



Intelligence for Turnaround Execution



A worker in a blue uniform and yellow hard hat is using a tablet in a factory setting. The worker is standing in front of a large industrial machine, possibly a mill or grinder, with a large vertical shaft. The background shows a complex network of pipes and machinery in a dimly lit industrial environment.

Turnaround and shutdowns are crucial and expensive events which if not executed flawlessly, can significantly impact our profitability, particularly in today's challenging market environment.

Achieving turnarounds on scheduled time and within budget is a rarity. Success hinges on availability of precise information, timely availability of equipment, materials, and skilled workforce. In our industry, a staggering 90% of turnarounds exceed their budget, time, or fail to meet quality standards. A mere 40% labor productivity is often deemed acceptable, primarily due to information gaps or inaccuracies. Embracing digital methods has the potential to address these inefficiencies, potentially reducing time to address issues by more than a third.

This article draws upon our experience to provide valuable insights and actionable strategies to enhance management of turnarounds.

The Dynamics of Turnaround Management:
**From Prevention to
Efficient Adaptation**

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Turnarounds, which serve as planned intervals for equipment maintenance and catalyst replacement, play a pivotal role in preventing costly and unplanned downtime due to equipment breakdowns. However, these strategically scheduled breaks, come with their own set of complexities. The intricate nature of turnarounds coupled with equipment that operates under constant stress, often leads to unexpected discoveries, commonly referred to as 'scope creep'.

Ideally, every aspect of a turnaround would strictly adhere to its initial plan. Nevertheless, the multifaceted intricacies of refinery processes and the diverse interests of involved stakeholders frequently deviate from this ideal scenario. Contractors, who may not be completely familiar with the nuanced aspects of the assets, further complicate matters by increasing the complexity of managing large volumes of information.

Interestingly, the main obstacles in turnarounds are not always rooted in technical expertise or unforeseeable events. More often than not, the key issue is obtaining timely and accurate information, whether it's about equipment status, progress updates, or the availability of resources. This underscores the need to shift from strategies designed for merely preventing issues to adeptly managing them.

Ultimately, a successful approach to managing turnarounds combines a strong commitment to the original plan with the agility to adapt to necessary changes. Such a balanced strategy ensures the achievement of operational goals without overstepping timelines or budgets.



Pain Point & Pitfalls Of Managing A Turnaround

Turnarounds (TAs) in refineries and other large-scale industrial settings can be subject to a myriad of potential issues that can result in delays. Below are the most common types of issues that TA team deal daily with on a daily basis during a Turnaround.

- 1. Equipment and Inspection Delays:** Inspecting equipment can sometimes take longer than expected, especially if unexpected wear or damage is discovered.
- 2. Tool and Equipment Malfunctions:** The breakdown or malfunction of critical tools and equipment can halt work until replacements or repairs are made.
- 3. Personnel Health and Safety:** Injuries, illnesses, or other health-related incidents can cause immediate stoppages, especially if personnel are critically affected.
- 4. Confined Space Challenges:** Working in confined spaces requires special equipment, training, and procedures. Oversight or unanticipated challenges can cause delays.
- 5. Material Shortages:** Delays can occur if necessary materials, parts, or components are not available when needed, whether due to supply chain issues, logistics, or oversight.
- 6. Scope Creep:** The expansion of a project's scope beyond its original parameters, often due to unforeseen complications or changes in requirements, can extend the duration of the TA.
- 7. Technical and Expertise Limitations:** Encountering a problem that the present team lacks the expertise to address can cause delays until specialists are consulted or brought in.
- 8. Weather and External Factors:** Outdoor turnarounds can be sensitive to weather conditions. Rain, extreme temperatures, or other adverse weather events can slow down or halt operations.

Traditionally, Different teams or individuals may end up using various channels to report or discuss each or a group of issues highlighted above. This fragmented approach can lead to missed messages, redundant efforts, or misinterpretations. Miscommunication exacerbates these issues, leading to the following negative effects:

- **Delayed Issue Identification:** Without a centralized system, issues may not be reported in real-time, causing delays in addressing them. The longer an issue persists without being addressed, the more it can affect ongoing tasks.
- **Loss of Critical Information:** Important details about the issue may be lost or not get captured at all. This can hinder the resolution process, leading to more time and resources to gather necessary information. Additionally, it can lead to incorrect prioritization leading to less critical problems being addressed before the more urgent ones.
- **Resource Misallocation:** In the absence of a clear view of all reported issues, it becomes difficult to allocate resources optimally. This can lead to either over-allocating resources to minor problems or under-allocating to major ones. Additionally, multiple teams might work on the same issue unknowingly, leading to wasted effort and resources.

