

DRONE
INSPECTIONS
AND ISSUES

INDUSTRIAL SKYWORKS

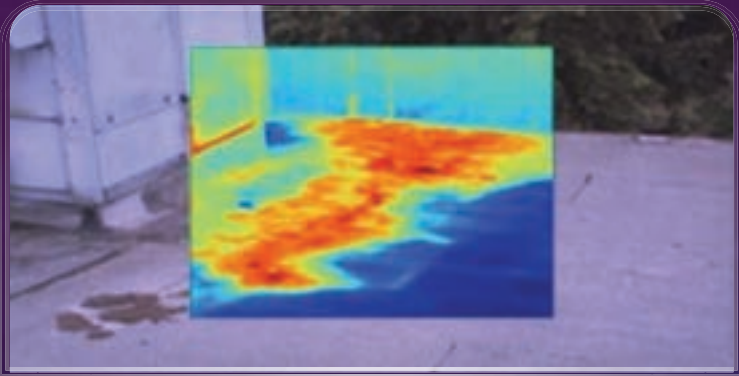
A photograph of a modern, multi-story building with a distinctive grid-like facade. The building is composed of light-colored concrete or stone panels forming a grid of rectangular openings. The top of the building features a large, illuminated sign that reads "INDUSTRIAL SKYWORKS" in a bold, sans-serif font. The sky in the background is a deep blue with some wispy clouds, suggesting a twilight or dusk setting. The building's design is minimalist and industrial.



BACKGROUND

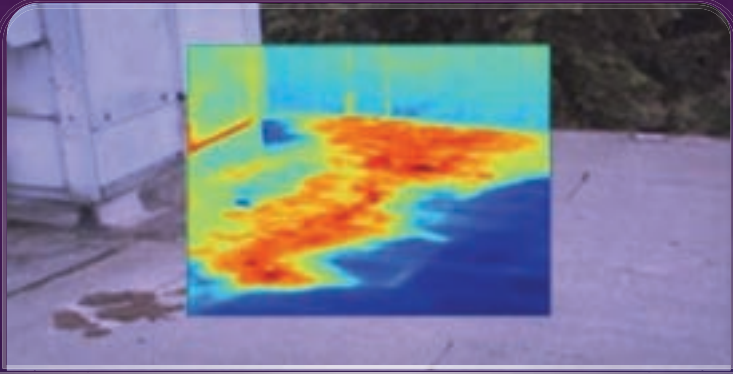
ISW WAS FORMED IN 2014
TO DEVELOP SOLUTIONS FOR THE COMMERCIAL
ROOFING INDUSTRY
CURRENTLY ONE OF THE LARGEST DRONE COMPANIES
IN CANADA.

DRONE=RPAS=UAV=UAS



THERMAL ROOF SCANS

- Problems we identified:
- Dangerous
- Incomplete
- Slow



THERMAL ROOF SCANS TRADITIONAL METHOD

- Team of at least 2 people
- Hand held thermal camera
- Night time work due to thermal differential
- Wet insulation holds heat longer than dry insulation.
- Cooling of air allows the subsurface moisture to become visible.
- The surface of the roof is dry while underneath the roof has moisture penetration



