TURNING FAILURES INTO FORTUNE: THE POWER OF QAQC IN ARTIFICIAL LIFT OPERATIONS

Courtney Richardson
Oxy

Abstract

examine the structured development and implementation of the Artificial Lift Quality Assurance and Quality Control (QAQC) Team at Oxy, emphasizing the team's strategic impact on reducing operational expenditures (Opex). The QAQC team delivers targeted training in sucker rod maintenance and handling to more than 100 workover crews, conducts systematic audits of pump shops across Oxy's U.S. assets, and actively manages warranty claims to recover costs from equipment failures. The team is also responsible for managing the region's most advanced reclamation programs for production tubing and sucker rods in the Permian Basin. Each month, over 800,000 feet of tubing are systematically processed through three centralized hubs, utilizing rigorous inspection and quality assurance protocols to ensure operational integrity and maximize asset recovery.

Serving as a crucial link between field operations and suppliers, the team's responsibilities include performing detailed root cause analyses of failures, organizing independent laboratory testing and assessments, and working closely with Oxy's Supply Chain Management (SCM) to strengthen contract terms. These efforts help limit Oxy's risk exposure from poor-quality materials and manufacturing flaws.

Insights gained from failure analyses often lead to the creation of standard operating procedures (SOPs) that are embedded into commercial agreements, enabling enforceable quality standards. The QAQC team also leverages warranty clauses to recover funds, ensuring that wells with working interest partners maintain transparent and accurate financial records. Ensuring adherence to both industry standards and Oxy-specific requirements at tubing reclamation facilities is a primary mandate for the QAQC team. The implementation and oversight of Oxy's proprietary inspection protocols at these plants have resulted in substantial annual cost savings, amounting to millions of dollars for the organization. Routine pump shop audits at each site enable ongoing vendor performance monitoring, supporting the identification and resolution and prevention of recurring issues.

This paper explores how the QAQC team's audit processes have transformed business operations and supplier qualification criteria. By presenting Real-world case studies and detailed failure analysis reports, we demonstrate how these practices have enhanced

Oxy's artificial lift systems and offer practical recommendations for implementing similar value-driven strategies in your own organization.

Turning Failures into Fortune: The Power of QAQC in Artificial Lift Operations

Background

the QAQC team at Oxy was established over a decade ago with the primary objective of providing oversight for tubing and sucker rod reclamation operations, as well as collaborating with rig crews to enhance the handling and maintenance of sucker rods. In response to persistent issues related to sucker rod connection integrity, particularly those arising from improper makeup and handling, Oxy initiated the QAQC program to systematically reduce makeup-related failures. Since its inception, the QAQC team has expanded to three times its original size and now carries a broad portfolio of duties and responsibilities. This growth has enabled the team to deliver substantial value to Oxy, both through measurable operational efficiencies and intangible improvements in process reliability and asset performance.

Reclamation Operations & Quality Enforcement

Since 2012, Oxy has strategically leveraged reclaimed production equipment, including sucker rods and tubing, as a cost-effective alternative to procuring new assets. These comprehensive reclamation programs have delivered substantial value by optimizing resource utilization and reducing capital expenditures. to ensure the effectiveness and integrity of these initiatives, rigorous oversight of reclamation operations is essential. While these processes are governed by established industry standards, such as those set forth by API and ASNT, ongoing verification and validation of operational practices are required to maintain compliance and uphold quality expectations.

The Oxy QAQC team plays a pivotal role in this framework by conducting systematic process audits at reclamation facilities. Their mandate is to confirm that quality management systems (QMS) not only document but also demonstrably implement best practices as claimed. A critical responsibility of the QAQC team is to ensure the authenticity and accuracy of operational reports, actively guarding against the risk of falsified or inadequately substantiated documentation, a prevalent challenge across the

reclamation sector. Through these efforts, the QAQC team reinforces operational integrity and sustains the value delivered by Oxy's reclamation programs.

