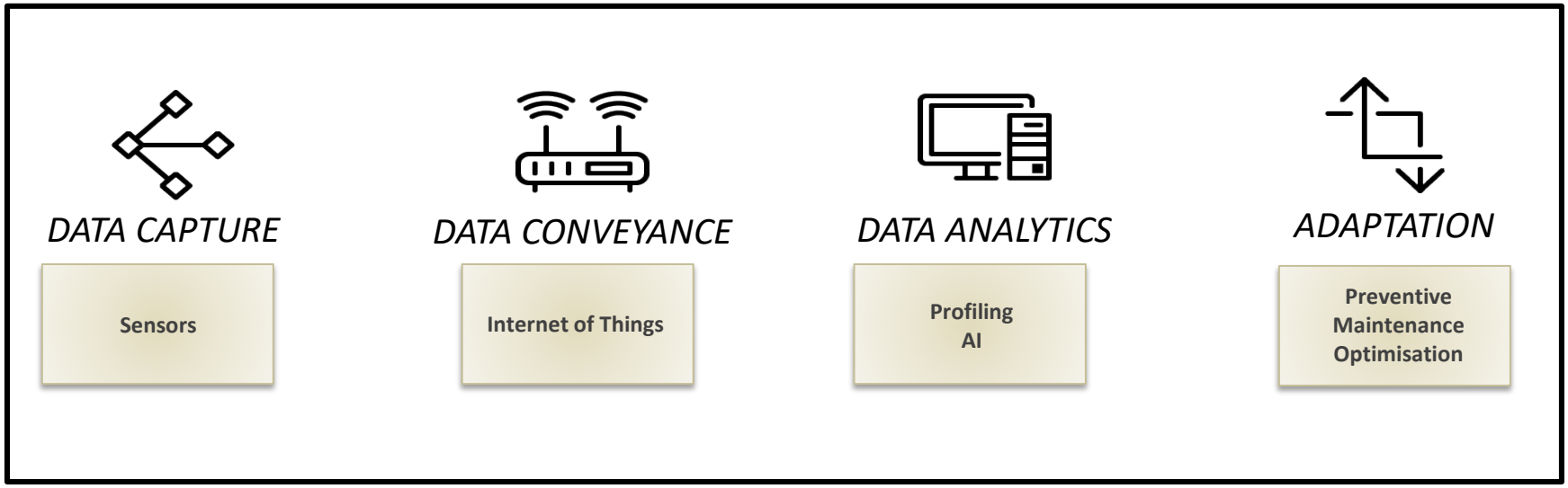
ELEMENTS OF A SMART INFRASTRUCTURE SYSTEM



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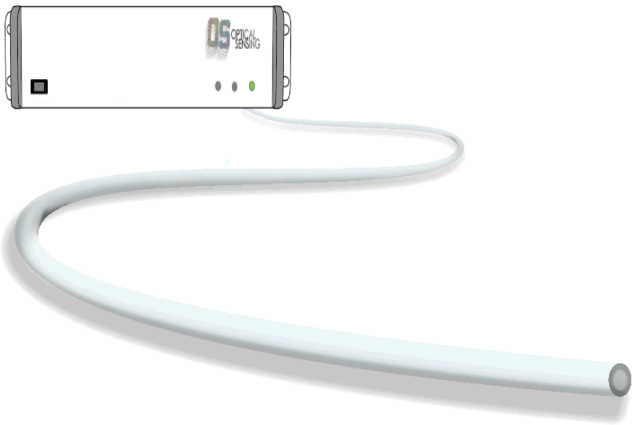
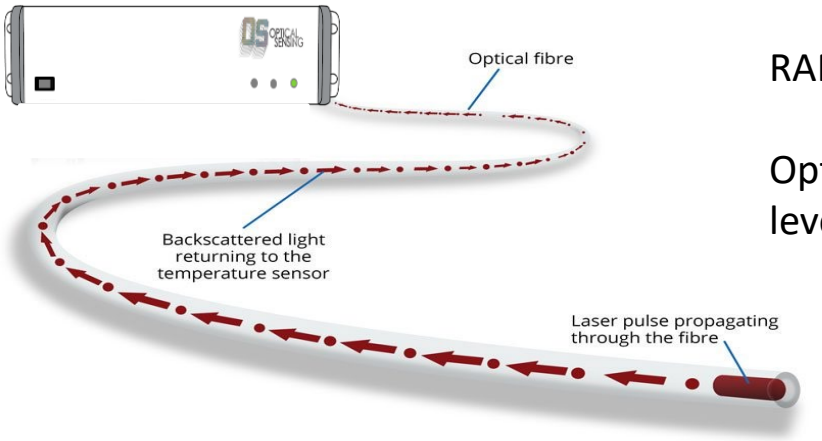
FIBRE OPTIC SENSING





IT OPERATES LIKE A RADAR

The Optical Equipment sends a series of pulses into the fiber core and records the return/ reflected light (scattered signal) against time

REFLECTED [BACK SCATTERED] LIGHT

The back-scattered light have a different value of wavelength from the incident light's wavelength due to change in energy between the two lights

RAMAN SHIFT = $1/\lambda_{incident} - 1/\lambda_{back\text{-}scattered}$

The change in optical properties enable the Optical Equipment to calculate the change in energy level, hence change in temperature

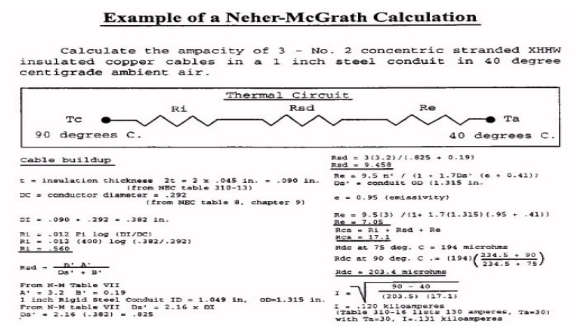
Data point location [L] is calculated by

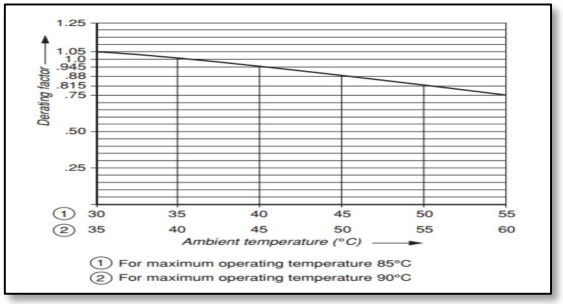
$L = c \times (T/2)$

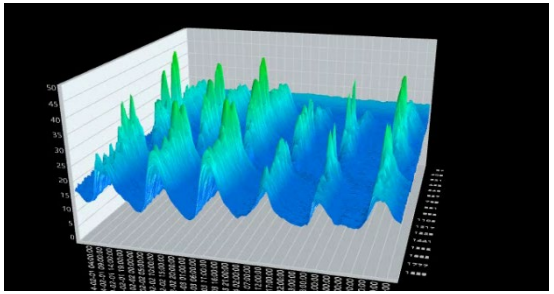
Where T is return path travel time

Air Connect Engineering (Thailand) Co., Ltd

DATA ANALYTICS TECHNIQUES







META ANALYTICS | **DATUM REFERENCING** | **PROFILING**

DATA ANALYTICS IS THE SINGLE MOST IMPORTANT ELEMENT IN

OPERATION CONDITION MONITORING

OSL HAS DEVELOPED ADVANCED AND PROVEN TECHNIQUES TO

TURN RAW DATA TO ACTIONABLE INTELLIGENCE

Air Connect Engineering (Thailand) Co., Ltd

WE HAVE ALREADY 2 PATENTS … MORE COMING

知識產權署專利註冊處
Patents Registry
Intellectual Property Department

香港特別行政區政府
The Government of the Hong Kong Special Administrative Region

批予短期專利證明書

《專利條例》(第 514 章)

CERTIFICATE OF GRANT OF SHORT-TERM PATENT

Patents Ordinance (Chapter 514)

I hereby certify that a short-term patent with the following particulars has been granted today:

專利所有人姓名或名稱及地址 Name and Address of Proprietor:
光傳感有限公司
香港
[illegible]
科技大道西 5 號
企業廣場 1 樓 107B 室
OPTICAL SENSING LIMITED
HONG KONG

專利編號 Patent No.: HK1179105　　申請編號 Application No.: 12110198.5

發明名稱 Title of Invention:
一種基於碼分 OTDR 的長距離分散式光纖溫度等感檢測裝置
A DEVICE BASED ON CODE DIVISION OTDR AND LONG DISTANCE DISTRIBUTED OPTICAL FIBER TEMPERATURE SENSING

短期專利有效期 (在符合續期的規定下) Term of Short-term Patent (subject to renewal):
由 16.10.2012 起計 8 年
Eight years commencing on 16.10.2012

