
Reliability-Centered Maintenance in Oil & Gas:

Abraj Energy Services' Innovative Approach

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EXECUTIVE SUMMARY

Equipment reliability is a persistent challenge in the oil and gas industry, largely due to harsh operating conditions and the frequent relocation of drilling rigs. Historically, unscheduled downtime and recurring equipment failures have been accepted as an inevitable cost of doing business. Abraj Energy Services is challenging this paradigm by implementing a Reliability Centered Maintenance (RCM) program across its fleet of drilling rigs, with the goal of exceeding conventional reliability expectations.

By adopting a data-driven maintenance strategy, encompassing rigorous failure analysis, a continuous feedback loop via SAP, and performance tracking with custom dashboards, Abraj Energy Services has significantly enhanced equipment uptime and maintenance efficiency. As a result, non-productive time (NPT) was reduced, equipment breakdowns decreased, operational costs dropped, and project timelines stayed on schedule.

This white paper details how the company's innovative RCM approach has addressed persistent industry challenges and positioned Abraj Energy Services as a maintenance innovator in the Middle East oil & gas sector.



PROBLEM IDENTIFICATION: INDUSTRY-WIDE RELIABILITY CHALLENGES

“Implementing RCM wasn’t just a maintenance upgrade - it was a cultural shift. We empowered our engineers to become proactive problem-solvers, not just technicians responding to breakdowns.”

- Ahmed Al Salmi, Technical Manager, Abraj Energy Services

Oil and gas exploration operations expose equipment to extreme and remote conditions, placing significant demands on reliability. Drilling rigs are frequently relocated between sites, making consistent maintenance difficult and adding additional strain on equipment.

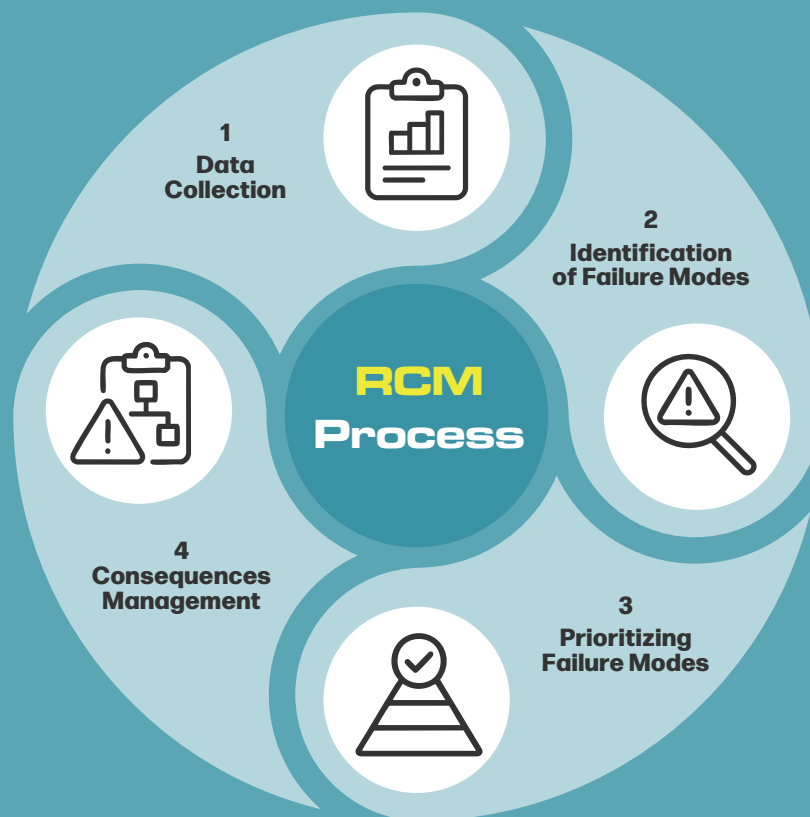
Industry culture has long treated a certain amount of downtime as normal - contracts even budgeted a few NPT hours each month. When a critical component failed, crews simply halted operations for repairs. Downtime was generally accepted as a cost of doing business. Industry research indicates that over two-thirds of industrial businesses experience unplanned outages at least once a month, with the typical cost per hour reaching approximately \$125,000. Nonetheless, at an industry level, NPT resulting from equipment failure is often seen as part of doing business:

“...the environment of this operation, it’s very harsh... and it’s non-static, which means you need to move from one area to another, which always keeps your equipment in a dynamic state. So, the failure itself... is something normal for... the drilling companies...”