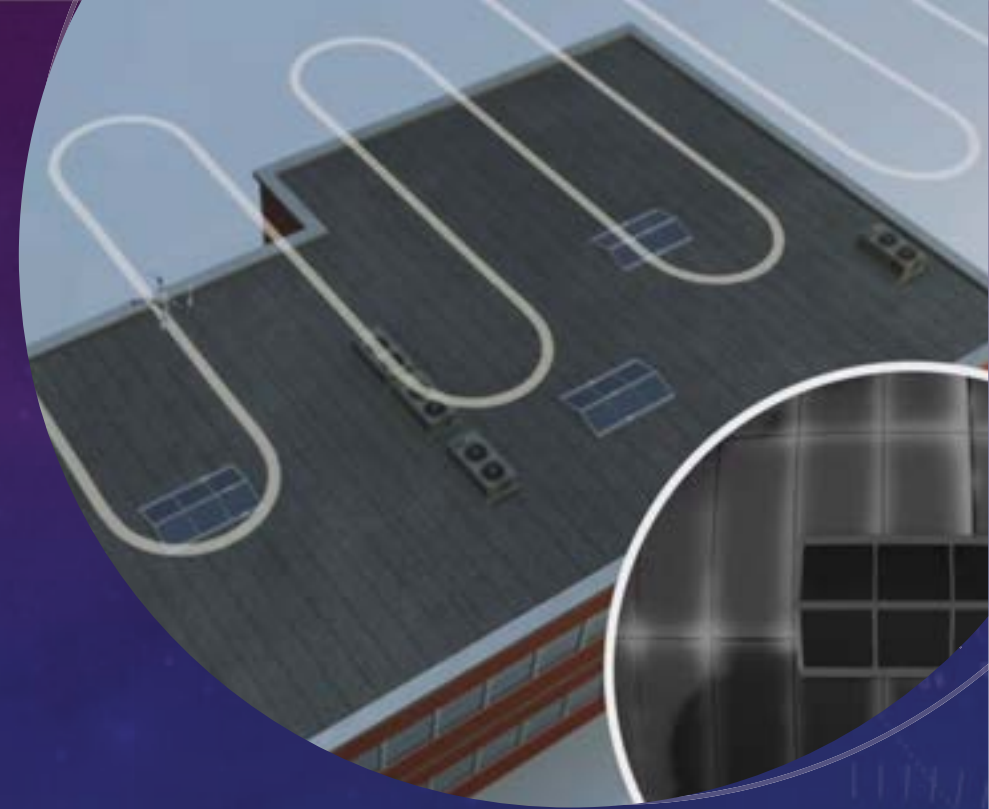
THERMAL ROOF SCANS

OUR DRONE SOLUTION

- Drone based thermal camera
- RGB and Thermal map of the entire roof (through othomosiacs)
- Fast
- Safe crew remain on the ground.

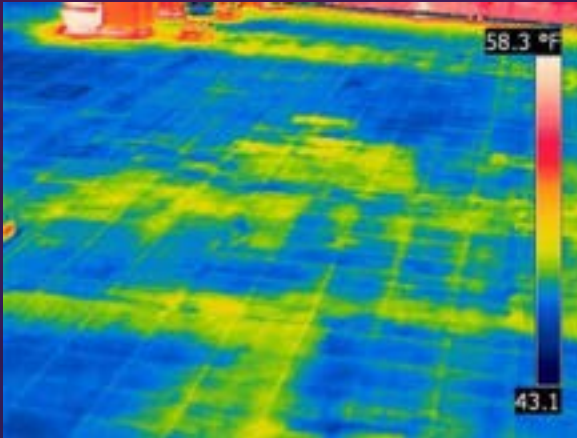
HOW DOES IT WORK?

- The drone flies in a predetermined path over the roof. Taking images every 2-3 meters.
- Hundreds of individual photos or thermal images are gathered
- On landing these images are transferred to a computer
- Software is used to stitch all these images together to create one single thermal map.



RESULT COMPARISON

GROUND BASED



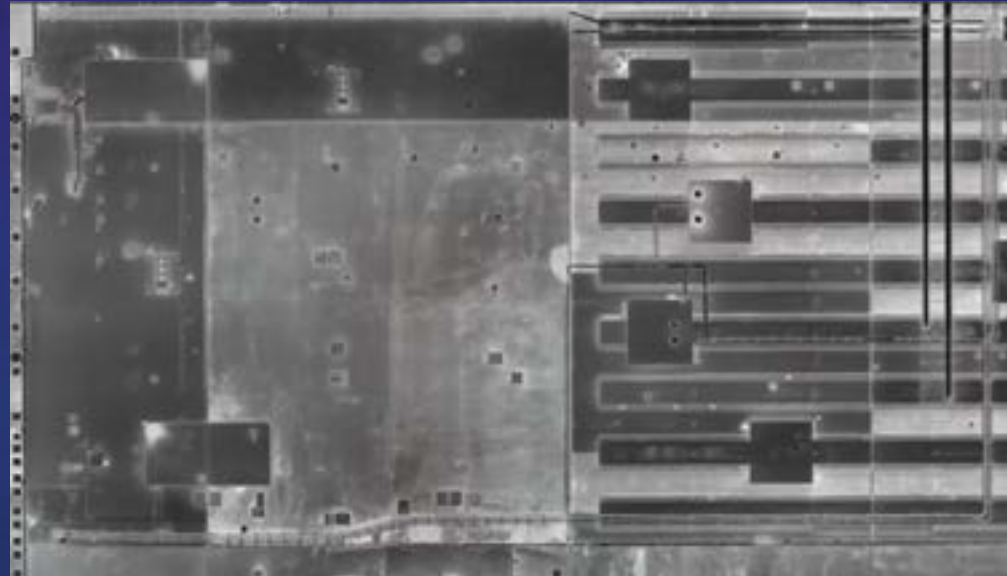
Single photos with no spatial awareness .

