



**MFE**  
INSPECTION  
SOLUTIONS



**OIL  
&  
GAS**

## Your Complete Inspection Checklist & Toolkit for Upstream, Midstream & Downstream Operations

Regular inspections of assets in the oil and gas industry are critical for ensuring safety, optimizing operational efficiencies, and maximizing return on investment (ROI). This comprehensive guide provides checklists, recommended tools, and best practices for inspecting upstream, midstream, and downstream assets.

# TABLE OF CONTENTS

INTRODUCTION .....	1
--------------------	---

UPSTREAM OIL & GAS FACILITIES .....	2
-------------------------------------	---

- Upstream Inspection Checklist & Toolkit ..... 3
  - » Exploration ..... 3
  - » Drilling Rigs ..... 4
  - » Wellheads and Christmas trees ..... 5
  - » Downhole Equipment ..... 6
  - » Production Facilities ..... 7

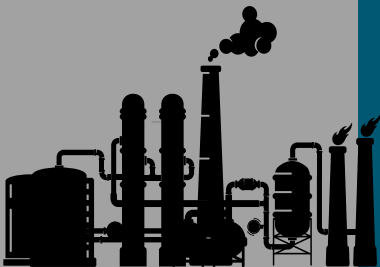
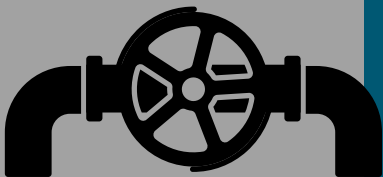
MIDSTREAM OIL & GAS FACILITIES .....	8
--------------------------------------	---

- Midstream Inspection Checklist & Toolkit ..... 9
  - » Pipeline Systems ..... 9
  - » Compressor Stations ..... 10
  - » Storage Facilities ..... 11
  - » Pump Stations ..... 12
  - » LNG Facilities ..... 13

DOWNSTREAM OIL & GAS FACILITIES .....	14
---------------------------------------	----

- Downstream Inspection Checklist & Toolkit ..... 15
  - » Refineries ..... 15
  - » Petrochemical Plants ..... 16
  - » Distribution Networks ..... 17
  - » Retail Outlets ..... 18

FINAL CONSIDERATIONS .....	19
----------------------------	----





# INTRODUCTION

**R**egular inspections of assets in the oil and gas industry are critical for ensuring safety, optimizing operational efficiencies, and maximizing return on investment (ROI).

The oil and gas sector operates in high-risk environments where equipment failure can lead to catastrophic consequences, including environmental damage, financial loss, and human casualties.

Conducting thorough and regular inspections helps to identify potential issues before they escalate, ensuring that facilities operate smoothly and safely.

Inspections play a crucial role in maintaining the integrity of infrastructure, from drilling rigs and pipelines to storage tanks and refineries. By leveraging advanced inspection tools and techniques, companies can detect wear and tear, corrosion, and other defects early on.

This proactive approach not only prevents accidents but also extends the lifespan of

equipment, reducing downtime and maintenance costs.

Moreover, regular inspections contribute to operational efficiencies by ensuring that all components function at their optimal capacity. This leads to smoother operations, higher productivity, and ultimately, greater profitability.

**The ROI of investing in regular inspections is clear: it enhances safety, reduces unexpected shutdowns, and ensures compliance with industry regulations—all of which contribute to the company's bottom line.**

This comprehensive inspection checklist is designed to help inspectors ensure thorough and consistent evaluations of upstream, midstream, and downstream oil and gas

facilities.

It includes specific inspection points, recommended tools from MFE Inspection Solutions, best practices for each type of equipment, and recommendations on how often each asset should be inspected.

Regular and thorough inspections are essential to comply with industry standards and regulations and to prevent accidents and equipment failures.

# UPSTREAM OIL & GAS FACILITIES



The upstream segment of the oil and gas industry involves the exploration and production phases. This includes:

1. Searching for potential underground or underwater crude oil and natural gas fields
2. Drilling exploratory wells
3. Drilling and operating wells that recover and bring crude oil or raw natural gas to the surface

In upstream operations, regular inspections are crucial to ensure the safety and efficiency of exploration and production activities.

Key components of upstream facilities include drilling rigs, wellheads, Christmas trees, downhole equipment, and production facilities.

By conducting thorough inspections of these

components, companies can identify and mitigate potential risks, ensuring smooth and safe operations.

The following section provides detailed checklists for inspecting various upstream assets, along with recommended tools and best practices to ensure the safe and efficient operation of your drilling and production infrastructure.