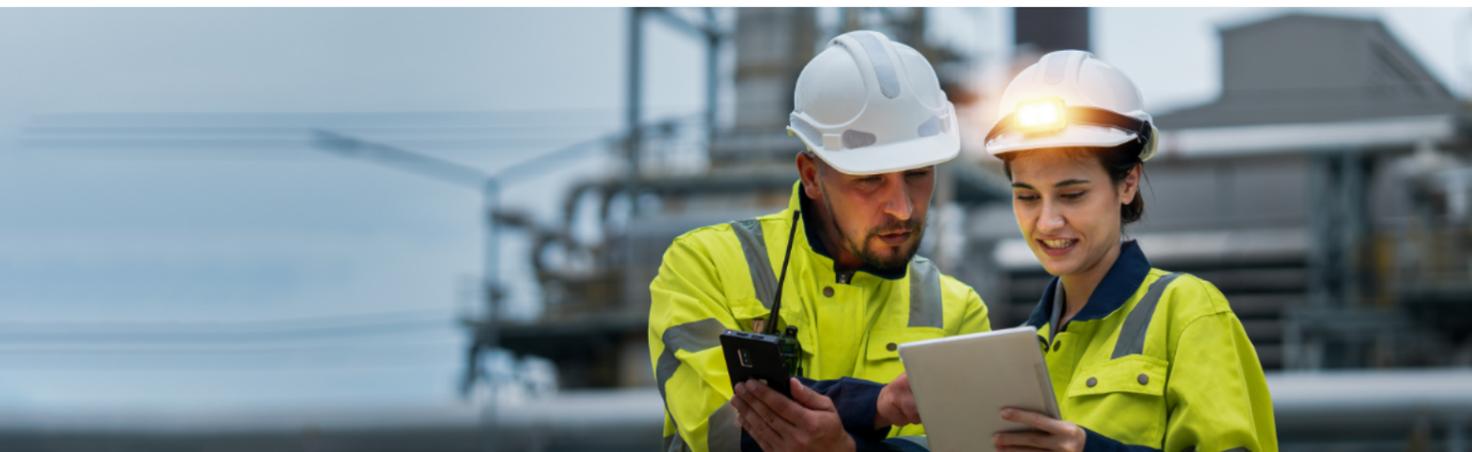
In a dynamic environment like a Turnaround (TA), where every minute counts these challenges can quickly compound, leading to significant delays, cost overruns, and operational inefficiencies.

Without a streamlined process, significant time can be wasted in simply figuring out how, where, and to whom to report an issue, in addition to navigating a fragmented communication system.

An efficient detection and information management system, while seemingly a simple administrative tool, can play a pivotal role in ensuring smooth operations and optimal productivity.



**Intelligent For
Turnaround
Operations and
Response Engine**



Intelligent FOR Turnaround Operations & Response Engine

While industries today make use of a wide range of operative digital tools, such as sensors, historians, distribution control systems (DCS), Centralized maintenance management systems (CMMS), PIMS software, LIMS, and much more there are limited systems in place to effectively manage an event that can influence 10% to 20% of annual non-feedstock spend, consume up to 50% of plants' total annual maintenance budget, and have the potential to impact facility uptime and quality by 5% to 10%.

Bringing Intelligence is crucial for efficient management of routine challenges faced during turnarounds. By integrating cutting-edge technologies like AI, IoT, and 5G into its design, the effectiveness of the turnaround management can be substantially enhanced. Advanced features, including visual recognition and real-time monitoring of operational conditions, further bolster the system's proactive identification and resolution capabilities saving crucial manhours which can be re-invested in issue resolution.

The STO assistant from T-Pulse operates as the operational nerve center, especially crucial in industries that demand immediate and coordinated actions. This is particularly true for industries like refinery operations where any delay, miscommunication, or oversight can lead to significant financial, operational, and safety consequences.

While selecting a Intelligent Turnaround Operations & Response Engine, it is essential to ensure that the software includes the following capabilities:

- **AI for inspection Image Scanning & Recognition for faster issue detection:**

- Utilizing AI-driven image processing, the system can automatically identify potential issues in visual inspections, such as rust, cracks, leaks, loss of insulation, biological growth, or other visible anomalies.
- If using specialized inspection cameras (e.g., thermal cameras), the system should be able to receive, analyze, and store these images/videos.

- **AI for Safety Hazard Detection:**

- Through AI-powered image recognition, the system can identify safety hazards

such as PPE, Breach of SOP, Vehicle and Road Safety, Lifting and Hoisting, Dropped Objects, etc., and flag any violations over handheld for immediate action.

