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Asset Maintenance Strategy in the Water Industry: A Journey to ‘Best Practice’

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Defining best practice in asset maintenance strategy is often challenging for industry professionals, given factors such as the varied nature of asset portfolios, unclear strategic priorities and budget limitations.

A commonly referenced benchmark is a 20/80 reactive-to-planned maintenance ratio. However, this has seen limited application and testing across many industries, including within the water sector.

Every fixed asset, be it a building, infrastructure, machinery or equipment, requires maintenance to perform its intended function. Ideally, such assets are supplied with maintenance instructions to guide users on how to operate them safely, reliably and cost-effectively, while meeting compliance and efficiency standards.

While these guidelines help service providers focus on maintenance priorities, they do not offer a comprehensive maintenance strategy. This makes it difficult to select the right indicators to assess whether an asset is under-maintained or over-maintained, both of which can result in under-performance and downtime. Useful indicators to guide maintenance practices include total maintenance cost compared to asset replacement value; overall equipment effectiveness; condition-based compliance measures; and the reactive-to-planned maintenance ratio, which is often simpler to monitor than other metrics.

What is best practice?

There is no clear evidence to suggest that best practice is solely determined by the ratio of reactive to planned maintenance. The general approach is to focus on planned maintenance to minimise unplanned downtime, extend asset life, and manage cost, risk and performance across the asset portfolio; however, this alone does not provide a complete picture.

The reactive-to-planned maintenance ratio remains a valuable indicator, offering meaningful insights into asset maintenance performance. To understand its full impact, we reviewed this ratio alongside two other key indicators: time management and schedule compliance. Including these two metrics not only helps

assess the effectiveness of the reactive-to-planned maintenance ratio but also supports monitoring the overall health of the asset maintenance strategy.

Before exploring the data set and findings, let's review the typical journey from a 'run-to-failure' approach to strategic asset management.

Setting the scene through maintenance strategy

Asset maintenance strategies in machine-heavy industries, such as car manufacturing and electricity generation, have evolved over time from relying solely on reactive maintenance to incorporating a mix of reactive and planned approaches. For example, studies show that the water industry in the early 1970s used only a small number of planned maintenance strategies, such as those for power/pump engines and influent/effluent pumps. Recently, however, there has been an increasing focus on the benefits of planned maintenance in reducing equipment failures, extending asset lifespans, and cutting operating costs by avoiding frequent breakdowns.

In the machine-heavy environment, maintenance strategies consider the balance between reactive and planned maintenance. This is typically calculated by comparing the total man-hours spent on each. A widely accepted target is 20–30% reactive maintenance and 70–80% planned maintenance. This approach is rooted in a method called Overall Equipment Effectiveness (OEE), introduced in the 1980s.[1] OEE suggests that achieving 95% performance, availability and quality requires a planned maintenance ratio of 85%.

The approach has recently been tested for an aluminium manufacturing facility, where the current maintenance practice was 67% planned vs 33% reactive maintenance. The study showed that transitioning from reactive maintenance to more planned maintenance could lead to $4.0 million in cost savings over 12 months as a result of a less costly maintenance schedule and fewer disruptions.

70–80%	85%	$4.0m
Widely accepted planned maintenance target	Planned ratio needed for 95% OEE	12-month savings, aluminium facility study

[1] Overall Equipment Effectiveness is calculated by multiplying targeted availability %, performance % and quality % of the equipment.

Adapting to the evolving nature of best practice

Best practice is fleeting and ever evolving. That's because businesses operate in a dynamic environment, where technology and macro-level uncertainties require constant adaptation. The water sector carries additional complexity related to its critical infrastructure, high-capital-intensive asset portfolios, and diverse stakeholders and customer relationships.

A seminal research project reviewed the maintenance strategy of 27 water companies in the USA and Canada, and highlighted three areas for reaching best practice:

1. **Strategy and Tactic**, where the maintenance strategy needs to be identified based on asset and process level
2. **Workflow Management**, where the effective management of work orders is prioritised
3. **Managing and Monitoring** of data to improve maintenance management, which touches every stage of the asset maintenance strategy.

To explore the achievement of best practice, we sampled a water mechanical and electrical maintenance data set over the two and a half years following mobilisation. The data collected was for reactive and planned work orders, and reported by three main indicators: **targeted reactive vs planned maintenance ratio, work order lifecycle management** and **work order compliance ratio.**

Maintenance strategy: reactive vs planned maintenance

The ratio of reactive to planned maintenance work is a key measure to monitor the time spent on scheduled tasks compared to unplanned breakdowns. The target for planned maintenance is set at 70–80%, while reactive maintenance is aimed at 20–30%. This approach is based on the principle that fewer breakdowns lead to a shorter work order life cycle, enabling optimised use of time and resources. Planned tasks are completed more efficiently than reactive ones, improving productivity and increasing availability.