# UPSTREAM Inspection Checklist & Toolkit

## 1. EXPLORATION

### Inspection Points

- Geophysical survey equipment
- Seismic testing gear

### Common Issues

- Wear and tear on survey equipment
- Calibration Issues

### Solutions & Best Practices

- Regularly check for wear and tear (especially on cables and connectors), schedule routine calibration checks to avoid inaccurate readings, and maintain a log of calibration records of survey instruments
- Replace worn components promptly to maintain equipment functionality

### Recommended Tools

- Industrial videoscopes
- Push camera inspection systems
- Surveying equipment

**Inspection Frequency** = Quarterly

*Trimble X7  
Laser Scanner  
More info.*



*Wöhler VIS  
700 Borescope  
More info.*





# UPSTREAM Inspection Checklist & Toolkit

## 2. DRILLING RIGS

### Inspection Points

- Derricks
- Masts
- Substructures
- Drill pipes
- Casings
- Blowout preventers (BOPs)

### Common Issues

- **Structural Damage:** Cracks or deformation in derricks, masts, and substructures
- **Corrosion on Drill Pipes and Casings:** Detection of rust and thinning walls
- **Blowout Preventer Malfunctions:** Leaks or pressure loss

### Solutions & Best Practices

- Conduct visual inspections for structural integrity
- Use non-destructive testing (NDT) methods like ultrasonic testing to detect structural damage early
- Apply protective coatings and conduct regular cleaning to prevent corrosion
- Perform regular pressure tests and maintenance on BOPs to ensure functionality

### Recommended Tools

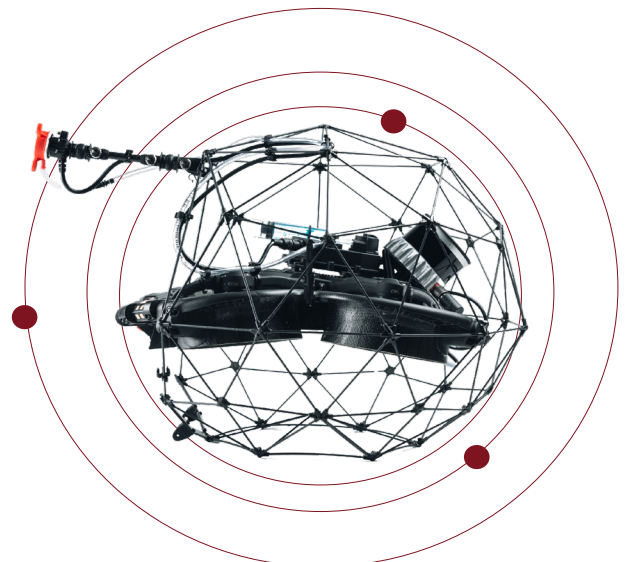
- Visual:** Uncrewed systems technology (E3/DJI/Skydio)
- Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)
- Flaw Detection:** Ultrasonic flaw detectors, eddy current flaw detectors
- Pressure Testing:** Industrial acoustic imaging (acoustic leak detection)

**Inspection Frequency** = Monthly

### RELATED READ

CAN USA Reduces Time for Offshore Drilling & Production Facility Inspections by 60% with the Elios 3

*Elios 3 UT*  
**More info.**





# UPSTREAM Inspection Checklist & Toolkit

## 3. WELLHEADS & CHRISTMAS TREES

### Inspection Points

- Valves
- Seals
- Wellhead components

### Common Issues

- **Valve and Seal Leaks:** Detection of leaks in valves and seals
- **Component Wear:** Wear and degradation of wellhead components

### Solutions & Best Practices

- Regular visual inspections and pressure tests to ensure integrity and functionality
- Use industrial acoustic imaging to identify and locate leaks
- Replace worn components promptly and maintain an inventory of critical spare parts