1/2

2012

证书号第2729117号

实用新型专利证书

实用新型名称：一种基于码分OTDR的长距离分布式光纤温度传感检测装置

发　明　人：王国华

专　利　号：ZL 2012 2 0451294.6

专利申请日：2012 年 09 月 06 日

专 利 权 人：光传感有限公司

授权公告日：2013 年 02 月 27 日

本实用新型经过本局依照中华人民共和国专利法进行初步审查，决定授予专利权、颁发本证书并在专利登记簿上予以登记。专利权自授权公告之日起生效。

本专利的专利权期限为十年，自申请日起算。专利权人应当依照专利法及其实施细则规定缴纳年费。本专利的年费应当在每年 09 月 06 日前缴纳。未按照规定缴纳年费的，专利权自应当缴纳年费期满之日起终止。

专利证书记载专利权登记时的法律状况。专利权的转移、质押、无效、终止、恢复和专利权人的姓名或名称、国籍、地址变更等事项记载在专利登记簿上。

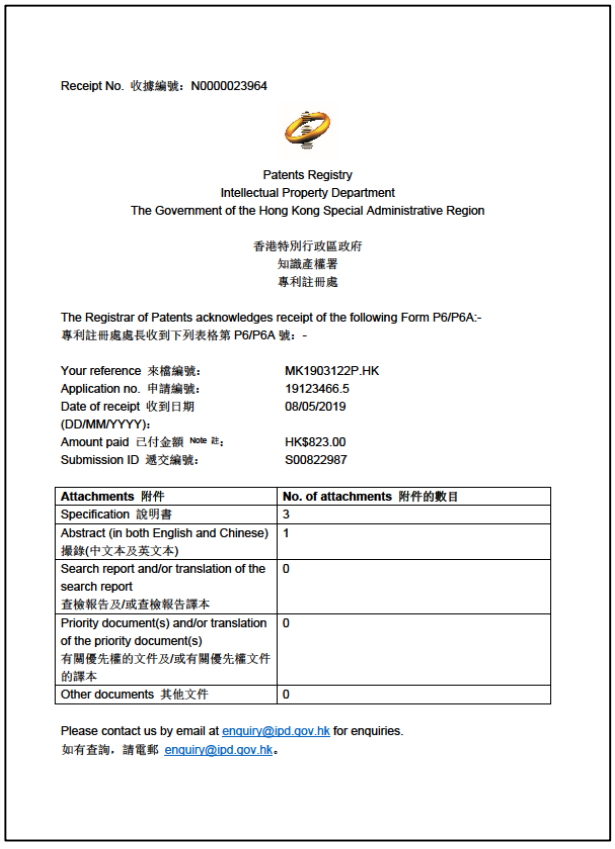
局长

中华人民共和国国家知识产权局

2013 年 02 月 27 日

第 1 页（共 1 页）

2012



Receipt No. 收據編號：N0000023964

Patents Registry
Intellectual Property Department
The Government of the Hong Kong Special Administrative Region

香港特別行政區政府
知識產權署
專利註冊處

The Registrar of Patents acknowledges receipt of the following Form P6/P6A:-
專利註冊處處長收到下列表格第 P6/P6A 號：-

Your reference 來檔編號：	MK1903122P.HK
Application no. 申請編號：	19123466.5
Date of receipt 收到日期 (DD/MM/YYYY)：	08/05/2019
Amount paid 已付金額 Note 註：	HK$823.00
Submission ID 遞交編號：	S00822987

Attachments 附件	No. of attachments 附件的數目
Specification 說明書	3
Abstract (in both English and Chinese) 撮錄(中文本及英文本)	1
Search report and/or translation of the search report 查檢報告及/或查檢報告譯本	0
Priority document(s) and/or translation of the priority document(s) 有關優先權的文件及/或有關優先權文件的譯本	0
Other documents 其他文件	0

Please contact us by email at enquiry@ipd.gov.hk for enquiries.
如有查詢，請電郵 enquiry@ipd.gov.hk。

2019 – 2 x PATENT PENDING

Air Connect Engineering (Thailand) Co., Ltd

FIBRE OPTIC SENSING SYSTEM – EXAMPLE

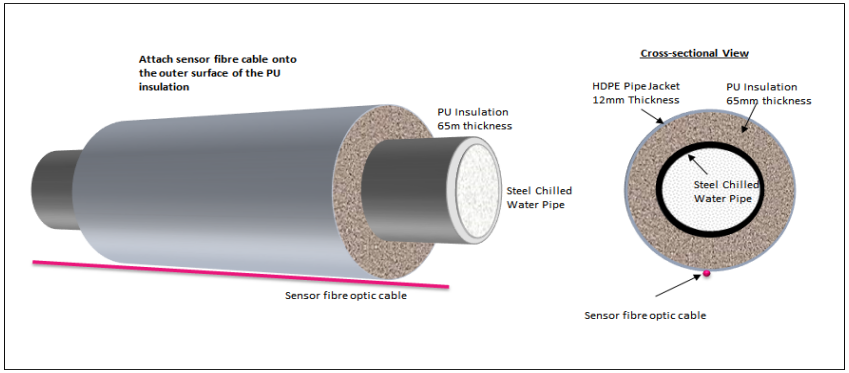
Air Connect Engineering (Thailand) Co., Ltd

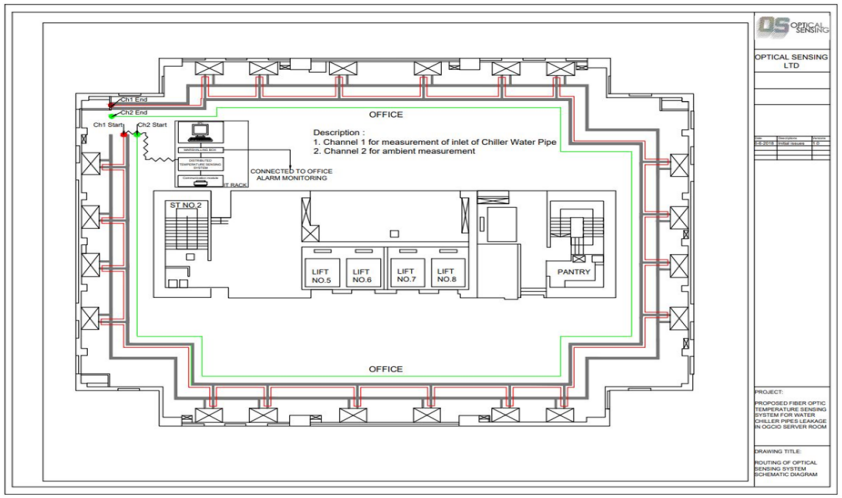
CHILLER PLANT LEAK DETECTON HK GOVERNMENT DATA CENTRE

Office of the Government Chief Information Officer
The Government of the Hong Kong Special Administrative Region

Our Fibre Optic Sensing System will be used to monitor chilled water pipeline network of the OGCIO Data Centre

OFFICE OF GOVERNMENT CHIET INFORMATION OFFICER [OGCIO] operates a major Data Centres at Tsuen Wan



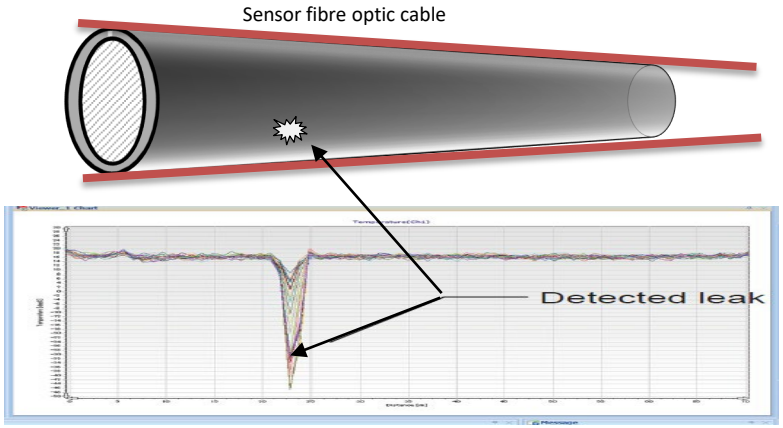


Air Connect Engineering (Thailand) Co., Ltd

GAS PIPELINE LEAK DETECTION

When there is a gas leak of a pipeline results in temperature differential between the ambient air and the escaping gas, Fibre Optic Temperature Sensing is the best choice to detect the leak.

