Integrated drone inspection service for oil & gas and power industry in Kazakhstan

TERRA DRONE

2019/9/26

Terra Drone Corporation

What is Terra Drone

Our mission

Providing innovative industrial solutions from sky

Our profile

- Company Name
  -Terra Drone Corporation
- Foundation
  -March 2016
- CEO & Founder
  -Toru Tokushige
- Office
  - Tokyo (HQ)
  - Australia
  - North America
  - Asia (India, Indonesia, China)
  - EU (Netherland, England, Belgium)
  - Africa (South Africa, Algeria, and more)
  - Latin America (Chile, Argentina, Brazil)
- Paid in Capital
  -3 million US dollars
- Business
  -Drone service providing
- Performance
  -Over 600 drone survey PJT in Japan
  -About 5,000 projects in Global Market

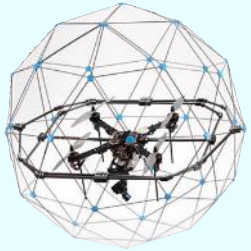
Business Area of Terra group

EV

4 subsidiaries in Asia

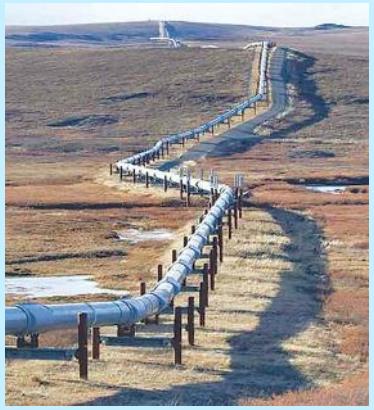
Drone

25 group companies in the world



Our Target Industries

Oil&Gas



Pipeline

Platform/FPSO

Refinery

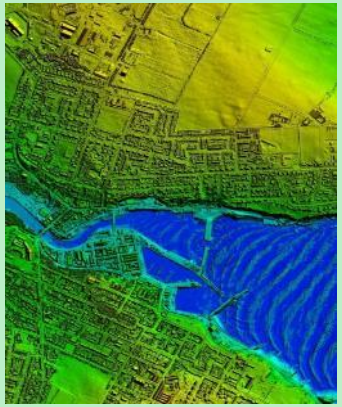
Storage Tank

Power/Utilities

Power line

Wind power generator

Land



GIS

Mining/Quarry

Open Pit

Underground

Main customer lists of each industries

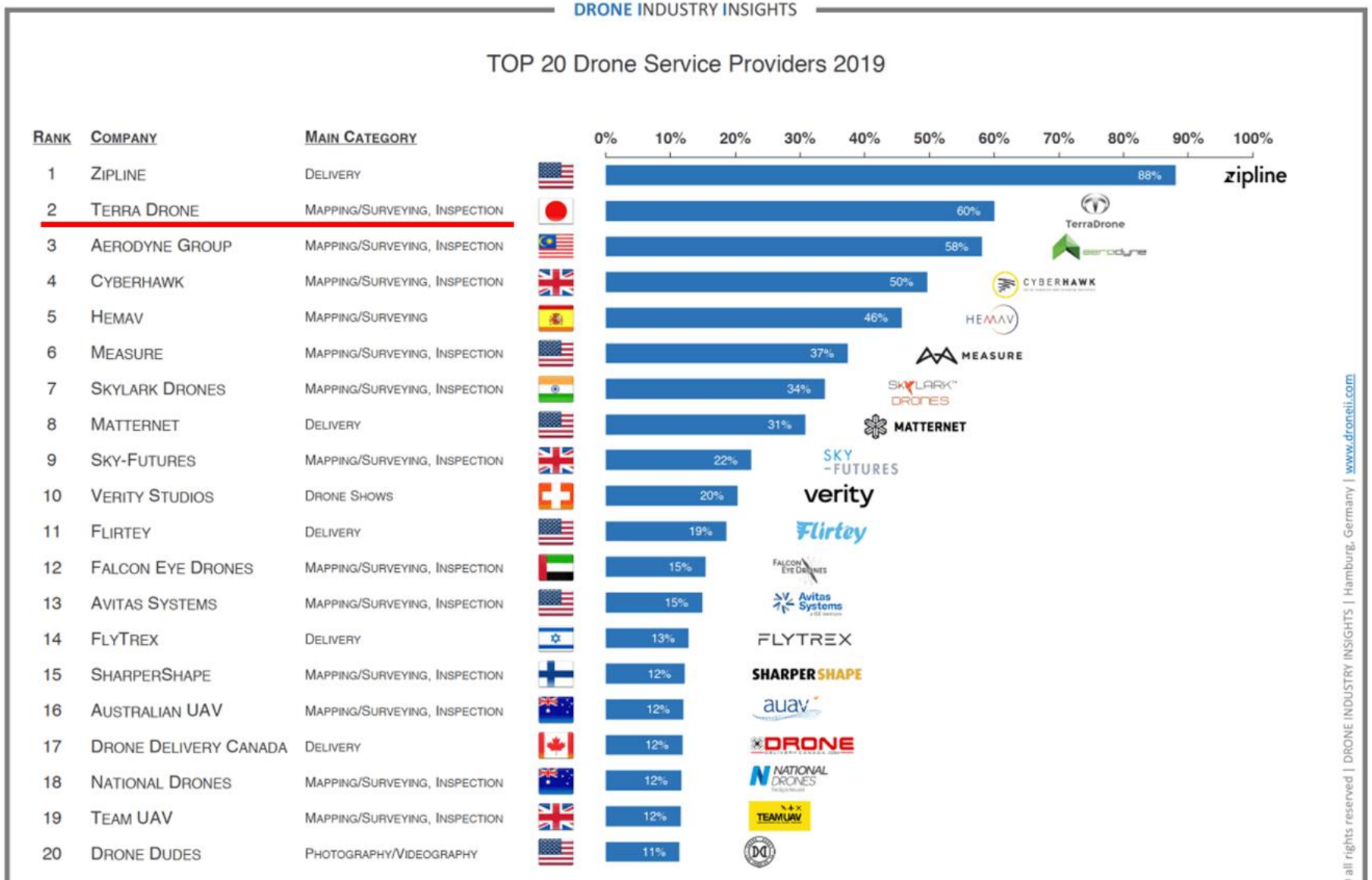
Oil&Gas

Mining/Quarry

Power/Utilities

Selected as **World No.2 DSP** this year (last year was 9th).

- And we are **the top among the mapping and inspection service.**

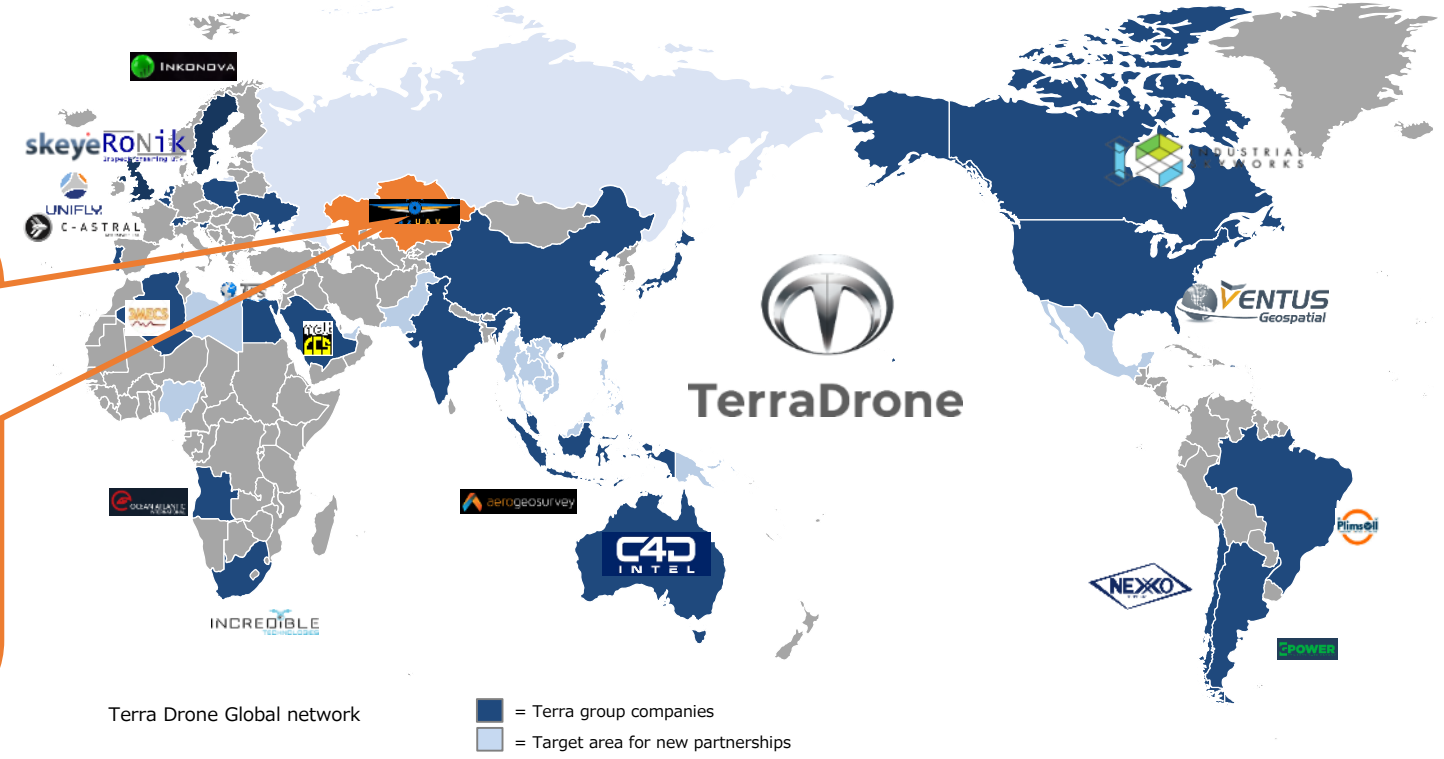


Global activities

- Terra drone is creating a **global partnership network** of **service companies** (>50% ownership) to serve end customers and **technology partners** (25-50% ownership) to feed the service companies with the latest cutting-edge technology
- Terra drone has been operating in **over 20 countries** so far.
- In Kazakhstan, we are collaborating with **KazUAV.**