DRONE



Thermal map of entire roof structure. 3.8 million sq./ft

Wet Insulation holds moisture and heat longer than dry air.



ADVANTAGES

- Drone 95% faster on larger buildings 3.9 Million sq. ft scanned in 4 hours. Compared to 3-4 weeks.
-
- Safer no one required on the roof. Insurance and liability issues reduced.
- Everything done in one environmental window. Better more consistent data.
- Complete coverage.
- Mapped building that is measurable.
- Anomalies can be measured and area found.

DISADVANTAGES

- Still requires secondary verification (as does ground based)
- Regulations can still be an issue.
- Mass of amount of data produced.



WHAT WE LEARNED

- Drones produce a lot of data
- You need a way to manage that data
- Othomosiacs do not work for every situation
- Resolution is king

Where are the top 2 images taken?

DRONES WE USE

Industrial specific drones

Dual payload, RGB and Thermal

Aeryon Skyranger (Canada)

Intel/Astec Falcon (Germany)

Flyability Elios (Swiss)

Limited use of DJI Drones.





CHINA QUESTION

- Is your data safe from foreign powers?.
 - Where is your data stored?.
 - What information privacy rules exist in other countries?.
-
- DJI is the world leader in drones. They make some of the best drones in the world.
 - Flight plans, location and some images get uploaded to servers.
 - DJI say this can be turned off.
 - Some companies question this. Although DJI have made active strides to assure people there data is safe.

