InspectAI

Effective Asset Monitoring for the Energy, Utility & Manufacturing Industries

Introduction

With thousands of physical assets – smokestacks, storage tanks, offshore rigs, pipelines, and refineries – inspection and regular maintenance checks are imperative tasks for the energy industry. To handle these requirements, the offshore industry has used surveillance and remote-control tools for many years, but the acceleration of the inspection process toward remote and virtual operations marks a critical step forward. Specifically, for the oil and gas operations at sea, a need exists to transform inspection procedures to ensure assets perform as required, no matter the conditions.

Although modern field locations are likely to be well equipped, the extent of equipment maintenance and the investments required for these tasks vary based on the age, configuration, and condition of assets. Unmanned aerial vehicles (UAVs) such as drones and advancements in camera technologies have made it easy to inspect equipment and identify anomalies more frequently at a lower cost, but leveraging the data gathered from multiple sources is challenging.

Potential consequences

- Leaks
- System Malfunctions
- Equipment Failures
- Unplanned Outages
- Health & Safety Issues

Effective asset integrity management using InspectAI

Wipro's InspectAI provides an effective means of inspecting and capturing valuable data from field assets. The solution helps in creating a digital data platform, enabling proactive asset management, while increasing the overall safety on rigs and other assets.

Its integrated platform can gather data from drones, cameras, crawlers, etc. InspectAI can then process and analyse these multisource inputs using AI to identify anomalies related to surface conditions (such as corrosion, substrate, etc.), missing parts, and the detection of foreign objects.

Key capabilities for intelligence-driven operations

Data gathering

InspectAI has the ability to collect data from a variety of inspection sources, including UAVs, magnetic crawlers, and various imaging assets (such as spectral, LiDAR, and other advanced cameras). Operators can plan the image-capture path and replay previously recorded inspection paths. They can also manage their image inventory with AI-assisted removals of distortion and duplications, as well as the stitching of related images.

Inspection management

Gathered data is transferred to the inspection management system and integrated with existing networks containing historical images and engineering drawings. The system processes data for the inspection operator, providing enhanced visibility into images with AI-assisted noise and duplicate removal, and it helps compare previously recorded coverage findings. In addition, the platform allows operators to manage rig activity in real time, enabling better control of job scheduling.

Data analysis and inspection reporting

InspectAI's image analysis and reporting component processes the captured images using machine learning (ML) tools and identifies surface condition anomalies and their severity.

It helps generate reports of anomalies that can be traced back to individual equipment, components, or parts that can be viewed with the click of a button. With its 3D point cloud and digital twin services, InspectAI provides a 360-degree view of performance issues, resulting in better situational awareness and planning.

