


Digital Inspection – Oil & Gas

Challenges

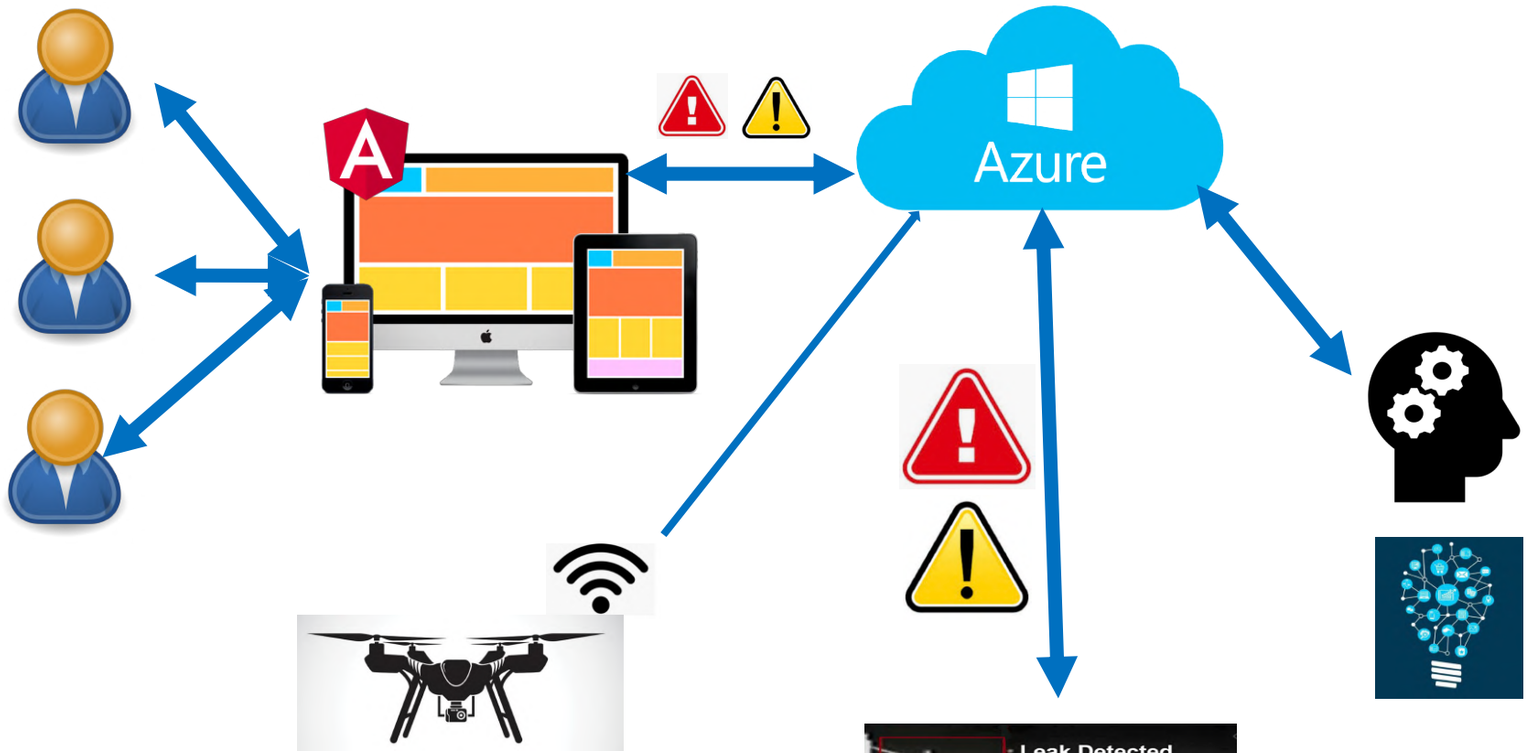
- Oil and gas companies are facing a critical challenge as the world increasingly shifts towards clean energy transitions.
- Primary component of Natural gas, Methane unseen by naked eye has global warming potential.
- Corrosion also a great concern in the oil and natural gas (O&G) industry because it adversely affects infrastructure in exploration, production, processing, and transport .
- Global Industries leakage loss estimated with 3.6 trillion cubic feet gas per year Annual revenue loss of USD 30 billions across O&G Industry Globally.
- Environmental, health and safety (EH&S) incidents