Collaboration in Kazakhstan

TERRA DRONE × KazUAV



Oil & Gas solution

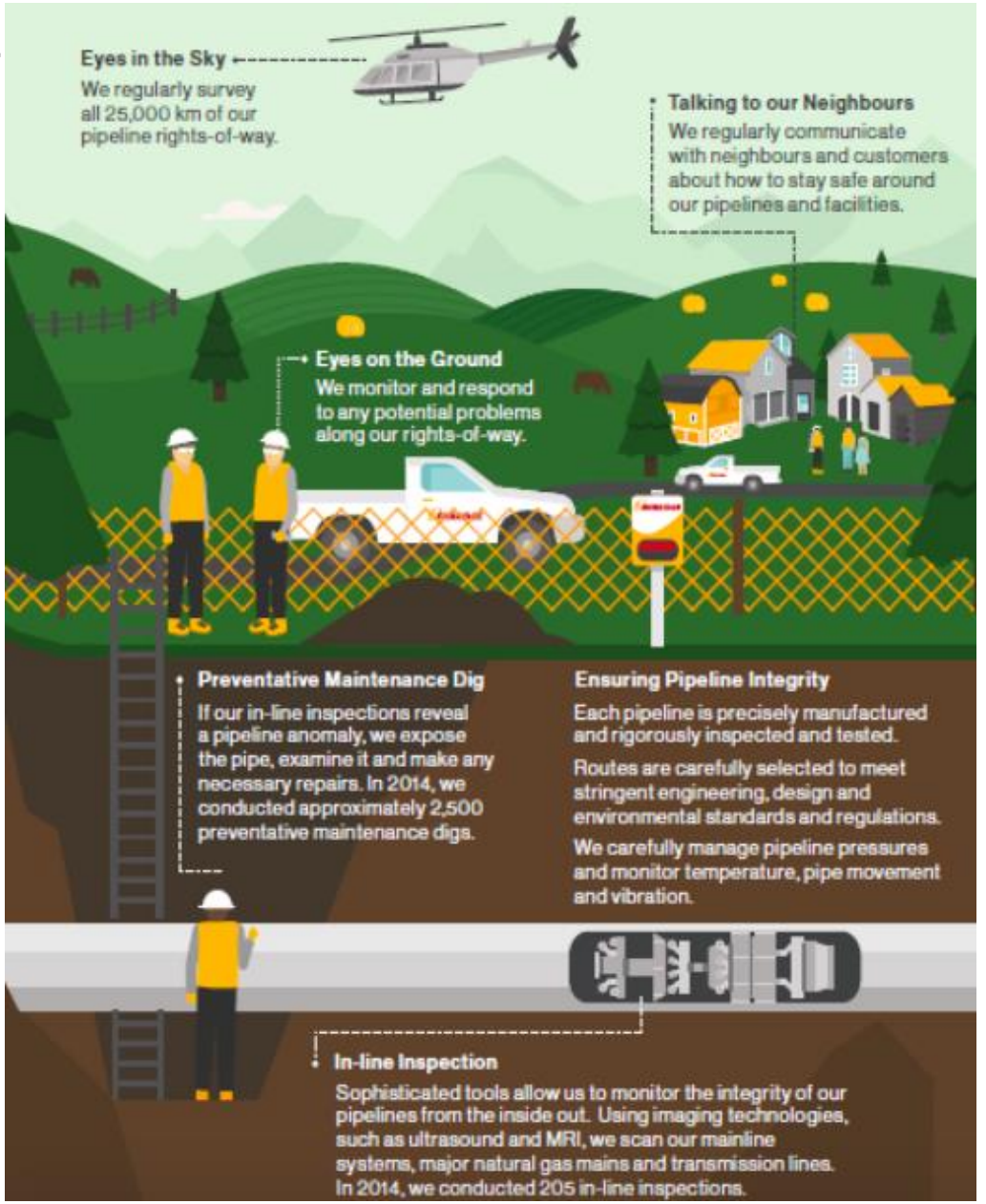
1.1 Pipeline

1.2 Tank inspection

1.3 Facility inspection

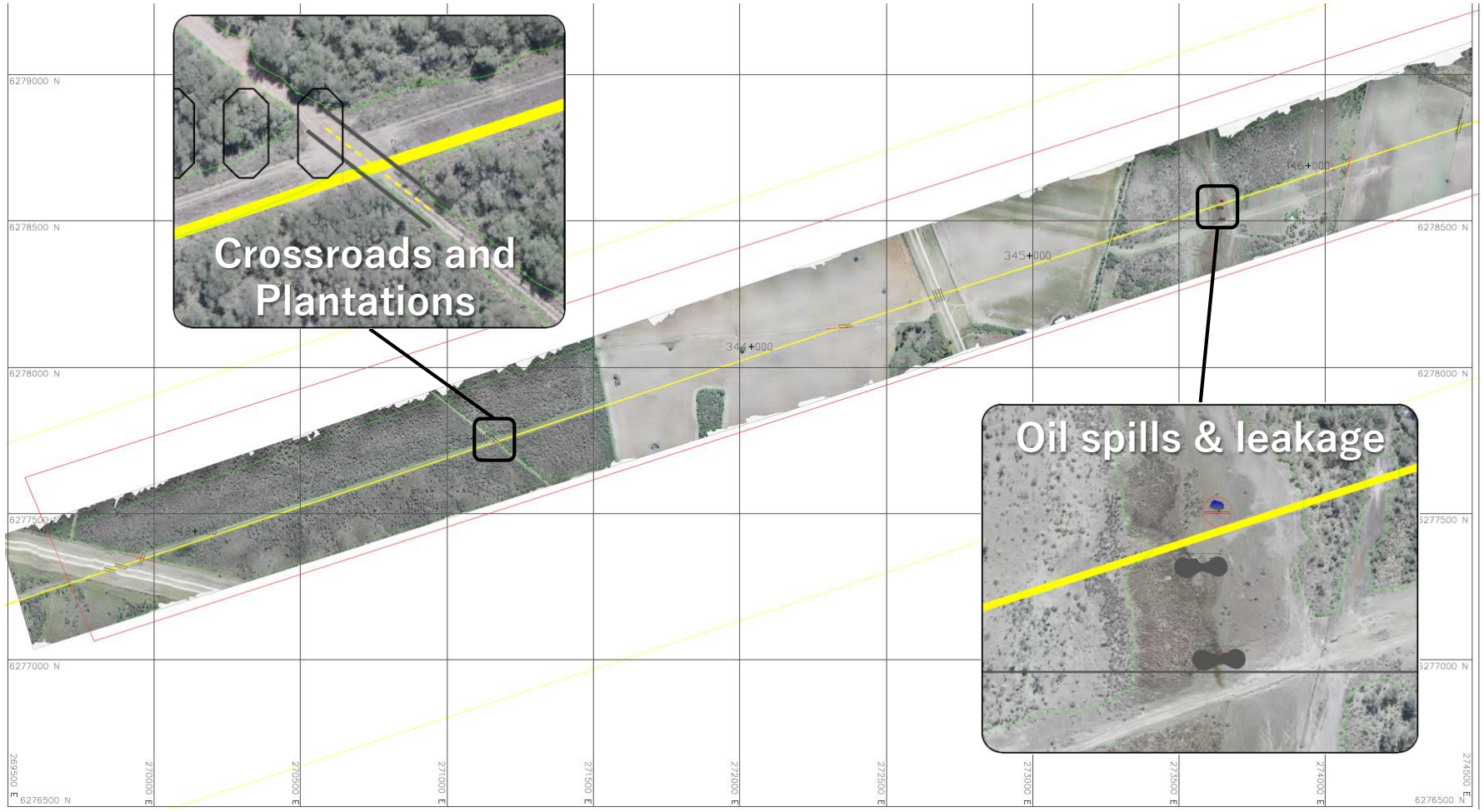
1.1 Pipeline ~Conventional method~

- In conventional way, we need to go site and go along to pipeline **by car or manned aircraft** to check pipeline location and if there are any construction is happening near pipeline.
- It will **take time and cost.**



1.1 Pipeline ~Inspection by Drone~

- We can generate **pipeline GIS map and RoW (Right of Way) inspection by our drones.**
- This will **save your cost and time with good accuracy** results.