- IoT enabled Monitoring system for Confined Spaces:
 - Integrate with IoT sensors placed in confined spaces to monitor conditions like oxygen levels, temperature, and presence of toxic gases. The system should generate immediate alerts if conditions become unsafe.
 - Additionally, Live feed from cameras placed in confined spaces can be monitored for any visible issues or emergencies. AI can be used to detect anomalies in worker behavior that may indicate distress.
 - Ensure that the system can count and track the number of workers entering and leaving confined spaces, ensuring that no one is left behind.
- Drone Integration:
 - For areas hard to reach or unsafe for manual inspections, drones equipped with cameras can capture visuals. The Platform should then be capable of receiving, analyzing, and storing this data.
- Realtime communication
 - Workers can instantly report issues or anomalies through handheld devices, ensuring rapid response.
 - These devices can support push notifications, allowing immediate dissemination of critical alerts or messages to all connected workers.
- Data Collection & Submission:
 - Workers can capture images, videos, or audio recordings using the device's built-in cameras and microphones and upload them directly to the TORE.
 - Integration with other tools: The handhelds can interface with other equipment (like barcode scanners) for easy data input.
- Task Management & Checklists:
 - Workers can receive their tasks directly on the handheld, with the ability to mark them as completed, ensuring everyone is aligned with their duties.
 - Interactive checklists can guide workers through complex processes, ensuring no steps are missed.

- **Live Streaming for Unbiased Visibility:**

- **Wearable Cameras:** Equipping field personnel with wearable cameras to stream their activities, providing transparency, allowing off-site experts or supervisors to observe, guide, and ensure compliance without being physically present.
- **Drone Surveillance:** Drones can provide aerial live feeds, especially useful for large sites. They can offer a broad perspective on activities, logistics, and compliance.
- **Secure & Optimized Streaming:** Leveraging 5G can ensure high-quality, real-time streaming without lags, especially important for critical observations.

Data Sources For Smarter Turnarounds

-  Operational and Asset Data
-  Work Management Systems
-  Project and Scheduling Tools
-  Field Data and Mobile Inputs
-  Historical and Benchmark Data
-  Safety and Compliance Data
-  Integrated Digital Platforms



Transformative Outcomes:

Navigating the Digital Revolution in Turnaround Success



Transformative Outcomes: Navigating the Digital Revolution in Turnaround Success

With the implementation of an Intelligent Turnaround Operations & Response Engine (iTORE), industries are ushering in a revolution in Safety, Asset Inspection, and Issue Resolution for faster Turnarounds. Here's some insights from experience:

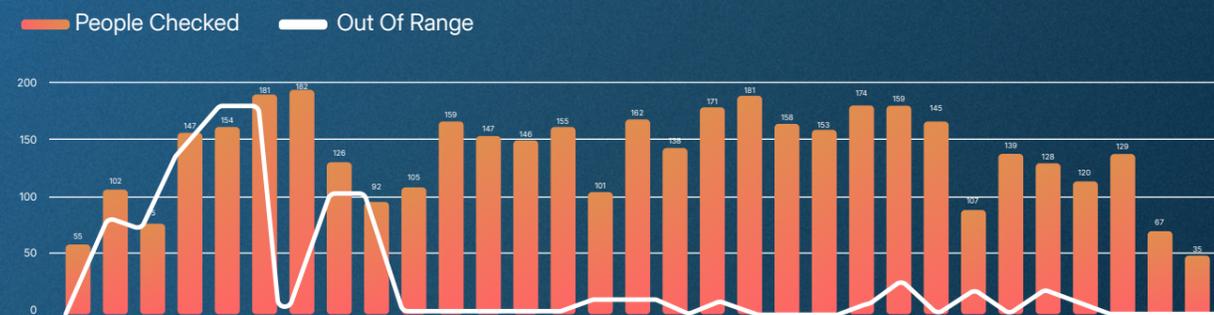
AI-Driven Safety Protocols: Amplifying Productivity Through Prioritized Focus

Safety management during a Turnaround often involves repetitive checks that can be time-consuming and can occasionally divert teams from core tasks. AI integration in safety management promises not only to enhance safety protocols but also to drive productivity by ensuring teams allocate their time where it matters most.

By integrating AI with CCTV and on-site cameras, T-pulse can automatically detect safety Hazards. Recognizing that not all safety concerns hold the same weight, T-Pulse analyses and ranks safety concerns based on urgency and severity, ensuring that teams address the most critical issues first.

Instead of manual logging of safety checks, T-Pulse automates this process, ensuring both accuracy and freeing up of safety team's time, allowing them to focus on more strategic safety initiatives.

People Checked vs. Out Of Range Cases During Turnaround



T-Pulse has identified more than 5Mn observations . However, what truly mattered was how these insights were utilized. Instead of simply triggering alarms or sounding hooters, the safety teams received actionable insights that were categorized by risk levels. Additionally, they were also kept informed on trending safety issues for each area. This helped safety teams to implement a calibrated and multipronged approach, which reduced the non-compliances by more than 40% by the end of the turnaround

Similarly, people were assessed for fitness to work through self-check stations that utilized IoT enabled sensors. The information from these sensors were used to intelligently alert the field medical staff on when and where a person needed medical assistance. Within the first few days more than 100 people were screened for health assistance.