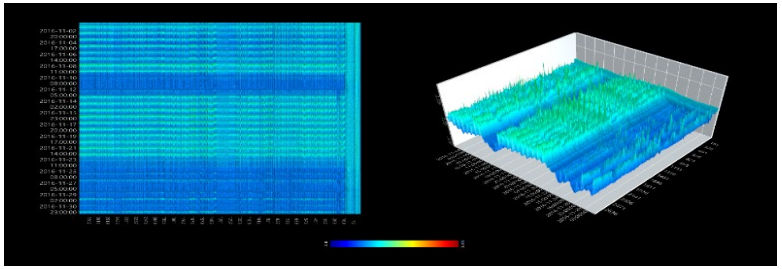
Pressurised Gas Pipelines



Pipeline leak, no matter how small, causes temperature drop at the point of leak

$$\mu_{\mathrm{JT}} = \left(\frac{\partial T}{\partial P}\right)_H = \frac{V}{C_{\mathrm{p}}}\left(\alpha T - 1\right)$$

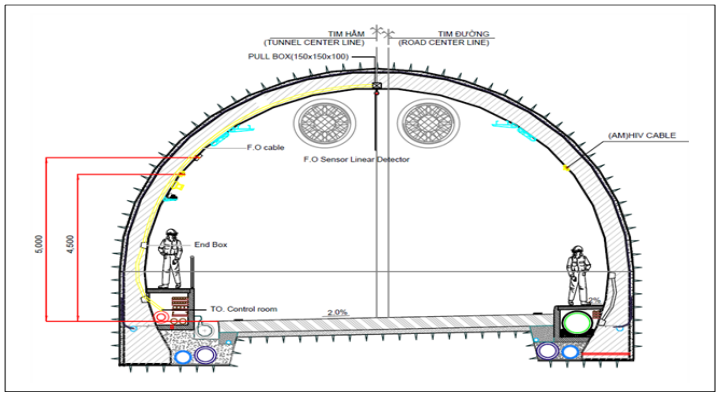
Joule Thompson Equation



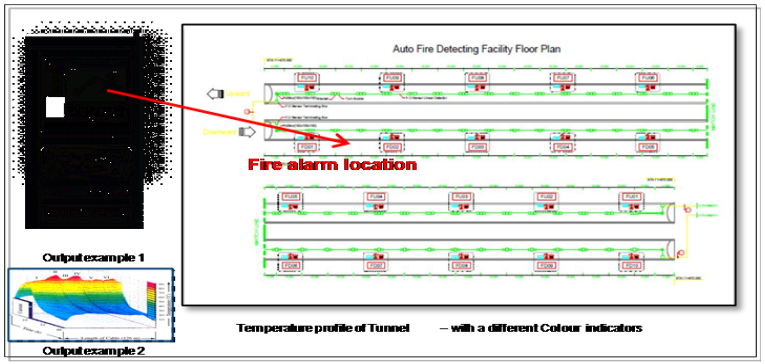
Monitoring and analysis of historical thermal profile of pipelines

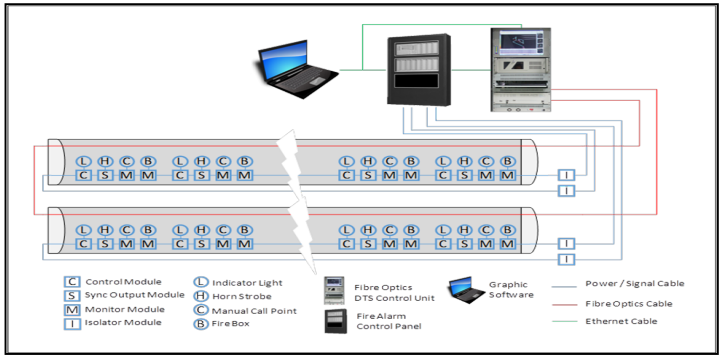
Air Connect Engineering (Thailand) Co., Ltd

LINE HEAT DETECTION



Application	Line Type Fire Detection / Alarm System for Vehicle Tunnel [2 x 500m tunnels]
Benefits	DTS fire detection system provides reliable detection as the fibre sensor does not require power and the sensor covers the full lengths of tunnel. Further, the DTS can trigger alarms based on increment in temperature gradient as well a absolute temperature readings





Air Connect Engineering (Thailand) Co., Ltd

FRESH WATER PIPELINE LEAK DETECTION

OUR R&D PROJECT FOR 2019 / 2020

The effectiveness of the detection system based on temperature gradient depends on:

$$T_D = T_A - T_W > 5^oC$$

T_D : Temperature Gradient / Difference
T_A : Ambience Temperature
T_W : Water Temperature

Data Profiling Technique may help to eliminate "background noise"

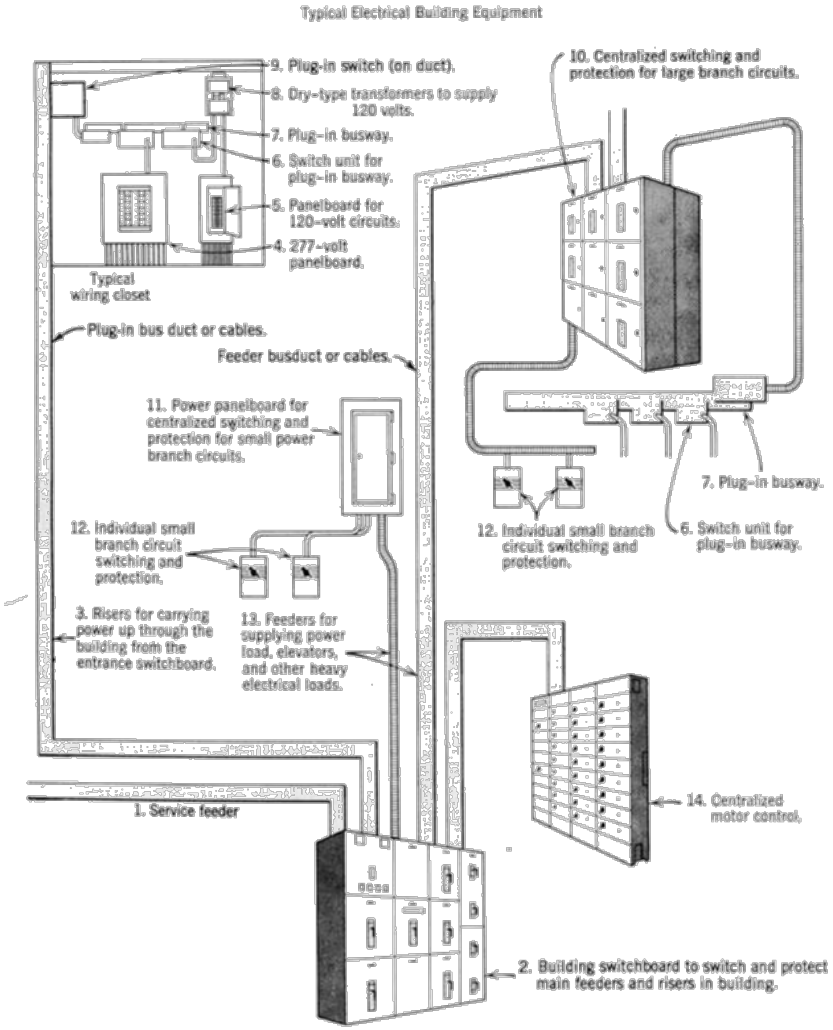
One solution being examined is to create a DISTINGUISHABLE THERMAL BOUNDARY

i.e. "warm up" the Fibre Sensing Cables to create a noticeable T_D when a leak occurs

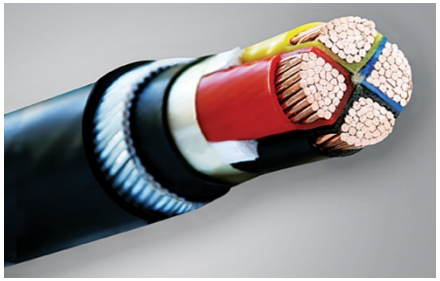
Potential heating mechanism is Far Infrared Heating by Carbon Fibre

Air Connect Engineering (Thailand) Co., Ltd

TYPICAL BUILDING ELECTRICAL RETICULATION SYSTEM



Bus Ducts



Cables

Switchboard / MCC

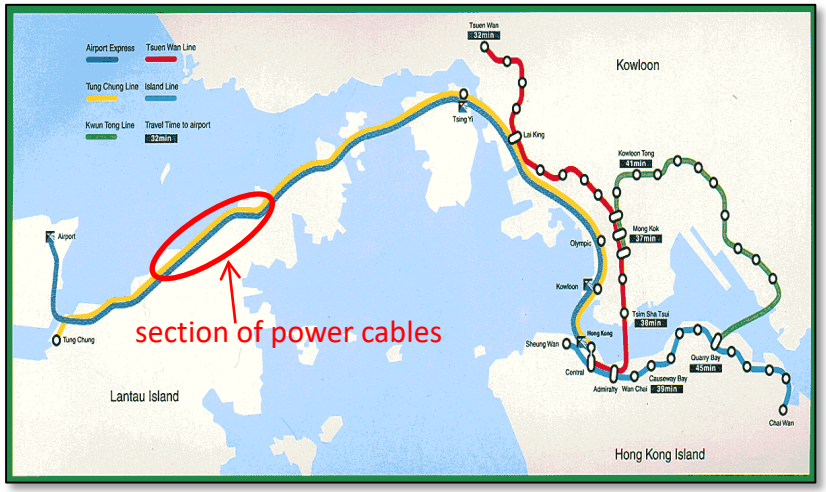
Air Connect Engineering (Thailand) Co., Ltd

CUSTOMER REFERENCE - 33kV POWER CABLE NETWORK

- Our Fibre Optic Sensing System monitors the 33KV Power Cables for the Lantau Airport Railway 33KV Power Cables