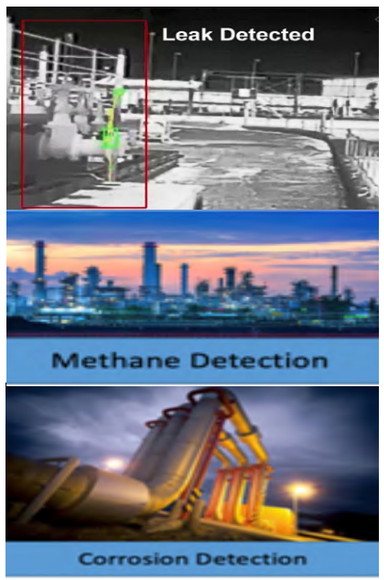
Goals of Oil & Gas Industry

- How do you make Refineries Safe for workers?
- How do you reduce the Hydro-Carbon footprint in atmosphere?
- How do you reduce the inspection cost and downtime for assets ?
- How do you increase asset life ?
- Are you able to avoid the hefty annual revenue losses?

* Architecture

Architecture





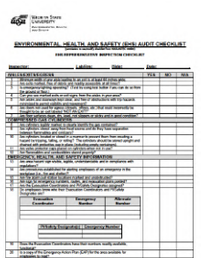
Employee Health & Safety

➢ According to the Centers for Disease Control and Prevention's NIOSH, between January, 2015 to February, 2017 oil and gas extraction workers were involved in 602 incidents, some resulting in multiple injuries. There were 481 hospitalizations and 166 amputations.

➢ EHS risks are inexorably embedded in other business areas like finance and accounting, human resources, legal, operations, maintenance, supply chain etc.

EHS – Regulatory Compliance

EHS Components	Requirements
Health and Safety Plan	Oil and Gas Company's vision and approach towards Health and Safety
Administration	Organizational hierarchy
	Key details of persons responsible for managing health and safety plans
Work Area Management	Proper demarcation and management of workplace according to processes, activities, design, etc.
	Worksite inspections
	Implementation of best practices and lessons learned from the past experiences at workplace
H&S Risk Management	Set of systems and processes for managing Health & Safety risks
	Job Hazard analysis
	Hazard ranking/risk matrix
	Corrective action plans
	Risk control levels analysis
Task and Workflow Management	Calendar management
	Role assignments - Involving and informing workers, safety officers and others about their roles and
	responsibilities, allocated tasks, etc.
	Automated notifications
H&S Maintenance Systems	Performance and monitoring of H&S activities and corrective action as needed



EHS Checklist

EHS – Regulatory Compliance

EHS Components	Requirements
Incident Management	Recording, processing, investigation, reporting and root cause analysis of any reported incident/accident/near miss/safety observations
Occupational Health Management	Health protocols
	Medical appointments
	Injury/Illness management
	Drug, alcohol and other medical testing
Management of Change	Identification of new hazards
	Introduction of new equipment
	Process change
	New regulatory requirements
Emergency Response Plan	Disaster management/Emergency response plan for all the potential predicaments based on predictive risk analysis
	Alarm system
Compliance Management	Comply with the obligations under pertinent local/national/global H&S regulations
Competency Management	Track capabilities/skills of workforce
	Trainings for employees, contractors and visitors
	Assessments
Contractor Management	Managing and coordinating activities of contractors
Rehabilitation Management	Tracks number of compensation days, rehabilitation information of workers
Statistics, Reporting and Dashboard	Relevant report generation from health and safety data
	Interactive dashboards for higher management view and decision making
Audit and Review	Internal and External Audit and review programs to check and improve the effectiveness of implemented Safety and Health Management System

