ılıılı CISCO Kinetic

Cisco Kinetic for Oil and Gas: Refineries and Plants

Cisco Kinetic helps oil and gas companies improve operations
IoT drives innovation in a new norm

ılıılı CISCO

Table of Contents

Introduction

Operating during a new norm of lower oil prices and heightened safety and environmental awareness, will not pose challenges for inefficient oil and gas companies. It will also drive the efficient ones to find new and consistent methods to preserve or increase profitability, compliance and reputation. According to Deloitte, digitization through IoT promises to help petroleum organizations meet these challenges head on as part of their key focus to:

- **Improve reliability and manage risk**: Minimizing the risks to health, safety, and the environment by reducing disruptions.

- **Optimize operations**: increasing productivity and optimizing the supply chain through the cost and capital efficiency of business operations.

- **Create new value**: exploring new sources of revenue and competitive advantage that drive business transformation.

The potential value of IoT for oil and gas companies is not through directly managing their assets, supply chains, or customer relationships. IoT provides a new dimension to the organization, by providing new information about these parts of the business, delivering a new level of value (Figure 1). This information can be readily leveraged to provide greater insight into operations, and to make better decisions.
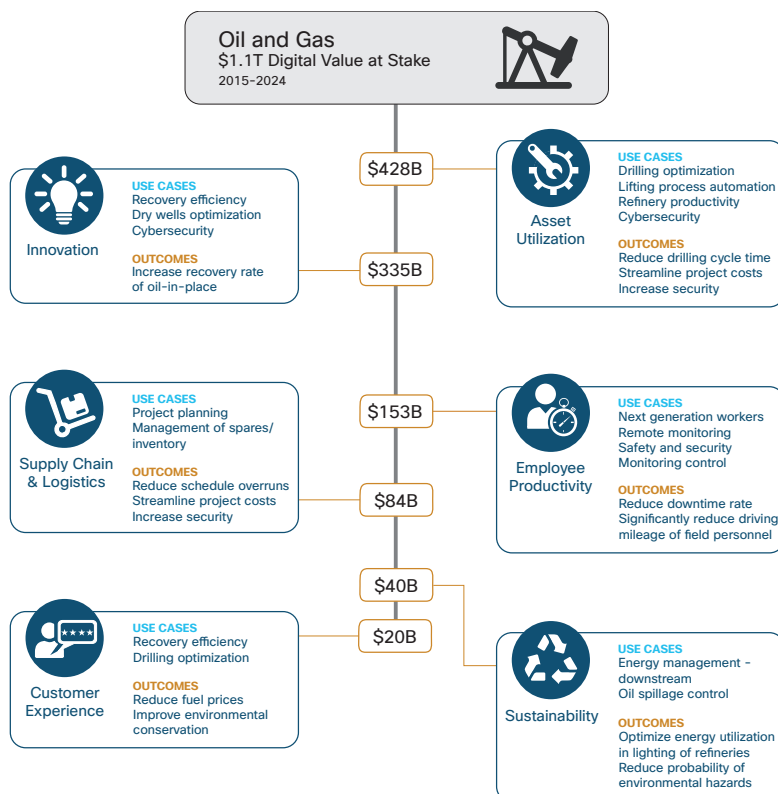
Increase business value with digital innovations that help increase productivity and minimize risk

Figure 1: Oil and Gas Digital Value at Stake (Source: Cisco, 2015)

Realizing the Benefits of IoT in Oil and Gas Refining and Processing

With the staggering number of machines, devices, and processes present on any plant floor, oil and gas is one of the top industries positioned to benefit from digital transformation, and specifically to benefit from IoT technologies.

Industry Trends	
62%	Over the next 3-5 years, 62% of oil and gas executives worldwide say they will invest more than they currently do in digital technologies.
$20B	Unscheduled refinery shutdowns in the U.S. alone cost customers 5% of their total production, or $20 billion per year.
5.6%	Global gas detection market will expand from $3.4B to $5.6B by 2024, a 5.6% CAGR.
77%	A refinery valve monitoring project reduced customer hydrocarbon losses by $3 million annually. The project paid for itself in five months with an estimated ROI of 271% annualized over 20 years.