- **CONDITION BASED MAINTENANCE**

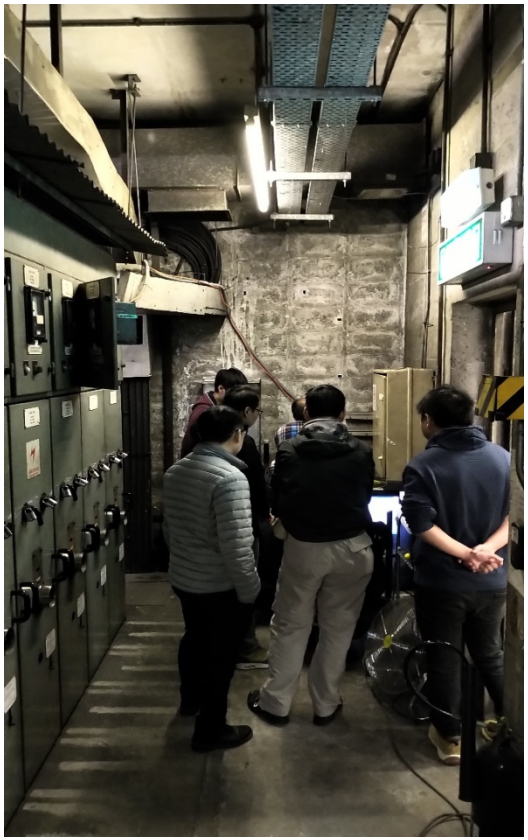
MTR港鐵



Air Connect Engineering (Thailand) Co., Ltd

CUSTOMER REFERENCE -TRACTION 1500VDC SWITCHBOARD

MTR 1500 VDC SWITCH GEAR AT YMT STATION [油麻地站 - GAR TRACTION STATION]



1500 VDC SWITCHBOARDS

FIBRE OPITC SENSOR

MAIN CONTROL UNIT

Air Connect Engineering (Thailand) Co., Ltd

CUSTOMER REFERENCE – 1500 VDC SWITCH GEAR

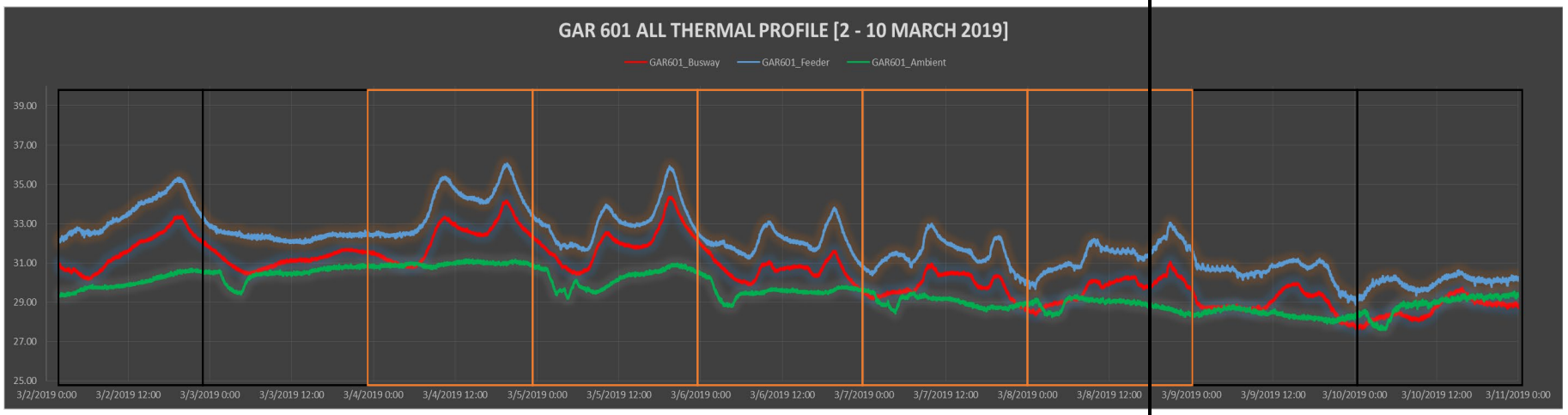


Figure 1. GAR 601 Temperature Distribution

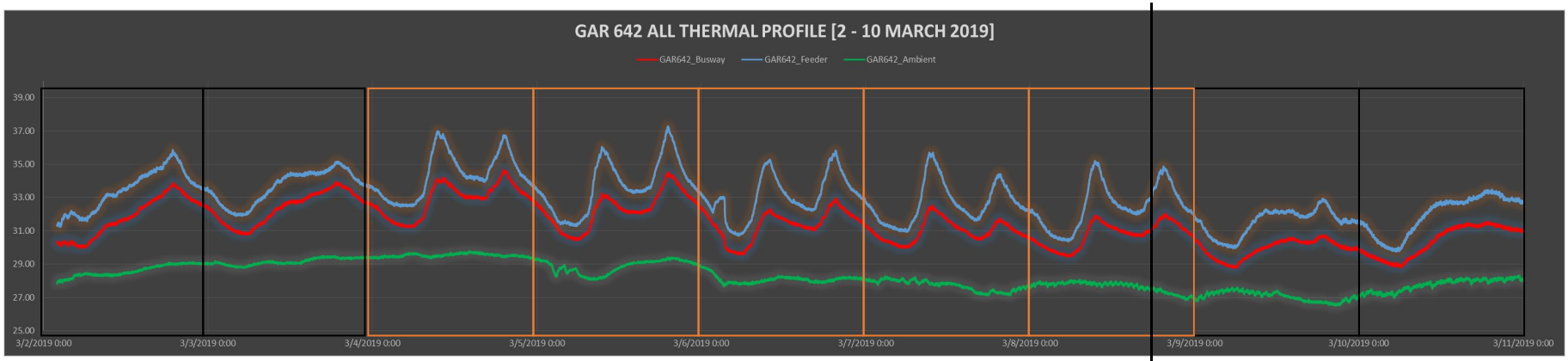


Figure 5 GAR 642 Temperature Distribution

Air Connect Engineering (Thailand) Co., Ltd

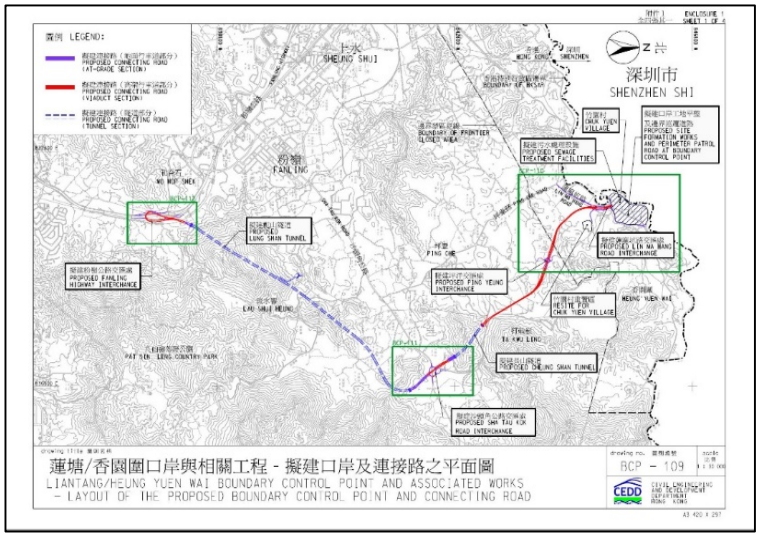
CUSTOMER REFERENCE – 132KV POWER CABLES

First Systems

Our Systems monitor CLP's 132kV power cable network started in 2015

Second Systems (2018)

Our System monitor the new HEUNG YUEN WAI BORDER CONTROL POINT [to be opened end 2018 / early 2019]



CLP & OSL joint video

https://www.youtube.com/watch?v=BlxVyWYqG1I&t=23s

Air Connect Engineering (Thailand) Co., Ltd

CUSTOMER REFERENCE – 110kV POWER CABLES

VIETNAM GOVERNMENT ELECTRICITY CORPORATION

OSL provides Fibre Optic Sensing System to monitor Electricity Vietnam Corporation (EVN) (Government owned electricity company) Hanoi High Voltage cables

