XXVII FIG CONGRESS
11–15 SEPTEMBER 2022
Warsaw, Poland

Volunteering for the future – Geospatial excellence for a better living

Proposed 4.0 Industrial Management System for daily operations that poses point cloud assets with annotated real-time sensory measurements and utilizes unsupervised alert logic

Ion-Anastasios KAROLOS[1], Stylianos BITHARIS[1], Vasileios TSIOUKAS[1], Christos PIKRIDAS[1], Sotirios KONTOGIANNIS[2], Theodosios GKAMAS[2], Nikolas ZINAS[3]

1: Aristotle University of Thessaloniki, School of Rural and Surveying Enginnering
2: University of Ioannina, Department of Mathematics
3: Tekmon P.C.

XXVII FIG CONGRESS
11–15 SEPTEMBER 2022 Warsaw, Poland

Volunteering for the future –
Geospatial excellence
for a better living

Study Main Purposes

- The representation of 3D industrial models and 3D industrial infrastructures, using advanced technologies such as Virtual Reality (VR) and web tools,

- The creation of centralized and normalized infrastructure maintenance processes,

- The development of a centralized assets sensory repository with embedded Machine Learning processing capabilities,

- The creation of a unified system that includes Augmented Reality (AR) capabilities in the machinery infrastructure field.

XXVII FIG CONGRESS
11–15 SEPTEMBER 2022 Warsaw, Poland

Volunteering for the future –
Geospatial excellence
for a better living

The Pilot Study Area

Hellenic Petroleum (ELPE) Facilities in Northern Greece

This study took place in three main infrastructures of the central Continuous Catalytic Reforming (CCR) unit of ELPE facilities in Thessaloniki, Greece.

XXVII FIG CONGRESS
11–15 SEPTEMBER 2022 Warsaw, Poland

Volunteering for the future –
Geospatial excellence
for a better living

3D Laser Scanning Equipment for Digital Twin recreation of the main infrastructure

Leica RTC360 LT

- Scanning Speed: 1 million points per second

- 3D Point accuracy at 10m: 1.9mm

- Field of view: 360° (horizontal) / 300° (vertical)

- 432 Mpx full dome capture

Leica BLK360

- Scanning Speed: 360,000 points per second

- 3D Point accuracy at 10m: 4mm

- Field of view: 360° (horizontal) / 300° (vertical)

- 150 Mpx full dome capture,

- Infrared sensor for thermal imaging

XXVII FIG CONGRESS
11–15 SEPTEMBER 2022 Warsaw, Poland

Volunteering for the future –
Geospatial excellence
for a better living

Measuring sessions and point cloud post processing

- Total number of 157 traverse (Laser Scanning) points,

- Georeferencing is provided by session scanning proper tags measured with a high precision GNSS receiver (Leica GS15),

- Initial data acquisition and registration on field using Leica Cyclone FIELD 360 iPadOS Application,

- Post process and final registration using Leica Cyclone Register 360 software
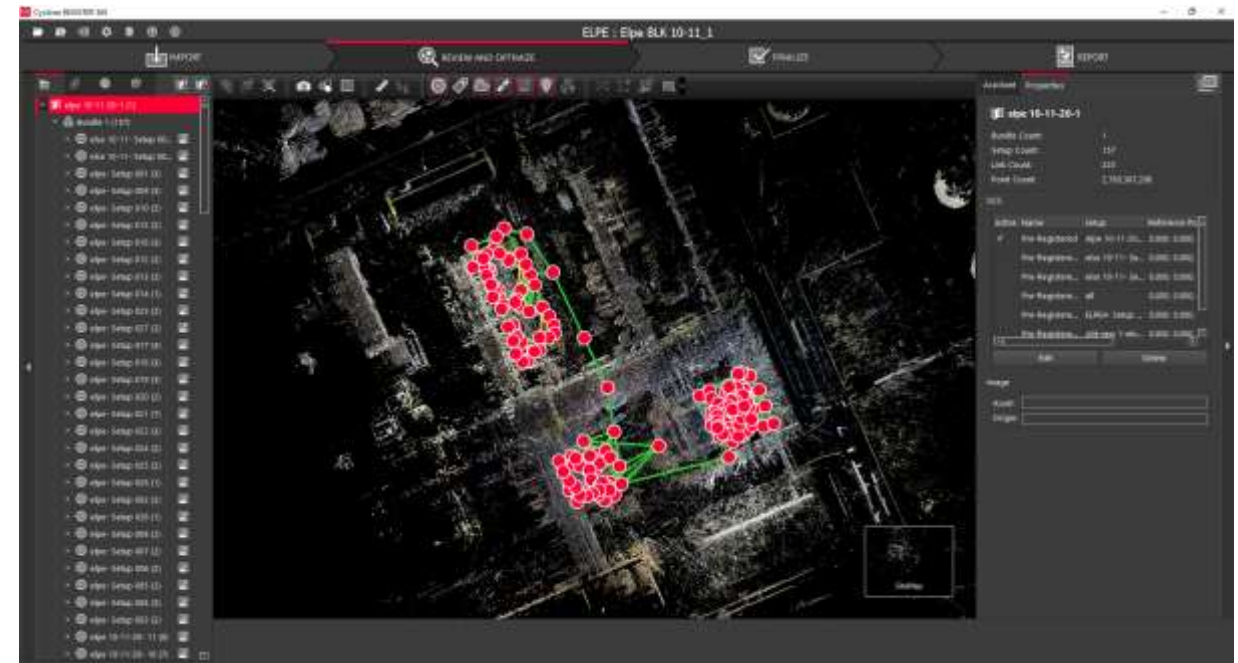
Representation of point cloud using web-based tools and Virtual Reality Headsets