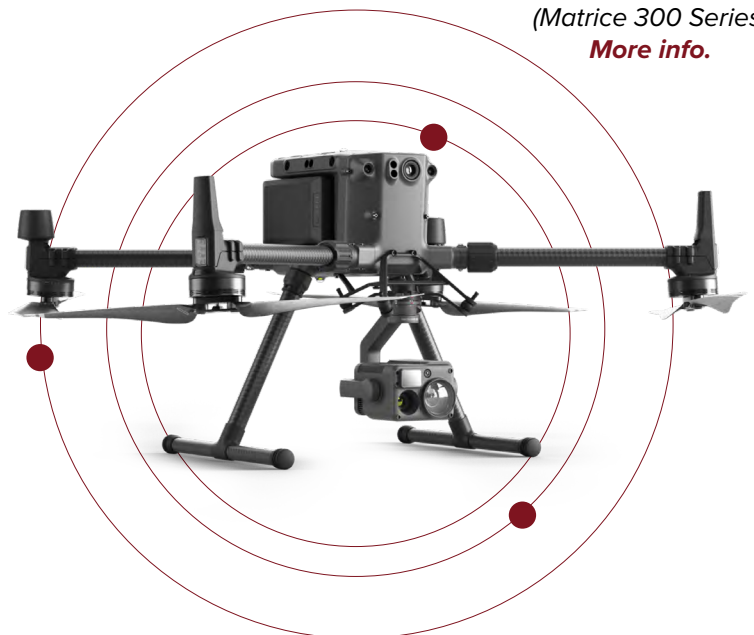
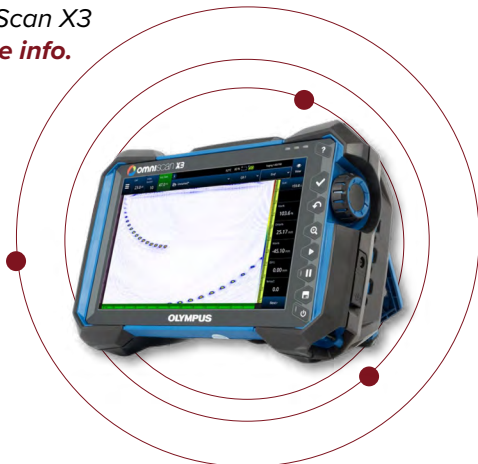
### Recommended Tools

- Visual:** Industrial videoscopes, push camera inspection systems, uncrewed systems technology (E3/DJI/Skydio)
- Ultrasonic:** Ultrasonic thickness gauges, uncrewed systems technology (E3/Voliro)
- Flaw Detection:** Ultrasonic flaw detectors, eddy current flaw detectors
- Pressure Testing:** Industrial acoustic imaging (acoustic leak detection)

**Inspection Frequency** = Quarterly

*OGI 640  
(Matrice 300 Series)  
**More info.***

*Olympus  
OmniScan X3  
**More info.***





# UPSTREAM Inspection Checklist & Toolkit

## 4. DOWNHOLE EQUIPMENT

### Inspection Points

- Tubing
- Casing

### Common Issues

- **Tubing and Casing Damage:** Physical damage or deformation
- **Flaws and Corrosion:** Detection of flaws or corrosion in the tubing and casing

### Solutions & Best Practices

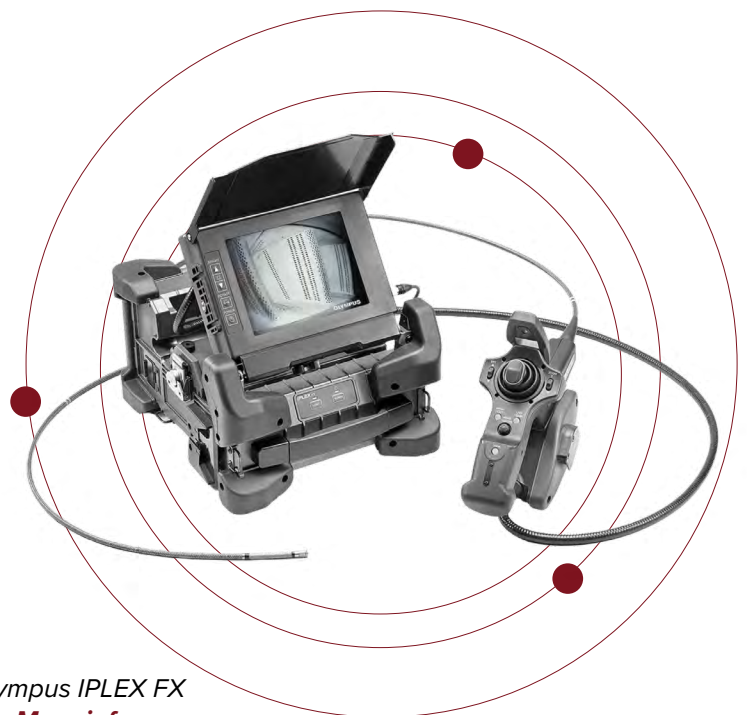
- Conduct regular visual inspections using videoscopes and push camera systems for physical damage
- Implement ultrasonic and eddy current testing to detect and address flaws early and ensure material integrity

### Recommended Tools

- **Visual:** Industrial videoscopes, push camera inspection systems
- **Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)

**Inspection Frequency** = Biannually

*Eddyfi Ectane 2*  
**More info.**



*Olympus IPLEX FX*  
**More info.**





# UPSTREAM Inspection Checklist & Toolkit

## 5. PRODUCTION FACILITIES

### Inspection Points

- Separators
- Treaters
- Storage tanks
- Pressure vessels
- Piping

### Common Issues

- **Separator and Treater Malfunctions:** Issues with separation and treatment processes
- **Storage Tank Corrosion:** Internal and external corrosion of storage tanks
- **Pressure Vessel Leaks:** Detection of leaks or pressure loss