InspectAI offers asset lifecycle predictions, based on environmental factors and preventive maintenance, leading to better inventory management. Organizations can also integrate their custom assets with the platform to more easily monitor assets and increase uptime reliability, thus facilitating communication between equipment owners and inspection teams for quicker decision making.
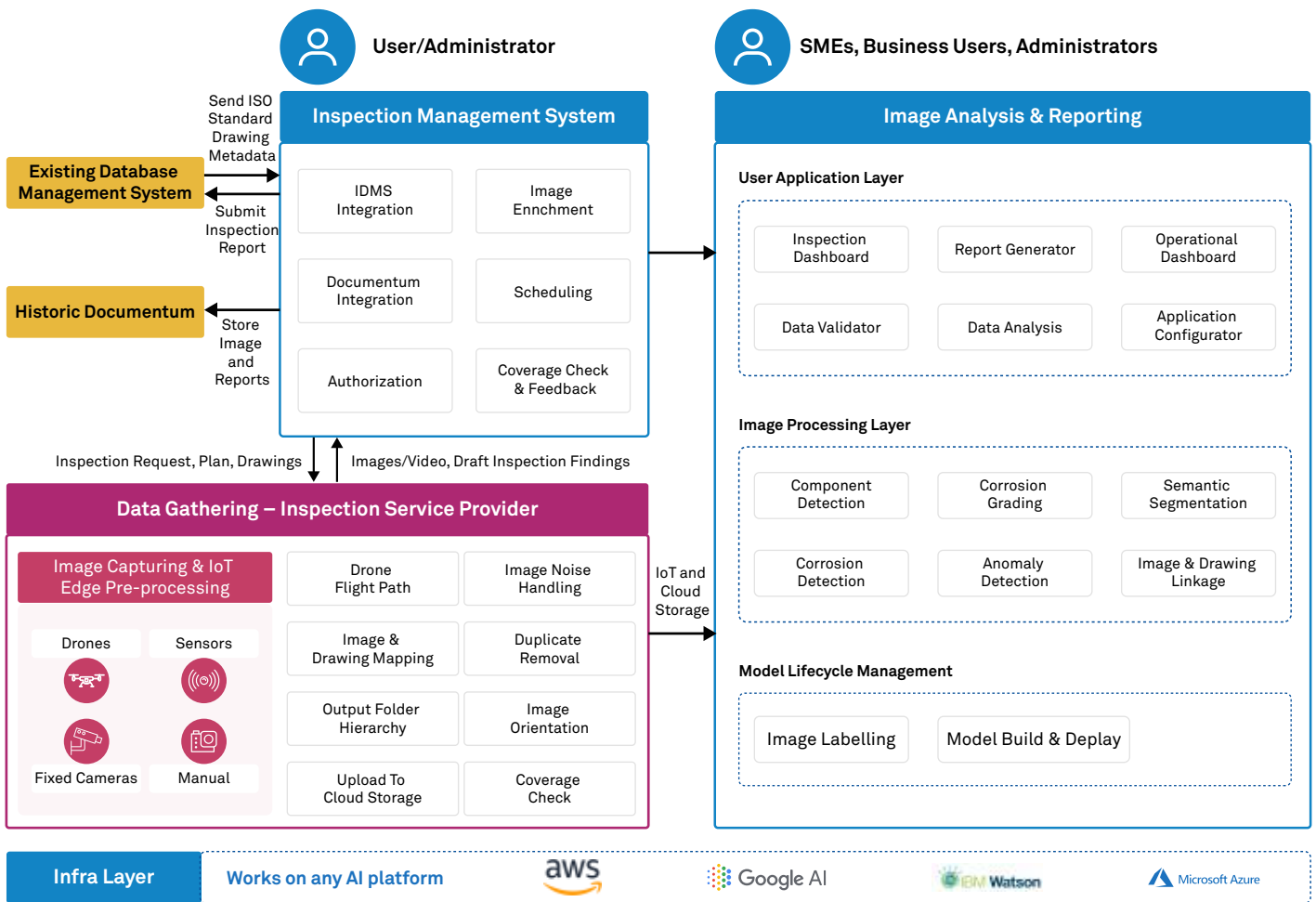
User/Administrator

SMEs, Business Users, Administrators

Send ISO Standard Drawing Metadata

Existing Database Management System

Submit Inspection Report

Historic Documentum

Store Image and Reports

Inspection Management System

IDMS Integration	Image Ennrichment
Documentum Integration	Scheduling
Authorization	Coverage Check & Feedback

Image Analysis & Reporting

User Application Layer

Inspection Dashboard	Report Generator	Operational Dashboard
Data Validator	Data Analysis	Application Configurator

Image Processing Layer

Component Detection	Corrosion Grading	Semantic Segmentation
Corrosion Detection	Anomaly Detection	Image & Drawing Linkage

Model Lifecycle Management

Image Labelling	Model Build & Deplay

Inspection Request, Plan, Drawings

Images/Video, Draft Inspection Findings

Data Gathering – Inspection Service Provider

Image Capturing & IoT Edge Pre-processing

Drones

Sensors

Fixed Cameras

Manual

Drone Flight Path	Image Noise Handling
Image & Drawing Mapping	Duplicate Removal
Output Folder Hierarchy	Image Orientation
Upload To Cloud Storage	Coverage Check

IoT and Cloud Storage

Infra Layer — **Works on any AI platform**

aws   Google AI   IBM Watson   Microsoft Azure

Figure 1: Solution Overview

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How can Wipro's InspectAI help upstream companies in inspection management?

