

# **CERN Tunnelling Workshop**

## **Report of Contributions**

Contribution ID: 1

Type: **not specified**

## Welcome & Introduction

*Thursday 24 October 2019 09:30 (30 minutes)*

**Presenter:** OSBORNE, John Andrew (CERN)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: 2

Type: **not specified**

## **Tunnel Asset Management @ CERN**

*Thursday 24 October 2019 10:00 (30 minutes)*

Introduction Tunnel Asset Management strategy at CERN, including technologies developed to improve the way we inspect and monitor the tunnels

**Presenter:** SWATTON, Ben (CERN)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: 3

Type: **not specified**

## **Multi-spectral analysis and machine learning for automated monitoring**

*Thursday 24 October 2019 10:30 (30 minutes)*

Overview of several different technologies under development including computer vision, thermal imaging and machine learning to allow remote and automated inspections of underground structures

**Presenter:** ATTARD, Leanne (University of Malta (MT))

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: 4

Type: **not specified**

## Use of Artificial Intelligence in Tunnel Infrastructure Management

*Thursday 24 October 2019 11:30 (30 minutes)*

Atkins has been actively testing and developing state of the art AI technology in tunnels and other infrastructure maintenance, including machine learning, drone inspections and AI objection recognition

**Presenter:** CHEW, Chris (Atkins)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: 5

Type: **not specified**

## **Distributed Fibre Optic Sensing of Underground Infrastructures**

*Thursday 24 October 2019 12:00 (30 minutes)*

This presentation will briefly introduce two case studies of fibre optic strain monitoring in underground infrastructures: 1) monitoring of retaining wall structure performance due to deep excavation in London Paddington Station; 2) monitoring and analysis of long-term tunnel behaviour at CERN.

**Presenter:** LI, Zili (University College Cork)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: 6

Type: **not specified**

## The Effective and Efficient Management of Tunnel Asset Data

*Thursday 24 October 2019 12:30 (30 minutes)*

Tunnel Information Management (TIM), an in-house product developed by London Bridge Associates (LBA) has been driving improvements in managing tunnel asset data since 2001. However, never content with standing still, we are now developing TIM for Tasking (TFT), an assets and actions database.

**Presenter:** CRAVEN, Daniel (LBA)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: 7

Type: **not specified**

## HiLumi Point 1 Site Visit (optional)

*Wednesday 23 October 2019 09:30 (3 hours)*

A group visit to the construction works at Point 1 for the High Luminosity LHC (HiLumi) project.

PPE can be provided, but if you have your own boots (or any other PPE), this will be really helpful.



Contribution ID: 8

Type: **not specified**

## Future Circular Collider Project Update

*Wednesday 23 October 2019 14:00 (30 minutes)*

Update on the progress and future plans of the civil engineering design of the 100km long FCC accelerator

**Presenter:** TUDORA, Alexandra

**Session Classification:** Day 1 - Tunnel Optimisation

Contribution ID: 9

Type: **not specified**

## Welcome & Introduction

*Wednesday 23 October 2019 13:30 (30 minutes)*

**Presenter:** OSBORNE, John Andrew (CERN)

**Session Classification:** Day 1 - Tunnel Optimisation

Contribution ID: **10**

Type: **not specified**

## Accelerating Digital Change: Planning to Feasibility

*Wednesday 23 October 2019 14:30 (30 minutes)*

An overview of the development of digital tools and strategies which have made advancements in alignment optimisation and site selection across major tunnelling projects around the world, at the planning and feasibility stage.

