

Case study

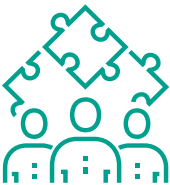
Liquefied natural gas (LNG) producer saves \$135 million, reduces failures through Maintenance Strategy Optimization

\$135 million

Cost savings over the next decade
including spares, labor, and
financial effects



Optimized preventative
maintenance to avoid asset failures
and unplanned shutdowns



Improved maintenance approach
to drive cost-reduction and
increased production

Executive Summary

One of the world's largest producers of Liquefied Natural Gas [LNG] was interested in exploring maintenance strategy optimization, documenting maintenance practices in order to decrease risk and increase production. Additionally, the company was experiencing new failure modes in their turbines, pumps, and fin fans, causing equipment failures and threatening unplanned shutdowns.

The company engaged ARMS Reliability to conduct a large-scale, two-part study – one part focused on Reliability Centered Maintenance [RCM] and the other focused on Preventive Maintenance Optimization [PMO] – to help the company improve its assets management.

ARMS Reliability's objectives for the study included:

- reducing the number of corrective work orders;
- optimizing total work hours required to maintain equipment;
- improving reliability performance for key assets; and
- optimizing maintenance strategies for high-priority systems.

Ultimately, ARMS optimized 20% of the company's highest-cost failure classes, demonstrating to them exactly where and to what degree they were over-maintaining their assets, as well as how to improve their strategies and ensure their risk and maintenance costs are aligned. The ARMS team identified 265 potential failure modes and saved the company about \$135 million over the next ten years through the implementation of new maintenance tasks.

The Problem

The LNG company was interested in exploring maintenance strategy optimization as a means to accomplish their business objectives, such as reducing risk, improving production, and as a result, achieving better cost-effectiveness. Additionally, the company was experiencing new failure modes in their turbines, pumps, and fin fans, causing equipment failures and threatening unplanned shutdowns.

Lacking the internal resources to complete the review, the company engaged ARMS Reliability to conduct a large-scale, two-part study – one part focused on Reliability Centered Maintenance and the other focused on Preventive Maintenance Optimization – to help them improve asset reliability.

The company wanted ARMS to: help reduce the business' costs and risks by optimizing their asset-management strategies; create maintenance strategies for their valves; deliver new strategies as computerized maintenance management system [CMMS] load sheets; identify flaws and defects within the existing preventive maintenance programs for turbines, pumps, and fin fans; determine new possible failure modes for this equipment; and update the organization's existing strategies for cost-effectiveness.

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Solutions

The client chose ARMS Reliability based upon its technical expertise and proven experience optimizing maintenance strategies on projects in the oil & gas and petrochemical industries. ARMS' solutions for maintenance-task development have been demonstrated to be 2-6x more efficient than traditional approaches, and ensure operating context is considered in failure-mode mitigation.

STUDY 1: Reliability-Centered Maintenance

To begin the RCM study, ARMS Reliability gathered information about the company's existing asset-maintenance strategies for their Waste Water, Heat Exchanger, and Fired Heater systems, including spares, routines, and resources.

Working with the company's experienced site planners, engineers, and technicians, the ARMS team identified critical assets based upon their necessity to business delivery, as well as the equipment already aligned with the organization's process safety, environmental, and production performance objectives.

Using this data, ARMS developed various strategy models, including options for valve maintenance, and simulated and optimized high-risk failure modes. Once optimized tasks were defined, they were grouped into logical job plans and preventive maintenance programs, which were presented to the company in the required format for loading to their Maximo CMMS. The ARMS team ran comparisons of three different strategic scenarios – run-to-failure, as-is, and optimized – and plotted the results from each strategy to illustrate the benefits of proper maintenance and optimized strategies. This simulation-based analysis also enabled forecasts to be generated, such as labor profiles, maintenance budgets, and spare usage.

ARMS applied RCM methodology using simulation software to balance the cost of business risk with the cost of maintenance performance, ensuring the most cost-effective and risk-optimized maintenance strategy. Ultimately, ARMS optimized 20% of the company's highest-cost failures, demonstrating to the company exactly where and to what degree they were over-maintaining their assets, as well as how to improve their maintenance strategies so that the company attains the lowest costs of business risk and maintenance performance.

STUDY 2: Preventive-Maintenance Optimization

For its PMO study, ARMS Reliability applied PMO methodology to determine defects and flaws in the existing preventive-maintenance [PM] program for the company's turbines, pumps, and fin fans. ARMS also sought to find new possible failure modes for each type of equipment, as unexpected failure modes kept appearing, causing failures and threatening shutdowns.

The ARMS team reviewed all the corrective data from the company's Maximo CMMS in order to generate new or improve existing PM tasks. The result was the identification of new failure modes, which will later be used to develop a set of new maintenance-task recommendations for the business' existing PM program.

The Benefits



Serious Cost Savings

ARMS' Reliability-Centered Maintenance study resulted in \$135 million in cost savings over the next decade for the company, – including spares, labor, and financial effects, as well as the implementation of recommended PM tasks for the valves in each system:

- **\$115 million** in potential savings for the Waste Water System, **a 59% cost cut**;
- **\$11 million** in savings for the Fired Heaters System, **a 52% cost cut**; and
- **\$9 million** in savings for the Heat Exchanger System, **a 54% cost cut**.



Asset Failure Prevention

Through its Preventive-Maintenance Optimization study, ARMS identified 265 potential equipment failure modes – 144 for fin fans, 105 for turbines, and 16 for pumps. The ARMS team then provided a list of new or improved preventive-maintenance tasks designed to help the company avoid asset failures and unplanned shutdowns.



Improved Maintenance Approach

Using ARMS Reliability's asset strategy management approach, the company now knows where to focus cost-reduction efforts, including areas where they had been over-maintaining. They now have the information to conduct the proper maintenance tasks at the correct intervals – as well as the understanding of why they should perform maintenance this way. This helps shift onsite personnel mindset to a more proactive, reliability-centered approach.



ARMS Reliability - Representative Vendor in Gartner 2018
& 2019 Asset Performance Management Market Guide