ENERGY SECTOR

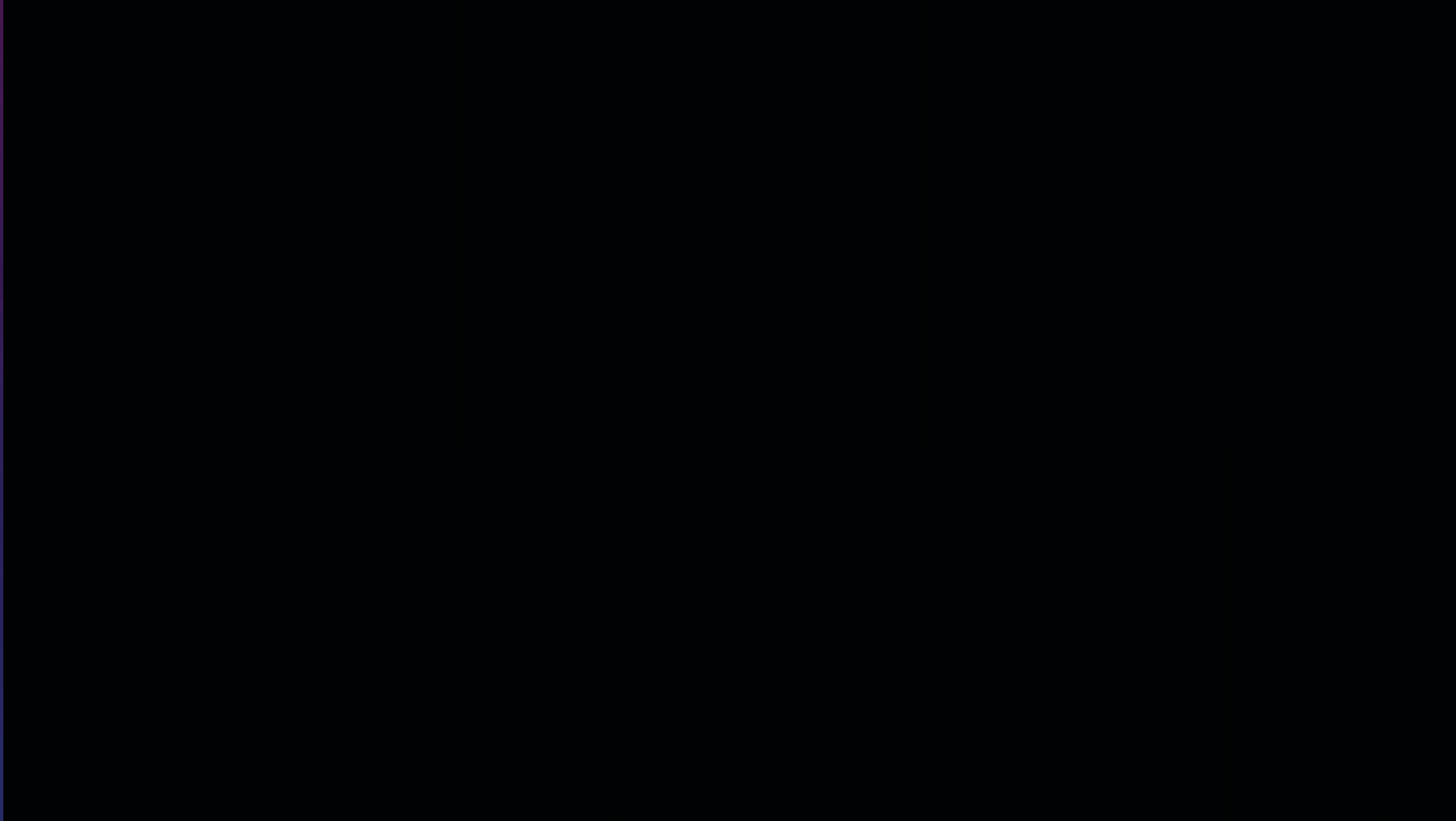
Flare stack inspections

Chimney inspections

Tank inspections

Interior inspections

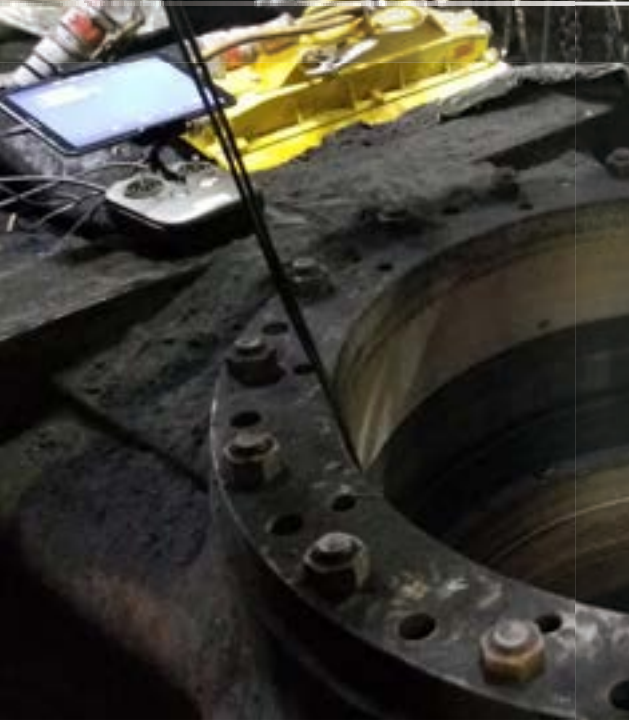
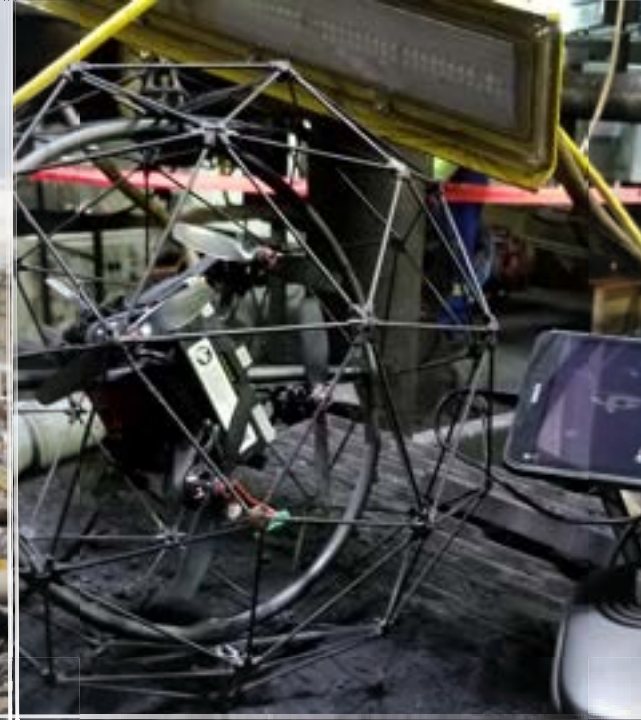
INTERIOR INSPECTIONS





GREAT SOLUTION

BUT HOW TO IDENTIFY
EACH PIPE ON VIDEO



TANK/PIPE INTERIOR INSPECTIONS

- Drone inspection ideal to replace human inspection
- 8 minutes of flight (4 out 4 back)
- Range dependent on signal strength
- Visual and thermal data gathered
- 15 inch Hole required
- Currently video only (no photogrammetry)
- Not intrinsically safe
- Future systems will allow mapping.