**Presenters:** Mr CECCARELLI, Matteo (Arup); LOO, Yung (Arup)

**Session Classification:** Day 1 - Tunnel Optimisation

Contribution ID: **11**

Type: **not specified**

# Digital Optimisation of Underground Rail Projects

*Wednesday 23 October 2019 15:00 (30 minutes)*

**Presenter:** PRÉ, Michel (SETEC)

**Session Classification:** Day 1 - Tunnel Optimisation

Contribution ID: 12

Type: **not specified**

# Digital Engineering for Alignment Optimisation

*Wednesday 23 October 2019 16:00 (30 minutes)*

**Presenters:** DANZI, Andrea (SWS Engineering); CRAVEN, Daniel (LBA)

**Session Classification:** Day 1 - Tunnel Optimisation

Contribution ID: 13

Type: **not specified**

# Using Automated Design for Optimisation of Tunnel Alignment

*Wednesday 23 October 2019 16:30 (30 minutes)*

This presentation will discuss the contributions that automation in detailed design can make in developing options for tunnel alignments ensuring that constraints are satisfied whilst also maximising aspirations such as keeping the projected construction cost as low as possible. The presentation will demonstrate the automated design technology and how tunnel sections can automatically be checked. Automation of settlement damage assessments will also be demonstrated.

**Presenter:** CHEW, Chris (Atkins)**Session Classification:** Day 1 - Tunnel Optimisation

Contribution ID: 14

Type: **not specified**

## **Contract management of underground works using combined GIS, 3D geological and BIM models**

*Wednesday 23 October 2019 17:00 (30 minutes)*

The latest in modern technology in combination with innovative software ensures has opened new venues of contract (claims) management. Amberg is presenting the case of the Monte Ceneri on how this saved 14 million CHF to owner. This includes how the models can be combined on a single platform in the Case of the 3dExperience platform by Dassault systems, notably in alignment optimisation with respect to geological conditions.

**Presenter:** BOURGET, Andrew (Amberg)

**Session Classification:** Day 1 - Tunnel Optimisation

Contribution ID: 15

Type: **not specified**

## **BIM & Preliminary Design of the Bruttentunnel**

*Wednesday 23 October 2019 17:30 (30 minutes)*

**Presenters:** FRIES, Thomas (ILF); DALLAPIAZZA, Werner (ILF)

**Session Classification:** Day 1 - Tunnel Optimisation



Contribution ID: 16

Type: **not specified**

## Railway tunnel overburden imaging using muon transmission radiography

*Thursday 24 October 2019 14:00 (30 minutes)*

Cosmic rays are a natural background radiation produced in collisions by primary particles from space with the Earth's upper atmosphere. Cosmic ray muons are highly penetrating, typically able to pass through many metres of rock, and are well suited to imaging the interior of thick man-made or natural structures. Recently we have performed the first field trial of a portable cosmic ray tracking system developed to provide radiographic measurements of the overburden of UK railway tunnels. In this talk we will report on this initial field trial, before discussing recent developments made to study density anomalies at a higher resolution, and over longer timescales.

**Presenter:** STEER, Chris (St Mary's University)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: 17

Type: **not specified**

## **Tunnel Maintenance 4.0 - High efficiency maintenance thanks to innovative 3D data capture technologies and use of AI**

*Thursday 24 October 2019 15:00 (30 minutes)*

The latest in modern technology in combination with innovative software ensures a high efficient and objective inspection and monitoring of tunnel infrastructure. Amberg is presenting workflows for 3D reality capture using multi sensor platforms, data analyses with Artificial Intelligence and real-time monitoring to get all relevant information around the clock. A Digital Twin of the facilities and the use of connected cloud-based solution will help to manage and maintain tunnels in a smart way.

**Presenters:** GROSSAUER, Karl (Amberg); BURI, Michael (Amberg)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: **18**

Type: **not specified**

## **Accelerating Digital Change: I&M and Operations**

*Thursday 24 October 2019 14:30 (30 minutes)*

An overview of the development of digital tools and strategies which have made advancements in smart monitoring, machine learning and operational performance across major tunnelling projects across the world, at the operations and monitoring stage.

**Presenters:** ROECKLINGER, Noemi (Arup); LOO, Yung (Arup)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: **19**

Type: **not specified**

## **Inspection Methods in Tunnels - New Technologies**

*Thursday 24 October 2019 16:00 (30 minutes)*

**Presenter:** FRACHON, Sebastien (DIADES)

**Session Classification:** Day 2 - Tunnel Monitoring

Contribution ID: **20**

Type: **not specified**

## Summary and Close-Out

*Thursday 24 October 2019 16:30 (30 minutes)*

**Presenter:** SWATTON, Ben (CERN)

**Session Classification:** Day 2 - Tunnel Monitoring