### Solutions & Best Practices

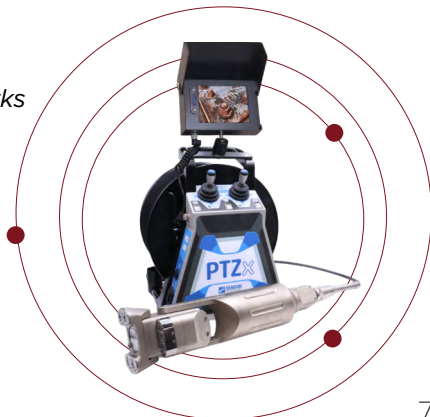
- Conduct regular visual inspections, use ultrasonic testing for thickness and flaw detection, and ensure pressure vessels and storage tanks are tested for leaks and integrity
- Regularly inspect and maintain separators and treaters to ensure operational efficiency
- Apply corrosion inhibitors

### Recommended Tools

- Visual:** Industrial videoscopes, tank inspection systems (PTZ dropdown camera systems), push camera inspection systems, uncrewed systems technology (E3/DJI/Skydio)
- Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)
- Flaw Detection:** Ultrasonic flaw detectors, eddy current flaw detectors
- Pressure Testing:** Industrial acoustic imaging (acoustic leak detection)

Inspection Frequency = Quarterly

Sensor Networks  
PTZx  
**More info.**



Volito T UT  
**More info.**



# MIDSTREAM OIL & GAS FACILITIES



The midstream segment of the oil and gas industry focuses on the transportation, storage, and wholesale marketing of crude or refined petroleum products.

This segment acts as the bridge between the upstream (exploration and production) and downstream (refining and distribution) sectors, ensuring that raw materials are efficiently moved to refineries and that refined products reach their

destinations.

In midstream operations, regular inspections are essential to maintain the safety, reliability, and efficiency of the transportation and storage infrastructure.

Key components of midstream facilities include pipeline systems, compressor stations, storage facilities, pump stations, and LNG (liquefied natural gas) facilities. Conducting

thorough inspections of these components helps prevent leaks, ruptures, and other failures that could lead to significant environmental and financial impacts.

The following section provides detailed checklists for inspecting various midstream assets, along with recommended tools and best practices to ensure the safe and efficient operation of your midstream infrastructure.



# MIDSTREAM Inspection Checklist & Toolkit

## 1. PIPELINE SYSTEMS

### Inspection Points

- Below-ground and above-ground pipelines

### Common Issues

- **Corrosion:** Internal and external corrosion in pipelines
- **Leaks:** Detection of leaks in pipelines

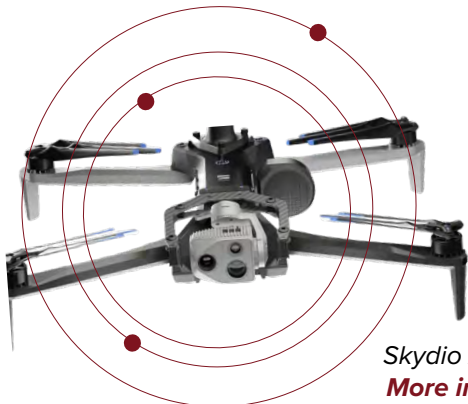
### Solutions & Best Practices

- Regular visual inspections for corrosion and damage
- Use eddy current flaw detectors and infrared cameras for regular corrosion inspections
- Implement ultrasonic thickness testing, pressure testing, and acoustic imaging to locate and repair leaks

### Recommended Tools

- Visual:** Industrial videoscopes, push camera inspection systems, crawler inspection system, uncrewed systems technology (E3/DJI/Skydio)
- Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)
- Flaw Detection:** Ultrasonic flaw detectors, eddy current flaw detectors
- Corrosion:** Eddy current flaw detectors (pulsed eddy current [PEC]), infrared cameras, uncrewed systems technology (Voliro)
- Pressure Testing:** Industrial acoustic imaging (acoustic leak detection)

Inspection Frequency = Quarterly



Skydio X10  
[More info.](#)



MFE OGI 640  
[More info.](#)



CRY2623  
[More info.](#)



# MIDSTREAM Inspection Checklist & Toolkit

## 2. COMPRESSOR STATIONS

### Inspection Points

- Compressors and associated piping

### Common Issues

- **Overheating:** Detection of overheating in compressors
- **Mechanical Failures:** Issues with mechanical components like bearings and seals

### Solutions & Best Practices

- Conduct visual inspections for structural integrity and for detecting mechanical issues
- Conduct regular thermographic inspections using infrared cameras to detect overheating
- Perform routine maintenance and replace worn mechanical components to prevent failures