Data sources: Deloitte, Cisco, Cisco, Research & Markets

An Ernst and Young survey of global executives showed 61% of oil and gas companies are experiencing positive financial change as a result of digital transformation. This is further backed by an FC Business Intelligence 2018 Market Outlook report that summarizes it well — automated data-centric software solutions deliver powerful productivity and collaboration tools that provide the following benefits:

- An increase in the speed and quality of decision making.

- Early identification and mitigation of risks.

- A seamless, single-source-of-truth data, amongst all participants in a value chain. This could include the owner (IT, OT, security), multiple contractors, subcontractors, vendors and suppliers.

- Intelligent analysis of information using purpose-built algorithms.

- Data captured, analyzed and shared in near real-time.

- Reliable data for benchmarking performance and passive non-intrusive data collection to continuously evaluate project practices.

- A workflow-focused, automatic dissemination approach.

CISCO

Oil and gas companies recognize this potential; however, according to a 2017 Accenture study, have been slow on the uptake. This is where Cisco Kinetic for Oil and Gas and our pre-integrated Starter Solutions can help. Cisco Kinetic helps oil and gas companies get maximum value from IoT data. It simplifies the process of gathering large amounts of data, sifting through data to identify meaningful information, and translating information into easy-to-consume, actionable insights.

Cisco Kinetic is a versatile platform that performs three key functions:

- Extracts data from its source.

- Computes data, anywhere in the network from edge to destination.

- Moves data to the applications and business intelligence systems the company uses for deeper analysis.

Because Cisco Kinetic is sensor and system vendor agnostic, it can collect and analyze information from all types of plant devices, applications and assets. The solution provides automated near real-time alerts on gas measurements and equipment performance, leading to optimized equipment maintenance. And plant operators gain the ability to simplify worker safety by tracking and monitoring location and associated leaks. Asset performance and worker safety information is monitored from a single, consolidated view.

This paper describes three use-case scenarios enabled by Cisco Kinetic for oil and gas refineries and processing plants: gas detection and monitoring, equipment health monitoring, and valve status and alignment. All of these use cases can be deployed individually, or as part of the same solution leveraging common communications infrastructure and operational visualization dashboards. The solutions can scale from a handful of sensors, to plant-wide deployments using the same technologies.

Get the right data to the right applications for actionable insights that drive value

