



Asset Performance Management (APM) Infrastructure Integration & Technical Services

The Asset Performance Management (APM) Technology Infrastructure supports the facility in executing the scope of activities required for managing the assets during the operations and maintenance phase. The key objective of this infrastructure is to ensure that all data collected from the Operational Technology (OT) (e.g. PLC, DCS, CMS) and the Information Technology (IT) (e.g. Oracle eAM, SAP) systems is consolidated and transformed into asset intelligence to support effective decision making so that the Asset Management Objectives are achieved in a manner consistent with the asset management processes and activities. Moreover, the APM Infrastructure supports initiatives for digitalization, autonomous reliability and maintenance management, and predictive-maintenance with application of predictive analytic technologies (e.g. machine learning models).

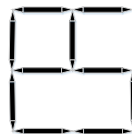
Phoenix Engineered Solutions Inc. (Phoenix) APM Technology Infrastructure integration and technical services includes:

- APM Infrastructure functional requirements preparation
- APM solution architecture and options selection
- APM modular component development and integration

APM Infrastructure Functional Requirements Document:

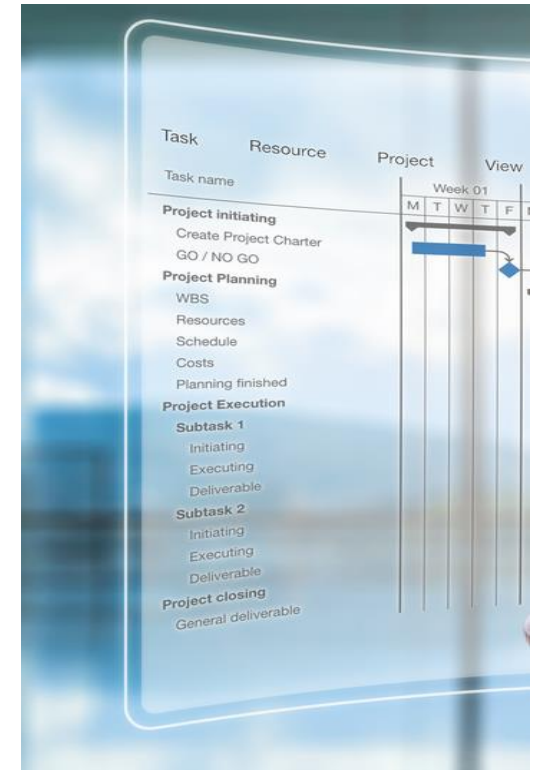
Through structured facilitation we work with our clients to develop the APM Technology Infrastructure Functional Requirements document, which addresses:

- Key business use-cases and features to support the asset management processes and activities. This information will be essential inputs for specifying the modular components of the infrastructure, its representative data/ information flows, and the roles interfacing with the infrastructure.



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*APM Technology
Infrastructure*



- The data processing specifications and criteria for OT and IT vendor packages. These specifications and criteria will determine where the data is best analyzed and processed, at the source of origin (i.e. the Edge) or in centralized data centres (i.e. the Cloud).
- The control specifications used to develop the Digitalization Platform (i.e. Asset Centric Digital Twin, Edge and Cloud Computing, Cybersecurity, Data Historian).
- The design specifications for the Condition Monitoring System (CMS) (based on the primary failure modes for critical assets), which defines the system functional requirements, the specific features to be incorporated, the reliability and performance requirements, and the acceptance criteria.

- The plans and requirements for the Advanced & Predictive Analytics Program, which defines the desired operational capabilities of the program.
- The control specifications to ensure that the Digitalization Platform, OT and IT Technologies, and APM applications integrate and function seamless within the infrastructure.

APM Solution Architecture & Options Selection:

The marketplace for APM solutions is a challenging one. Basically, there are two options which exists:

1. Architecting a set of point solutions together, to create a comprehensive, APM Technology Infrastructure. These point solutions could currently exist to support the facility (to capitalize on prior investments), be considered for procurement, or be in the process of being implemented.
2. Implementing a comprehensive APM Solution Suite from one vendor, augmented by point solutions from other vendors to achieve additional required functionality.

Referencing the APM Infrastructure functional requirements, Phoenix can provide a roadmap to confirm which solution architecture will deliver the greatest return.

Additionally, we can facilitate a Value Factor Analysis (VFA) process to choose the vendor most aligned with the functional requirements and capable of delivering the required value for the facility.

APM Modular Component Development and Integration:

Phoenix executes the following upon selection of the APM Solution architecture, options, and vendors:

- Data Historian and Data Analytics software customization.
- Development of the CMS statistical predictive/ machine learning models applied to execute predictive maintenance.
- Development and configuration of the Production-Availability Simulator.
- Business Intelligence Dashboard Development.
- Data loading/ migration.

- Development and configuration of other applications within the APM Technology Infrastructure: Asset Health Monitoring, Risk Based Mechanical Integrity (RBMI), Equipment Strategy, Reliability & Deterioration Analysis.

Our integration services include:

- Mapping data/ information flows and functionality between various APM Infrastructure components.
- Facilitating data/ information imports and exports between components.
- Software integration of modular components (e.g. Data Historian, CMMS etc.).
- Acceptance testing, readiness, and planning of the APM System to ensure it delivers the user functionality as described in the requirements document.
- Development and implementation of the interfaces for the APM System.
- Deployment of the APM System in the production environment.

Our consultants and engineers have directed or participated in the following APM Implementation Projects:

APM System Implementation for Jorf Fertilizer Complex 2/4 – Developed the technical specifications for the APM Technology Infrastructure; and facilitated the Value Factor Analysis selection process for the APM solution vendors.

Production-Availability Simulator Development: ENMAX Energy, Capstone Pinto Valley Mine, Jorf Fertilizer Complex 2/4, Candelaria Copper Mine, Alberta Products Pipeline Ltd.

Risk-Based Mechanical Integrity Program Development: Saudi Aramco Ras Tanura Refinery Installed North Sour Water Stripper, Jorf Fertilizer Complex 2/4, Saudi Aramco Ras Tanura Refinery Dorra Gas Facilities, Saudi Aramco Ras Tanura Refinery Clean Fuel and Aromatics Project (CFAP), National Cooperative Refinery Association



Industrial Asset Management Services

About Us

Phoenix Engineered Solutions Inc. is a Industrial Asset Management consultancy based out of Edmonton, Alberta, Canada. Our firm provides technology solutions and technical services to ensure the operational readiness of projects and to improve asset reliability, integrity, and sustaining costs within operating plants.

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