The structure of these programs is characterized by direct company ownership and centralized management, ensuring that equipment remains the property of Oxy throughout the reclamation lifecycle. This approach enables precise and transparent financial accounting, which is essential given the presence of asset partners requiring fiscal oversight. To maintain this transparency, the programs are designed so that the originating well is responsible for inspection costs; Following inspection, the equipment is assigned a value based on its assessed condition. This value is subsequently credited to the originating well, and The equipment is transferred to managed inventory at the assigned valuation. When another well assumes ownership of the equipment, it inherits the associated cost burden established during the inspection process.

Over time, these programs have been systematically refined to better align with evolving business objectives. Notably, the Tubing Reclamation Program underwent a comprehensive overhaul in late 2023. Key enhancements included the strategic reorganization of inspection hubs to optimize their proximity to major operational centers, thereby improving logistical efficiency. Additionally, the deployment of advanced logistics management software has played a pivotal role in streamlining transportation, minimizing empty backhauls, and significantly reducing carbon emissions. These improvements have collectively contributed to operational excellence and sustainability within Oxy's reclamation framework. Oxy QAQC has also developed a comprehensive Quality Process Manual (QPM), which is exclusively owned and governed by Oxy. This document is formally incorporated into our commercial agreements as mandatory exhibits that reclamation service providers are required to adhere to.. The QPM establishes unambiguous procedural requirements and performance expectations, thereby ensuring a consistent and rigorous application of quality standards across all service providers.

In 2025, Oxy incurred approximately $3.3 million in inspection costs associated with the tubing reclamation program. Analyzing the volume of color-band tubing generated through reclamation and subsequently deployed in operational wells, and comparing these expenditures to the hypothetical costs of procuring new tubing for equivalent usage, the program yielded net cost savings of $9.9 million for the year. The stewardship and optimization of these reclamation initiatives are facilitated by supply chain category managers, whose proactive management mitigates the accumulation of stagnant inventory and minimizes the risk of aging or obsolete assets requiring write-off, thus safeguarding company financial interests.

To quantitatively assess the effectiveness of Oxy's reclaimed tubing inventory management, key performance metrics are presented in **Figure 1**. This figure delineates the aggregate inventory value of all Oxy-owned equipment under supply chain management, alongside the overstock value, providing a comprehensive evaluation of the program's operational efficiency and inventory health.