··I··I··
CISCO

Gas Monitoring and Detection Use Case

Customer Situation

An oil and gas major had limited visibility into gas leaks in the refinery as their sensors were installed in fixed locations. They also had no visibility into the location of personnel, raising potential safety issues as they couldn't see where workers were in relation to leaks. Productivity of workers was also impacted as commencement of work was always delayed due to a manual gas detection survey in places of work. Installing wired gas detectors to provide pervasive coverage was not an option due to high installation costs.
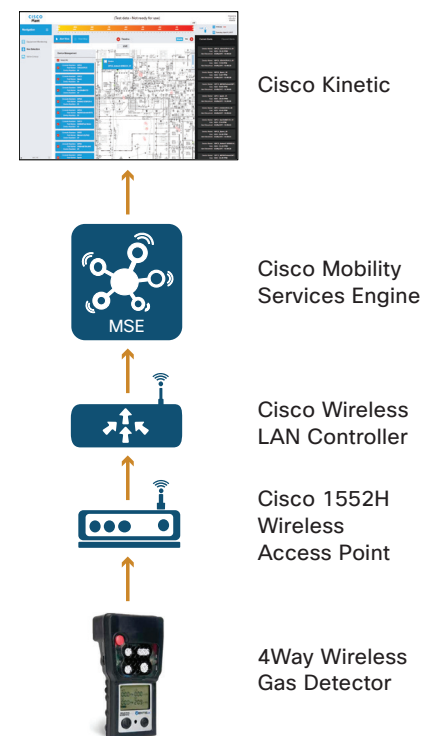
The plant manager and safety teams needed a solution that provided near real-time visibility of gas detection and personnel location, with easy to understand visualization and alerting dashboards. This would enable them to improve productivity through decreasing the time taken to start work, optimize evacuation route planning, and to meet critical staff safety and compliance goals.
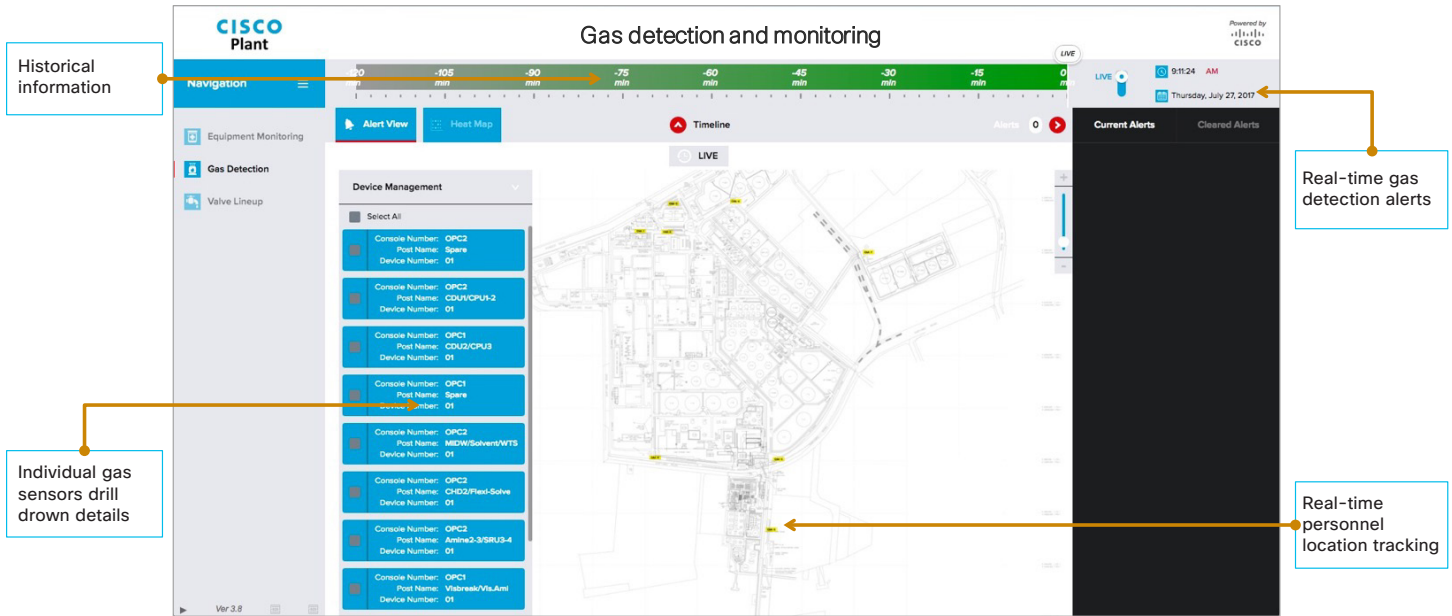
Cisco Kinetic Gas Detection and Monitoring Solution

To address these customer needs, the gas detection and monitoring solution was developed, featuring Cisco Kinetic, Cisco industrial hazardous location wireless infrastructure, and key partner fixed and mobile wireless 4-way gas detectors from trusted partners.