Commissioned in 4Q2017

Air Connect Engineering (Thailand) Co., Ltd

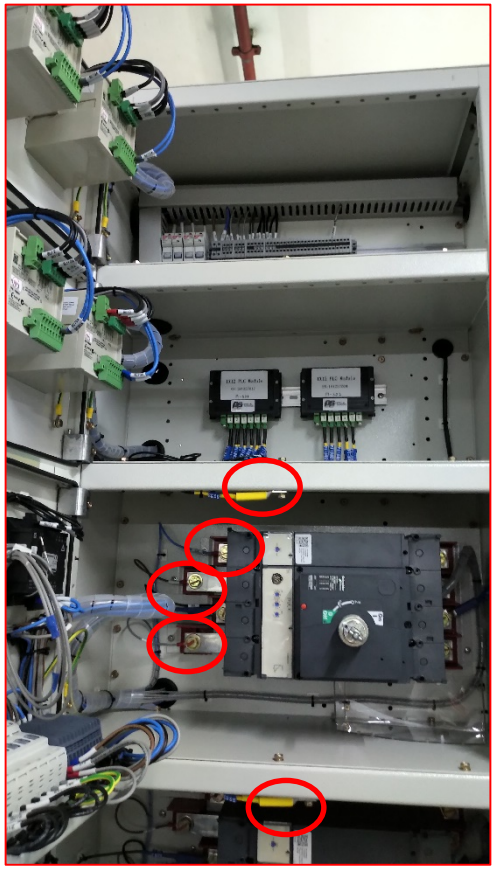
CUSTOMER REFERENCE – 5 SETS LV SWITCHBOARDS

A TOTAL OF 36 NEW SWITCHBOARD PANELS, BUS DUCTS & 11kV POWER CABLES

機電工程署 EMSD

屯門醫院 TUEN MUN HOSPITAL

Sensor Installations in Switchboards

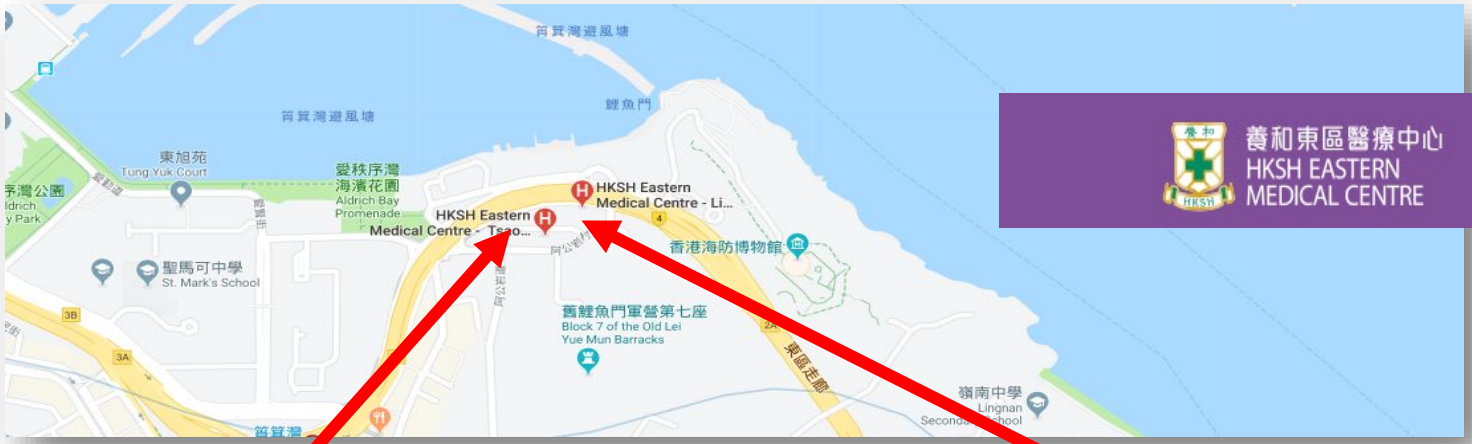


Temperature Verification Test by EMSD

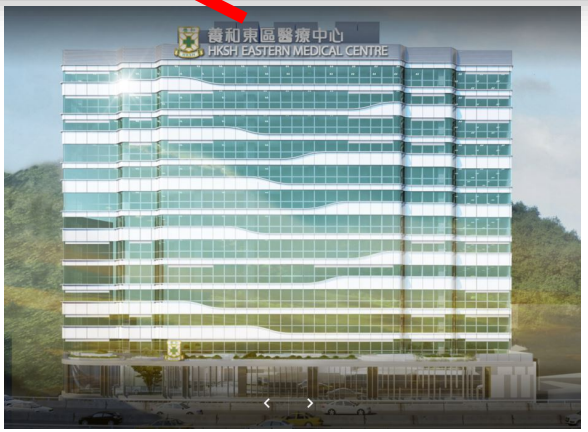
Air Connect Engineering (Thailand) Co., Ltd

CUSTOMER REFERENCE – HKSH HOSPITAL 養和醫院

TWO BRAND NEW STATE-OF-THE-ART MEDICAL CENTRES AT HONG KONG ISLAND EAST



HKSH Eastern Medical Centre - Tsao Yin Kai Block
阿公岩村道3號 – TO BE COMMISSION IN 2020



HKSH Eastern Medical Centre - Li Shu Fong Building
阿公岩村道5號 – COMMISSIONED APRIL 2019

Air Connect Engineering (Thailand) Co., Ltd

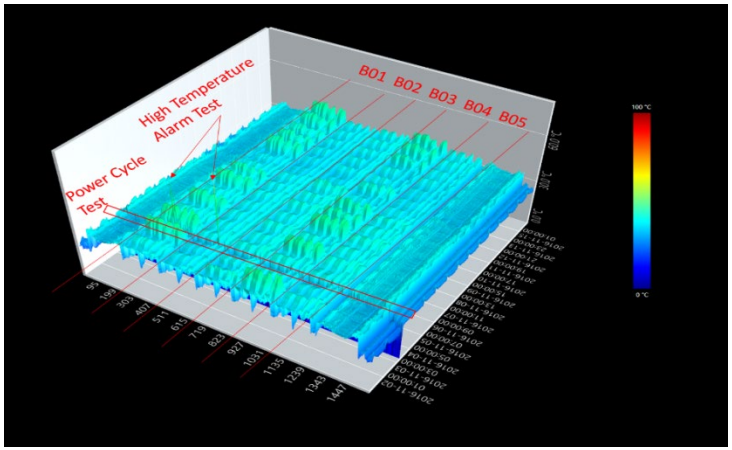
LANGHAM PLACE, MONGKOK

朗豪坊 LANGHAM PLACE
A Champion REIT Property

OSL provides the power supply monitoring system to Langham Place Shopping Mall & Office Towers

- First System commissioned November 2016
- Second System commissioned Dec 2018

Langham Place, Mongkok



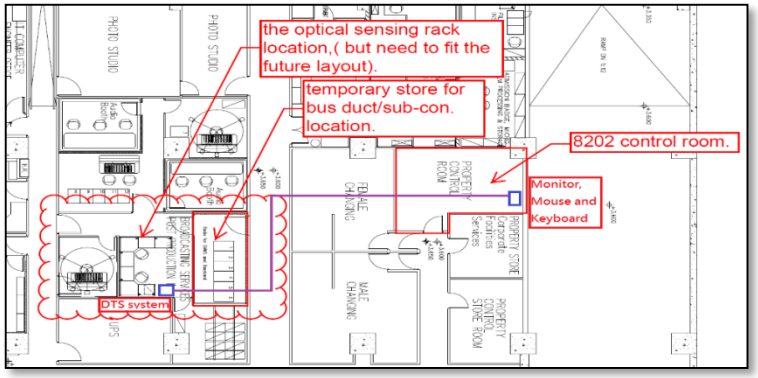
DTS Main Control Unit installed in switch panel room

Air Connect Engineering (Thailand) Co., Ltd

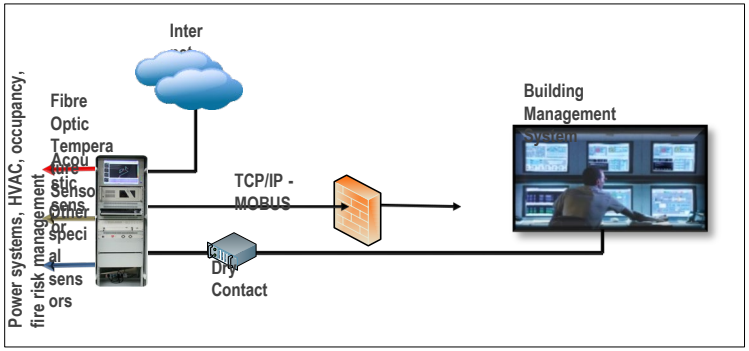
HK JOCKEY CLUB HEAD OFFICE

Our Smart Building Infrastructure Platform will be used to enhance service integrity and energy consumption efficiency. Further, the Platform can be used to improve comfort level of environment; fire risk management & proactive maintenance of valuable infrastructure assets