Building on adjacent AI capabilities.

INDUSTRIAL (Colling Towers, Structures etc.)	UTILITIES (Systems & Products)	ENERGY (Wind Turbine and Solar)	OIL & GAS (Mines,Onshore & Offshore Platforms)	TELECOM (Infrastructure, Equipment, Telephone,Radio,TV,Internet)
	Vegetation Management		Stockpile Volumetric	
	Cracks on equipment and insulators		Site Surveying and Mapping	
	Power-line Inspection		Hotspot Detection	
	Corroded power line joints		Asset Management	
	Process Satellite Imagery		Thorough Inspection	
Digital Twin	Asset Management	Solar Farm Inspection	Live Inspection	
Live Inspection	Thorough Inspection	Wind Turbine Blade Inspection	Digital Twin	Alignment/Orientation of Antenna
Drone Inspection	Live Inspection	Thorough Inspection	Multi-Source Data Capture (Drone & Magnetic Crawlers)	Cracks in Equipment
Predictive Analysis	Digital Twin	Live Inspection	Gas & Oil Leak Detection	Loose Cables, Nuts and Bolts
Asset Management	Multi-Source Data Capture (Drone, Helicopter, Mobile)	Component Detection	Predictive Analysis	Vegetation Management
Thorough Inspection	Predictive Analysis	Defect Detection	Vegetation Management	
			Process Satelllite Imagery	

