Improving District Heating Maintenance Programs w/ Drone Technology
Problem

- District heating systems are aging & leaking
-Leaks are expensive and can be hard to locate

- Traditional inspection methods are ineffective and/or expensive

- Reactive maintenance results in higher costs and unplanned energy losses
Traditional Thermal Inspection Methods

Walking
- Slow
- Lack Perspective
- Limited Data
- No GIS Info

Pickup Truck
- Still need to walk parts of system
- Limited Perspective
- Limited Data
- No GIS Info

Helicopter
- Expensive
- Disruptive
- Shaky Video
- Limited Data
- No GIS Info

Airplane
- Expensive
- High Altitude
- Limited Data
- Lacks Detail
Drone-Enabled Inspections

- Scalable & Affordable
- Efficient
- Effective
- Safe
- Smooth Video
- High-Res Visual
- Radiometric Thermal Data
- GIS Ready
Equipment

- FAA Part 107 Certified Pilots
- FAA Registered Aircraft
- Aviation Insurance $3M - $5M
Process

Daytime
• Map Campus
• Capture Pre-Programmed Video

Nighttime
• Capture Pre-Programmed Thermal Video
• Capture Radiometric Thermal Images
Deliverables

Comprehensive & Detailed Interactive Report

Picture-in-Picture Video
Picture-in-Picture Video
Map Data

Quick & easy integration with existing systems
Map Data

Map Generated from Drone Imagery

Google Maps
Case Study 1
The Benefits of Recurring Inspections
Case Study 1 – Ivy League School #1

April 2018

Dec 2018

Nov 2019
Case Study 1 – First Inspection

April 2018

39 Areas of Concern:
- 4 Major
- 11 Minor
- 24 Monitor
Case Study 1 – Second Inspection

35 Areas of Concern:
- 6 Major
- 8 Minor
- 21 Monitor

Dec 2018
Case Study 1 – Third Inspection

17 Areas of Concern:
- 1 Major
- 5 Minor
- 11 Monitor
Case Study 1 – Summary

• Established annual inspection program
  • Previously done every 3 years

• Data used to make effective repairs & improvements
  • Reduced the number of areas of concern over 3 years

• Early detection of major issues
  • Cost savings in reducing energy and condensate losses
Case Study 2
The Benefits of Recurring Inspections
Case Study 2 – Ivy League School #2

Mar 2019

Dec 2019
Case Study 2 – First Inspection

Mar 2019

15 Areas of Concern:
- 5 Major
- 5 Minor
- 5 Monitor
Case Study 2 – Second Inspection

Dec 2019

19 Areas of Concern:
- 1 Major
- 5 Minor
- 13 Monitor
Case Study 2 – Summary

- Established annual inspection program
  - Previously no formal aerial inspection program

- Data used to make effective repairs & improvements
  - Reduced the number of major areas of concern over 3 years

- Early detection of major issues
  - Cost savings in reducing energy and condensate loses
Case Study 3
Pre & Post Repair Inspection Results
Case Study 3 – Pre-Repair Inspection
Case Study 3 – Repair
Case Study 3 – Post-Repair Inspection

Pre-Repair

Post-Repair
Case Study 3 – Summary

• Pinpointed the location of the leak

• Reduced digging and making expensive holes

• Helped save 30 – 40 % in total project costs
Lessons Learned

• Preventative maintenance and early detection works!
  • Reduce costs and energy losses
  • Proven ROI

• Drone-enabled inspections are more effective and affordable.
  • Enabling annual inspection programs
  • First inspection helps create a baseline and roadmap

• Good data makes a facilities manager's life easier!
Questions?

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