In the refinery, engineers are equipped with mobile 4-way gas detectors, supplemented by fixed wireless gas detectors in key locations. The plant is covered by a pervasive industrial wireless MESH. Real-time gas monitoring measurements information is sent from the gas detectors, across the wireless infrastructure, to the Cisco Mobility Services Engine (MSE). This information includes gas measurements for H2S, LEL, CO2, and O2, in addition to the location of the sensor and engineer in the plant. This data is passed from the MSE to Cisco Kinetic.

Cisco Kinetic receives the data, processes it using customer defined policies and key performance indicators (KPIs), and turns the data into actionable insight via a near real-time gas monitoring and detection risk map in an operational dashboard. The dashboard is viewable by operations, maintenance and safety teams, and can be extended securely to the enterprise. The dashboard also includes historical analysis that can be leveraged for gas leak prediction and automated evacuation route planning and mustering.

Cisco Kinetic

Cisco Mobility Services Engine

Cisco Wireless LAN Controller

Cisco 1552H Wireless Access Point

4Way Wireless Gas Detector

CISCO

Historical information

Real-time gas detection alerts

Individual gas sensors drill drown details

Real-time personnel location tracking

Solution Benefits

- Operational cost savings through the elimination of significant gas testing effort for hot work starts.

- Time-savings and productivity improvements by eliminating gas testing activities, resulting in higher wrench time for employees and contractors.

- Improved safety through near real-time location awareness of individuals, especially during turnaround.

- Quantifiable benefits with the company realizing annual $1.4M USD savings based on the reduction of time keepers, contractor productivity improvement and early start of hot work.

Gas Detection Use Case Components

- **Cisco Kinetic**: Provides real-time visibility into gas levels throughout the plant and location of all workers through a single operational view of your IT and OT environments along with your broader networks of IoT devices. It includes a secure IoT data pipeline, and an embedded, operational reporting and visualization dashboard, providing real-time and historical location based tracking of employees and gas detection alerts.

- **Cisco Mobility Services Engine**: Provides secure wireless asset and worker location based services to deliver:

  - Worker location tracking for personal safety monitoring

  - Portable H2S gas detector monitoring and tracking

  - Man-down alarming and alerting

- **Cisco Wireless Infrastructure**: The 1552H Industrial Wireless Access points are hazardous location-certified and designed specifically for industrial environments like oil and gas refineries, chemical plants, and process control applications. They create flexible, secure, scalable, self-healing and self-optimizing wireless networks, to support multiple-device and multiple-network application delivery such as real-time mobility, video surveillance, and high speed data transfer.

  Cisco wireless controllers provide the visibility, scalability, and reliability needed for highly secure, enterprise-scale wireless networks, with simplified operations and centralized control.

- **Wireless 4Way Gas Detector**: Continuously monitors a worker's exposure to gas, and their location in the plant. It detects up to four gases (H2S, LEL, CO, O2, SO2, NO2), transmits real-time alerts over a wireless network, and alerts the control room during man-down or panic-button scenarios.

Track gas detection alerts and employees with a real-time, location-based reporting dashboard

cisco

Equipment Health Monitoring Use Case

Customer Situation

An oil and gas major had inadequate sensor instrumentation on key plant assets to adequately monitor key equipment health variables in real-time. The company wanted to increase overall uptime of assets through real-time operation of equipment, identifying faults and fixing them before they occurred and caused outages, and ultimately extending the life of assets. Equipment was inspected on a pre-scheduled basis. This meant that equipment might not perform optimally, or might break, prior to a scheduled maintenance visit. It also meant that equipment would be taken offline during the inspection, even if it had no issues. Both could impact production time and profitability.
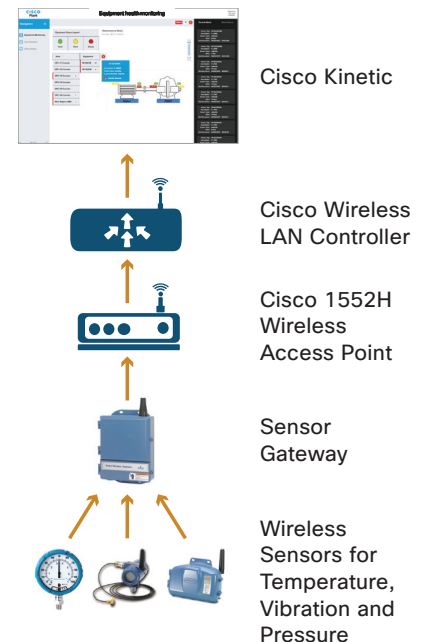
The plant manager and engineering teams needed a solution that provided near real-time visibility of equipment performance in line with vendor and industry recommendations, for optimal performance. They also wanted to be forewarned if any equipment began exhibiting signs of requiring maintenance, and to be able to introduce a condition-based maintenance plan. Deploying wired sensors would incur high costs, and would not enable transient or intermittent monitoring.