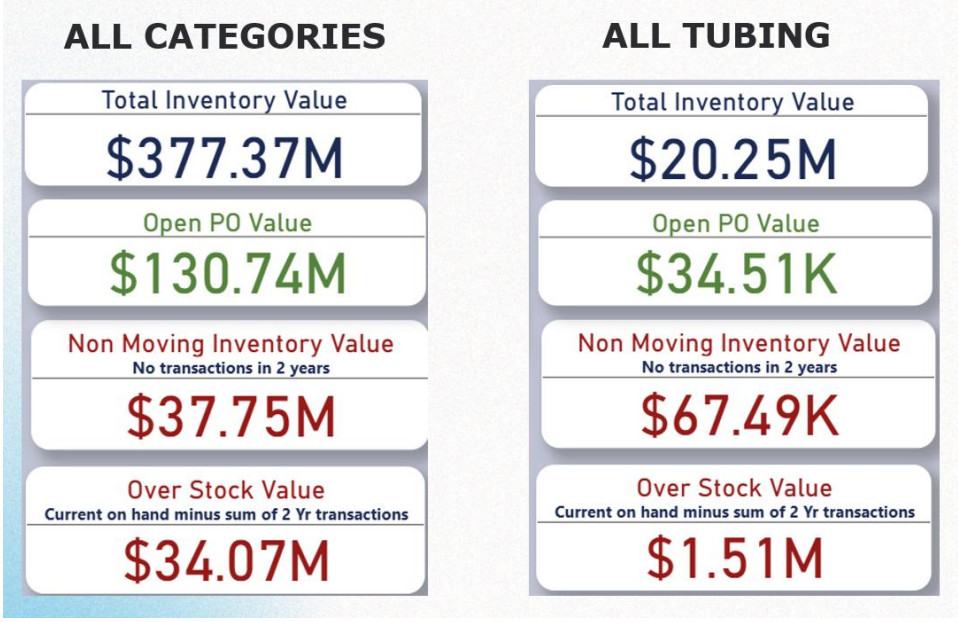

Figure 1 – Inventory Efficiency Metrics

In 2025, Oxy QAQC implemented rigorous color band categorization verification audits across all reclamation facilities in addition to their routine process checks. This comprehensive process audit was designed to ensure that tubing was accurately classified according to its designated color bandin strict alignment with established quality standards. For reference, the API color band classification system establishes standardized criteria for tubing, designating specific color codes that correspond to allowable nominal wall loss thresholds. When a tube exceeds these thresholds, it is reclassified to a lower color band, reflecting its current condition and remaining service suitability. **Figure 2** breaks down the API categorization into a table below.

(1) Class	(2) Color Band	(3) Loss of Nominal Wall Thickness (percent)	(4) Remaining Wall Thickness (percent minimum)
2	Yellow	0 – 15	85
3	Blue	16 – 30	70
4	Green	31 – 50	50
5	Red	Over 50	less than 50

Figure 2 – Classification and Color Coding of Used Casing and Tubing (API RP 5C1).

As part of this protocol, Oxy QAQC personnel conducted randomized sampling by selecting a representative number of joints from inspected racks for independent verification. The audit procedure mandated onsite validation of the reference standards utilized for calibrating electromagnetic inspection (EMI) equipment, direct observation of EMI calibration activities, and oversight of ultrasonic testing (UT) verification as tubing segments progressed through the EMI process and were ultimately categorized. The findings from the 2025 audit illuminated critical deficiencies within existing quality control practices and yielded actionable insights for enhancing the accuracy and reliability of reclamation service providers' performance. These audits will continue to serve as an essential instrument for the Oxy QAQC team in evaluating the performance and effectiveness of our reclamation service providers.

Beyond the targeted audits detailed above with tubulars, the Oxy QAQC team is tasked with executing comprehensive bi-annual audits across all sucker rod pump shops and rod inspection facilities. This systematic approach results in the completion of over 54 base audits annually. Additionally, the team conducts reactive audits in response to emerging operational trends or field observations that necessitate immediate attention to specific sites. This rigorous auditing framework ensures ongoing compliance with quality standards, facilitates proactive identification of process deviations, and supports continuous improvement within Oxy's asset management operations.

Sucker Rod Care and Handling School

Oxy QAQC maintains direct stewardship of the formalized Sucker Rod Care and Handling training program, which is internally governed and delivered to all well servicing personnel. The QAQC team has engineered a comprehensive, bi-annual instructional curriculum that encompasses industry-leading best practices for sucker rod care, handling, proper makeup, and standardized procedures for running and pulling operations. The training also incorporates detailed protocols for ancillary rod-related equipment, including load cells, rod rotators, pump clamps, polished rods, and polished rod clamps, ensuring holistic

competency across all relevant operational domains. The systematic deployment of this program has yielded a demonstrable reduction in makeup-related failures, underscoring its efficacy in operational risk mitigation. Notably, a co-authored SPE publication identified Oxy's rigorous QAQC training initiatives as a critical element within a three-pronged methodology, attributing a 25% reduction in failures associated with improper makeup and handling to the implementation of these robust quality assurance measures (Richardson et al., 2022).

The methodology employed for delivering These instructional sessions is characterized by a structured, formalized training model. Each session convenes all well servicing personnel, including the reverse unit operator and company man, in a large-scale, classroom-style interactive environment. The training curriculum is designed to foster active engagement through targeted questioning, mandatory participation, and live demonstrations of critical operational tasks. Comprehensive instruction is provided on the standardized procedures for cleaning and preparing sucker rods prior to deployment, as well as the protocols for verifying correct sucker rod connection makeup utilizing circumferential displacement cards, including prescribed verification intervals. Furthermore, The program outlines inspection methodologies for the pulling and inspection of sucker rods, and provides comprehensive guidance on the standardized procedures for palletizing sucker rods to facilitate efficient mobilization to inspection facilities for reclamation and subsequent reuse.