EHS Guidelines

Thermal IR Technology

* The Solution

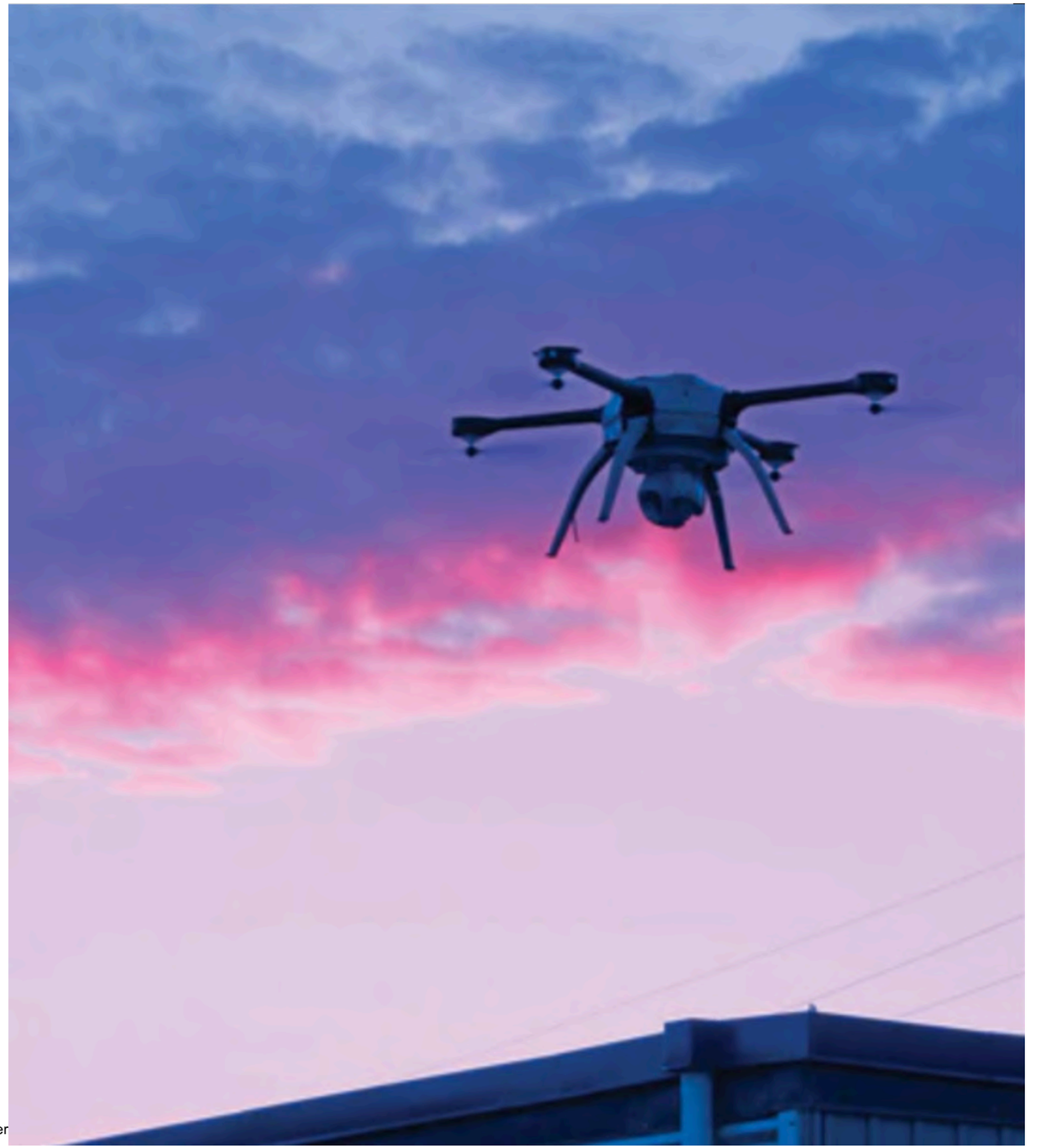
Solution for Digital Inspection

➢ Thermal Infrared imaging technology Cameras with Drones complete the Inspection.