## Cisco Kinetic Equipment Health Monitoring Solution

To address these customer needs, the equipment health monitoring solution was developed that features Cisco Kinetic, Cisco industrial hazardous location wireless infrastructure, and key partner wireless temperature, vibration and pressure sensors.

The wireless sensors are deployed on assets throughout the plant, including heat exchangers, compressors, turbines, flare stacks, cokers, motors, pumps and drives. The plant is covered by a pervasive industrial wireless MESH infrastructure. The sensors transmit real-time process data to the sensor gateway, which is passed across the wireless infrastructure to Cisco Kinetic.

Cisco Kinetic receives the data, and provides near real-time edge processing and analysis of data, immediately forwarding critical data and alerts to a real-time operational dashboard, and forwarding aggregated historical data to a storage database. Kinetic analyses the sensor data (which can come from multiple vendors, and via multiple industrial protocols) against pre-defined policies and key performance indicators (KPIs), and turns the data into actionable insight via a near real-time equipment health monitoring operational dashboard.

Cisco Kinetic

Cisco Wireless LAN Controller

Cisco 1552H Wireless Access Point

Sensor Gateway

Wireless Sensors for Temperature, Vibration and Pressure

The dashboard is viewable by operations and engineering teams, and is securely accessible by the enterprise. The dashboard also includes historical analysis that can be leveraged for equipment performance optimization, and for maintenance planning moving towards more of a condition-based model.
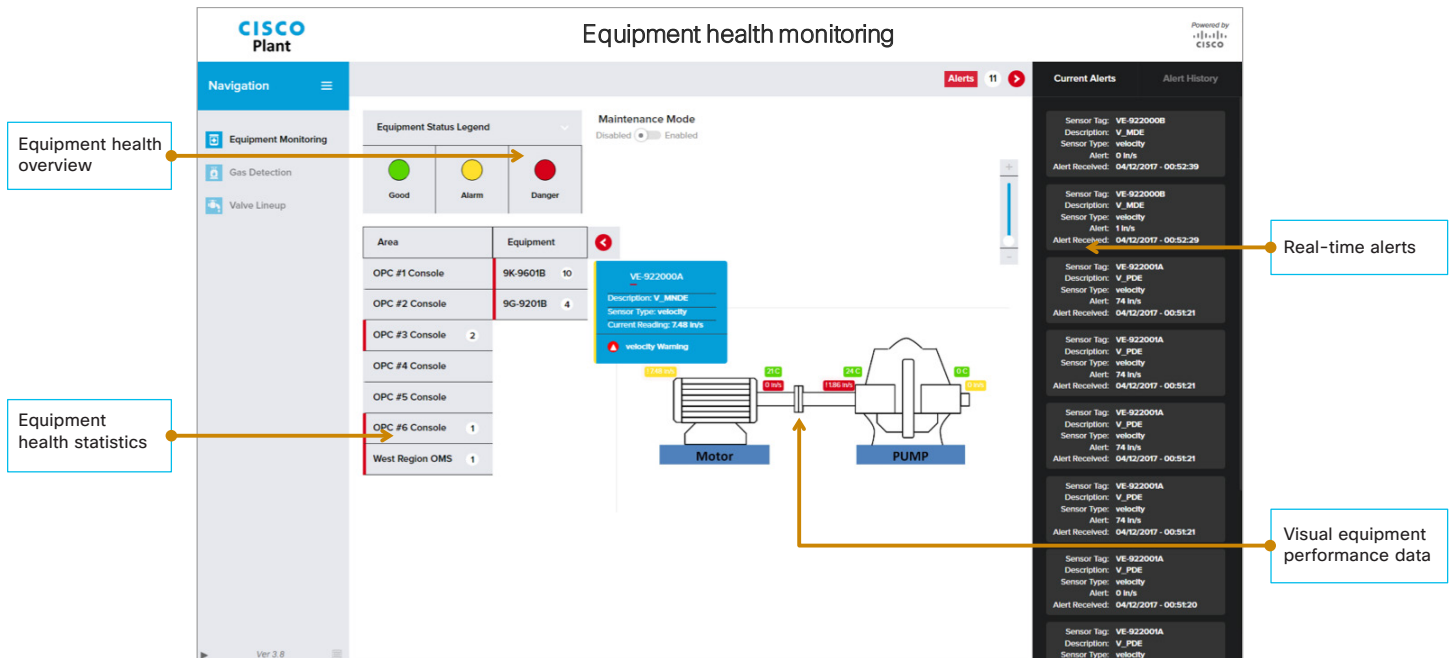
Solution Benefits