The curriculum further addresses prevalent manufacturing defects, equipping well servicing crews with the technical acumen necessary to proactively identify and report anomalies in the field before they cause operational failures. Annually, over 100 well servicing crews at Oxy are recipients of this training, with the QAQC team retaining full responsibility for the development and delivery of the program, as illustrated in **Figure 3**.

Figure 3 - Oxy QAQC Training in Denver City

Oxy's QAQC team continues to pursue advanced strategies to further reduce makeup-related failures in sucker rod connections. The team has managed comprehensive calibration and reliability assessments of conventional hydraulic rod tongs deployed across all operational fields, identifying a critical reliability concern in these conventional tools. In response, a targeted pilot initiative involving the deployment of smart tongs has been launched in select applications that satisfy predefined pilot criteria. This program is designed to rigorously evaluate the efficacy and operational benefits of smart tong technology. Pending successful outcomes, the QAQC team will coordinate the phased expansion of smart tong deployment across the majority of Oxy's onshore assets. The QAQC function, which originated as a specialized group of experts focusing exclusively on EOR fields, has since evolved into a robust organization comprising nine dedicated professionals. This expanded team now provides oversight and technical leadership across all domestic assets, delivering substantial cost savings through the systematic reduction of failures associated with sucker rod care, handling, and connection makeup.

Compensation Recovery

This process represents what the QAQC team considers its unique value proposition, our "secret sauce" among quality assurance personnel across Permian operating companies. A primary emphasis for Oxy's QAQC function is the systematic pursuit of warranty claims

and what is internally termed “compensation recovery” for affected wells. In the current operational environment, where many operators maintain shared working interests, it is imperative to ensure full transparency in financial transactions with our partners. Successful implementation of such a program is predicated on the inclusion of robust technical specifications and rigorous sourcing criteria within commercial agreements, which are designed to elevate equipment quality standards. These agreements must incorporate precise technical language that mandates adherence to stringent quality assurance protocols, while maintaining comprehensive warranty provisions addressing workmanship and material defects. The Oxy QAQC team collaborates extensively with supply chain management to ensure contractual frameworks are structured to deliver optimal protection against substandard lift equipment and establish a solid foundation for the systematic pursuit and recovery of warranty claims.

Historically, warranty issues stemming from substandard workmanship or manufacturing defects were addressed informally, often through the provision of credits or replacement equipment that could be allocated at the operator’s discretion across various leases. For instance, a sucker rod pump failure due to a manufacturing defect might have resulted in the operator receiving several replacement pumps at no charge, with the credits applied arbitrarily to offset costs. This legacy approach is no longer acceptable in joint venture scenarios, as compensation recovery must be precisely attributed to the specific well impacted by the issue.

Over the past five years, Oxy has implemented a rigorously structured warranty program. Under this framework, the QAQC team submits formal claim invoices for all costs associated with well repairs, including intervention expenses such as rig time, reverse unit deployment, and BOP rental fees. These claims are processed as direct credits to the well in question, ensuring clear and auditable financial remediation for the well that incurred the repair costs. This structured approach delivers two significant improvements over historical industry practices. First, it establishes a level of accountability that cannot be circumvented; previously, undocumented verbal agreements for warranty compensation were susceptible to loss or negation due to personnel turnover or lack of formal record-keeping. Second, the program facilitates a transparent, well-documented financial trail that can be readily provided to partners, ensuring that only the affected well receives compensation, thereby eliminating cross-subsidization among unrelated assets and upholding fiduciary integrity. Since 2019, the QAQC team has issued claims totaling more than $4.1M and after negotiations has successfully recovered over $2.1M in direct compensation, with these funds accurately credited back to the wells impacted as shown in **Figure 4**.