➢ The Video is Streamed to the Cloud Infrastructure

➢ Advanced Analytics & Video Analytics is used to analyze these streamed data.

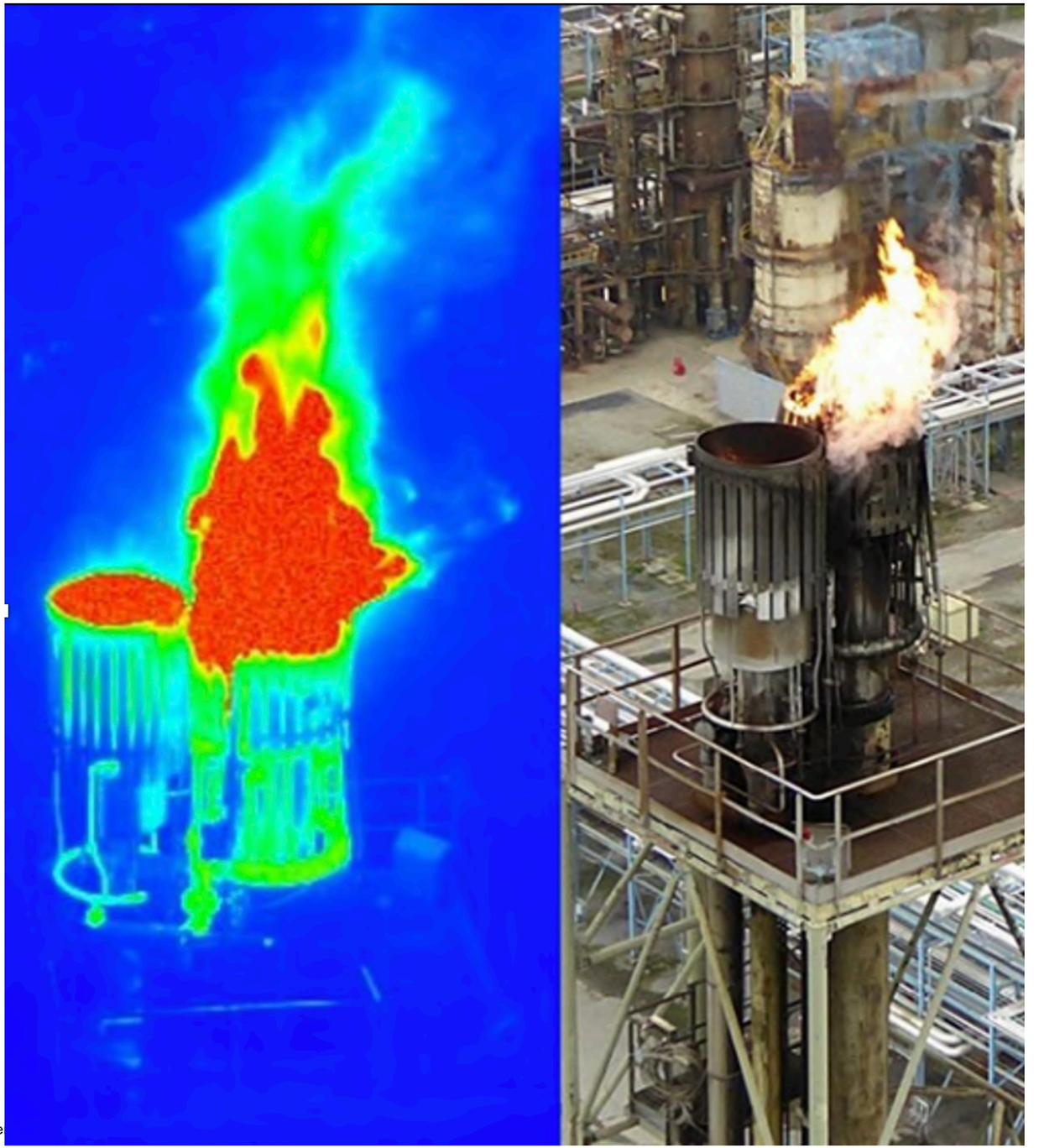
➢ In case of any anomalies the required personnel is intimated with an automated voice call or escalated depending on the severity.