TANK INSPECTIONS



AFTER THE FLIGHT

DATA AND HOW TO HANDLE IT



TYPICAL INSPECTION RESULTS IN HUNDREDS (OR THOUSANDS) OF PHOTOGRAPHS.



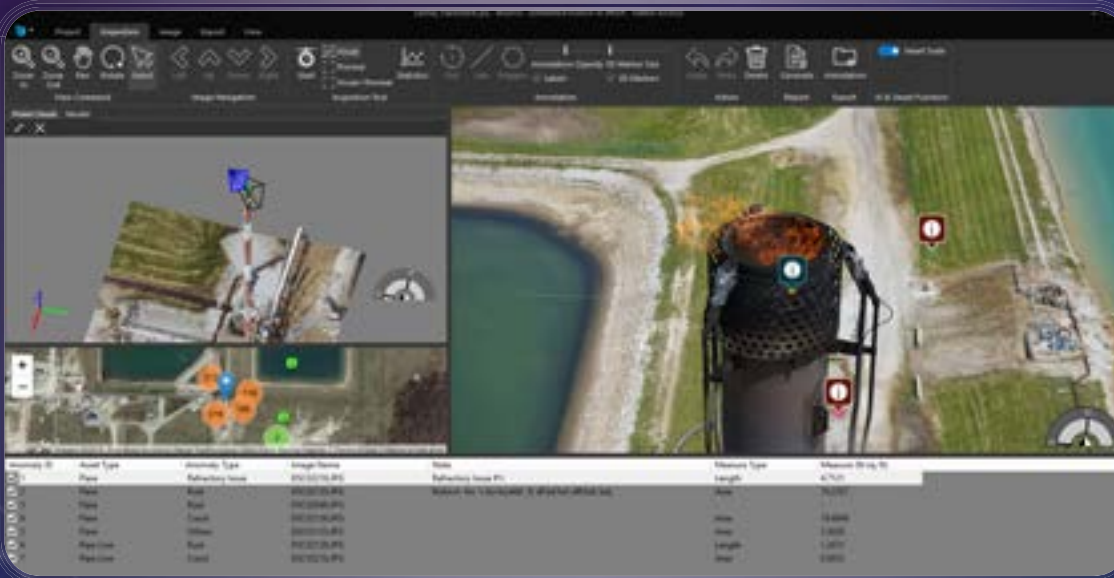
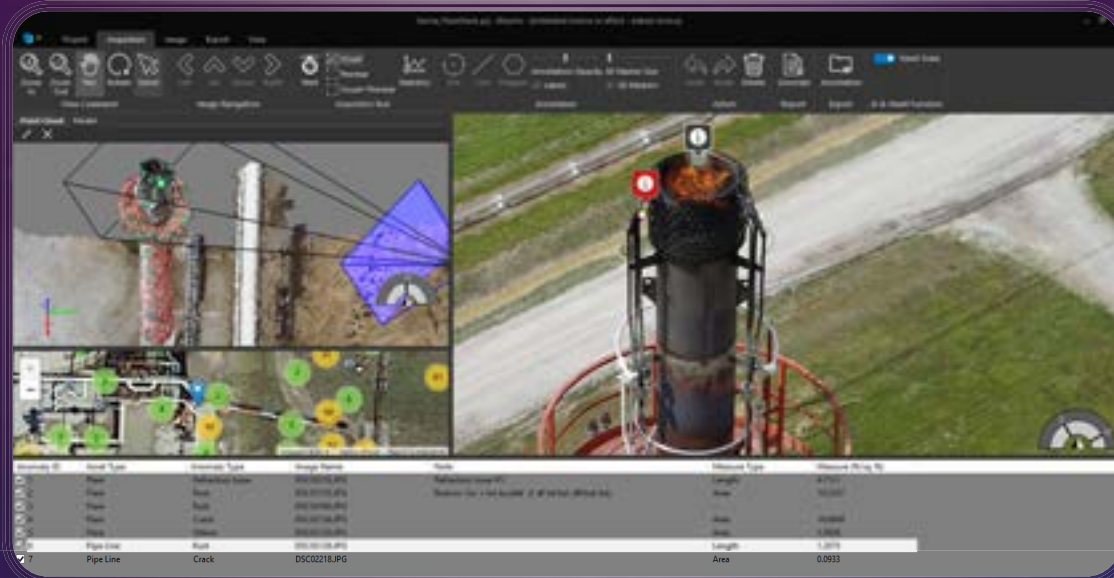
MANY PHOTOGRAPHS ARE HOMOGENOUS IN NATURE.