- Electrical Preventative Maintenance Specialist at Abraj Energy Services

LEGACY APPROACHES: TRADITIONAL MAINTENANCE AND REACTIVE NORMS

The industry-standard approach to preventive maintenance has historically been characterized by fixed-interval servicing (daily checks, monthly service, overhauls after X hours) for all rigs, regardless of equipment condition. This time-based approach treats all equipment equally on a schedule, without accounting for real-world usage or recent operating severity.



In this traditional model, equipment health monitoring is periodic. Crews perform routine inspections and log readings at set intervals. If no obvious anomalies are detected and no alarms are triggered, the equipment is considered functional until the next scheduled check. Real-time condition monitoring is essentially limited to built-in gauges and alarms.

Unexpected issues are handled reactively – when a pump or engine fails, a team is dispatched to make urgent repairs and return the rig to service. The failure is typically attributed to normal wear and tear, and the faulty component is replaced without conducting a root cause analysis. This “keep-it-running” approach allows failures to recur, as underlying reliability issues remain unaddressed.

LIMITATIONS OF PAST SOLUTIONS: INFLEXIBILITY, INEFFICIENCY, AND HIGH COSTS

Fixed maintenance schedules, however, cannot adapt to real-world operating conditions. For example, equipment running in environments with significant dust may require servicing sooner than the scheduled interval, but the schedule does not account for that. Conversely, lightly used equipment may be serviced prematurely, resulting in wasted effort and resources. In both cases, static maintenance plans mean either late intervention (avoidable failures) or unnecessary work (driving inefficiency).

This approach also leads to **inefficiencies and recurring problems**. Without comprehensive failure analysis, the same issues could arise. A component that fails will be replaced, but the preventive main-

tenance plan for that component often remains unchanged – leaving the root cause unaddressed. Whether due to procedural shortcomings, design flaws, or problematic usage patterns, the underlying issue persists. Perhaps the costliest outcome of this legacy approach is the **high cost of unplanned downtime**. Every breakdown means the rig sits idle (no revenue earned) and could delay the entire drilling schedule, risking penalties or lost opportunities. Emergency repairs are expensive – rush shipping for parts, overtime for crews, and sometimes secondary damage from sudden failures. Recurring failures compound these costs, as the company repeatedly pays to fix the same problems. In short, the conventional industry approach is inefficient and expensive.

At a Glance: Traditional Versus RCM-Based Maintenance Approaches

Aspect	Traditional	RCM
Trigger	Fixed Schedule	Condition-Based
Approach	Reactive	Proactive
Decision Basis	Past Norms	Real-Time Data
Failure Response	Repair After the Fact	Preventive Action
Analysis Depth	Minimal	Root-Cause Focused
Plan Type	One Size Fits All	Custom per Equipment
Tech Use	Basic Logs	Real Time Dashboards
Cost Impact	High	Lower/Predictable
Downtime	Frequent	Reduced

ABRAJ ENERGY SERVICES' NEW APPROACH: DATA-DRIVEN AND PROACTIVE MAINTENANCE

Abraj Energy Services has responded to these challenges by adopting an RCM approach. This data-driven, proactive, and [proven](#) approach completely rethinks how the company plans and performs maintenance. Although it is an approach that has been used in other industries, Abraj Energy Services is among the early adopters bringing it to oil and gas drilling rigs:

“For us, the RCM, it’s a process to improve our maintenance... so that we can have an operation without any breakdown and any NPT. The RCM has been implemented in many industries... but here in oil and gas drilling rigs ...I think we are (among) the first to implement the RCM...”