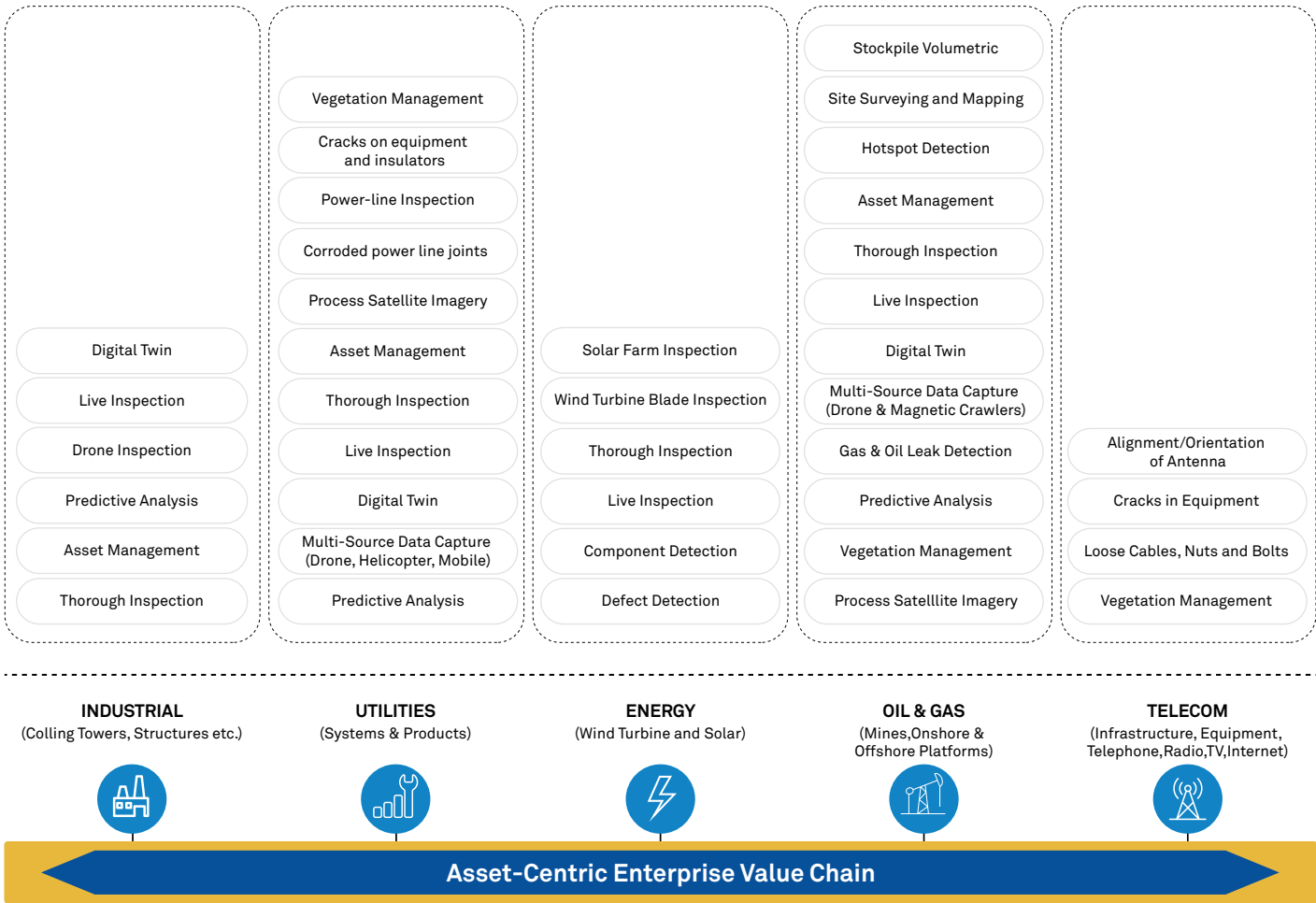**Asset-Centric Enterprise Value Chain**

Figure 2: Components in the energy value chain where AI makes a difference

The benefits InspectAI offers

Accelerated results

Reduces the cycle time of identifying and recording anomalies, with support for 47 different anomaly classes. Data can be collected without shutting down the equipment, reducing/eliminating downtime for inspection.

Increased accuracy

Provides 84% accuracy with the available image set, along with significantly reduced incidents, and reduced operating costs. Inspections are quicker and cheaper to conduct with fewer expensive emergency repairs.

Environmentally efficient

Decreases carbon footprint and operating costs, thus helping companies achieve their NetZero ambition by providing a pathway to reach the critical goal of 'reimagining energy' with AI.

Continuous improvement

Improves prediction of platform/asset condition and enables corrosion gradation. Because data is easier to collect, inspections can be done more frequently, mainly where an area of concern has been identified.

Safety and quality maintenance

Facilitates greater standardization, safety, simplification, and automation capabilities, reducing field operator travel by up to 800,000 km/year, subject to the company size and extent of their infrastructure.

Reduced HSE exposure

Reduced high-exposure HSE hours. No need for operators to climb scaffolding, enter tanks, or use helicopter flights for inspection.

Improved HSE performance

Through better compliance and reduced risk of incident, it is easier to schedule and conduct timely inspections. This facilitates improved quality of the output data and provides an increased ability to identify potential issues - reducing the risk of environmental incidents like leaks or emissions.

An InspectAI success story

Wipro recently partnered with a multinational oil and gas company to lead a pilot project aimed at using drones to inspect flare-tip equipment and identify regions of interest (ROI). The client had struggled with inspecting inaccessible areas such as flare and stacks due to health, safety, and environmental risks. Similarly, their work management processes were manual, causing delays in work execution.

Using InspectAI, the customer could more effectively track any existing defects, make historical comparisons of flare-tip images, and gather data around the time-evolution of a defect using statistical analysis – all with an 84% accuracy on the available image set.

InspectAI is a one-stop solution for safe, cost-effective asset integrity management across industries.

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