Head Office Building



Head Office Site Planning

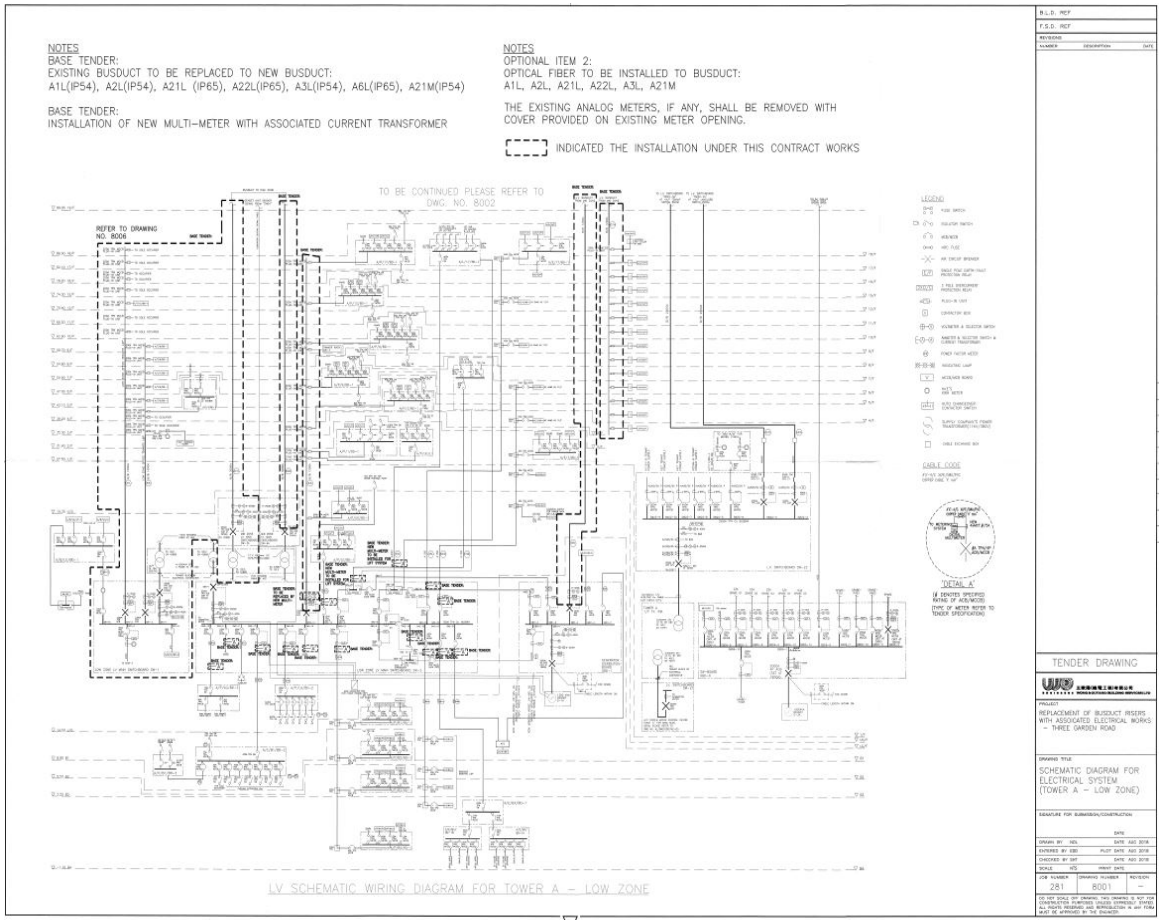


System Configuration

Air Connect Engineering (Thailand) Co., Ltd

CUSTOMER REFERENCE - ICBC BANK TOWER, 3 GARDEN ROAD

Our system safeguards the electrical supply system of this prestigious landmark building

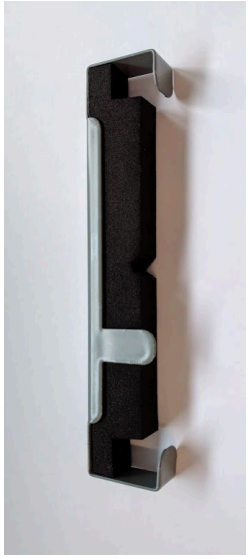


Air Connect Engineering (Thailand) Co., Ltd

CUSTOMER REFERENCE WE HAVE WORKED WITH MOST BUS DUCT MANUFACTURERS

SCHNEIDELER ELECTRIC

OSL / SCHNEIDLER DESIGNED CLIPS FOR SENSING FIBRE CABLES

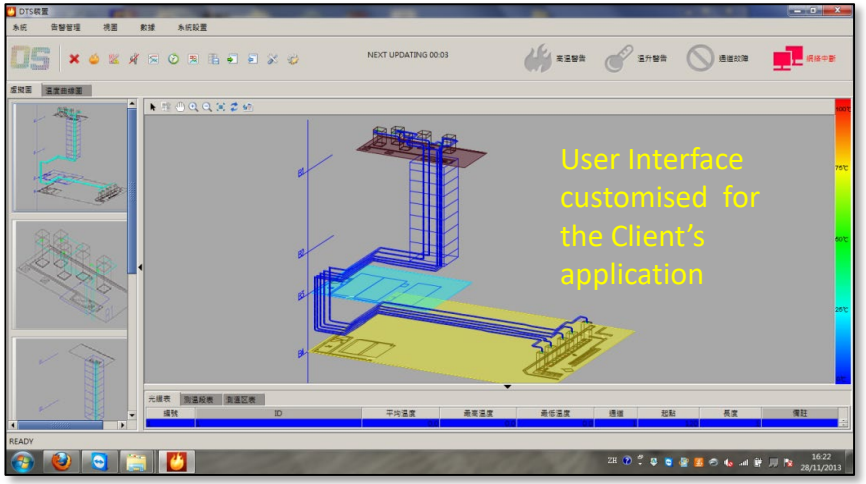


LS [KOREA]

Air Connect Engineering (Thailand) Co., Ltd

STUDIO CITY, HOTEL D - MACAU

- Our Fibre Optic Sensing system monitor the operations conditions of in-building power systems
- Studio City is located on a 35-acre site comprises of a large shopping mall and world class hotels
- Hotel D is designed by the famous architect, Zaha Hadid and will become a landmark of Macau



Air Connect Engineering (Thailand) Co., Ltd

JAKARTA INTERNATIONAL AIRPORT TERMINAL 3

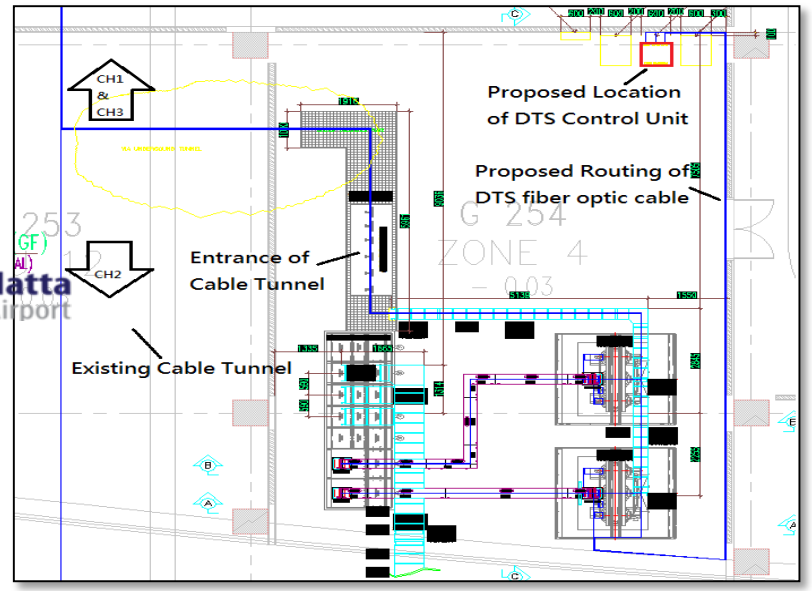
The new Terminal 3 (Phase I) was opened in August 2016. Terminal 3 has a total floor area of 422, 804m^2 and 48 aerobridges. It can handle 25 million passengers. The client/ user is Angkasa Pura (Airport Authority of Indonesia)

Terminal 3 has an Intelligence Building Management System (IBMS) to control uses of electricity, water and recycling of rain water

OSL won a contract for the provisioning of a Power System Fibre Optic Monitoring System – the power system can self-monitor and self-analyse itself. It will provide Early Stage Pre-warning of potential electricity faults. The Project was completed in September 2016.