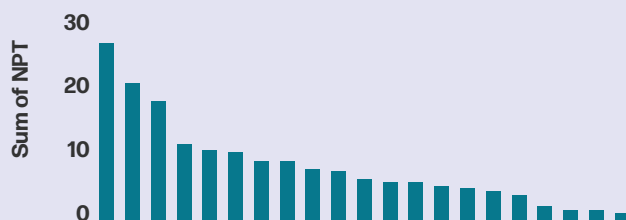
– Mechanical Preventive Maintenance Engineer at Abraj Energy Services

- **Data Collection and Quality:** Abraj Energy Services’ first step was ensuring high-quality data. They upgraded their SAP maintenance system to capture detailed records of every task and failure. Field technicians were trained to enter data consistently (using standard failure codes, checklists, etc.), and the team even audited historical records to clean them up. The goal was to have a reliable data foundation, as RCM decisions are [only as effective](#) as the data that informs them.
- **Failure Analysis (Learning from History):** With good data in hand, engineers performed in-depth analyses to identify recurring failures. Using Pareto’s [80/20 rule](#), they focused on the critical few systems causing the most downtime. Every failure report was examined to find root causes, not just symptoms, pinpointing which components failed most and why. An example of just one insight: a particular pump’s mechanical seals were failing frequently, not because of the seal material, but due to an improper installation procedure. Discoveries like this drove targeted changes to prevent recurrence.



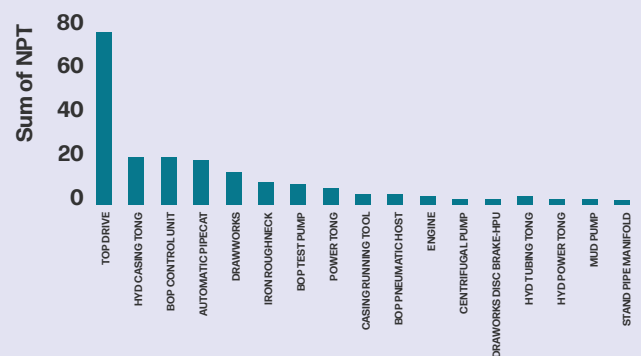
- SAP-Based Feedback Loop:** Abraj Energy Services established a closed-loop system using SAP. Reliability engineers issue monthly maintenance work orders via the platform, tailored based on the latest analysis. Field crews execute the tasks and then log detailed feedback on what was done and any anomalies found (including photos or data). Engineers at HQ review these reports, checking that tasks were completed properly and noting any emerging issues from the field observations. Then they refine the next month's plans accordingly. For example, if crews repeatedly find a certain bolt loose, engineers might increase the inspection frequency or improve the procedure for that bolt across all rigs. Using SAP as a single repository ensures nothing is overlooked – every maintenance action becomes part of the data for analysis.
- KPI Dashboards and Monitoring:** To keep the program on track, Abraj Energy Services introduced Key Performance Indicators (KPIs) and interactive dashboards (leveraging tools like Power BI). Process KPIs (e.g., % of work orders completed on time, average time to close tasks) ensure accountability, while outcome KPIs (e.g., equipment uptime, MTBF, total NPT hours) measure results. Power BI dashboards visualize these metrics so engineers and managers can spot trends immediately – for example, identifying which rig has rising downtime or ranking the top causes of NPT fleet-wide. Such visual analyses quickly highlight outliers (e.g., Rig B had three pump failures while Rig A had none) and help justify proactive changes, such as installing better sensors on a troublesome piece of equipment or retraining a crew.