- Fast, easy deployment, with reduced deployment costs.

- Optimized equipment performance leading to increased production.

- Reduced downtime through identifying faults before they occur and preventing equipment failure.

- Intuitive and easy to understand multi-vendor operational information dashboard, providing a vendor agnostic way to connect and monitor assets.

- Quantifiable benefits with the company realizing annual $1.5M USD savings due to performance monitoring, process condition optimization, and predictive maintenance.

Equipment Health Monitoring Use Case Components

- **Cisco Kinetic**: Provides real-time visibility into the equipment performance of any vendor throughout the plant through a common IoT platform that can be leveraged in your IT and OT environments. It includes a secure IoT data pipeline, and an embedded operational reporting and visualization dashboard, allowing real-time and historical equipment performance information.

- **Cisco Wireless Infrastructure**: The 1552H Industrial Wireless Access points are hazardous location-certified and designed specifically for industrial environments like oil and gas refineries, chemical plants, and process control applications. They create flexible, secure, scalable, self-healing and self-optimizing wireless networks, to support multiple-device and multiple-network application delivery such as real-time mobility, video surveillance, and high speed data transfer.

  Cisco wireless controllers provide the visibility, scalability, and reliability needed for highly secure, enterprise-scale wireless networks, with simplified operations and centralized control.

  The addition of a Cisco MSE will provide site-wide location of assets.

- **Wireless Sensors and Wireless Gateway**: Wireless sensors are connected to plant assets, measuring and monitoring temperature, vibration, and pressure sensors. The wireless gateway consolidates data from the wireless sensors and passes the data the Cisco 1552H wireless access point infrastructure.

Count on secure and self-optimizing wireless networks for reliable tracking of equipment performance

ılıılıı
CISCO

Valve Status Use Case

Customer Situation

An oil and gas company had challenges with the valve alignment process in their plant. Valve misalignments in tank fields and blending areas caused incorrect product mixes, resulting in financial losses from product quality, and posed environmental safety issues. Multiple incidents of misalignment in a single plant caused millions of dollars in documented financial losses in a single year, through poor product quality due to tanks or deliveries being contaminated, and operational issues affecting the performance of multiple process assets.

The valve alignment status and monitoring process in the plant was manual, or verbally communicated. Worker and documentation errors led to production issues, and it was a time consuming and manually intensive process. The plant manager needed a solution that provided near real-time status of the valve positions throughout the plant, including location to help engineers identify individual valves for manual changes. The manager needed a single operational dashboard that would indicate the correct status of all valves involved in a product transfer so they could be locked in place, prior to starting the transfer or blending process.