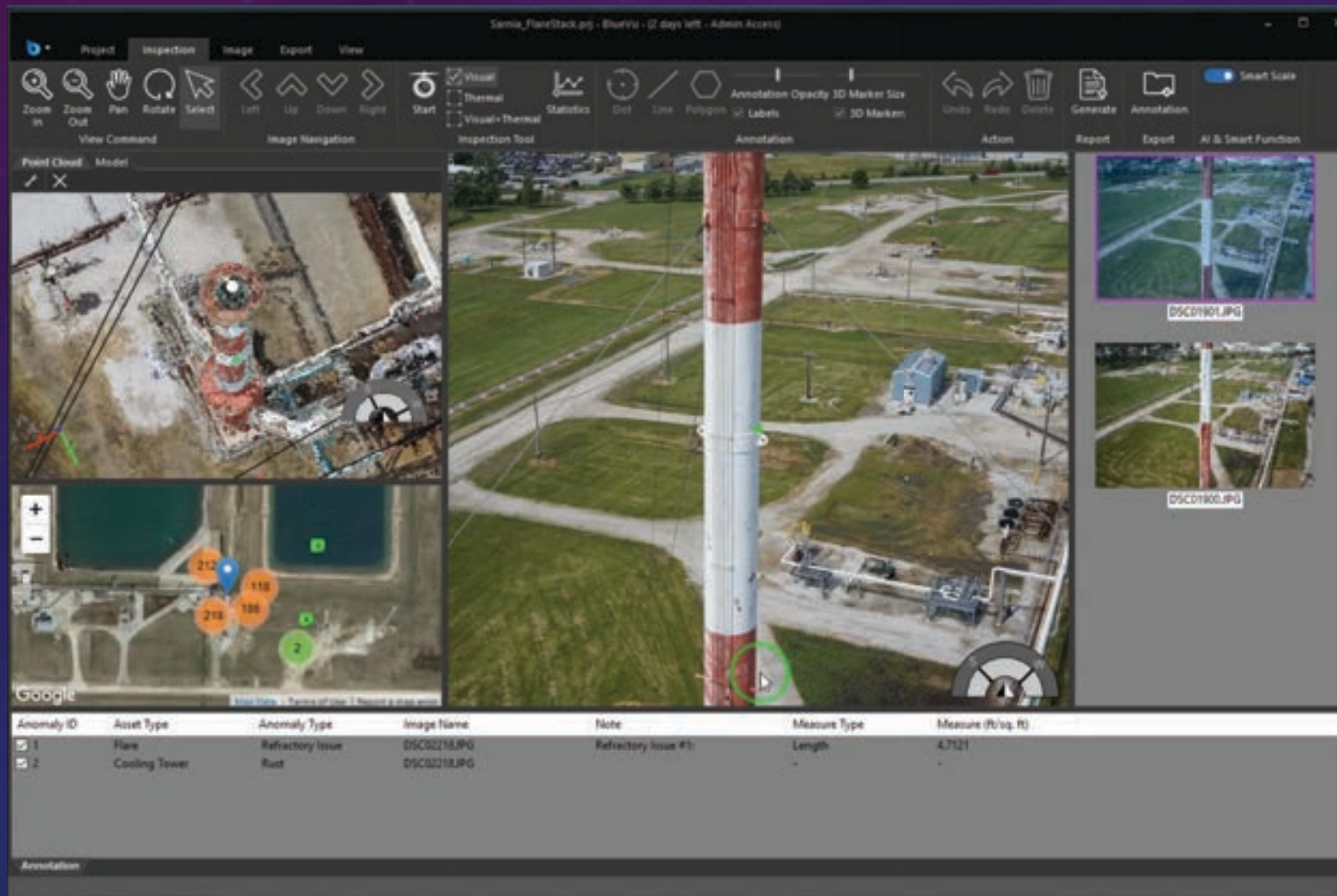
CAUSES CONFUSION AND RUINS WEEKENDS

BLUE VU

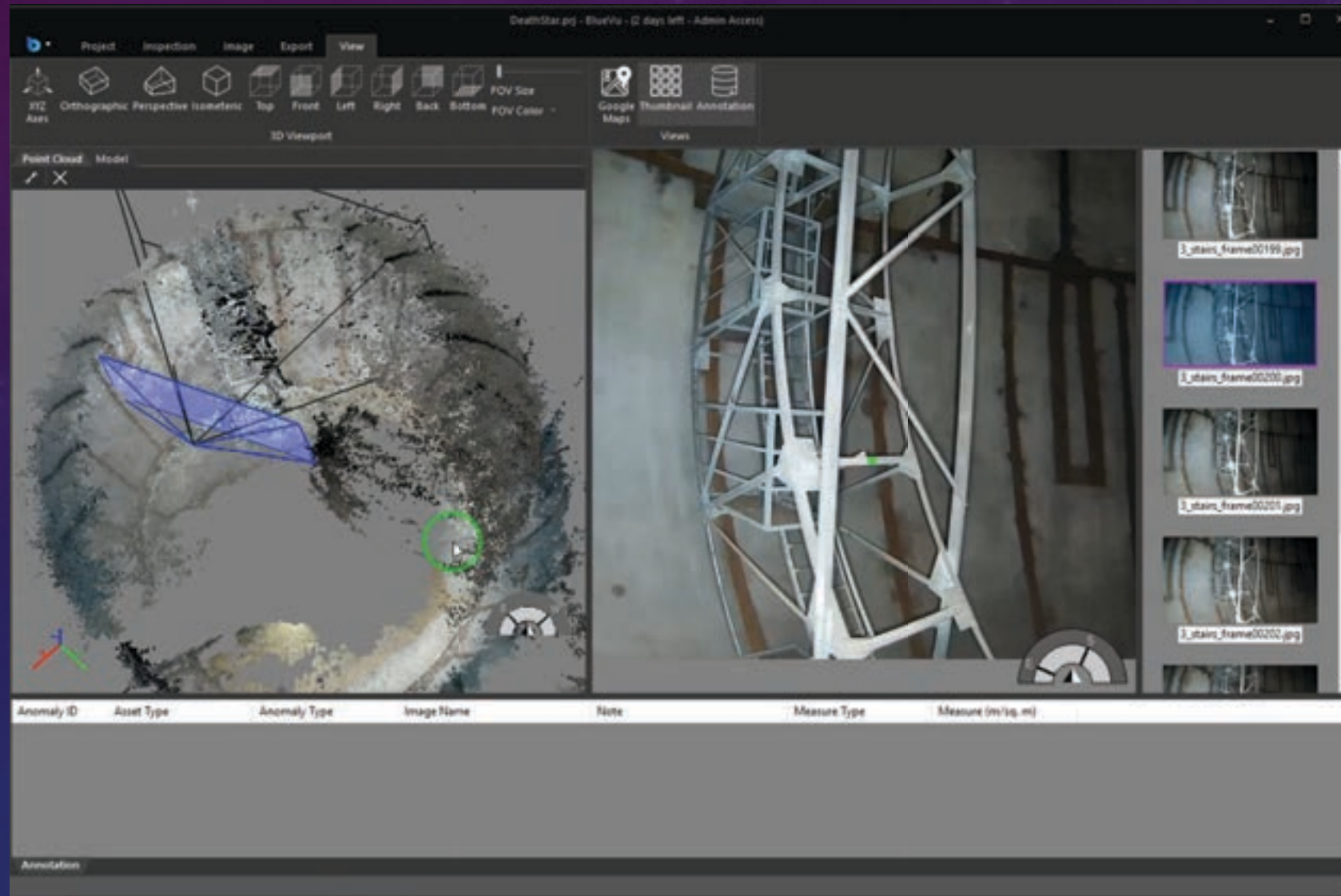
- Software specifically designed for inspections.
- Uses a 3D model created from Drone photographs.
- GPS preferred but not required.
- Users can mark up photos in 3D space.
- Automatically generate reports.



550 PHOTOS



802 PHOTOS



INSPECTION REPORT



Project Name

Company Name

Date: 2019-08-15

Reviewed By:

Company Address

0-0



Type	Rust
Severity	Medium
Image	DSC02254.JPG
Length (in)	1.027940



MED



COMMENTS

SUMMARY

SEVERITY



HIGH

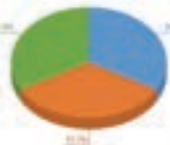


MED



LOW

ANOMALY TYPE



Date	Inspector	Company	Project
2019-08-15	John Doe	ABC Corp	XYZ Project

AUTOMATIC REPORT GENERATION

- All anomalies displayed in a comprehensive report
- All fields and Logos customizable
- Summary pages
- Detailed Photographs
- Comments and Executive Summary