Point Cloud visualization using VR headset and FARO SCENE LT software
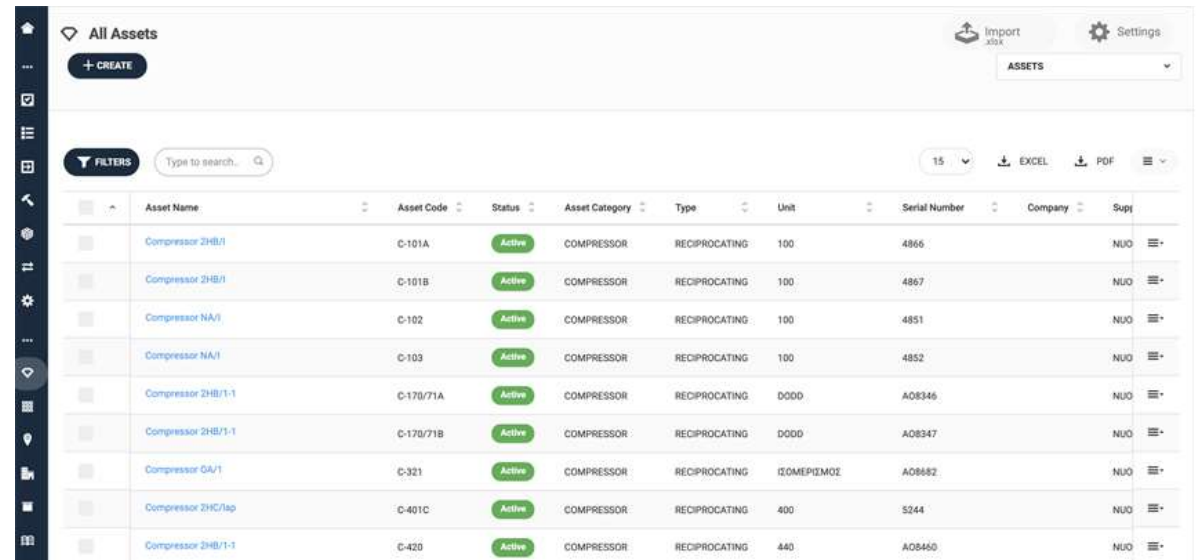
Potree WebGL Point Cloud Open-Source Viewer

Cloud based Maintenance Management System component

- Asset information storage, like name, type, serial number, manufacturer, dimensions,
- Fault prediction using time-series sensory data analysis and visualization for specific metrics

![FIG WARSAW CONGRESS 2022] XXVII FIG CONGRESS
11–15 SEPTEMBER 2022 Warsaw, Poland
Volunteering for the future –
Geospatial excellence
for a better living

Sensor Measurements component

- The sensory database interface that connects the sensors Measurements component to the data collection via appropriate JSON API,

- The real-time and historical data representation called Stats Manager, based on Telegraf and Grafana, and raw data navigation and update called CRUD Manager for NoSQL data,

- Intelligent Agent, that traverses' data via the JSON API providing assets predictions based on past sensory data

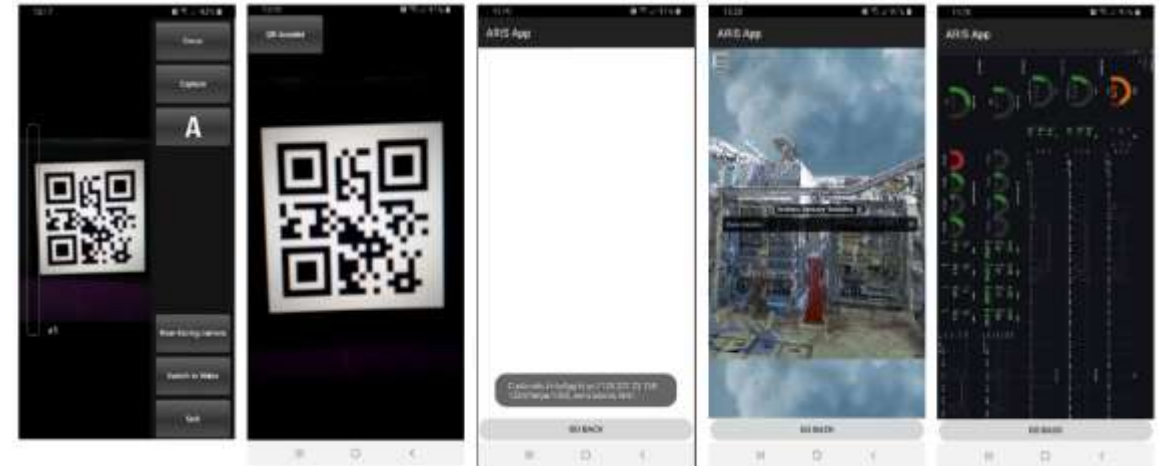(1) Crud Manager for the compressor with Tag ID e78cc4fffe87a622

(2) Stats Manager for the compressor with Tag ID e78cc4fffe87a622

XXVII FIG CONGRESS
11–15 SEPTEMBER 2022 Warsaw, Poland

Volunteering for the future –
Geospatial excellence
for a better living

Mobile Application component

- Android based smartphone app allows each user to monitor critical indicators during complex machinery operations,

- The Android based devices that we are using conform to ATEX Zone 1, II 2G; db IIC T4 Gb certification

Thank you for your attention