Strategies for Asset Lifecycle Information Management

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Asset Information Management (AIM) Enables Performance throughout the Lifecycle of All Types of Assets

Asset Lifecycle Information Management Concept
Executive Overview

Most businesses are driven by efforts to maximize their return on asset investments and the pressure for continuous improvement is increasing. Currently, the cost of existing asset management practices is excessive and the opportunities for savings are large. Further factors such as globalization, contract manufacturing, compliance with regulations and even sustainability (“Green”) considerations will drive almost all businesses to re-examine their asset management practices in order to remain competitive.

Most asset-intensive businesses have some form of Asset Lifecycle Management program (ALM), but the current situation demands that they be re-evaluated. ARC research indicates that this should be done from a broad perspective, while considering the benefits that new information technologies and practices can offer. ALM is thought of today as a set of interconnected, iterative processes. In the design and build phases of the asset, asset projects and programs are managed for performance (Project Performance Management, PPM). During operations and maintenance phases, another process manages the asset performance (Asset Performance Management, APM). Asset and project portfolio management (APPM) aligns the overall portfolio of investments in assets with the company’s strategic objectives. Because of their interconnectedness, these processes require a continuous exchange of information. This is Asset Lifecycle Information Management (ALIM). ALIM incorporates the collection, management and distribution of information about design and construction, operation and maintenance of the asset portfolio and makes it available to PPM, APM and APPM. The images on page 2 portray ARC’s ALM and ALIM concepts.

While companies may recognize the value that a comprehensive ALIM strategy offers, its implementation is frequently complex. This complexity derives from the diversity of asset information and the fact that it is commonly spread across many applications. This is at odds with the need for standardized information sharing. One potential solution is to use an existing application as a platform for building an ALIM solution, but this can be problematic as most applications have limited capability to satisfy infor-
Some industries are building new plants and factories, while others are re-purposing existing facilities. All want to get the most out of their asset investments.

Alternative approaches are therefore almost certain to lead to extensive and costly custom systems with a consequently high total cost of ownership (TCO).

Alternatively, modern IT infrastructures may provide more flexible platforms, but by themselves they lack ALIM-specific functionality such as workflows, integrations, information structure and relationships, and visualizations. Owner/Operators can gain far more benefit by creating business-specific ALIM systems based on off-the-shelf solutions such as the Meridian Suite from BlueCielo ECM Solutions. Such solutions not only provide Engineering Content Management functionality but also a comprehensive ALIM solution for managing engineering change projects. This may include small to extremely large change projects in brownfield plants, as well as work outsourced to EPC’s and contractors. Once commissioning is over, information is handed over seamlessly to operations to keep an accurate “as-built” record of the asset. The as-built technical asset information is immediately at hand for Operations & Maintenance through the integration with the Enterprise Asset Management system of choice.

Business Drivers for Investing in Asset Management

In addition to return on assets (ROA), several factors are stimulating additional interest in asset management practices and related industry collaborations.

The impact of globalization on supply chains gets ample attention, but the impact on asset management strategies can be equally pronounced. Globalization, in combination with other trends, changes the asset investment equation for many industries. Emerging consumer markets and the associated supply chains make it more beneficial to relocate into new regions, possibly further away from suppliers, partners, and current sites. In turn, the changing cost of labor and availability of skills influences asset design, especially the level of automation, in addition to asset management practices.

Several areas related to regulations are also driving increased attention to asset management strategies. Overall Environmental, Health and Safety
(EH&S) and product quality issues continue to drive improvements in asset information practices in most industries, but some industries have additional challenges associated with compliance. For example, the food, pharmaceutical, biotech and medical devices industries must also address FDA (US Federal Drug Administration) regulations such as 21 CFR Part 11. FDA regulations have been driving manufacturers’ asset management programs for some time. However, new FDA regulations encourage risk-based methods that require more attention to regulations in the design phase. Consequently, manufacturers must now provide better asset information transfers and broader change management to support ongoing compliance effectiveness. The influence of “green” considerations such as the cost of energy and environmental or trade regulations is also changing global asset investment and management decisions.