Chart 1 shows the reactive-to-planned work order ratio, calculated by comparing the hours spent on each type of work order over a 2.5-year period. The data highlights steady progress towards the 70–80% target for planned maintenance. Year 1 reflects the initial period after service commencement, where performance varied between 73.0% and 67.9%, followed by Year 2 where results ranged between 69.5% and 65.6%. The figures indicate challenges in reaching the planned maintenance target, primarily linked to the mobilisation of new services. This included the time required to establish routines, address performance gaps and identify process bottlenecks. From that point onwards, the data demonstrates consistent improvement, with stronger planning practices, enhanced scheduling control and reduced unplanned work.

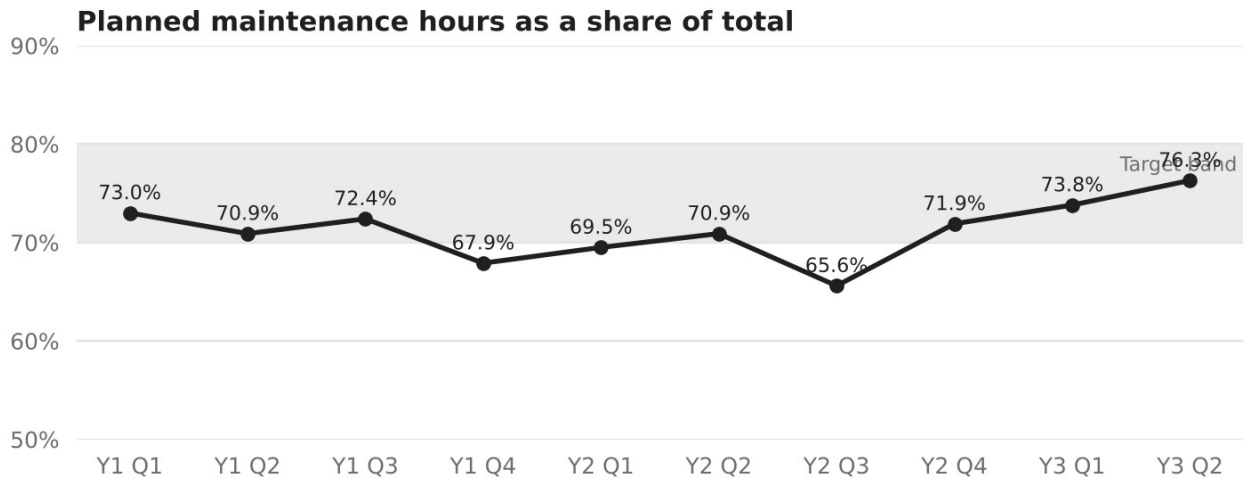

Chart 1: Planned maintenance hours as a share of total maintenance hours, by quarter. Shaded band shows the 70–80% target.

Work order lifecycle management: optimising resources

The **Work Order Lifecycle** indicator for reactive and planned work orders measures the total time from the creation of a work order to its completion. Reducing the average time for each work order is key to delivering the maintenance strategy. Chart 2 outlines the quarterly trend in average work order lifecycle over two and a half years. There has been a consistent and substantial reduction in the average lifecycle over this period. Notably, after Year 2 Q3, the average days spent on work orders decreased by 33% and have since fallen further to 20 days. This ongoing improvement reflects a maturing maintenance strategy that is producing consistent and measurable outcomes.

These results align with the improvements in planned maintenance shown in Chart 1 and support the conclusion that a proactive approach is successfully reducing both the frequency and duration of reactive work orders, while increasing asset availability, shortening repair times and improving productivity.

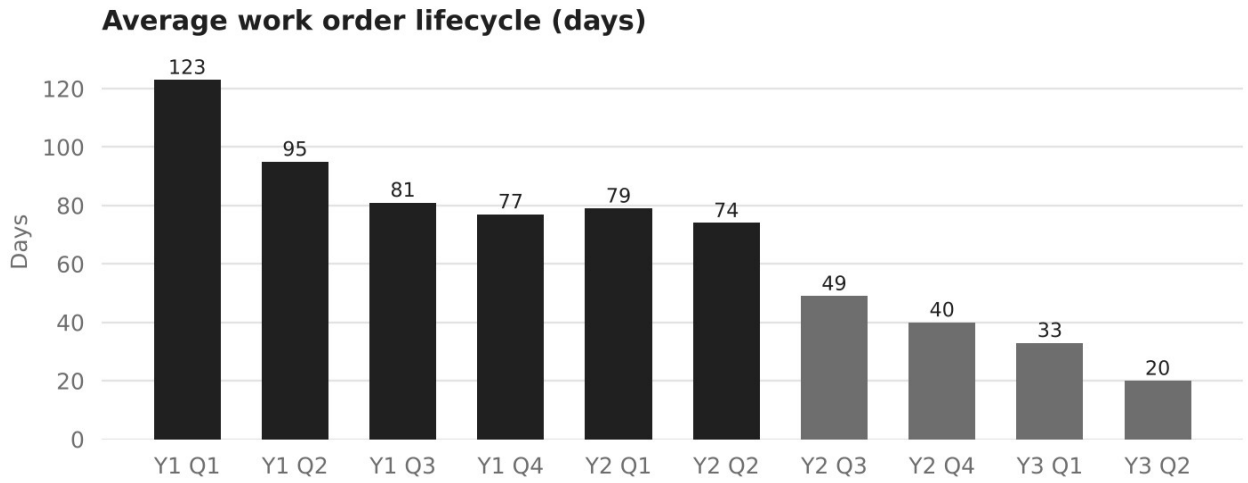

Chart 2: Average work order lifecycle per work order (days), by quarter.

