

Optimising Alumina Production Through Advanced Process Monitoring and Alert Systems

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Abstract

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Alerting systems are critical for maintaining operational excellence, providing timely notifications that enable rapid responses to potential challenges. This innovative system integrates intelligent automation with comprehensive monitoring to optimise industrial operations. The core approach combines automated task management with sophisticated data gathering. Its flexible data collection capabilities allow seamless integration of diverse information sources, creating a holistic operational overview and by automating repetitive processes, the system frees organisational resources for strategic decision-making. The system's key strengths include customised reporting that transforms raw process data into actionable insights, enhancing decision-making precision. A unique feature is the dynamic procedure attachment, which directly links relevant procedural documents to specific alerts, empowering teams to respond swiftly and confidently. Beyond merely tracking events, this comprehensive approach guarantees enhanced safety, reliability, and operational efficiency. By leveraging advanced automation and intelligent data management, the system represents a significant technological advancement in industrial monitoring, fundamentally transforming how organisations approach operational management and continuous improvement. Some of the processes monitored by our tool includes:

- Monitoring of radioactive devices as per governmental regulations.
- Tracking product quality indicators as agreed with our customers.
- Tracking the regular testing of safety devices across the refinery in line with EGA's EHS requirements.
- Monitoring high voltage critical equipment across all of refinery's substations

Keywords: Robotic process automation, Operational technology, Process information management system, Digital transformation, Alerting and events reporting.

1. Introduction

Alerting and reporting systems are indispensable tools for manufacturing industries, empowering organisations to monitor operations in real-time, maintain quality standards, optimise efficiency, ensure regulatory compliance, and drive continuous improvement. Despite being one of the most modern alumina refineries in the world, EGA's Al Taweeleah alumina refinery also faced challenges with robust and efficient alerting given such a diverse range of applications and data sources that comprises the suite of solutions required to run and monitor the process. The main reason that drove the development of this tool was the need for highly customisable alerts based on process parameters which are especially dynamic on a greenfield refinery.

2. Automated Customised Reporting

The need for customised reporting emerged from the operations as a requirement to automate rule-based process condition alerts and screen capture of existing monitoring pages into scheduled

reports. As these processes matured, we expanded the scope into health alerting systems as well. You can see in Figure 1 the evolution of the Robotic Process Automation (RPA) system as we incorporated more features to it and what each block is comprised of:

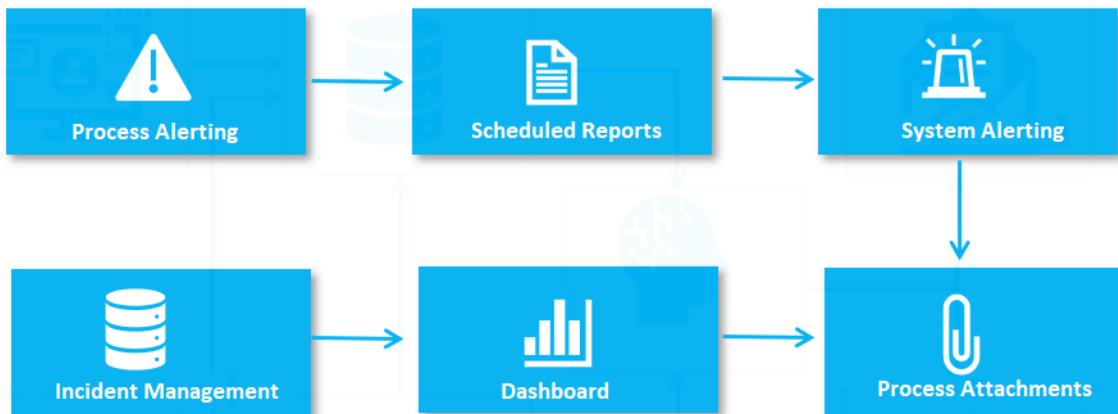


Figure 1. Al Taweelah alumina Robotic Process Automation (RPA) system.

- Process Alerting: Includes rules for email alerting based on process conditions and caters requirements from technical, maintenance, or production departments.
 - Inputs are from process data or process events.
- Scheduled Reports: Provides automated reporting based on a fixed schedule and can have dynamically built designs or take screen capture of other applications that have their own reports or system status screens.
 - Inputs are from process data, process events or web applications.
- System Alerting: Added alerting for the technical department to monitor the system health and react pre-emptively to issues. Allows us to bring alerting from several different systems into one place and to create custom trigger rules to map different types of issues from the same system to different alerts.
 - Inputs are from applications, Windows services, and Windows Scheduled Tasks.
- Procedure Attachment: Improved the system alerting by mapping the alerts to specific procedures on how to address them to optimise even further the troubleshooting and make the fix more consistent regardless of engineer.
- Dashboards: Provides a centralised hub for all alerts and reports with historical search capabilities. Real-time health monitoring of technical department systems with status indicators. Advanced analytics that identify failure patterns to prioritise system improvements.
- Incident Management: Enables an end-to-end solution for handling system failures. Allowing users to log these alerts as formal incidents, either through the web portal or by directly responding to notification emails. Each incident captures critical metadata including the affected system, model information, error types, and timestamps, creating a structured record for tracking. The platform guides incidents through a defined lifecycle from creation to resolution, enabling assignment to responsible parties, real-time status updates, and collaborative troubleshooting. The system stores all resolution details including root cause analysis and corrective actions, building an institutional knowledge base that facilitates searching through previous similar incidents to speed up troubleshooting.

2.1. Custom vs Off-the-Shelf

While numerous commercial alerting solutions exist in the marketplace we benchmarked applications such as UiPath [1] and Microsoft Power Automate [2] for task automation and ManageEngine Applications Manager [3] for system monitoring, our requirements highlighted many key areas that favoured implementing an in-house developed system. Mainly, but not limited to the fact that the specialised requirements of industrial monitoring environments demand

The timeline for implementing these enhancements is not yet defined, as we are still focused on expanding the current scope and bringing the same level of enhanced monitoring to more applications throughout the refinery.

8. References

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