Even if there were no trends driving change, there is ample evidence that the high cost of existing asset management practices is sufficient to validate re-examining current asset-related practices. A 2004 NIST study\(^1\) estimated that in the US within a sample of businesses with a $374 billion capital spend, losses of $15.8 billion were incurred, mostly during asset operation and maintenance. These losses were associated with the effort expended to avoid, mitigate and correct problems caused by poor asset information practices, indicating that the opportunity is significant.

To address these issues and enable better performance, the ISO 55000 standard, originating from the UK standard PAS55, gives guidelines for efficiency and performance of asset management and asset management systems. The standard’s very fast adoption rate is an indication of its effectiveness.

Therefore, traditional Asset Lifecycle Management (ALM) needs to evolve, and to take on a broader perspective. It needs to better represent each phase.

of an asset’s life, from design to operations and maintenance. To begin this process, ARC recommends that businesses focus on improving the overall management of asset information, as an essential step in improving ALM.

**Asset Lifecycle Information Management (ALIM) Enables Better Performance**

Emerging ALM strategies continue to focus on traditional physical assets, but additionally consider the associated human and virtual assets. (See the images on page 2.) Virtual assets include all the models and information needed to optimize performance. Asset Lifecycle Information Management is the collection, management and distribution of virtual assets needed by people for the design, construction, operation, and maintenance of physical assets, throughout the asset lifecycle.

ALIM provides information management capabilities in support of ALM processes and workflows for the entire life of assets. Some asset information is created when the asset is created, updated to as-built status when the asset is installed, and passed to asset Owner/Operators, typically through purchasing and the Engineering organization. The Engineering organization usually validates the information received, stores it in department systems and enriches it in preparation for a handover to Operations and Maintenance. Both Operations and Maintenance further enrich the information for their purposes. Although this sounds very sequential, in practice information is continuously flowing in many directions and this complicates change management considerably. Concurrent improvement projects add yet another dimension of complexity to this process.

ALIM involves a wide variety of reference and activity information about assets. For example, ALIM can include design drawings, data and specifications, manuals, inspection reports, test data, MRO inventory, operating instructions, equipment performance data, maintenance history, and more. Some of this information is only used within a single department, but a large majority of it is used by several departments,
usually for different purposes. Consequently, ALIM strategies must provide common access services for asset information through a variety of applications, as well as to information stored within IT infrastructures such as relational databases and content management systems.

It is important to note that Asset Lifecycle Information Management comprises much more than just (technical) document management. Document management relates to how data gets stored and/or exchanged between contributors. Asset Lifecycle Information Management on the other hand is the process that transforms documents, designs and other data sources into validated and compliant information which is associated with assets, enabling multiple stakeholders to perform their job effectively. Asset information is created throughout all stages of the entire asset lifecycle, from creation, operation, maintenance and redesign to disposal of the asset.

The asset lifecycle starts with electronic requirements documents from Engineering. These are transformed, often by outside organizations such as EPCs, into designs represented in related CAD files, databases, PDFs, spreadsheets, etc. Information about reviews, approvals, comments, and changes have contractual and legal implications and must also be carefully maintained. Operations and Maintenance then uses this information and adds other information to it, such as plant breakdown structures, functional locations, asset ID’s, data sheets, maintenance records, status and activity records, etc. It is an information management challenge to keep track of all this information and to make sure that the digital representation of the plant continues to provide accurate and accessible information to all the stakeholders depending on it.

In addition to information storage, ALIM strategies now include strategies for workflow, integration, security, role-based portals and workspaces.

The management of this data has evolved with information technology advancements from simple, paper-based, manual systems, to comprehensive ALIM strategies capable of dealing with complex and extensive environments. In addition to information storage, ALIM strategies now include technology strategies for workflow, validation, security, role-based portals, automation and workspaces.
ALIM Strategies and Solutions

Traditionally, asset information has been managed largely at a departmental or application level and this limitation has led to inherent problems. Even solutions designed to be enterprise-wide were often built without a comprehensive set of requirements. The result is missing and out of date information, error prone manual re-entry of information, laborious information collection processes, and reports that do not represent reality. The management of legacy asset information (paper drawings, manuals, etc.) is especially problematic in today’s electronic world.