Rig NPT



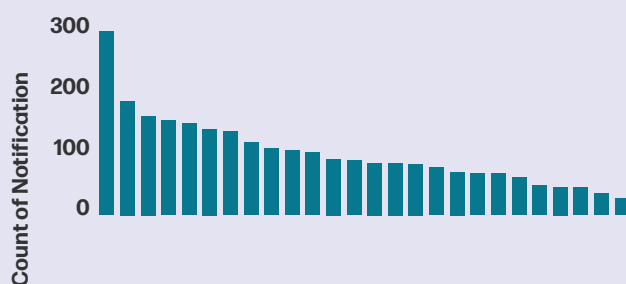
Main WorkCtr

Equipment NPT



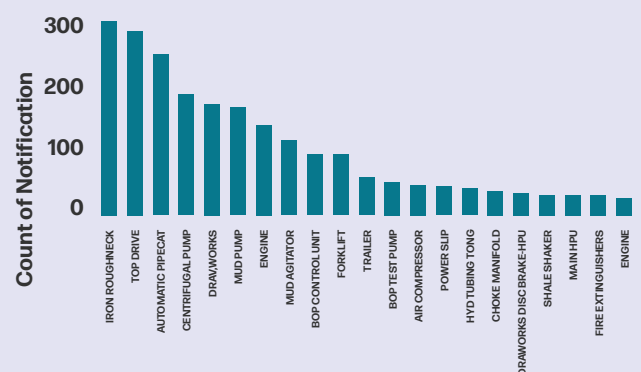
Equipment Name

Equipment Failure Rig Wise



Main WorkCtr

Equipment Failure



Equipment Name

In short, these tools translate large amounts of data into actionable insights and communicate progress clearly to everyone, including upper management.

“...by using the Power BI dashboard, [we] analyze all those data, and it will be clear to us... what the big failure is and what function is failing most, and what are the most NPT... and by preventing that, what will we be saving...”

– Abraj Energy Services maintenance engineers

- **Modular Maintenance Planning:** Abraj Energy Services changed from one-size-fits-all schedules to tailored maintenance modules for each critical equipment type. Based on RCM insights, engineers created custom maintenance plans for problem components. For example, they developed a special module for a generator model that tended to overheat: an extra inspection at mid-interval focusing on its cooling and fuel systems, beyond the standard schedule. They also introduced new procedures (such as a revised SOP for pump seal installation to prevent the earlier failures). Each module targets a specific reliability risk and is implemented through SAP work orders, just like routine tasks. Over time, Abraj Energy Services built a library of these modules and rolled them out to more assets. This phased approach – piloting on the worst offenders first and then expanding – managed the complexity and acknowledged that full RCM implementation is a multi-year journey.



ADVANTAGES OF THE RCM APPROACH

Abraj Energy Services' RCM program represents a major improvement over the legacy maintenance approach, delivering improved reliability through [proactive](#) and intelligent design. Several factors make this approach advantageous:



Data-Backed Decisions and Proactive Intervention

Maintenance is now guided by data rather than fixed schedules or guesswork, a recognized [industry](#) best practice. By spotting patterns in data, Abraj Energy Services intervenes before a failure is likely. For example, they might adjust a service interval or proactively replace a part based on analysis, instead of waiting for a breakdown. This prevents surprises and targets known risks directly, in stark contrast to the old reactive approach.



Reduced Non-Productive Time

The most tangible win is the significant reduction in downtime. Major breakdowns occur far less often now (as demonstrated in the next section's data), so rigs spend more time drilling and less time waiting for repairs. Every avoided hour of downtime is an additional hour of productive work, directly boosting efficiency and revenue. Cutting NPT is a major competitive advantage that enables Abraj Energy Services to deliver projects faster for clients.



Use of Engineering Expertise

Under RCM, Abraj Energy Services' maintenance engineers are no longer simply following routine schedules; they're diagnosing problems and crafting solutions. This elevates them from task executors to true problem-solvers. Their expertise in failure modes now directly improves the maintenance plans. In practice, issues that previously went unaddressed are now dissected and resolved at the foundation. In this way, the company is leveraging its engineers' full skill set to drive reliability improvements.



Optimized Maintenance Intervals and Tasks

RCM has refined what maintenance is performed and when. Some tasks are now carried out more often to prevent recurring issues, while others are undertaken less frequently if they are not delivering value. This eliminates unnecessary work and frees up resources for critical tasks. For example, if filters were being changed too frequently with no added value, that frequency was reduced, allowing more attention to be focused on a truly critical component instead. Conversely, if a lubricant is found to degrade faster in the field, the lubrication interval is shortened. Such adjustments extend equipment life and reduce failures without increasing workload.