Symbols	
Encroachments	
Wall and FENCE Crossing	
Landslides	
Oil Spills	
Oil Leakages	
Missing/Damaged pipeline markers	
Crossroads	
Plantation/ Forestry activity	
River crossings	
Rail crossings	
Improper backfilling	
Dredging/excavation by third party	
Assembly of Crowd	
Dumping of debris	
Chainage	
Pipeline	

1.1 Pipeline ~Gas leakage detection~

- We are going to provide new technology that can **detect the leakage of several types of gas.**

Our gas detection system uses analytical software which accounts for atmospheric and weather conditions before flight planning. This enables us to plan the best flight path to detect potential leaks. Any leaks are analysed by specialists to calculate the location of the leak source based off the gas plume model. CH4 pipeline leak detection, LNG production, storage, transport, GHG monitoring, and facility. Gases available for detection include:

Accuracy: < 0.05 ppm (CH_4)

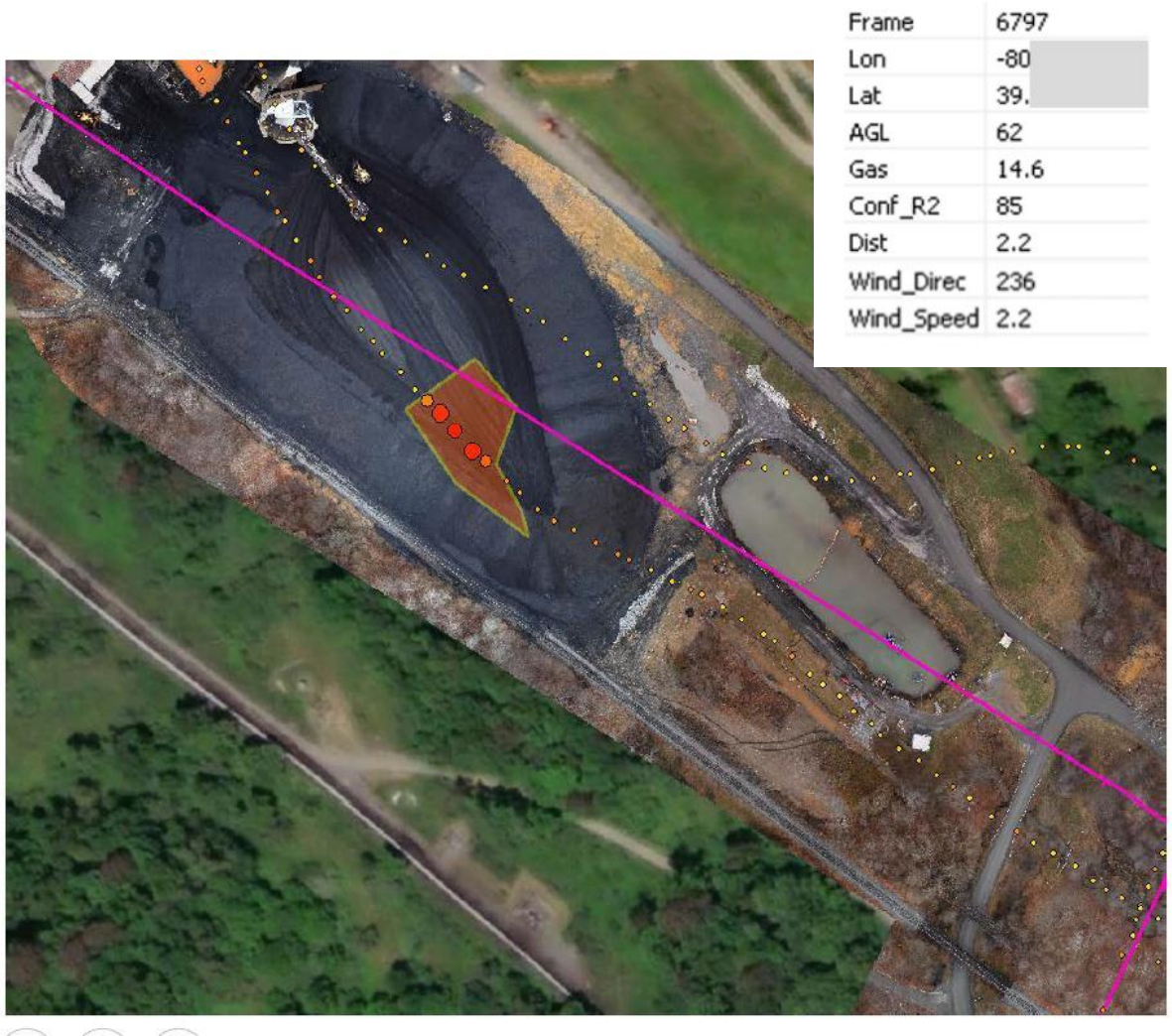
Altitude: 50-90m (165ft+)

Battery Powered

Speed: 100 Knots Max (if applicable)