Empowering Rapid Insights by improving Asset Inspection Efficiency

Through the implementation of a unified dashboard that consolidated the inspection process, our clients achieved an unprecedented level of clarity and control. This integration led to a remarkable 200% improvement in resolution time through accelerated decision-making. The inspection engineers could now swiftly identify anomalies and deviations faster, share relevant information with experts who can populate recommendation, offer guidance for rapid and safe repairs, and notify maintenance engineers about additional tasks on a centralized platform.

One of the most notable enhancements was the rapid identification of previously unidentified issues. These are challenges that traditionally remain concealed until assets are physically opened and inspected. Leveraging the advanced capabilities of iTORE, what previously took 3-5 days was now accomplished within few hours. This expedited insight empowered the client with early visibility, enabling them to strategically anticipate and plan for upcoming activities.

With this newfound efficiency, the client successfully executed more than 150 new maintenance activities. The decision-making process, previously hindered by delays and fragmented information, was supercharged, registering a two-fold increase in speed and precision.

In essence, iTORE didn't simply streamline operations; it fundamentally transformed them. By bringing unidentified issues to light faster and providing a comprehensive view on a centralized platform, the system established a new paradigm in asset inspection efficiency during turnarounds.

Intelligence Implementation Process



Real-Time Issue Resolution: The Catalyst for Enhanced Maintenance Efficiency

Historically, industries have relied on traditional communication methods for its maintenance operations. This often meant that by the time an issue was communicated, diagnosed, and acted upon, valuable operational hours were lost. The lack of real-time visibility meant that remote experts and decision-makers couldn't directly observe or assess the problems, which added layers of delay to the resolution process.

By leveraging live-streaming capabilities with real time communication capabilities, iTORE opened a window to real-time on-ground operations, bridging the communication gap like never before.

With live streaming, as soon as a technician identifies an issue, not only is it communicated, but it is also visually shared with relevant stakeholders. This direct visual insight enables immediate assessment and informed decision-making. If a technician encounters a perplexing issue, they can live-stream the scenario to experts or colleagues. This facilitates real-time collaborative troubleshooting, drastically reducing diagnostic times.

Additionally, the real time communication allowed Supervisors and managers to be always informed on issues. When a technician requires a specific tool or part, the logistics team can see exactly what's needed via the live-stream, ensuring precise and rapid resource provisioning.

Following the incorporation of live-streaming and real time communication (RTC), the company witnessed a transformative boost in its maintenance efficiency. Issue

resolution time shrunk dramatically, and the company benefited from increased operational productivity. The newfound transparency also fosters a culture of collaboration and accountability among the teams.

Integrating live-streaming with RTC isn't just a technological leap; it represents a comprehensive shift in maintenance operations. This union ensures that accurate, visual information is available to the right stakeholders instantly, driving a more proactive, efficient, and transparent maintenance approach.

Cumulative Maintenance Issue Resolution Over Time





Conclusion

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As the dynamics of the refinery industry continue to evolve, the essence of successful turnaround management lies in harnessing the power of emerging technologies. The integration of AI, IoT, and real-time communication platforms, manifested through tools T-Pulse, showcases the profound potential of this evolution.

It's not just about reducing inefficiencies; it's about reimagining the way refineries operate during crucial turnarounds. By embracing these advancements, refineries can significantly mitigate operational risks, maximize productivity, and ensure the sustainability of their operations.

However, it's crucial to understand that the digitization of turnarounds isn't a golden pill. They serve as catalysts for process enhancement rather than standalone solutions. With a myriad of options available, operators must discern their objectives, emphasizing a comprehensive system integration over piecemeal technological acquisitions. It's not merely about reducing inefficiencies; it's about reshaping how refineries approach pivotal turnarounds.

The future of turnaround management beckons, replete with innovation, effectiveness, and promise. It is here, and it's technologically charged, efficient, and promising.

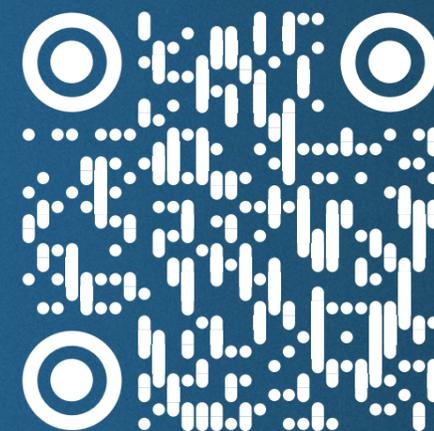
Plot a Proactive Route to Workplace Safety, Productivity and Sustainability with T-Pulse

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