Material and Cost Savings

Fewer breakdowns translate into significant cost reductions. Parts last longer and do not need emergency replacement as frequently, which means less money spent on rush orders and fewer consumables used. Planning maintenance rather than reacting to failures also saves money: it allows for replacements at convenient times (such as between wells) rather than costly last-minute airfreights to remote sites. Labor costs improve too – crews spend significantly less time on overtime for urgent repairs, which saves budget and reduces fatigue. Over time, Abraj Energy Services has seen the maintenance cost per operating hour decrease, demonstrating RCM's financial payoff.



Improved Maintenance Quality and Safety

With the team no longer constantly in a reactive state, they can perform maintenance more deliberately and thoroughly. The feedback loop ensures procedures are followed correctly and continuously improved. Crews now have the time to execute tasks properly – even double-checking if something seems amiss – instead of cutting corners to rush a rig back online. Higher-quality maintenance, in turn, leads to even fewer failures, creating a positive feedback loop. It also improves safety: well-maintained equipment is far less likely to fail catastrophically, so both personnel and assets are better protected.

By combining data, expert analysis, and proactive planning, maintenance now anticipates and prevents problems rather than just reacting to them. The result is a safer, more efficient operation that maximizes uptime and minimizes waste – a clear win by every measure.

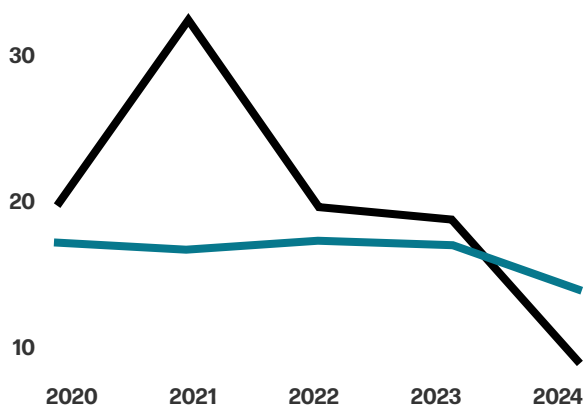


DEMONSTRATED IMPACT: RELIABILITY AND PERFORMANCE GAINS

Abraj Energy Services' implementation of RCM has translated into concrete, measurable improvements:

- **Reduction in NPT:** Comparing the year before the RCM approach was adopted to the year after, Abraj Energy Services saw non-productive time reduced significantly. Rigs now spend far more time drilling instead of waiting for fixes. This reclaimed time allows Abraj Energy Services to finish wells faster, directly benefiting clients and boosting revenue.

**Average NPT Hours vs
Average Repair Cost by Year**



● Average NPT Hours ● Average Repair Cost

- **Significantly Fewer Breakdowns:** Major equipment failures have become much rarer. Components that previously failed regularly now operate for longer periods without incident. A pump that averaged five failures per year before RCM might now experience only one minor issue annually – some rigs even report zero unplanned failures on key systems. By addressing root causes (such as the seal installation process), recurring failures have almost ceased. Fewer breakdowns mean reduced downtime and less disruption from un-

expected outages. Operations are now more predictable and stable.

- **Improved Maintenance Quality and Consistency:** RCM has led to clear improvements in how maintenance tasks are executed. Internal audits show that work orders are now completed on schedule and according to specifications far more consistently. Field teams closely follow the new procedures, and any deviations are corrected in the next cycle. For example, after introducing a new step-by-step SOP for the previously referenced pump's seal installation, installation errors dropped significantly, and seal failures essentially disappeared the following year. This level of consistency was previously difficult to envision, as crews frequently operated under the strain of recurring equipment failures. Now, every rig is maintained to the same high standard, resulting in uniformly reliable equipment performance.
- **Higher Crew Efficiency and Morale:** With far fewer emergencies, the maintenance crew's workload has leveled out into more planned, manageable tasks. Technicians report they can spend more time on preventive maintenance and even training, rather than hurrying from one urgent fix to the next. This calmer, proactive work environment is less stressful and more satisfying. Morale has improved – the team takes pride in the downtime reduction their efforts have achieved. A motivated, well-trained crew, in turn, reinforces the reliability of improvements, creating a positive feedback loop.