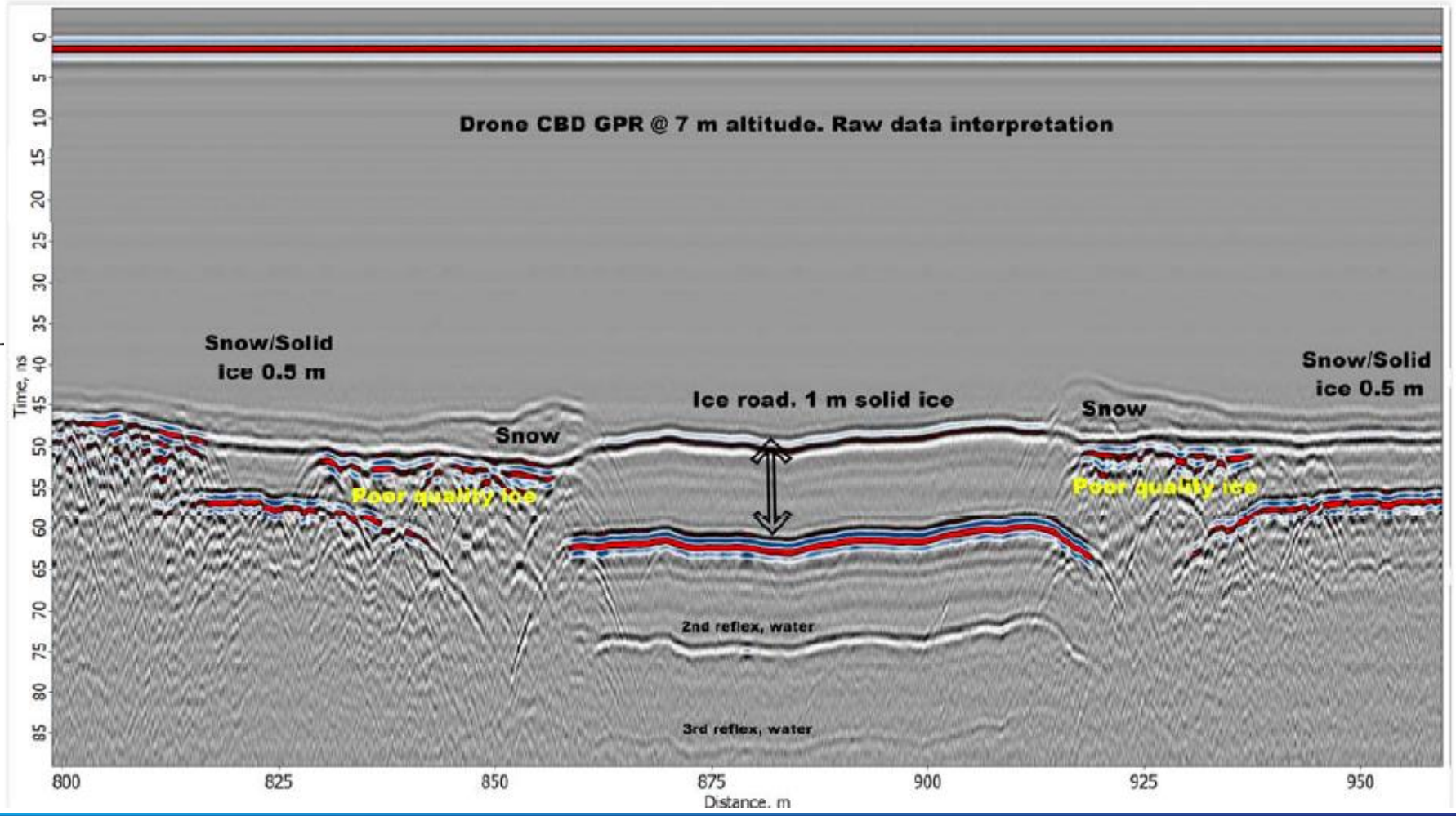
Default Alarm: 10 ppm

Data Rate: 7 Reading per Second



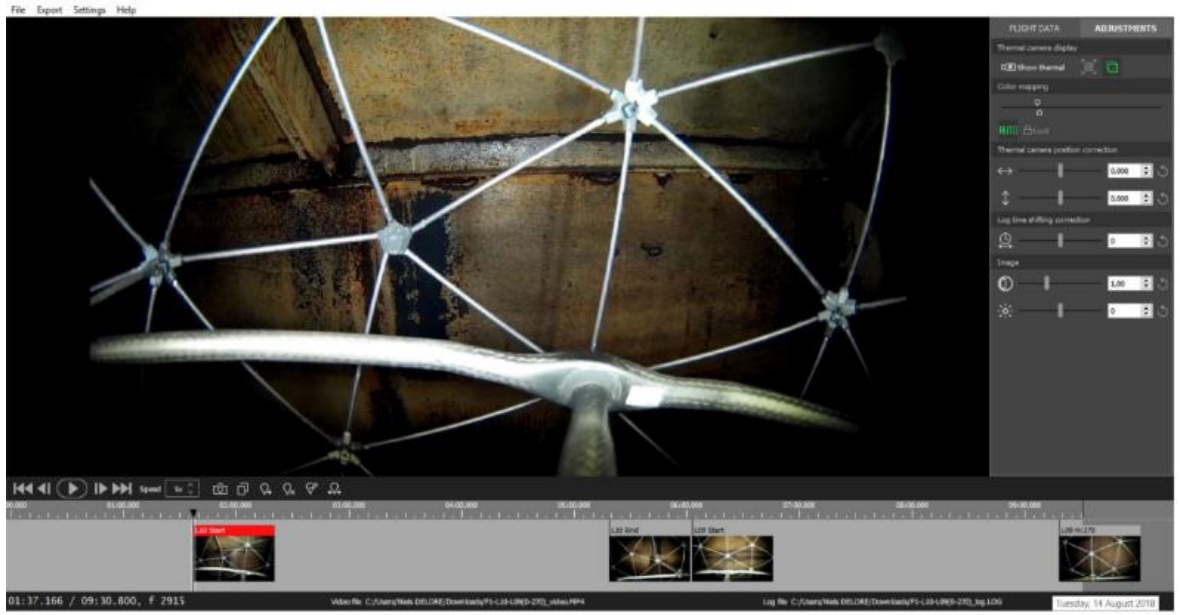
1.1 Pipeline ~Ground Penetrating Rader~ (In development)

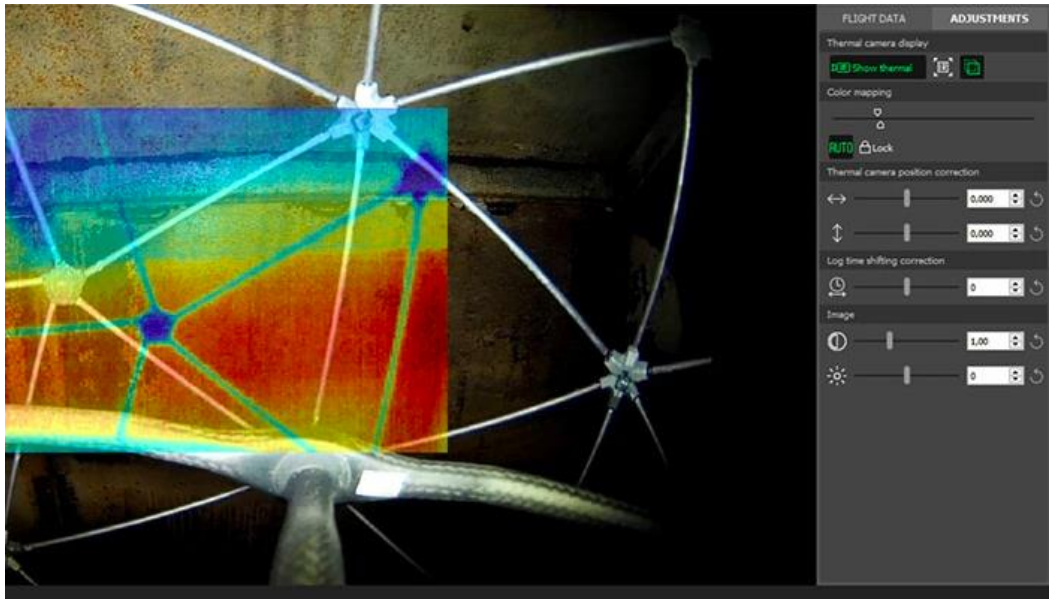
- We are developing new technology that can **detect underground pipeline** by Ground Penetrate Radar (GPR).



1.2 Tank inspection ~Visual inspection~

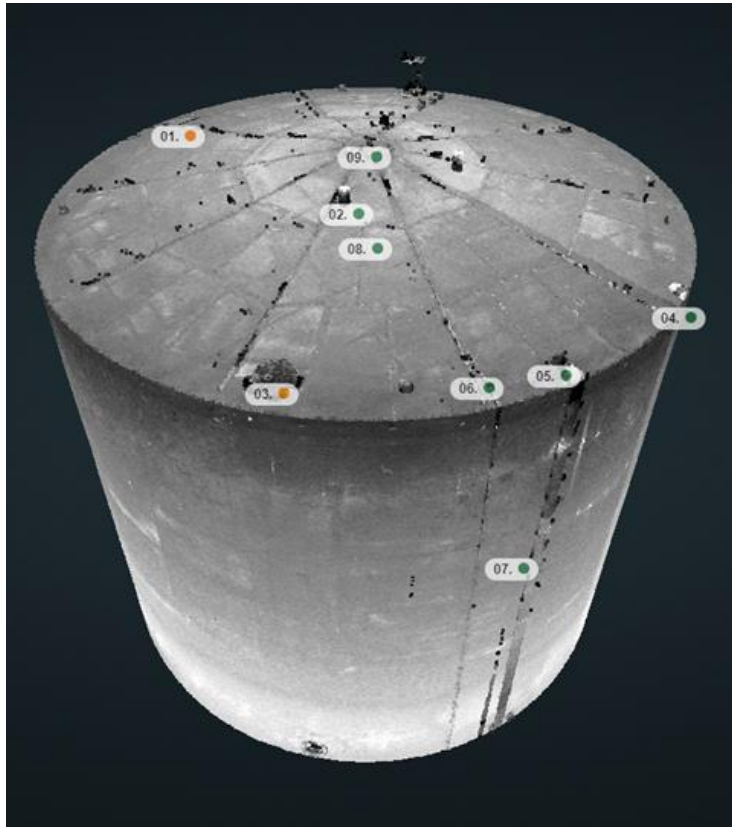
- The first collision-tolerant drone, designed for the inspection and exploration of **the most inaccessible places by human**.
- Allowing for the first time to fly in complex, cluttered or indoor spaces, Elios enables to reach those areas with **visual and thermal inspection.**
- In addition, this technology is globally patented.





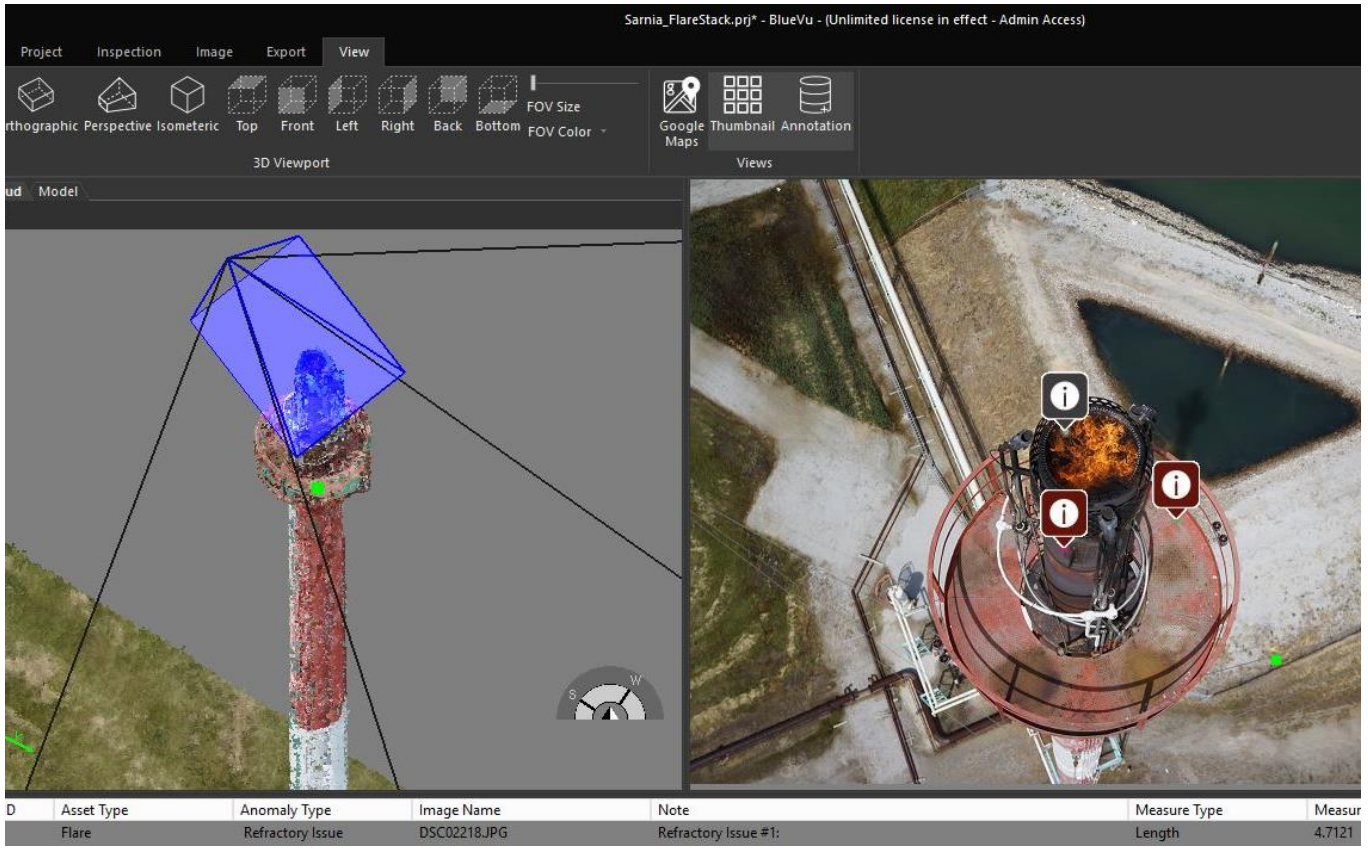
1.2 Tank inspection ~Ultrasonic Testing~