Terminal 3 under construction – January 2015

Soekarno-Hatta International Airport

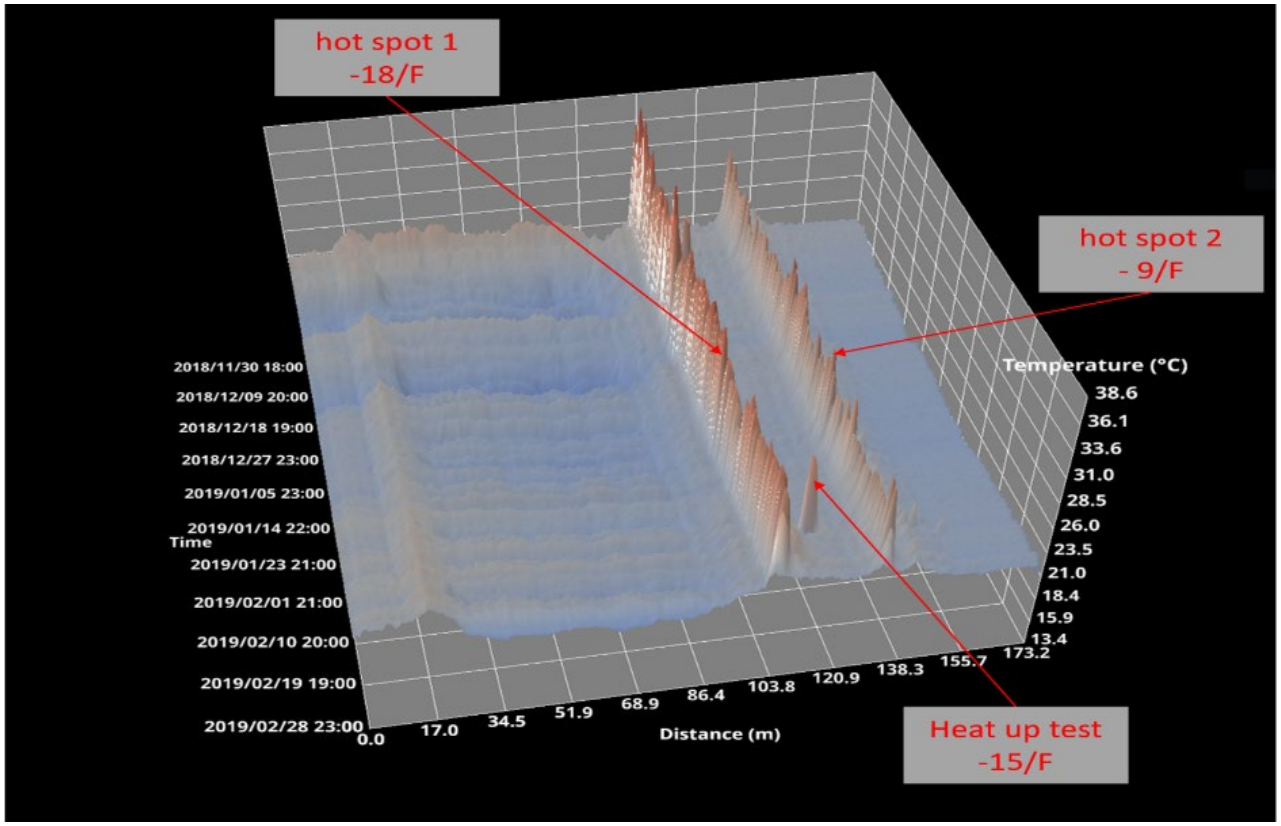


Terminal 3 – August 2016

Air Connect Engineering (Thailand) Co., Ltd

OPERATION CONDITION ANALYSIS

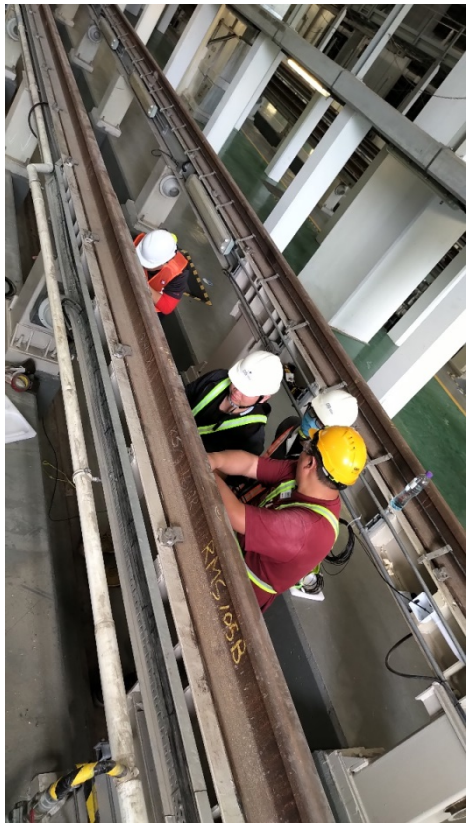
Trend Analytics pin-points hot spots on bus ducts [and site verification]



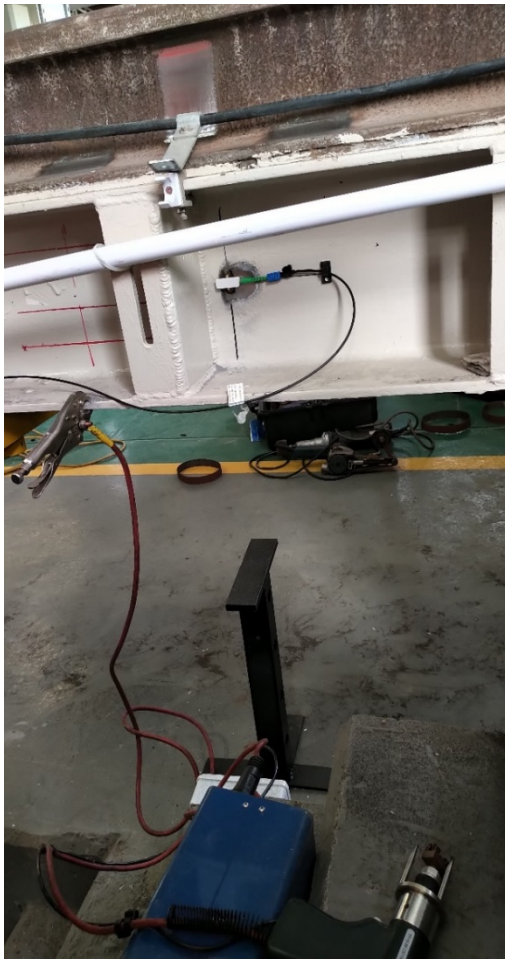
Air Connect Engineering (Thailand) Co., Ltd

APPLICATION – STRAIN SENSING

MTR港鐵



INSTALLING FIBRE SENSORS



FIBRE SENSORS INSTALLED

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ONGOING PROJECT – MTR XRL SSS RAIL SUPPORT STRUCTURE

TRAINING ARRIVING SSS TRACK 03 8KMPH

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ONGOING PROJECT – MTR XRL SSS RAIL SUPPORT STRUCTURE

TRAINING DEPARTING SSS TRACK 03 8KMPH

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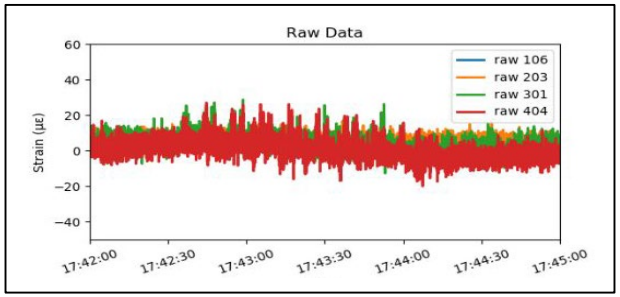
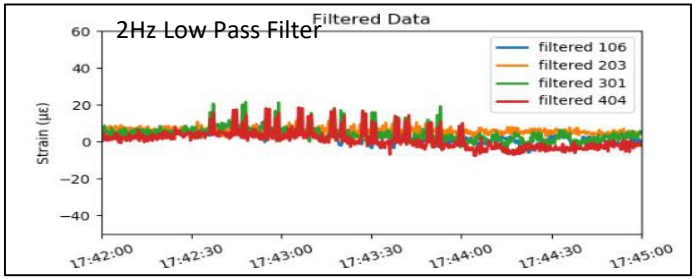
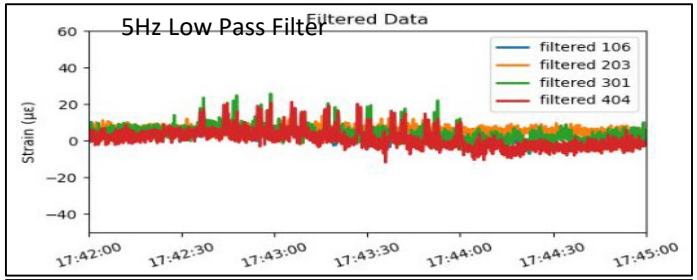
OBSERVATIONS – EXPRESS TRAIN ARRIVING AT SSS 8KPH

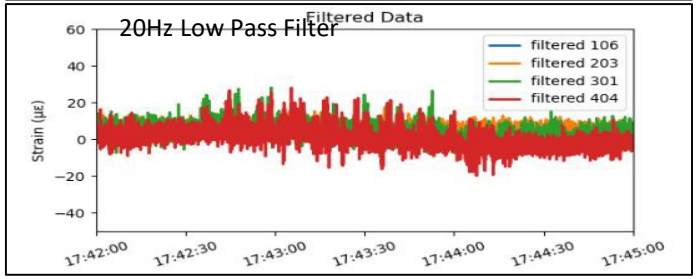


DISCRETE FAST FOURIER TRANSFORMATION (DFFT)