* The Benefits

Benefits of Thermal IR Technology

- Fast, contact-less measurement tool can be used in rugged terrain
- Increase workplace safety
- Improve air quality and cut greenhouse gas emissions
- Gain a competitive edge and boost productivity
- Detect small & large leaks from distance under low light
- Reduced Downtime & Improved Productivity
- Optimization of maintenance time and costs
- Higher return on Investments.
- Monitoring of Digital Inspection results can be done from a Global Command Center for multiple locations.




Sensor Technology

Sensor Technology for Digital Inspection

➢ Sensor technology integrated with Unmanned Areal Vehicle delivers actionable, affordable and reliable emission data.

➢ Data will be generated in a format that integrates with the existing control software or cloud which provide the actionable results.

➢ System can detect emissions with exact locations of the leakage.

➢ Solution can be used for preventative inspection where air quality is constantly monitored

➢ Aerial drone – sensor solution equipped with the lowest false positives.

Benefits of Sensor solution

- Ultra accurate resolution for leak grading
- Hyper accurate GPS
- Small size, Light weight and easy to integrate with steam traps.
- Quantified emission leak data
- Provides healthily environment and safety
- Aerial inspections can executes rapidly
- Reduced Downtime & Improved Productivity
- Robust to hazardous environments.

Sens

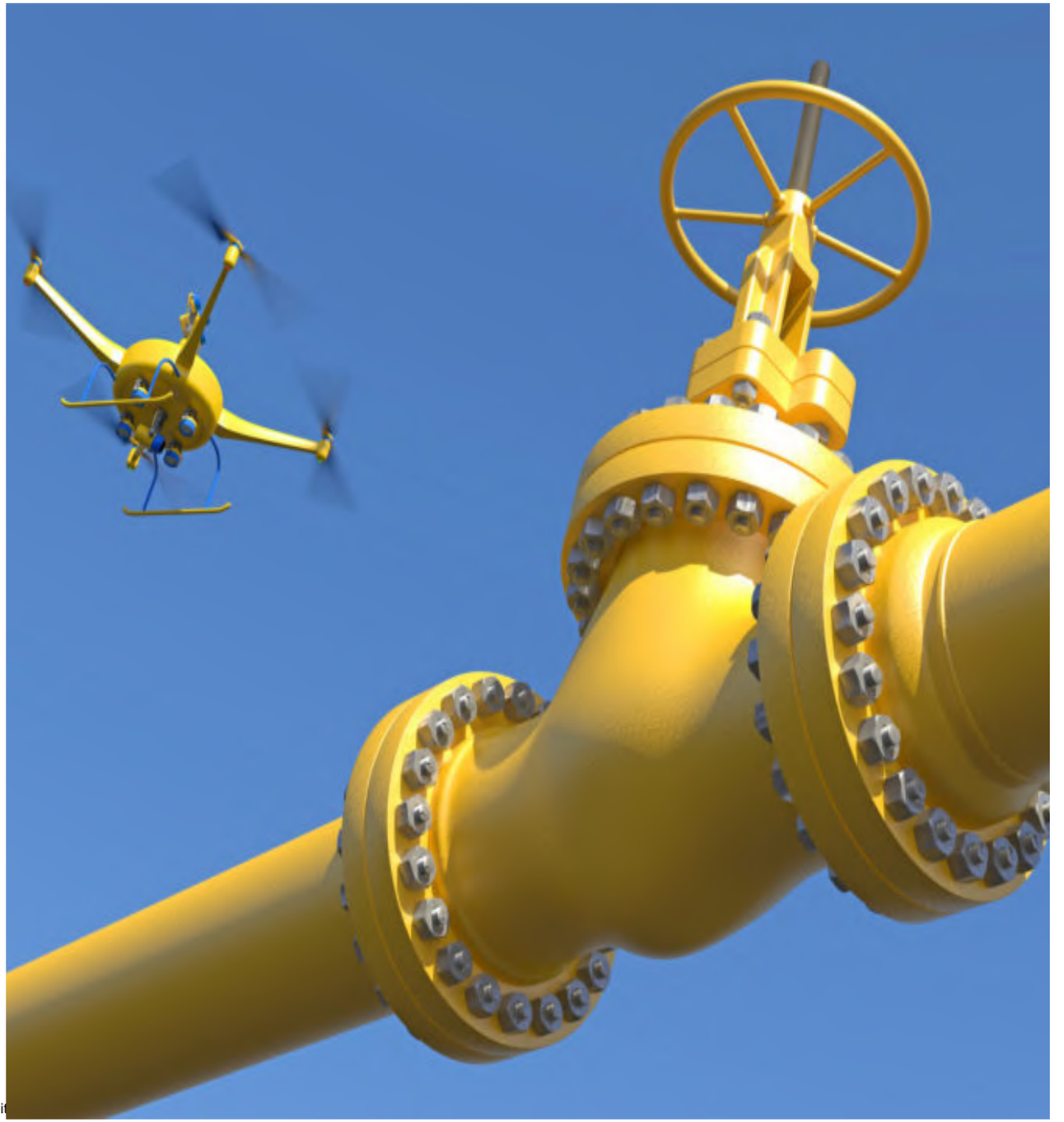
EXTERNAL CORROSION MANAGEMENT

Digital Inspection For Corrosion

➢ Drones have become increasingly autonomous with their services and usability. Corrosion detection is one of the use case in oil and gas industry.

➢ UAV integrated with high resolution cameras to inspect the external corrosion

➢ Data streamed to on premise or cloud infrastructure for corrosion detection.



Benefits of UAV integrated robotic NDT techniques

- Speed up the entire inspection process.
- Reduced Downtime & Improved Productivity
- faster determination of defects
- Preventing costly repairs or catastrophic failures.
- Real – time data transmission
- Improved worker safety
- Inspection can be performed on critical heights .
- Overall reduction in inspection cost.

Hardware Requirement

Hardware – Thermal IR Cameras list

Thermal Camera	Dimensions	Weight	Spectral Band(μm)	Frame Rate(Hz)	Resolution	URL
Duo® Pro R	85 × 81.3 × 68.5	325	7.5 – 13.5	9	336*256	Click Me
Vue Pro R	57 × 44	100	7.5 – 13.5	30	336*256	Click Me
Vue Pro	57 × 44	120	7.5 – 13.5	30	336*256	Click Me
VUE TZ20	128 × 154 × 141	640	8 – 14	30	640*512	Click Me
ZENMUSE H20	150×114×151	680g	8 – 14	30	640*512	Click Me
ZENMUSE XT	103 x 74 x 102	270	7.5 – 13.5	30	640*512	Click Me
WIRIS Pro	83 x 85 x 68	450	7.5 – 13.5	30	640*512	Click Me
GIS-320	201 x 150 x 105	1500	3.2 – 3.4	30	320 x 240	Click Me
ZESMUSE X4S	125×100×80	253	7.5 – 13.5	30	640*512	Click Me