- Patented technology that enables the drone to press **the UT (Ultrasonic Testing) probe** against a surface in order to **measure the thickness of walls.**
- This UT drone has been specially developed for indoor use in industrial confined spaces and can be controlled in the presence of steel and concrete, such as oil tanks.



1.3 Facility inspection ~Visual & AI inspection~

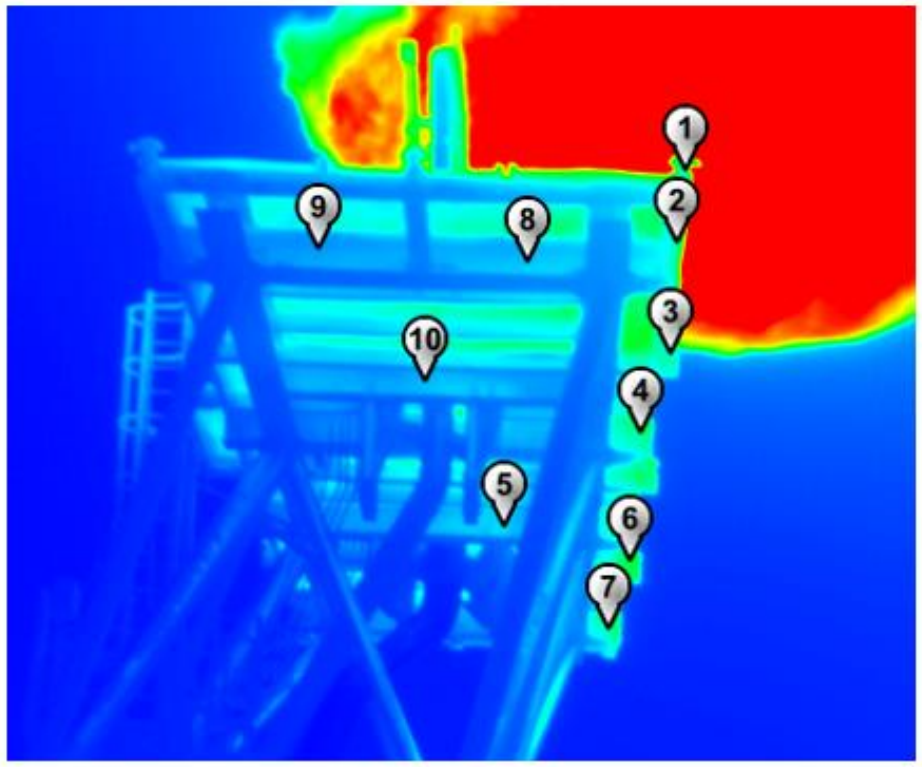
- Items inspected: 1) Structure of the access platform, 2) Missing screw, 3) Risky of falling, 4) General structure, 5) Corrosion, and etc.
- Drones can conduct the inspection with running the facilities.



1.3 Facility inspection ~Thermal inspection~

- IR Camera can highlight hotspots which can indicate failure of heat shields.
- Gas leaks can also be detected as gas temperatures are higher than ambient.

Flare Platform - Bow Side Thermal Plot

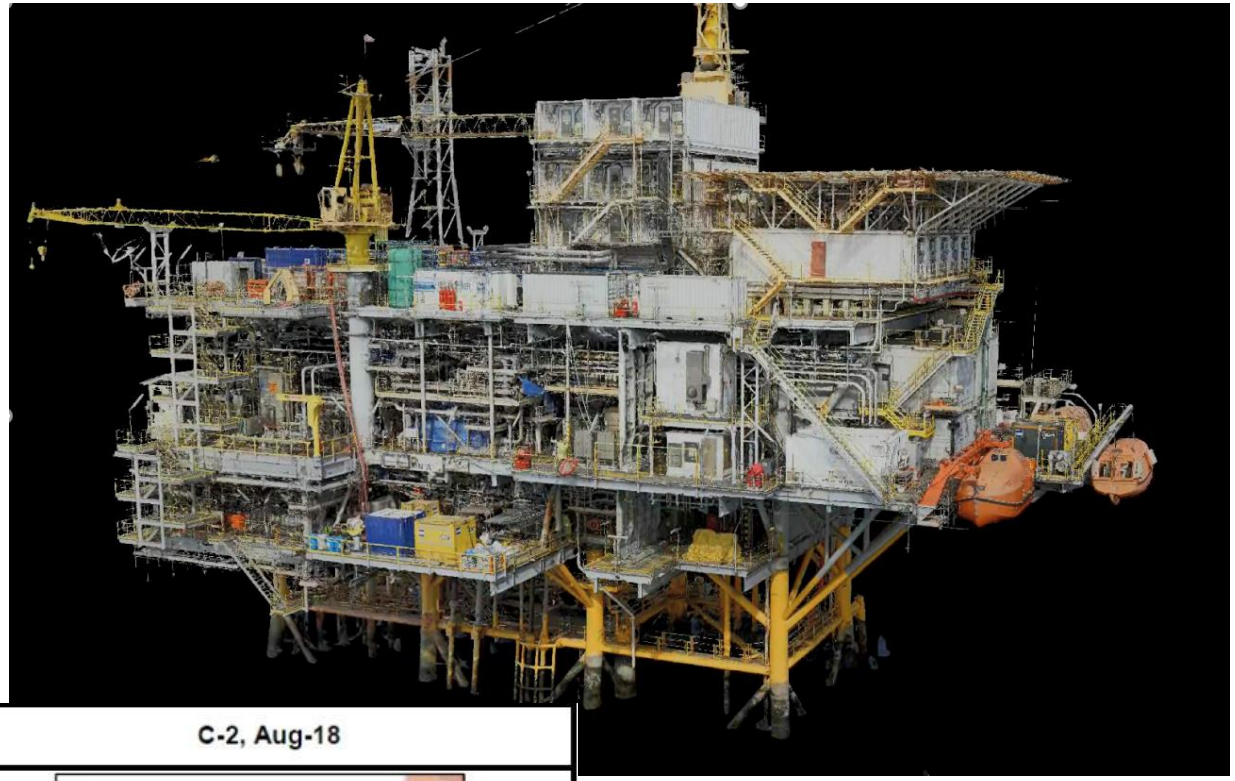


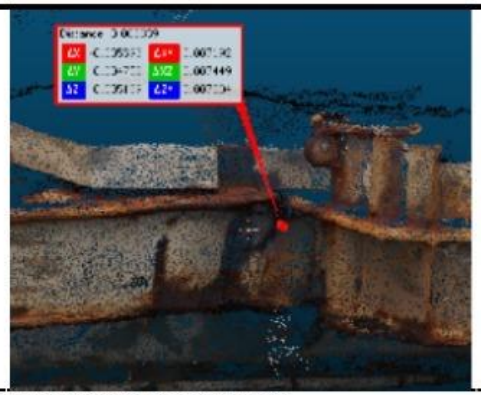
Thermal Readings:

Type	ID	Value
Point	1	275.25°C
Point	2	260.05°C
Point	3	236.85°C
Point	4	266.45°C
Point	5	151.65°C
Point	6	333.25°C
Point	7	240.85°C
Point	8	140.85°C
Point	9	107.25°C
Point	10	131.25°C

1.3 Facility inspection ~3D modelling~

- 3D Modelling
- Defect Assessment & Measurement
- Presentation of Data in a manner that is useful to the client.



C-2, 3D modelling Sep-18	C-2, Sep-18	C-2, Aug-18
		
1. Measured crack opening: 9mm.	1. Crack has propagated to a full cross-section penetration, and some vertical lift is observed. 2. Observed max. crack gap along the beam web is approximately more than 8mm (ref. methodology).	1. Crack has propagated to a full cross-section penetration, and some vertical lift is observed.