### Recommended Tools

- Visual:** Industrial videoscopes, uncrewed systems technology (DJI/Skydio)
- Thermographic cameras:** Infrared cameras

**Inspection Frequency** = Quarterly

*DJI Mavic 3  
Enterprise Advanced  
**More info.***



*DJI Zenmuse  
H20T Payload  
**More info.***



# MIDSTREAM Inspection Checklist & Toolkit

## 3. STORAGE FACILITIES

### Inspection Points

- Interior and exterior of tanks

### Common Issues

- **Tank Settlement:** Uneven settling or shifting of storage tanks
- **Magnetic Flux Leakage:** Detection of flaws or leaks in tank walls

### Solutions & Best Practices

- Regular visual inspections and ultrasonic thickness testing to ensure tank integrity and safety
- Use LiDAR equipment for settlement surveys and ensure proper tank calibration
- Conduct regular magnetic flux leakage testing to identify and repair flaws promptly

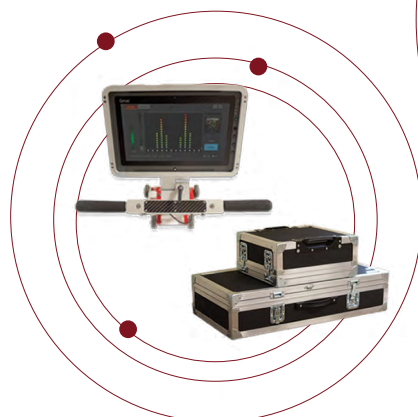
### Recommended Tools

- Visual:** Tank inspection systems (PTZ dropdown camera systems), push camera inspection systems, uncrewed systems technology (E3/DJI/Skydio)
- Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)
- Magnetic Flux Leakage:** Magnetic flux leakage (MFL) inspection equipment
- Flaw Detection:** Ultrasonic flaw detectors, eddy current flaw detectors
- Settlement Surveys and Calibration:** LiDAR equipment

**Inspection Frequency** = Annually



*MFE HPX  
Wall Crawler  
More info.*



*MFE Mark IV  
More info.*





# MIDSTREAM Inspection Checklist & Toolkit

## 4. PUMP STATIONS

### Inspection Points

- Pumps and associated piping

### Common Issues

- **Mechanical Wear:** Wear and tear on pumps and associated piping
- **Overheating:** Detection of overheating in pumps

### Solutions & Best Practices

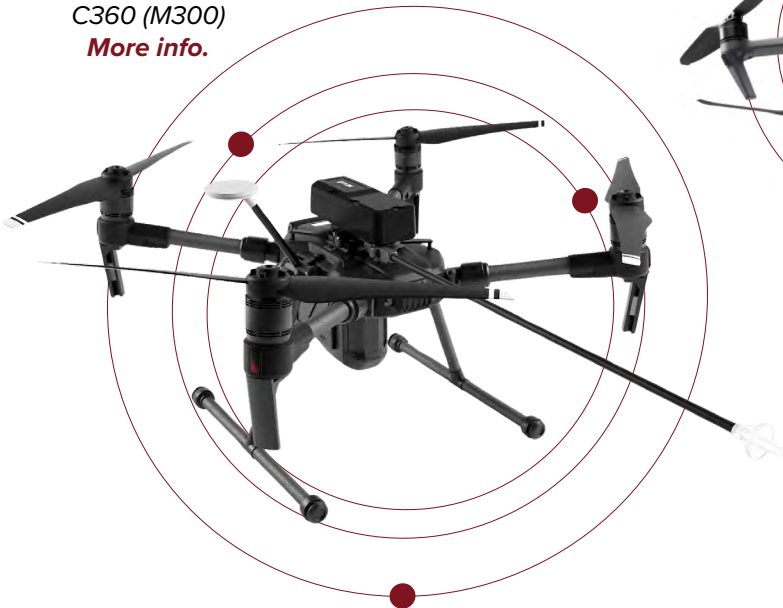
- Perform regular visual inspections for mechanical wear and tear and replace worn components as needed
- Use infrared cameras for thermographic inspections to detect and address overheating issues

### Recommended Tools

- Visual:** Industrial videoscopes
- Thermographic:** Infrared cameras, uncrewed systems technology (DJI/Skydio)

**Inspection Frequency** = Quarterly

*FLIR MUVE  
C360 (M300)  
More info.*



*DJI Mavic 3  
Thermal  
More info.*



*FLIR E95  
IR Camera  
More info.*





# MIDSTREAM Inspection Checklist & Toolkit

## 5. LNG FACILITIES

### Inspection Points

- Cryogenic storage tanks
- Piping

### Common Issues

- **Cryogenic Tank Leaks:** Leaks in cryogenic storage tanks and piping
- **Material Degradation:** Degradation of materials due to low temperatures