We also analysed the connection between the work order lifecycle and the reactive-to-planned work order ratio. The data demonstrates a clear linear correlation: as man-hours spent on reactive work decreased, the overall work order lifecycle became shorter. Specifically, a year-on-year reduction in reactive work orders resulted in a **98%** decrease in the average work order lifecycle. Put simply, fewer breakdowns led to better time management and much faster work order completion compared to the previous quarter.

Work order compliance: delivering on customer service

One way to monitor and uphold a commitment to customer service is the **Work Order Compliance Ratio of Planned Maintenance** indicator. This measures the percentage of work completed within the week it was scheduled. A lower compliance ratio signals rescheduled tasks, which can disrupt the schedule and reflect poor planning. Such inefficiencies can also reduce operational confidence.

Chart 3 shows the trend in planned maintenance compliance over two and a half years. The first two years display significant volatility, with the lowest points in Year 1 Q2 and Year 2 Q3 due to challenges during mobilisation, process improvements and structural changes. From Year 2 Q4 onwards, the compliance ratio stabilises and steadily improves. Despite an increase in work orders during Years 2 and 3, the compliance ratio stays above 85%, supported by improved monitoring and consistent process refinement.

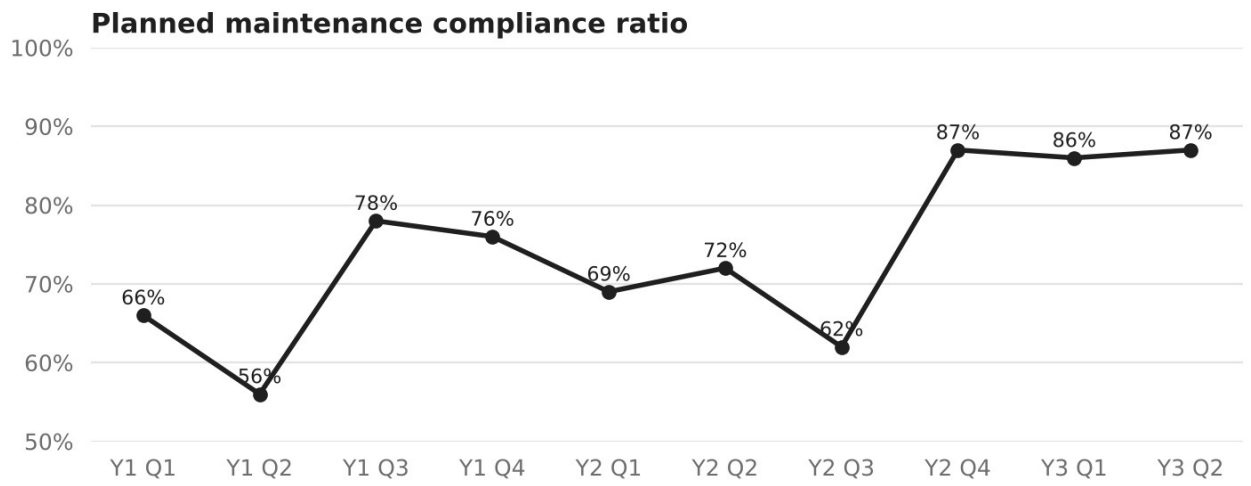

Chart 3: Planned maintenance compliance ratio, by quarter.

Driving excellence: monitoring and revising for optimal maintenance strategy

Consistent improvements in operational efficiency and resource use were achieved across the water contracts studied. What enabled this level of ‘best’ practice? The final step in the maintenance strategy framework, ‘Managing and Monitoring’, underpins the method. Regular evaluation of maintenance strategies allowed programs to be adjusted, efficiency improved and effectiveness enhanced.

Specifically, the following were monitored and adjusted:

- **Team structure** to ensure clearer accountability between delivery, planning and scheduling. Previously, these functions competed with one another. Aligning them under a single point of accountability improved collaboration and performance.
- **Data-driven decision-making**, supported by interactive business intelligence reports. These reports present data in a more accessible format than a computerised maintenance management system. For example, one report highlights whether a breakdown occurs at a functional location when scheduling planned maintenance.
- **A workforce-led continuous improvement program** focused on insourcing. Insourcing improves reliability and consistency.

The most effective maintenance strategies are built on clarity, control and ongoing learning. By combining relevant indicators, practical insights, smart technologies and the right expertise, the contract moved from delivering maintenance services to developing resilient, efficient and cost-effective maintenance strategies.

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