



The Imperative of Nitrogen Helium Leak Testing in Oil and Gas Facilities

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1 ABSTRACT

Oil and gas facilities such as Central Processing Platforms, Well Head Platforms, Refineries, and similar installations operate in environments where safety and reliability are paramount. One critical aspect of ensuring the integrity of these facilities is leak testing. Among various methods available, Nitrogen Helium Leak Testing stands out for its unparalleled accuracy and reliability. This white paper delves into the necessity of implementing Nitrogen Helium Leak Testing in such facilities, supported by case studies that highlight its effectiveness in enhancing safety, minimizing environmental impact, and maximizing operational efficiency.

2 INTRODUCTION

Oil and gas facilities operate under stringent safety and environmental regulations, necessitating robust measures to ensure the integrity of equipment and infrastructure. Leak testing plays a pivotal role in this regard, as undetected leaks can pose serious safety hazards, environmental risks, and financial implications. Among the available leak testing methods, Nitrogen Helium Leak Testing emerges as a highly effective technique due to its sensitivity, accuracy, and versatility.

MCCS International is an expert in Nitrogen Helium Leak Testing, serving the oil and gas Industry for decades with cutting-edge technology, comprehensive solutions, regulatory compliance, proven track record, cost-effective approach, and unwavering commitment to safety. Choosing MCCS International ensures that the facility receives a superior leak free confident process start-up.

3 WHY NITROGEN HELIUM LEAK TESTING?

Nitrogen Helium Leak Testing involves pressurizing the system with a mixture of nitrogen and helium gases and then detecting any leaks by measuring the concentration of helium using specialized equipment. This method offers several advantages over traditional leak testing methods, including:

- i. High Sensitivity: Nitrogen Helium Leak Testing can detect leaks as small as 10^{-6} standard cubic centimetres per second (sccs), ensuring the detection of even minor leaks that may go unnoticed with other methods.*
- ii. Non-Destructive: Unlike destructive testing methods that may compromise equipment integrity, Nitrogen Helium Leak Testing is non-destructive, allowing for thorough inspection without causing damage.*



- iii. *Versatility: This method can be applied to a wide range of equipment and materials, including pipelines, valves, tanks, and pressure vessels, making it ideal for various components found in oil and gas facilities.*
- iv. *Real-time Monitoring: Nitrogen Helium Leak Testing enables real-time monitoring of leak rates, facilitating prompt remedial action to mitigate potential risks.*

4 CASE STUDIES

4.1 CENTRAL PROCESSING PLATFORM (CPP)

In a recent inspection of a Central Processing Platform located in the North Sea, Nitrogen Helium Leak Testing identified a small leak in a high-pressure valve that had gone undetected by previous methods. Prompt repair of the valve prevented a potential safety incident and minimized production downtime. The estimated cost savings from preventing a shutdown due to a critical failure amounted to \$1.5 million USD.

4.2 WELL HEAD PLATFORM (WHP)

During routine maintenance of a Well Head Platform situated in the North Sea, Nitrogen Helium Leak Testing was conducted on critical equipment, including wellhead valves and control systems. The testing revealed a small leak in a wellhead valve that had previously gone undetected by visual inspections. The leak, if left unaddressed, had the potential to escalate into a safety hazard, risking the integrity of the entire wellhead system and surrounding marine environment. Prompt identification and repair of the leak ensured the continued safe operation of the platform and prevented any environmental contamination. This incident highlighted the effectiveness of Nitrogen Helium Leak Testing in identifying elusive leaks in critical equipment, thereby safeguarding personnel, assets, and the environment in offshore oil and gas operations.

4.3 REFINERY

A refinery in Texas implemented Nitrogen Helium Leak Testing during a major turnaround. The testing uncovered leaks in several heat exchangers, which, if left unaddressed, could have led to loss of efficiency and increased energy consumption. Timely repairs resulted in significant cost savings and enhanced operational performance. The estimated cost of the leak testing campaign was \$200,000 USD, whereas the potential cost of a shutdown due to critical failure, considering lost production, repair expenses, and regulatory fines, could have exceeded \$5 million USD.



5 COST COMPARISON

The average cost of a shutdown due to a critical failure in oil and gas facilities varies depending on the scale of the operation, the extent of the damage, and the duration of the shutdown. However, industry data suggests that the cost of such shutdowns can range from hundreds of thousands to several million dollars per day. In contrast, the cost of a comprehensive Nitrogen Helium Leak Testing campaign typically amounts to a fraction of the potential cost of a shutdown. For instance, the cost of the leak testing campaign conducted at the refinery in Texas was \$200,000 USD, significantly lower than the potential cost of a shutdown, which could have exceeded \$5 million USD. Thus, investing in proactive leak testing measures such as Nitrogen Helium Leak Testing not only enhances safety and operational efficiency but also represents a cost-effective strategy for mitigating the financial risks associated with critical failures in oil and gas facilities.

6 CONCLUSION

The case studies presented underscore the critical importance of Nitrogen Helium Leak Testing in oil and gas facilities, including Central Processing Platforms, Well Head Platforms, Refineries, and similar installations. By leveraging the sensitivity and accuracy of this method, operators can proactively identify and rectify leaks, thereby enhancing safety, protecting the environment, and optimizing operational efficiency. As regulatory scrutiny increases and stakeholders demand greater accountability, the adoption of Nitrogen Helium Leak Testing emerges as an indispensable practice for ensuring the integrity and reliability of oil and gas facilities. Moreover, the cost comparison highlights the significant financial benefits of investing in leak testing campaigns compared to the potential costs of shutdowns due to critical failures.