Power line solution

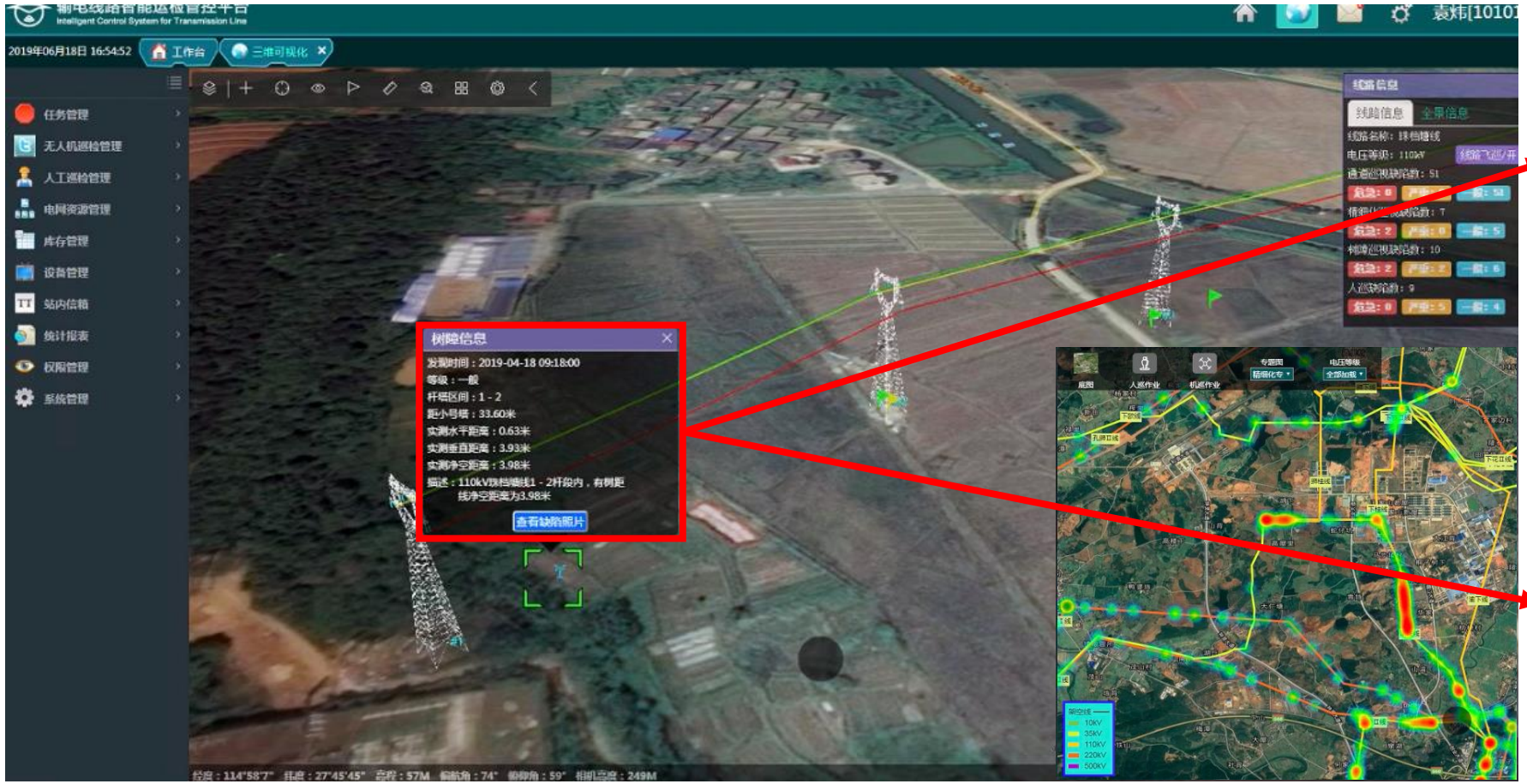
1.1 3D modelling & Control Centre

1.2 Vegetation management

1.3 Item inspection

2.1 3D modelling and Control Center~

- All the inspection data are connected with the 3D models on the platform
- Problems are displayed as flags and you can get the detail info by clicking the flags



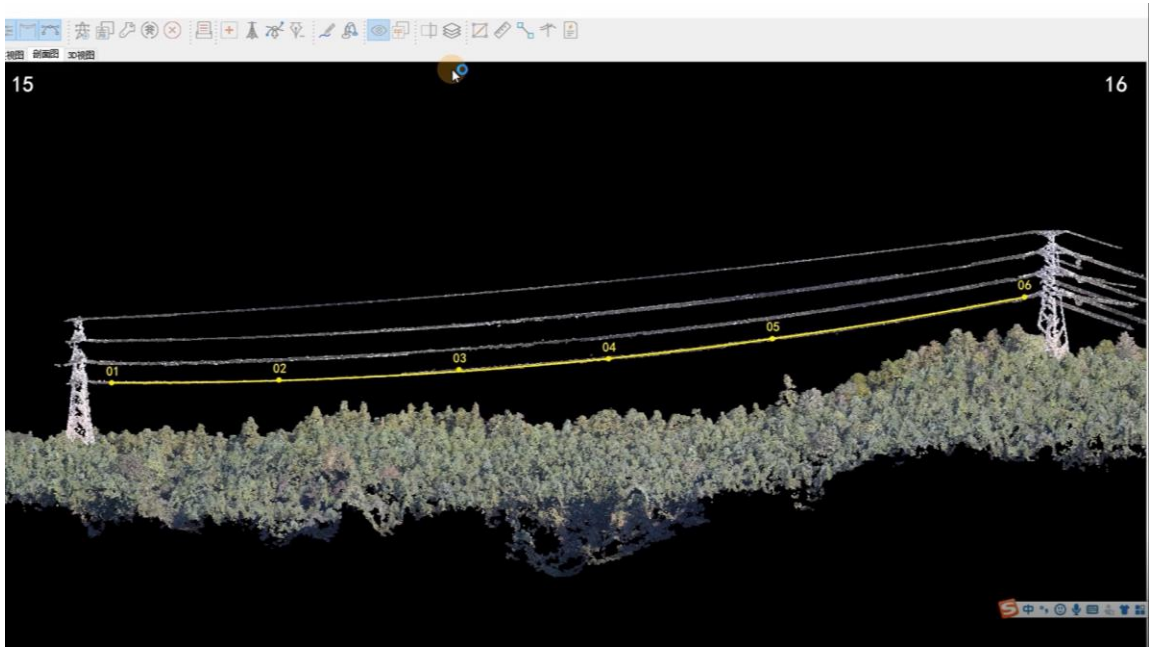
[Item inspection]

[Vegetation Management]

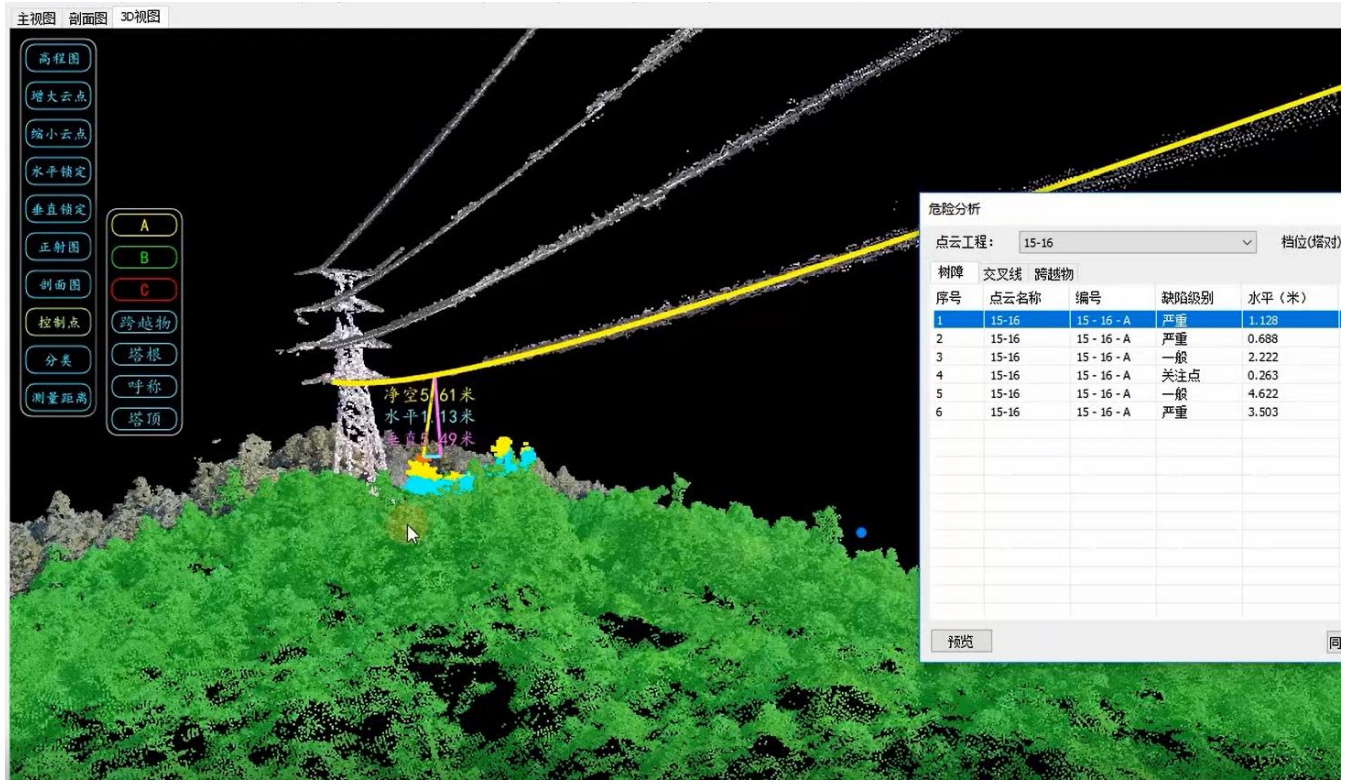
2.2 Vegetation management: Software

- Out software can automatically provide accurate vegetation management in 3D models.