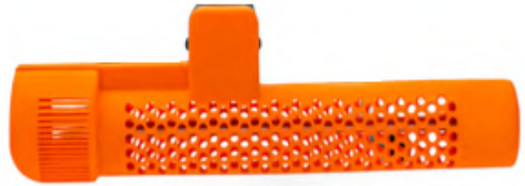
FLIR®

WORKSWELL®
INFRARED CAMERAS AND SYSTEMS

dji

Hardware – Sensor list

Sensor Name	Manufacturer	# Gas Dectection	Dimension	Link
SeekIR	SeekOps	1	22 x 3.3 x 3.1	Click Me
CRIRE1	Honeywell	1	3.3 x 2.2 x 1.12	Click Me
CRIRM1	Honeywell	1	3.3 x 2.2 x 1.12	Click Me
VentisPro	IS	5	10.4 x 5.8 x 3.6	Click Me
VentisMX4	IS	4	10.3 x 5.8 x 3.0	Click Me
MX6	iBird	6	13.5 x 7.7 x 4.3	Click Me
G7	Backline	1	6.4 x 12.4 x 2.7	Click Me
Tango TX1	IS	1	9.9 x 5.1 x 3.5	Click Me
GasbadgePro	IS	12	9.4 x 5.08 x 2.79	Click Me
BW Ultra	Honeywell	4	14.8 x 8.5 x 4.0	Click Me
BW Icon	Honeywell	4	10.82 x 6.15 x 3.78	Click Me
miniVUX-1DL	RIEGL	1	23.2 x 9.9 x 12.3	Click Me



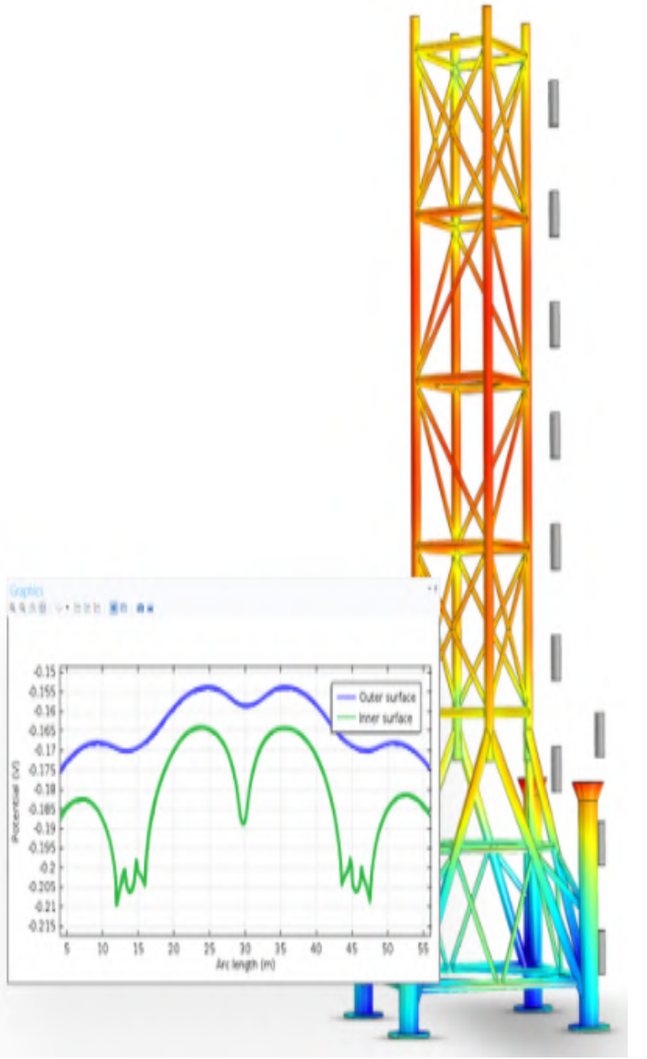
INDUSTRIAL SCIENTIFIC Honeywell MSA UAVOS

Hardware - Drones List

Drone Name	Dimension(mm)	Weight (kg)	Max Payload(kg)	Max Flight Time(min)	URL
MATRICE 300 RTK	810×670×430	3.6	2.7	55	Click Me
MATRICE 210 RTK V2	883×886×427	4.91	1.34	33	Click Me
MATRICE 100	887×880×378	2.35	1	40	Click Me
MATRICE 200	887×880×378	3.8	2.3	38	Click Me
MATRICE 600 PRO	1668×1518×727	9.5	6	38	Click Me
MATRICE 210 RTK	887×880×408	4.27	1.87	32	Click Me
MATRICE 200 V2	883×886×398	4.69	1.45	38	Click Me
MAVIC 2 PRO	322×242×84	1	1.1	31	Click Me
Acecore NEO	1107x1107x635	11	9	25	Click Me