- **Enhanced Client Satisfaction:** Clients have noticed the difference. Rigs now complete jobs on or ahead of schedule more often. For instance, a campaign expected to take 60 days might previously have slowed to 65 due to breakdowns, but now it can be completed in 58 days. In a competitive market, this reliability gives Abraj Energy Services a reputation for operational excellence, resulting in repeat business. Essentially, RCM is a quiet yet powerful way to ensure customer expectations are met without issue.

Proof of Value: RCM at Abraj Energy Services has reduced downtime, turned breakdowns into rare events, ensured maintenance is performed properly, and left both crews and clients happier. These results prove that RCM isn't just a theory but a proven, strategic enabler of business value in oil and gas operations.



STRATEGIC AND COMPETITIVE ADVANTAGES GAINED

Beyond immediate performance metrics, Abraj Energy Services' implementation of RCM has yielded several **strategic advantages** that strengthen the company's position in the market:

- **Operational Efficiency:** With higher uptime, Abraj Energy Services drills more efficiently. By minimizing unplanned outages, rigs complete wells faster with fewer disruptions. Consistently finishing projects on time or ahead of schedule now sets Abraj Energy Services apart from competitors still hampered by breakdowns. RCM has effectively made operations leaner and more productive – a strong selling point to customers who demand reliability.
- **Cost-Effectiveness and Competitive Pricing:** RCM-driven savings (including fewer emergency repairs, optimized parts usage, less overtime) give Abraj Energy Services a financial edge. These efficiencies allow the company to bid with greater confidence, knowing that its rigs are less likely to incur costly downtime. This reliability cushion enables Abraj Energy Services to handle unexpected issues without causing budget overruns. Increased reliability also helps preserve equipment value (through less severe damage, longer asset life), reducing capital spending on replacements. This makes Abraj Energy Services a cost-effective operator in an industry where budgets are carefully considered.





- **Future-Ready Infrastructure (AI and Advanced Analytics):** By building a centralized, digital maintenance knowledge base, Abraj Energy Services has laid the foundation for next-generation technologies. Thanks to years of clean data, the company is now able to apply AI/machine learning to predict failures or optimize maintenance schedules automatically. Abraj Energy Services has started using advanced condition-monitoring tools (including oil analysis, infrared thermal scans, vibration sensors) that feed additional data into the system. When paired with AI, these tools can flag issues before they become visible to human operators – signaling the shift toward true predictive maintenance. Importantly, Abraj Energy Services first focused on getting the fundamentals right, avoiding AI in its early stages. This was to ensure that any new AI or Internet of Things (IoT) enhancements would augment an already robust process, rather than trying to compensate for a flawed one. This head start positions the company to adopt emerging technologies more rapidly and effectively than its peers, staying ahead of industry trends.
- **Pioneering Leadership:** Abraj Energy Services' success with RCM has made it a regional pioneer. While RCM is not new globally (other industries like aviation have applied it for decades), its application to land rigs in the Middle East is relatively novel. Abraj Energy Services is among the first in the region to implement RCM at this scale, providing a first-mover advantage. It gives Abraj Energy Services a knowledge lead – practical RCM experience that competitors lack and will need time to develop. If industry standards evolve to demand greater reliability (for instance, through stricter NPT clauses in contracts), Abraj Energy Services is already operating at that high level, essentially setting the benchmark that others will have to follow.

In summary, Abraj Energy Services' RCM initiative doesn't just improve maintenance metrics – it translates into strategic business gains. The company runs more efficiently at lower cost, is positioned to adopt future technology easily, and has secured a reputation as a leader in its market.

ADVICE TO INDUSTRY PEERS: KEYS TO RCM SUCCESS

Implementing RCM is a major undertaking, but Abraj Energy Services' experience offers these key lessons to others who want to improve their chances of success:



Invest in Clean, Accurate Data

Ensure you have reliable maintenance and failure data from the outset. Set up an effective CMMS (like SAP, Maximo, etc.) and enforce consistent data entry for every maintenance job and breakdown. If existing records are incomplete, take the time to correct them and standardize entries (remove duplicates, ensure each asset and failure is logged correctly). Abraj Energy Services found that training field staff to input detailed, standardized information (clear failure codes, run hours, conditions) was foundational – ‘good data in means good analysis out.’ An initial data cleanup effort will return dividends throughout your RCM program.