### Solutions & Best Practices

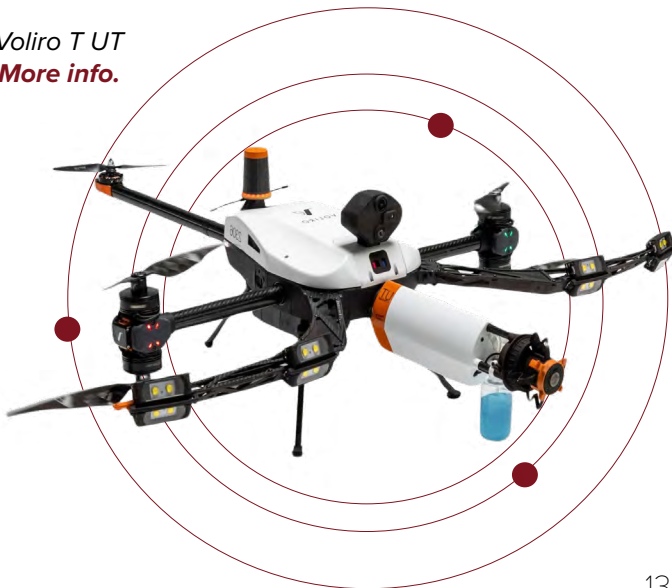
- Perform regular visual inspections for physical damage, ultrasonic thickness testing for material integrity, and acoustic leak detection for leak detection

### Recommended Tools

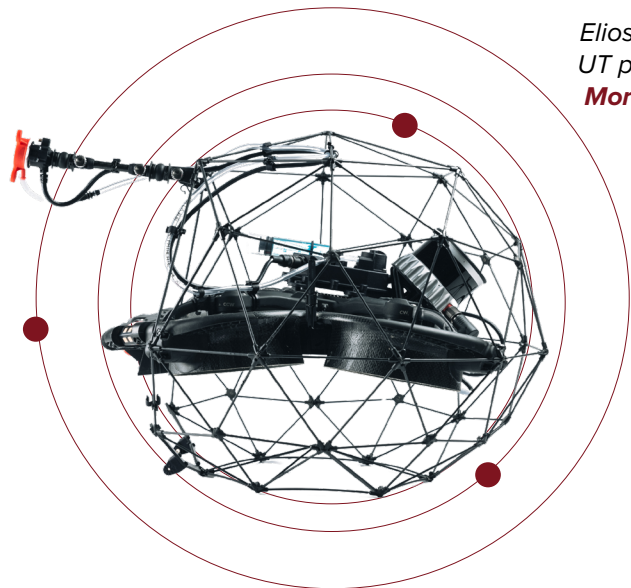
- **Visual:** Industrial videoscopes, tank inspection systems (PTZ dropdown camera systems), push camera inspection systems, uncrewed systems technology (E3/DJI/Skydio)
- **Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)
- **Flaw Detection:** Ultrasonic flaw detectors, eddy current flaw detectors
- **Leak Detection and Pressure Testing:** Industrial acoustic imaging (acoustic leak detection)

**Inspection Frequency** = Biannually

*Voliro T UT*  
**More info.**



*Elios 3 with UT payload*  
**More info.**



### RELATED READ

**INFOGRAPHIC: Cut Costs Using the Right sUAS UT Solution**

# DOWNSTREAM OIL & GAS FACILITIES



The downstream segment of the oil and gas industry encompasses the refining, processing, distribution, and retail of petroleum products.

This sector is responsible for transforming crude oil and natural gas into usable products such as gasoline, diesel, jet fuel, heating oil, and petrochemicals.

Downstream operations are critical for delivering refined products to end users, including

consumers and businesses. In downstream operations, regular inspections are vital for maintaining the safety, efficiency, and reliability of the refining and distribution processes.

Key components of downstream facilities include refineries, petrochemical plants, storage tanks, distribution networks, and retail outlets.

Thorough inspections of these

components help ensure that refined products meet quality standards, prevent accidents, and optimize the supply chain.

The following section provides detailed checklists for inspecting various downstream assets, along with recommended tools and best practices to ensure the safe and efficient operation of your refining and distribution infrastructure.