ALIM strategies, because of their broad scope, are naturally comprised of a variety of software products, data stores, and technologies. Departmental solutions (CAD software, maintenance management, condition monitoring, etc.) will always be essential and no single solution will serve all ALIM needs. Consequently, ALIM strategies must provide common methods for aggregating, storing, synchronizing, managing and sharing selected information. Therefore, one challenge for ALIM strategies is to identify the information that should be managed centrally versus that which should be left to the applications operating largely in silos. Furthermore, information from both the central store and application databases must be shared consistently through a set of common access services, providing released data while being used concurrently within plant modification projects.

ALIM strategies must provide several capabilities beyond central data management and there are questions about how to implement these capabilities. Some workflows can be accommodated within a single application, but others cross multiple applications and should be implemented separately. Information should be presented consistently for all stakeholders, regardless of the many work environments and supporting technologies from different suppliers that are in use.

Building a Technology-based ALIM Solution

While it is possible to adopt a dominant application as the central ALIM platform, in practice this requires extensive customization that often results
in a limited and inflexible solution. Consequently, it is better focus on the ALIM requirements that are common across applications, such as ways to provide consistent presentation, cross-functional workflows, common access services, unified information structure, and single approach to integration and synchronization. These capabilities are typically found in *technology platforms* and may already be included in the existing IT landscape.

Architecturally, a technology platform decouples an ALIM strategy from application dependencies and fills gaps left by applications. A technology platform for ALIM may be comprised of a portal environment, content management, workflow engine, integration engine, database management, data quality tools, in addition to others, depending on the organization’s needs.

Generic technology platforms such as content management or portal environments must be extended to accommodate the requirements of the business’s ALIM system. These platforms may provide a foundation for common information management, but they lack ALIM-specific capabilities such as standardized information structures, categorization, linkages, and transformations. Even software which provides a role-based framework may still lack the definition of ALIM specific roles needed for the visualization of diverse asset information.

This means that Owner/Operators must either extend technology platforms themselves or select specialized domain applications with built-in ALIM capabilities. Today, the latter is preferred because it presents a lower risk, requires less time, is easier to maintain and provides the lowest cost of ownership. Fortunately, a growing number of suppliers offer ready-to-go ALIM capabilities that complement technology platforms.

One category of such ALIM solutions is Engineering Information Management (EIM). As the name implies, the EIM focal point is on the Engineering organization needs, but the trend is for EIM solutions to expand beyond basic engineering documents and into operations, maintenance and beyond.
BlueCielo manages shared engineering content in a common repository that is designed for revision management and support for critical “as built” processes. Customers can use Oracle, Microsoft or BlueCielo database technologies.

BlueCielo ALIM Offerings

BlueCielo ECM Solutions was originally an EIM supplier that focused on CAD-related content, but has expanded to cover a comprehensive ALIM footprint for Owner/Operators with brownfield assets. BlueCielo’s overall approach is to recognize that ALIM should be an enterprise-wide strategy, requiring many parts and that they cannot provide all the needed technology or all the business specific capabilities. BlueCielo focuses on providing a CAD and engineering software vendor-independent solution called the BlueCielo Meridian Suite. It provides a best practices ALIM implementation and integrates with leading line of business applications in the ALM landscape, such as CAD, plant- and equipment design software, and Enterprise Asset Management (EAM) solutions such as SAP/PM and IBM Maximo. It also offers an FDA Module to meet the specific needs of industries that require compliance with this regulation.

BlueCielo specializes in the Oil & Gas, Pharmaceutical, Chemical, Utility and Metals & Mining industries. They have well-known customers across several industries such as BASF, ExxonMobil, Pfizer, RWE, Shell, Total, Wyeth and others, totaling over 250,000 users. This level of industry presence classifies them as one of leaders in EIM.

More than just managing files, BlueCielo structures information as related objects, documents and projects. Objects contain all information about assets including design data, purchasing information, vendor data, or operating history. Documents may be drawings, instructions, data sheets or design specifications. Projects provide a model for managing changes related to engineering and asset value optimization and keeping information current, throughout the asset lifecycle.
For example, their solution can relate documents (such as P&IDs, Process and Instrument Diagrams) to asset object data (pumps, valves, instruments, etc.), and properly manage their use on concurrent projects that can simultaneously work on the same document under separate release schedules. Document packages (secure briefcases) are provided that can be distributed in review, comment and approval workflows, including external collaborative activities with partners and suppliers.