LOW PASS FITERING



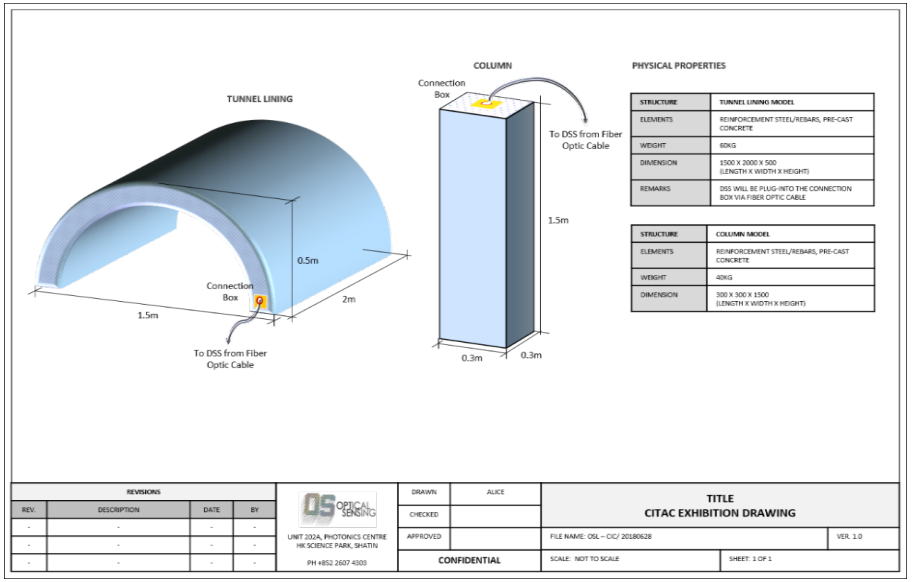




Air Connect Engineering (Thailand) Co., Ltd

APPLICATIONS – DYNAMIC LOAD

- Dynamic load monitoring
- Performance Based Design vs Code Based Design
- Long Term Load Behavior



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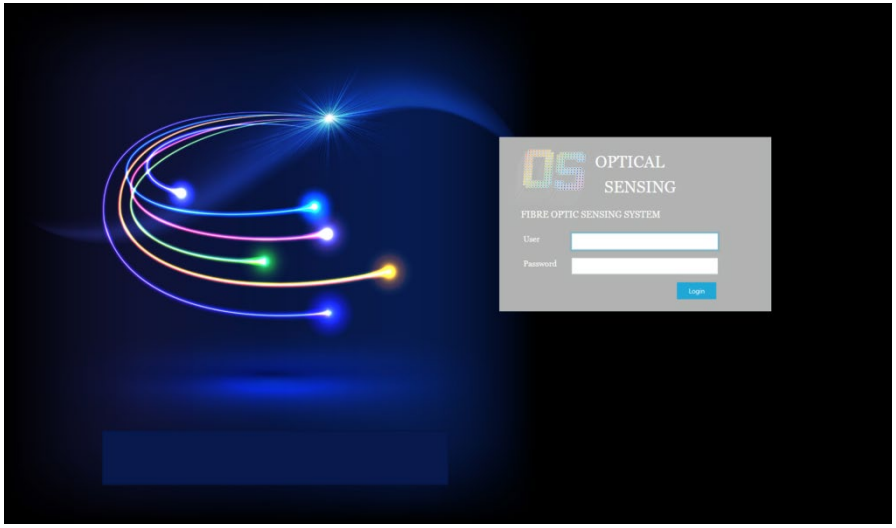
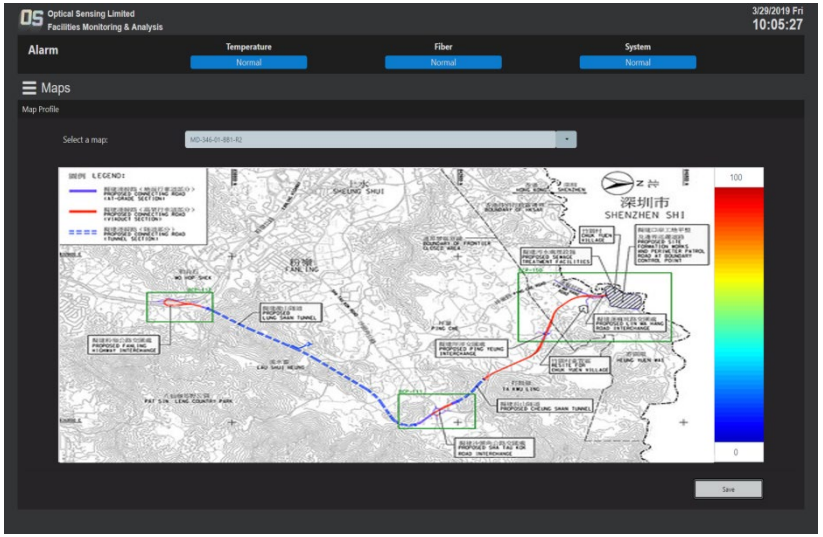
USER INTERFACE



LOG-IN

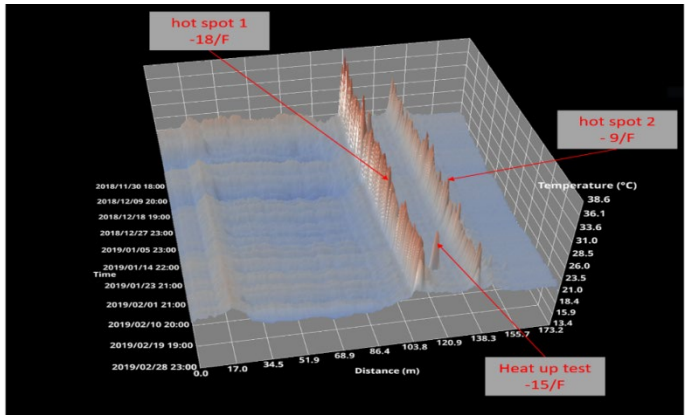


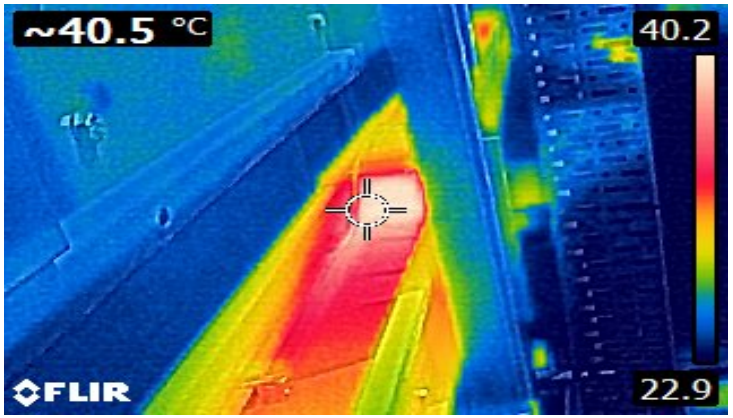
MAP

Air Connect Engineering (Thailand) Co., Ltd

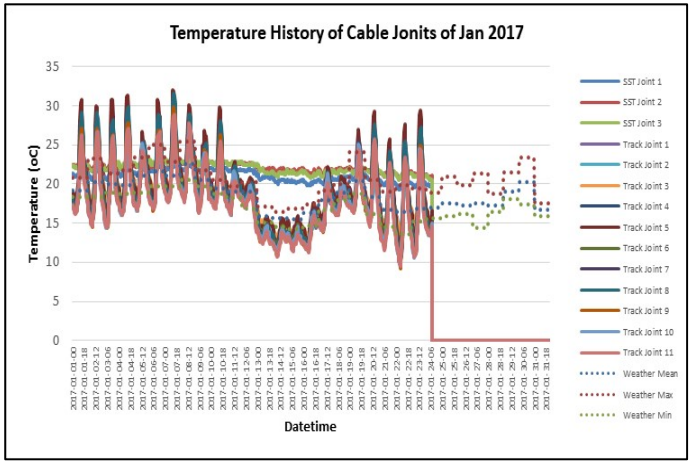
OPERATION CONDITION ANALYSIS

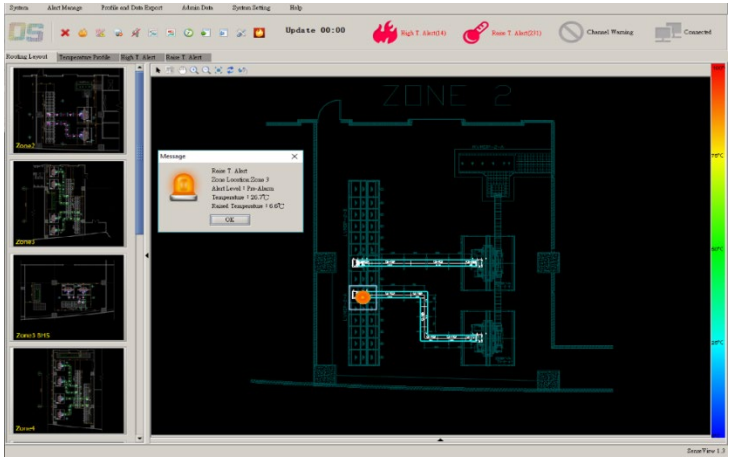
Trend Analytics pin-points hot spots on bus ducts [and site verification]





Profile Analytics on power cables





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APPLICATIONS – DYNAMIC LOAD