# DOWNSTREAM Inspection Checklist & Toolkit

## 1. REFINERIES

### Inspection Points

- Pressure vessels, piping, storage tanks

### Common Issues

- **Pressure Vessel Leaks:** Detection of leaks in pressure vessels
- **Material Identification Errors:** Inaccurate material identification

### Solutions & Best Practices

- Use industrial acoustic imaging for regular pressure testing and leak detection
- Implement XRF analyzers and LIBS for accurate positive material identification
- Conduct regular visual inspections, ultrasonic thickness testing, and flaw detection to ensure safety and reliability

### Recommended Tools

- Visual:** Tank inspection systems (PTZ dropdown camera systems), industrial videoscopes, push camera inspection systems, uncrewed systems technology (E3)
- Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)
- Pressure Testing:** Industrial acoustic imaging (acoustic leak detection)
- Positive Material Identification:** XRF Analyzer, LIBS
- Flaw Detection:** Ultrasonic flaw detectors, eddy current flaw detectors

**Inspection Frequency** = Quarterly

### RELATED READ

**Drones Improve Inspection Results For Argentina's Oil & Gas Refineries**



Olympus  
Nortec 600  
**More info.**

Niton XL5  
**More info.**





# DOWNSTREAM Inspection Checklist & Toolkit

## 2. PETROCHEMICAL PLANTS

### Inspection Points

- Heat exchangers
- Pumps
- Compressors
- Valves

### Common Issues

- **Heat Exchanger Failures:** Detection of flaws or overheating in heat exchangers
- **Pump and Compressor Issues:** Mechanical failures in pumps and compressors

### Solutions & Best Practices

- Conduct regular visual and ultrasonic inspections of heat exchangers
- Use thermographic inspections and acoustic leak detection for pumps and compressors to prevent failures

### Recommended Tools

- Visual:** Industrial videoscopes, push camera inspection systems
- Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)
- Thermographic:** Infrared cameras
- Pressure Testing:** Industrial acoustic imaging (acoustic leak detection)

**Inspection Frequency** = Biannually

### RELATED READ

How Borescopes Are Revolutionizing Inspections in the Oil & Gas Industry

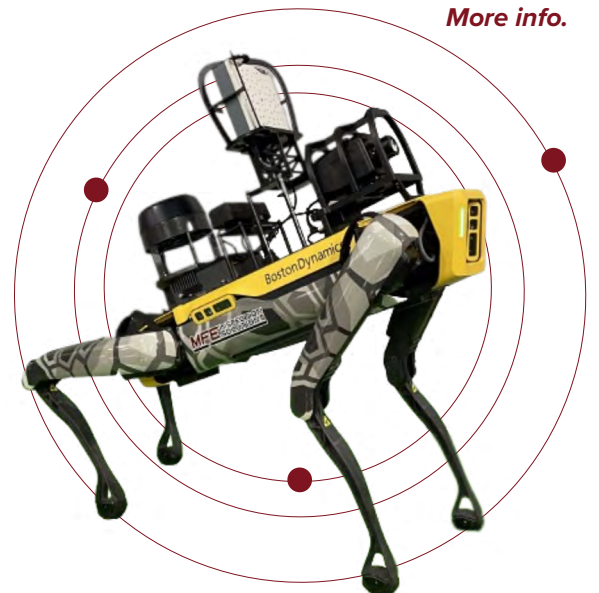
Fluke SV600 & Boston Dynamics' Spot  
**More info.**



Eddyfi  
Ectane 2  
**More info.**



Waygate XL  
Flex Series  
**More info.**





# DOWNSTREAM Inspection Checklist & Toolkit

## 3. DISTRIBUTION NETWORKS

### Inspection Points

- Pipelines
- Storage tanks
- Rail systems
- Trucks

### Common Issues

- **Pipeline Corrosion:** Internal and external corrosion in distribution pipelines
- **Storage Tank Leaks:** Leaks in storage tanks and associated piping

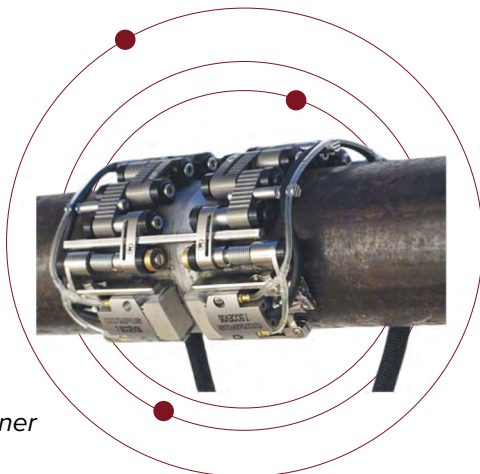
### Solutions & Best Practices

- Implement regular visual inspections and magnetic flux leakage testing for pipelines and storage tanks
- Use ultrasonic thickness testing and flaw detection to identify and repair leaks promptly and ensure the safety and efficiency of distribution networks