## Cisco Kinetic Valve Status Alignment Solution

To address these customer needs, Cisco has developed a solution that features Cisco Kinetic, Cisco industrial hazardous location wireless infrastructure, and key partner wireless valve position sensors.

The wireless sensors are deployed on non-monitored valves throughout the plant, with the plant covered by a pervasive industrial wireless MESH infrastructure. The sensors transmit near real-time valve status process data to a sensor gateway, which is passed across the wireless infrastructure to Cisco Kinetic.

Cisco Kinetic receives the data, and provides real-time visualization of all monitored valves and their status. The dashboard provides full schematics for the plant environment, and PDFs, images files or real-time video for each valve can be reached at the click of a button. Kinetic also provides real-time analysis of the valve data, against pre-defined business rules and actions set by the company, and turns this into actionable insight by providing full product flow path status and indicators that operators can use to indicate it is safe to start the transfer or blending process.

Cisco Kinetic

Cisco Mobility Services Engine

Cisco Wireless LAN Controller

Cisco 1552H Wireless Access Point

Sensor Gateway

Wireless Position Monitor Sensors
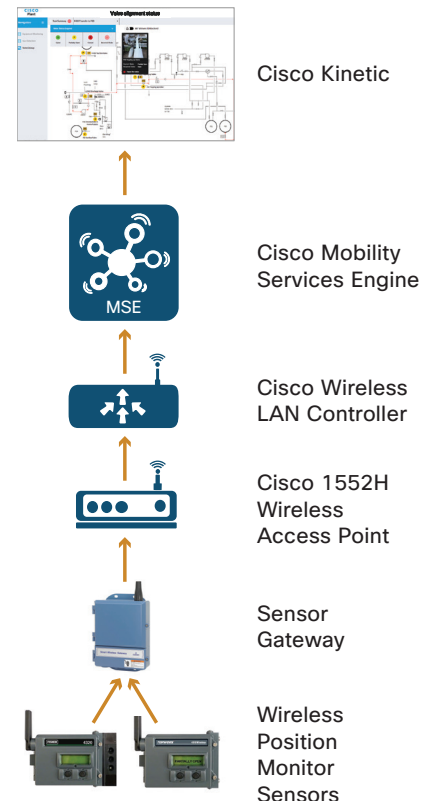
The dashboard is viewable by operations and engineering teams, and can also be securely accessed by the enterprise. The dashboard also includes historical analysis that can be leveraged for logistics optimization, scheduling efficiencies, and event analysis.
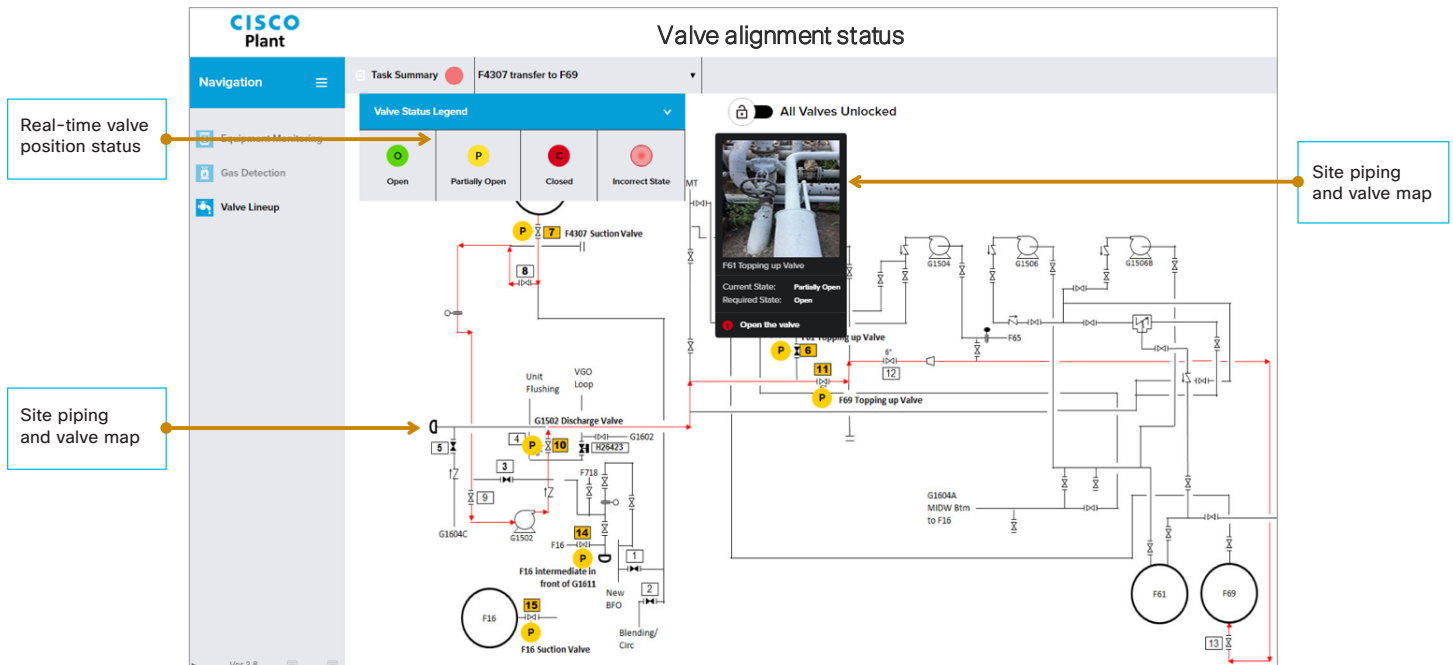
Solution Benefits