BlueCielo supports ALIM throughout the user work environments and provides modules to support asset management practices and related information processes. These include: mass data import, data classification & validation, flexible project workflow, rendition support, concurrent projects and tag extraction. BlueCielo also supports multi-CAD (2D & 3D based) global collaboration and data exchange with contractors via a cloud-based portal, including transmittal management.

In line with ALIM integration requirements, the BlueCielo Asset Management Module keeps as-built engineering content synchronized with popular maintenance management solutions such as IBM Maximo, SAP Plant Maintenance, Infor Datastream and Ultimo. BlueCielo solutions integrate with Microsoft SharePoint, EMC Documentum as well as IBM FileNet.

For many businesses, BlueCielo offerings can result in fast time to value, high ALIM stakeholder productivity and more flexibility in the users’ hands. This is especially true when the implementation is done using the BlueCielo Industry Configuration Templates. These templates facilitate the accelerated implementation of ALIM and reduce project impact on the organization. The industry-specific standard implementation templates come with pre-packaged services that allow for configuration to meet business needs, without the investment of time and resources for defining basic implementation requirements. The Industry Configuration Templates allow the quick implementation of the BlueCielo Meridian Suite to deliver a greater return on investment. The templates support system expansion and extensions based on organizational growth.

Businesses needing to select or replace their document management solution in an ALIM context should evaluate BlueCielo’s Meridian Suite.
Conclusions

Today’s business environment requires better asset management and more comprehensive ALIM strategies. More comprehensive ALIM strategies enable opportunities for better asset-related business planning as well as eliminating losses associated with weak programs and poor information.

- A comprehensive ALIM strategy must cover the entire asset lifecycle: design & build, operate & optimize, and maintain & improve. The handover of information from asset designer and builder to Owner/Operator is a critical step in ALIM where information and the as-built assets must be consistent. A more comprehensive ALIM program also means enriching engineering data with operating and maintenance data relevant for the next 30+ years in which the asset is operational.

- Asset information resides in several applications used during various phases of an asset's life, and information needs differ for each phase. This creates a very complex ALIM architectural problem. No single application will contain all asset information, and the ALIM strategy and solution must be designed with this in mind.

- Evolving information technologies offer opportunities for improved ALIM programs. Many of the technical requirements for ALIM are similar to those in other information management domains. Consequently ALIM solutions can utilize many of the same components.

- A technology platform alone is insufficient as an ALIM solution. Technology platforms require the development of specific capabilities for the asset management domain: information structures and linkages, workflows, role-based environments, visualization, data management and versioning, and other more specific capabilities.

- Businesses looking for rapid deployment and less customization should determine how ALIM specific products, such as those from BlueCielo ECM Solutions can complement their existing ALIM technical platforms. Traditionally, engineering information management offerings have been engineering focused, but they now commonly address a broader need that includes the needs of operations and maintenance.
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Acronym Reference: For a complete list of industry acronyms, refer to our web page at www.arcweb.com/Research/IndustryTerms/

AIM  Asset Information Management  EPC  Engineering, Procurement and Construction contractors
ALM  Asset Lifecycle Management  IT  Information Technology
ALIM  Asset Lifecycle Information Mgt  NIST  National Institute of Standards & Technology
Apps  Applications  OpX  Operational Excellence
BI  Business Intelligence  OEE  Operational Equipment Effectiveness
BPM  Business Process Management  MDM  Master Data Management
CAD  Computer Automated Design  MRO  Maintenance Repair Operations
CMM  Collaborative Manufacturing Management  PAM  Plant Asset Management
DOM  Design, Operate, Maintain  P&ID  Process & Instrument Diagram
EAM  Enterprise Asset Management  PLM  Product Lifecycle Management
ECM  Enterprise Content Management  ROA  Return on Assets
or  Engineering Content Management  SCM  Supply Chain Management
EIM  Engineering Information Management  XML  Extensible Markup Language
ERP  Enterprise Resource Planning  WMS  Warehouse Management System

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