### Recommended Tools

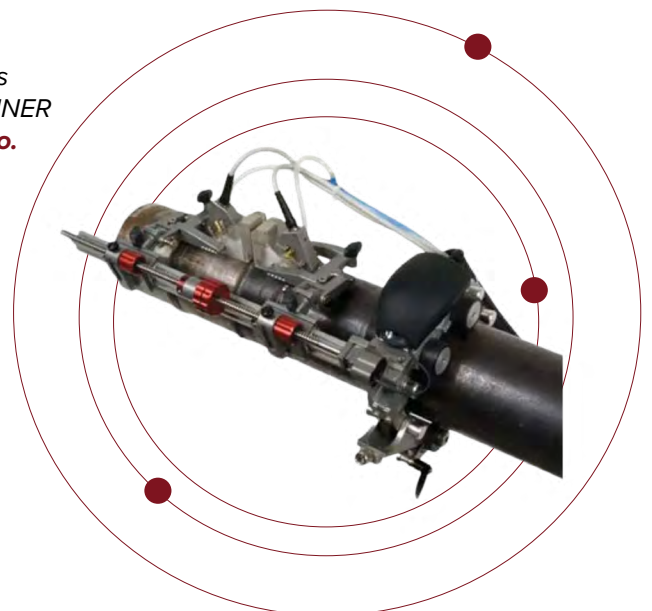
- **Visual:** Industrial videoscopes, tank inspection systems (PTZ dropdown camera systems), push camera inspection systems, uncrewed systems technology (E3/DJI/Skydio)
- **Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners, uncrewed systems technology (E3/Voliro)
- **Magnetic Flux Leakage:** Magnetic flux leakage (MFL) inspection equipment
- **Flaw Detection:** Ultrasonic flaw detectors, eddy current flaw detectors

Inspection Frequency = Annually



Olympus  
COBRA Scanner  
[More info.](#)

Olympus  
ChainSCANNER  
[More info.](#)





# DOWNSTREAM Inspection Checklist & Toolkit

## 4. RETAIL OUTLETS

### Inspection Points

- Gas stations
- Storage tanks
- Dispensing equipment

### Common Issues

- **Dispensing Equipment Failures:** Issues with fuel dispensing equipment
- **Storage Tank Integrity:** Detection of leaks or corrosion in storage tanks

### Solutions & Best Practices

- Conduct regular visual and ultrasonic inspections of dispensing equipment and storage tanks
- Replace worn components and maintain proper calibration to ensure equipment functionality

### Recommended Tools

- **Visual:** Industrial videoscopes, push camera inspection systems
- **Ultrasonic:** Ultrasonic thickness gauges, manual/motorized ultrasonic thickness scanners
- **Pressure Testing:** Industrial acoustic imaging (acoustic leak detection)

**Inspection Frequency** = Annually



Olympus 38DL PLUS  
[More info.](#)



CRY8124  
[More info.](#)



# FINAL CONSIDERATIONS

Inspections play a vital role in maintaining the integrity of critical infrastructure.

By identifying potential issues before they escalate, regular inspections help prevent accidents, reduce downtime, and extend the lifespan of equipment. Here's a review of the benefits:

- **Safety:** Inspections identify and mitigate risks that could lead to hazardous situations. For example, detecting corrosion in pipelines early can prevent leaks that might result in environmental disasters and costly cleanups.
- **Efficiency:** Well-maintained equipment operates more efficiently. Inspections ensure that machinery such as compressors and pumps are functioning optimally, reducing energy consumption and operational costs.
- **ROI:** Investing in regular inspections reduces the likelihood of costly emergency repairs and extends the life of expensive equipment. This means fewer replacements

and less downtime, which directly contributes to the bottom line.

This proactive approach minimizes unexpected shutdowns, enhances productivity, and ultimately leads to greater profitability.

## Why You Should Choose MFE Inspection Solutions

Choosing MFE Inspection Solutions means partnering with a provider who understands the critical importance of safety and efficiency in the oil and gas sector.

Our advanced tools enable companies to detect wear and tear, corrosion, and other defects with unparalleled precision. Here's a look at what MFE offers:

- **Technology:** Our state-of-the-art inspection tools offer unparalleled accuracy and efficiency, making it easier to conduct thorough inspections even in hard-to-reach areas.

- **Training:** MFE offers certified training programs that ensure your inspection personnel are well-versed in the latest techniques and technologies, enhancing their ability to perform accurate and effective inspections.

- **Repairs & Calibrations:** Regular calibration of inspection equipment ensures that your tools provide accurate readings, which is essential for making informed maintenance decisions. MFE's repair services help maintain the reliability and longevity of your inspection tools.

Our expertise and dedication to excellence make us the ideal choice for companies looking to maintain their assets and protect their investments.

Regular and thorough inspections, supported by MFE's technology and services, not only comply with industry standards and regulations but also safeguard personnel and assets, ultimately driving the success and sustainability of your business. ■