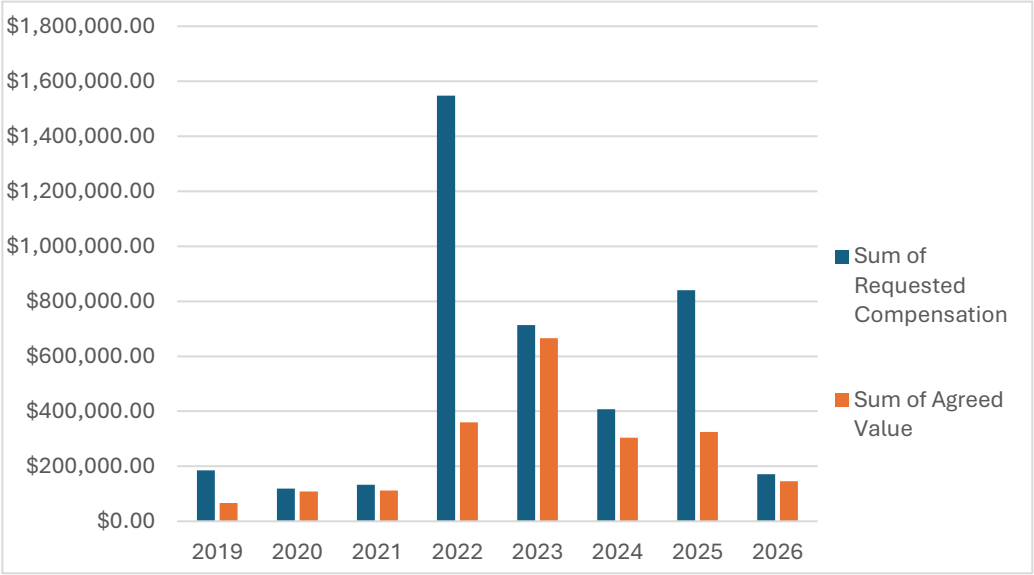

Figure 4 - Oxy QAQC Artificial Lift Compensation Recovered

The mechanism by which Oxy achieves successful compensation recovery in an environment governed by robust commercial agreements is fundamentally anchored in the precise technical language embedded within these contracts. As outlined previously, the pivotal factor is the strategic incorporation of rigorous, standards-based requirements. The QAQC team, in close collaboration with our artificial lift advisors, meticulously crafts contractual language that references applicable industry standards, thereby establishing a defensible framework that safeguards Oxy against substandard manufactured equipment. This approach also enables the engagement of relevant industry organizations when a supplier fails to comply with contractual requirements. In such instances, Oxy can substantiate claims of non-conformance by demonstrating that supplied materials deviate from specified industry standards, despite supplier assertions of compliance.

To illustrate, our agreements include explicit requirements such as API monogram certification for sucker rod pump components, provisions mandating that OCTG products originate from API 5CT-licensed facilities, and stipulations specifying acceptable countries of origin for tubular products. Additionally, the agreements delineate strict hardness tolerance parameters for field welds in continuous rod applications. These contractual provisions not only elevate the quality assurance baseline but also provide Oxy with clear recourse in the event of material or workmanship deviations, thereby strengthening our position in warranty and compensation recovery processes.

Summary

The purpose of This paper was to present a comprehensive overview of Oxy's QAQC team and its transformative impact on artificial lift operations. Through targeted training programs, systematic audits, and advanced reclamation protocols, the QAQC team has driven significant operational efficiency, reduced Opex, and enhanced asset reliability. Their rigorous oversight of reclamation operations, backed by proprietary inspection standards and centralized financial management, has yielded millions in annual cost savings and improved transparency among working interest partners. The formalized sucker rod care and handling training has directly reduced operational failures, while advanced initiatives such as smart tong pilot programs continue to push the boundaries of reliability and process improvement. The QAQC team's structured warranty recovery program, anchored in robust technical contract language, has ensured clear, auditable compensation for wells impacted by equipment failures, setting new standards for accountability and financial integrity. Collectively, the strategic approach detailed in this paper demonstrates how a dedicated QAQC function can transform operational practices, supplier relationships, and asset management, offering practical recommendations for organizations seeking to drive similar value and performance improvements in artificial lift operations.

References:

Anderson, Jordan, Oliva, Esteban, Richardson, Courtney, Mogus, Stephen, and Dylan Morin. *"Sucker Rod Connection Failure Reduction Using a Three-Pronged Approach."* Paper Presented at the SPE Artificial Lift Conference and Exhibition - Americas, Galveston, Texas, USA, August 2022. doi: https://doi.org/10.2118/209750-MS