- Increased visibility into real time valve status, plant-wide.

- Cost avoidance through improved product quality and minimized waste.

- Improved worker productivity through minimizing manual intervention and locating valves.

- Ensuring compliance by meeting safety and environmental goals, and providing a second barrier of protection to operational activities.

Valve Status Use Case Components

- **Cisco Kinetic**: Provides a single operational view of your IT and OT environments along with your broader networks of IoT devices. It includes an embedded, operational reporting and visualization dashboard.

- **Cisco Wireless Infrastructure**: The 1552H Industrial Wireless Access points are hazardous location-certified and designed specifically for industrial environments like oil and gas refineries, chemical plants, and process control applications. They create flexible, secure, scalable, self-healing and self-optimizing wireless networks, to support multiple-device and multiple-network application delivery such as real-time mobility, video surveillance, and high speed data transfer.

  Cisco wireless controllers provide the visibility, scalability, and reliability needed for highly secure, enterprise-scale wireless networks, with simplified operations and centralized control.

- **Wireless Valve Alignment Sensor and Wireless Gateway**: Wireless sensors are connected to valves across the plant, monitoring and reporting on valve position (open, close, angle). The wireless gateway consolidates data from the wireless sensors and passes the data the Cisco 1552H wireless access point infrastructure.

Analyze valve data in real time, based on your customized business rules

CISCO

Why Cisco

All of these solutions can be achieved through a single implementation of Cisco Kinetic, with one powerful IoT platform providing a single operations and management portal for multiple use cases in the refinery and plant environments.

Digital transformation is accelerating, and keeping pace with these changes is more important than ever for organizations that want to stay competitive. That means deploying flexible solutions that can help you optimize your most important business processes. Cisco delivers a digital-ready infrastructure that is secure, automated, simple, and intelligent. And our rich portfolio of solutions, backed by our service offerings and our global partner ecosystem, delivers a robust foundation for your digital transformation. Jump-start your digital journey today.

For more information, check out www.ciscokinetic.com.