NEXT STEPS

- Artificial Intelligence Based Detection of Anomalies
 - Advantages:
 - Minimal human intervention to keep human and time cost low
 - Data driven solution
 - Coarse and fine level anomaly detection
 - Quicker analysis of hundreds of images as compared to in person
 - Continuous evolution of higher accuracy in detection
 - Easily deployable and trainable as per customer scenario

Current state - Corrosion detection

Input Image



Corrosion detection



Current state - Crack detection

Input Image



Crack Detection



Input Image



Crack Detection



Drone images

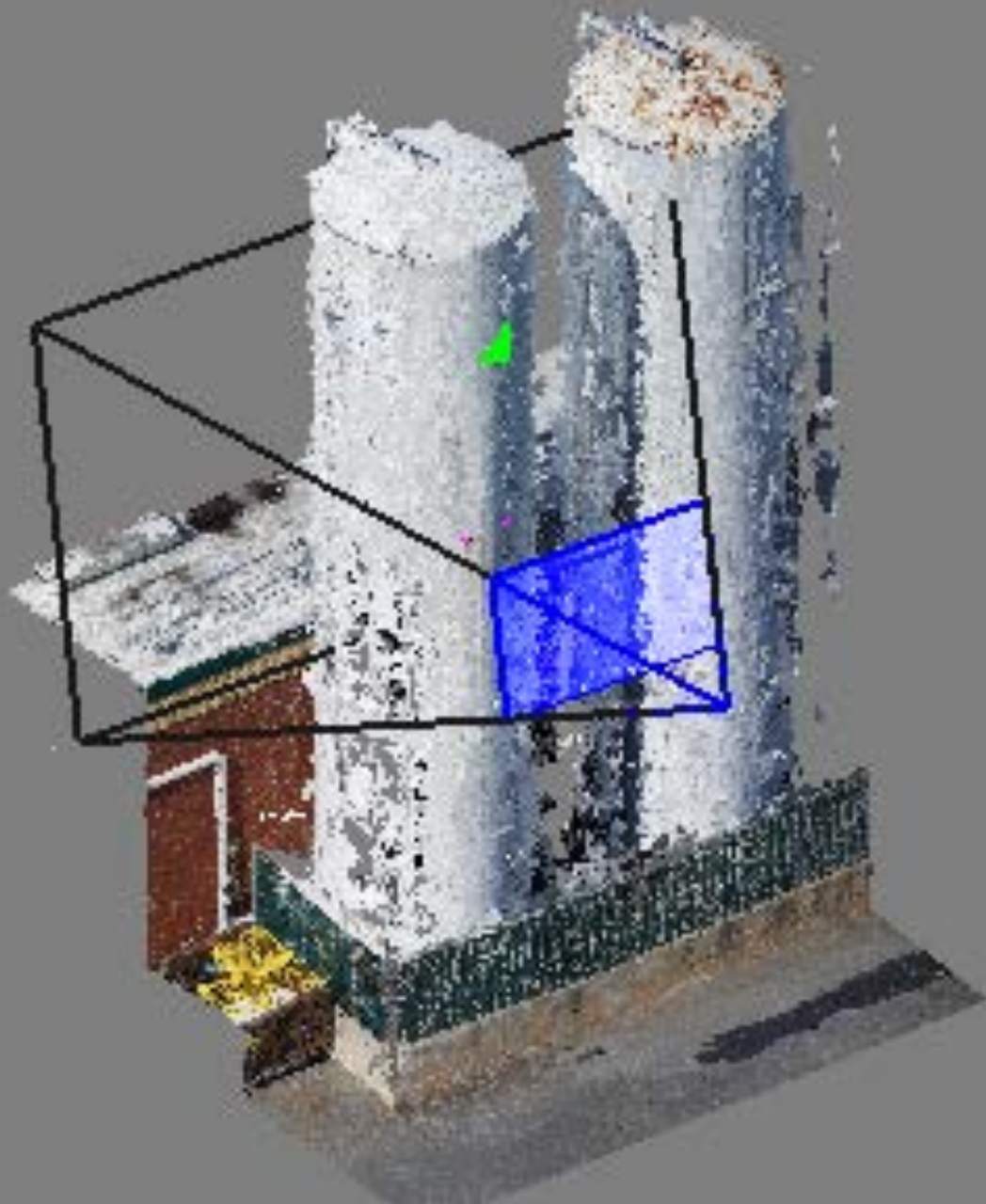
Processing
(3D model
build)

AI Active
Learning

Automatic
annotation of
anomalies

BlueVu
Output

BUILDING BLOCKS
FOR FUTURE DRONE INSPECTION PROCESS



QUESTIONS?