Dedicate Personnel to RCM Efforts

Treat RCM as a strategic project – assign dedicated people to drive it. Whether it's appointing a full-time Reliability Engineer or forming a focused task force, ensure they have the time and authority to analyze data, identify insights, and coordinate changes. Abraj Energy Services did this by assigning specific engineers to focus on RCM analysis full-time. Select individuals with the right skills or provide the necessary training – they should understand maintenance engineering, reliability methods, and be comfortable with data analysis tools. If those capabilities are lacking in-house, invest in training or hiring. The bottom line: if no one owns RCM, it risks being rushed and shallow. Staff your reliability initiative like a core project, not a side task.



Educate and Engage the Whole Team

Educate engineers and managers on RCM principles – formal reliability training or certifications can help everyone speak the same language. Equally important is engaging the front-line maintenance crews. Explain why the approach is changing and show them how their feedback is vital to success. Abraj Energy Services holds monthly site team meetings to review recent failures, share data insights, and preview upcoming maintenance changes – transforming field technicians into active partners rather than passive recipients of new instructions. Encourage a culture where technicians perform tasks, report anomalies and suggest improvements – they often know the equipment best. In short, overcome the mindset of ‘maintaining the status quo’ by communicating clearly and involving staff at all levels. When the whole team understands the purpose and sees progress, they'll be **more likely to embrace** the shift.



Leverage the Right Tools and Technology

Use modern tools to manage RCM's data-intensive demands. A centralized maintenance system is essential – Abraj Energy Services' use of SAP as the single source of truth for all maintenance and feedback was a major enabler. Complement this with analytics and visualization software (Power BI, Tableau, or similar) to process data and highlight trends. These platforms automate KPI tracking and present insights in a format that's easily digestible for both engineers and executives. Additionally, consider adopting condition-monitoring technologies (vibration sensors, oil quality sensors, thermal imaging, etc.) to collect real-time health data. Abraj Energy Services has implemented these methods (thermal scans, vibration monitoring) to detect early warning signs. The key is selecting technology that fits your operations and ensures your team can manage the data it produces. Smart use of software and sensors will multiply the effectiveness of your RCM efforts without overwhelming your workforce.



Be Patient and Commit for the Long Term

RCM is a journey, not a destination – it can take many months or years to see full results. Early on, costs may increase (extra analysis work, some downtime to implement improvements) with little immediate payoff. Don't be deterred. Leadership must commit to allowing RCM time to work. Abraj Energy Services approached the first phase as a pilot, allowing space for results to emerge. Set realistic expectations: the first year may be focused on data collection and process design; bigger gains follow in year two. Track progress and celebrate interim milestones (e.g., a 10% downtime reduction, then 20%, etc.) to maintain momentum. Be flexible and ready to iterate – RCM can and should evolve over time. The greatest risk is giving up too soon because the return isn't instant. For Abraj Energy Services, the payoff was significant – but it came only after sustained, consistent effort. Perseverance is critical. Commit fully, and the long-term savings and reliability the gains will follow.

By following these guidelines – focusing on data, people, education, technology, and long-term commitment – industry peers can greatly increase their chances of replicating Abraj Energy Services' success with RCM. Reliability Centered Maintenance can transform operational performance, but it must be approached methodically and with dedication.

CONCLUSION

By solving today's reliability challenges with RCM, Abraj Energy Services has created a springboard for tomorrow's advancements. As RCM continues to evolve – potentially integrating AI and meeting stricter industry norms – the company is well-positioned to stay at the forefront of oil and gas maintenance. Its pioneering efforts not only secure its competitive future but also set an example for peers, showing the immense value unlocked when a business challenges the status quo and pursues operational excellence through innovation.

For more information, please visit [our website](#)

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