External Corrosion Product Suites

Name of the Product	Description
PREDICT®	predict and control carbon steel corrosion and erosion in CO2 and H2S environments
PREDICT®-AMINE	predict and quantify corrosion in rich and lean amine systems.
PREDICT® CRUDE	For accurate quantification of corrosion due to Naphthenic acid and sulfidic corrosion
PREDICT®-SA	predict and quantify corrosion in sulfuric acid alkylation units
PREDICT®-SW	predicts corrosion rates for typical process plant materials in corrosive alkaline sour water environments
SOCRATES®	comprehensive corrosion resistant alloy (CRA) material selection system
STRATEGY™- A	an effective tool for evaluating cracking of steels
SMARTCET® TRANSMITTERS	provides multiple measurements from a single device to get a complete overview of the corrosion phenomenon
SMARTCET® WIRELESS TRANSMITTER	enables users to obtain data from remote and hazardous measurement locations wirelessly
SMARTCET® DATALOGGER	acquires real-time corrosion information at satellite locations in a process plant
Cathodic Protection Systems	Specializing in Custom Directionally Drilled Groundbeds
COMSOL®	Optimizing Corrosion Protection Systems



MESA™ CORROSION CONTROL+INTEGRITY

CORTEC CORPORATION Environmentally Safe VpCI®/MCI® Technologies

Honeywell

COMSOL

Competitors

TCS

TCS helping their clients reimagine operations by leveraging drone technologies and fit-for-purpose sensors, providing them an ecosystem for rapid experimentation and co-innovation to accelerate outcomes. The devices capture real-time data, analyze it for insights, and integrate it with data from other sensors and enterprise systems available either in-premise or on the cloud.

Infosys

Infosys-backed drone startup ideaForge Technology has bagged an order from energy conglomerate NTPC to supply two highly sophisticated unmanned aerial vehicles (UAVs) along with high-end programmatic sensors, Thermal Imaging Sensor and LiDAR Sensor.

Accenture

Aerial Monitoring Solution Accenture is helping Oil & Gas and Utility companies to reduce survey costs up to 30%, perform faster and safer inspections for external corrosion , improve control, mitigate risks and prevent accidents from occurring

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EngineeringNXT is a set of offerings that enable

innovation at scale to build products, platforms & technologies.

Leverages our maturity of

- Product development methodologies
- Engineering DNA
- Access to a diverse ecosystem and Global Talent

35+

years of strong Engineering DNA

5000+

products engineered across software, platforms, networking & consumer devices & chips

400+

Global Customers across 10 industries

25

Global Development Centers, with 20000+ strong Engineering community

Hundreds of Patents filed for customers

Building Blocks

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VLSI & System Design

- VLSI Engineering
- Hardware System
- Digital Mfg.
- Product Compliance
- Analog Design
- Value Engineering
- Mfg. Engineering
- Product Support
- Product Quality

Wireless

- Wireless / 5G
- Connectivity endpoint
- Wireless infrastructure
- V2X Applications
- IoT Connectivity
- Radio Networks

Software

- Agile , Dev ops, CI / CD
- Embedded Software
- Cloud Engineering
- Software Product Testing
- Top coder - Crowdsourcing
- Performance Engg.
- Mobility / UI / UX
- Dev Ops

Data Platforms

- Global Data Platform
- AI Enabled Edge Platform
- High Performance Computing
- Smart Factory Applications
- Low Latency Messaging Platforms

IoT

- Device & Edge Engineering
- IoT Platform Engineering
- Application Build
- Analytics & ML
- Command Center

Industry 4.0

- Industrial Automation
- Industrial IoT applications
- PLM , PDM
- Additive Manufacturing
- Connected supply chain
- Digital Twin
- EDS
- Mfg. Operations
- Model Based Engineering

Serving all stages of the lifecycle: Consulting, Design & Prototyping, Engineering, Operating and Automating