1) 3D model of Power line & Vegetation



2) Our software can automatically calculate the distance between Power line and Vegetation, and it will show with color as “dangerous“ area.

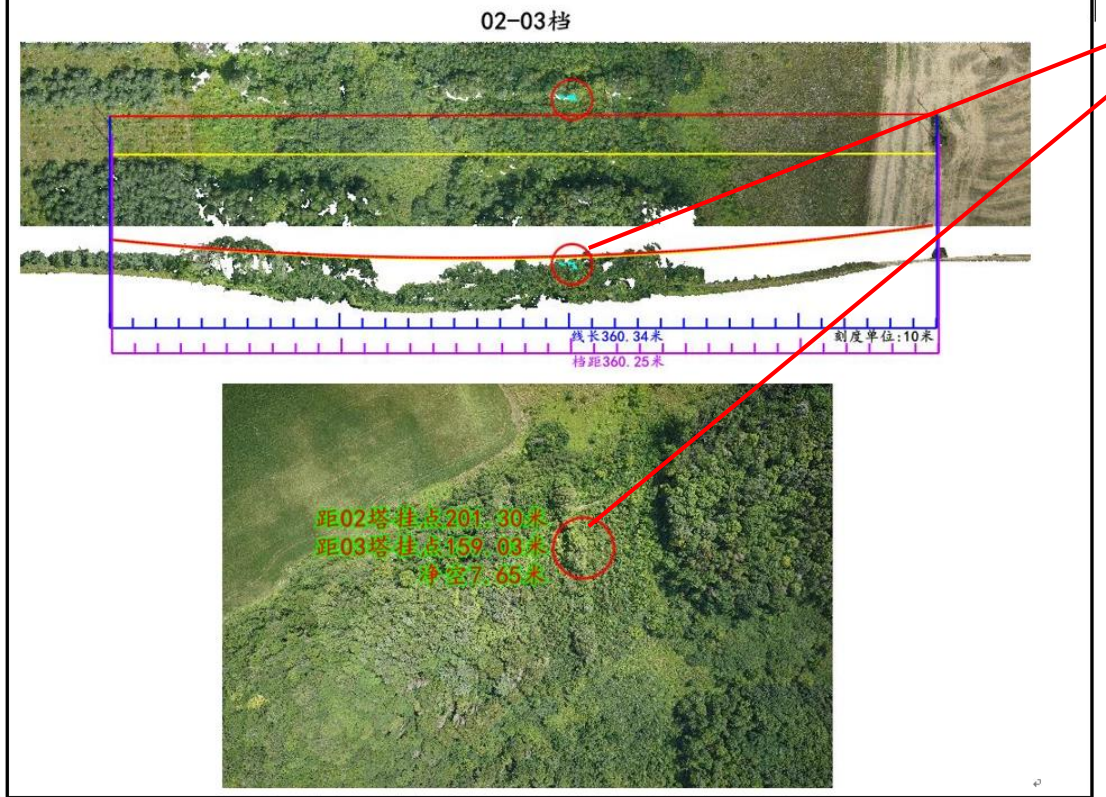


2.2 Vegetation management: Report

- Our software can also automatically generate the reports as follows.

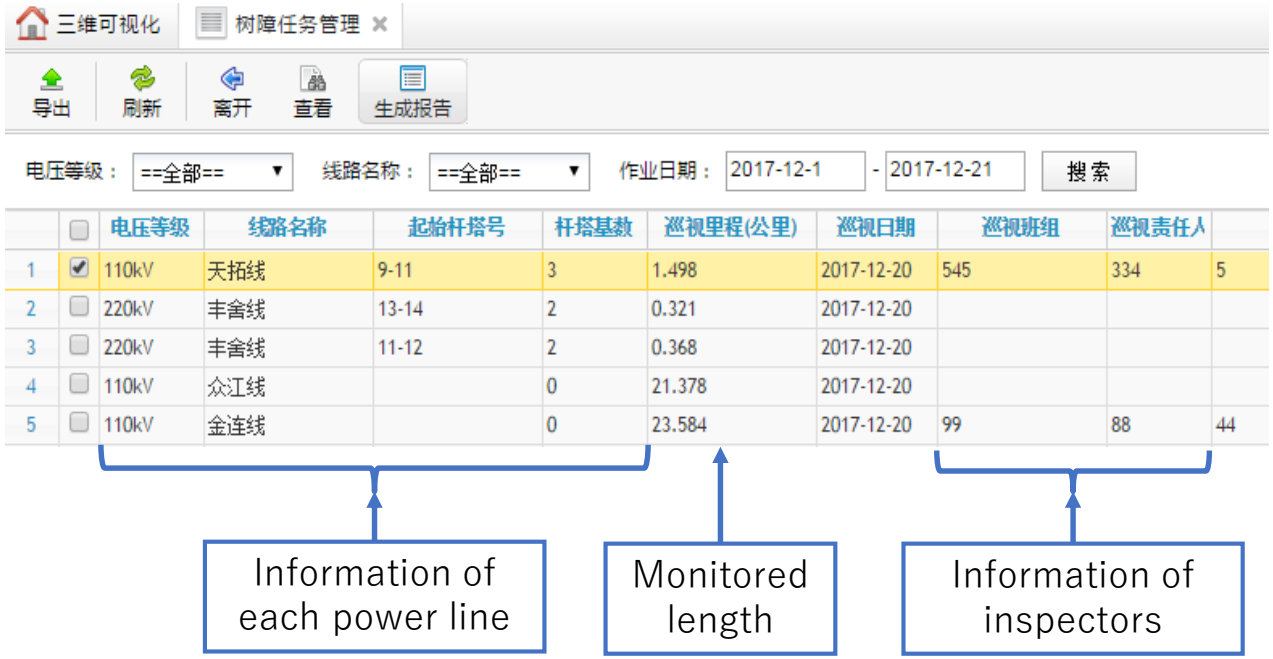
<Trial case in Ukraine>

Serial number	Pole tower interval	Distance from small tower (m)	Latitude and Longitude	Types of defects	Defect level	Measured distance (m)		
						Level	Vertical	Clearance
4	#02-#03-C	200.931	27.021795, 49.358199	Tree barrier	What to Follow	6.748	3.598	7.647



Distance from vegetation with xyz axis

Potential hazardous area



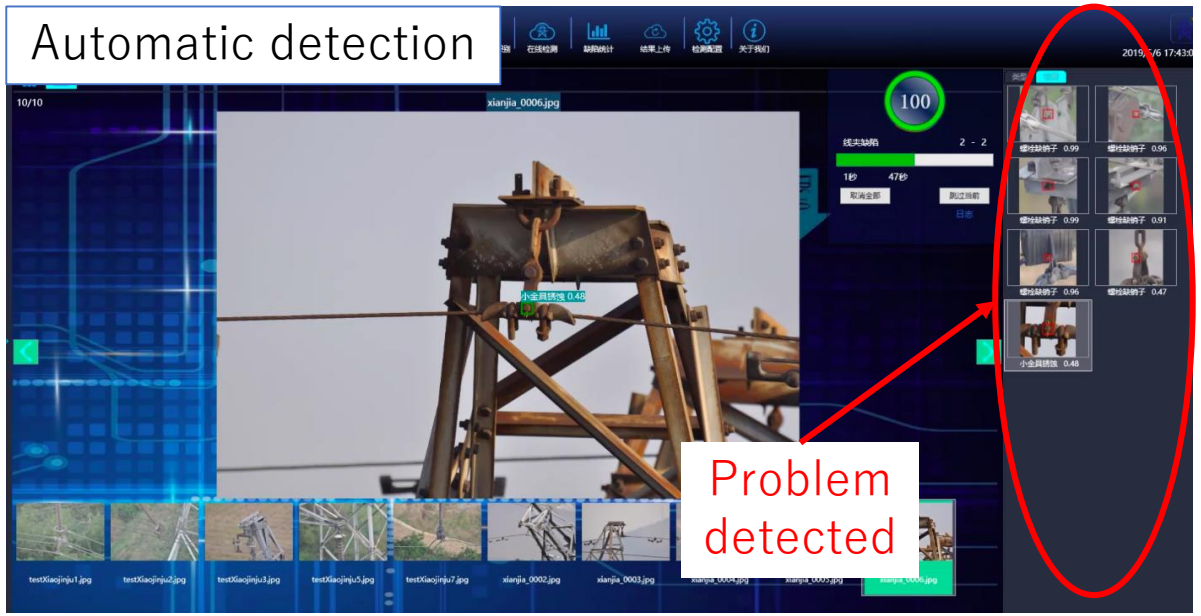
Information of each power line

Monitored length

Information of inspectors

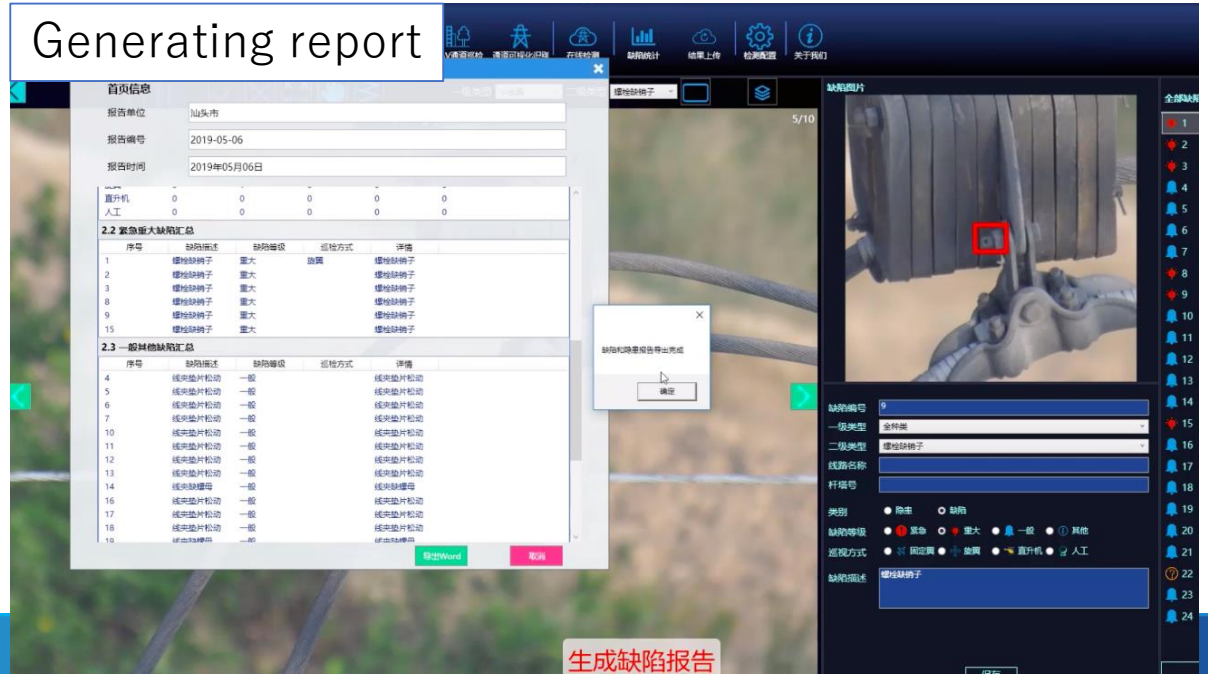
2.3 Software for Item inspection

Automatic detection

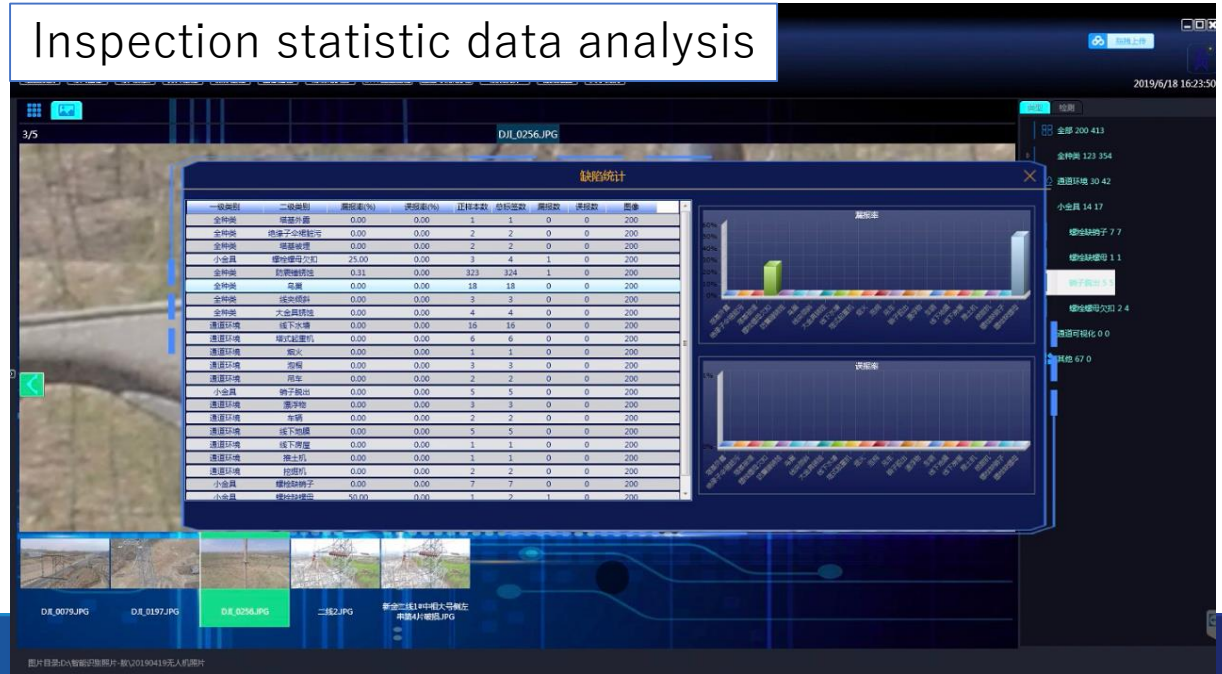


Detection of no screw

Generating report

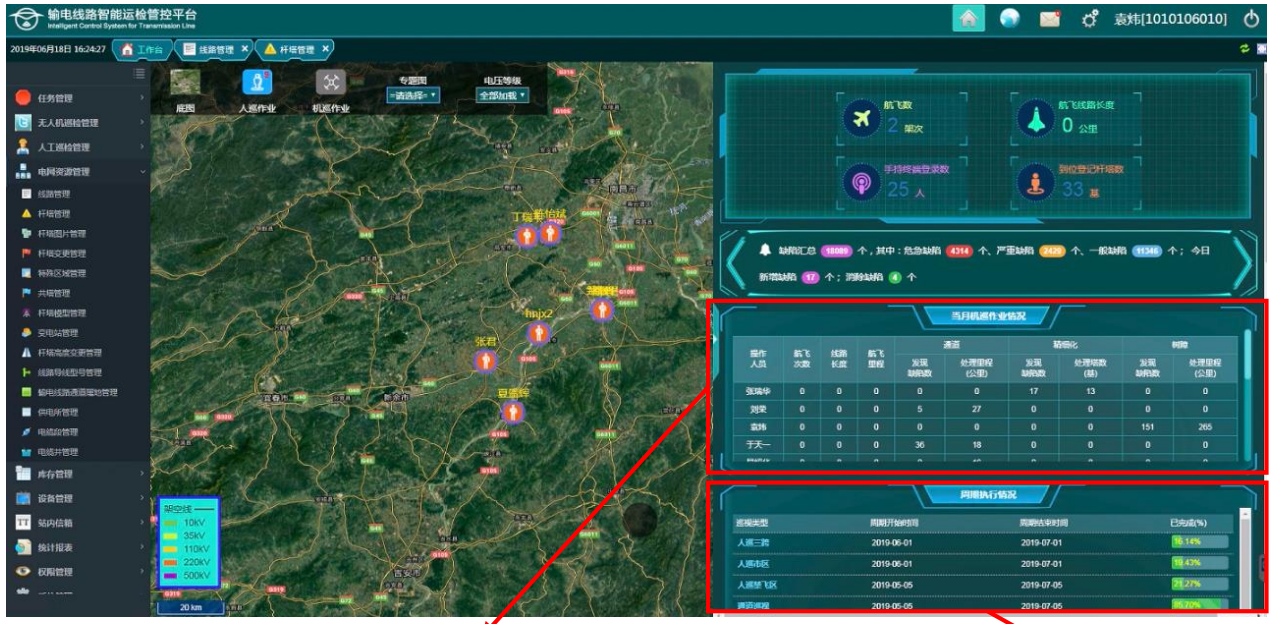


Inspection statistic data analysis



2.4 Software for Task management

Display the on-going tasks of each inspectors and drones



Mobile apps for inspectors

Monthly Inspection Status by Person

Names of inspector

Information of inspected towers

Inspection Progress Monitoring by Person

Thank you for your attention!

Contact:
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