Improve Plant Operations with Mobile Devices, KPIs and Alerts — Anytime, Anywhere

An Industry White Paper

Jonathan Kadane, Industry Marketing Director, Pharmaceuticals, Aspen Technology, Inc.
About AspenTech

AspenTech is a leading supplier of software that optimizes process manufacturing—including oil and gas, petroleum, chemicals, pharmaceuticals and other industries that manufacture and produce products from a chemical process. With integrated aspenONE solutions, process manufacturers can implement best practices for optimizing their engineering, manufacturing and supply chain operations. As a result, AspenTech customers are better able to increase capacity, improve margins, reduce costs and become more energy efficient. To see how the world’s leading process manufacturers rely on AspenTech to achieve their operational excellence goals, visit www.aspentech.com.
Background

Competitive pressures and changing business conditions have forced process industry plant owners/operators to work with smaller, global professional manufacturing and engineering staffs. Because there are now fewer of these professionals on-board, they are often out of their offices — in the field or on the shop floor. Consequently, they have less time to collect data, perform insightful analyses and make prompt decisions. Overall, their productivity is a critical issue. Application of mobile technologies addresses this productivity issue by providing more efficient access to the crucial, “real-time” information needed to maintain and improve a plant’s operations.

Because of this real-time access, smart phones, tablets and associated mobile applications are rapidly becoming vital tools to engineering and maintenance teams in their daily work routines, taking the place of desktop devices that were traditionally used to access information and perform departmental functions.

This paper provides an overview of how mobile technology was implemented in a large process industry company, discussing the methods, challenges and benefits of enabling mobile devices with real-time operations information, critical equipment alerts and performance data, along with listings of key steps to a successful project implementation.

Industry Dynamics

There are many opportunities within an enterprise to improve asset performance. Often the emphasis is on reducing costs. This can be achieved by focusing on the physical assets – by increasing yields, reducing waste and lowering energy usage. When applied correctly, techniques to reduce operational costs and improve agility can create lucrative benefits and improved competitiveness. In order to optimize the entire enterprise, organizations are now looking to optimize their human assets as well as how to cut costs and increase efficiencies in their workforce.

Organizations around the globe are realizing that they can achieve additional financial gains by speeding responses to variable performance. Shortening the time from recognizing an adverse event to executing an appropriate response creates value – whether by cutting energy consumption, minimizing product losses, reducing equipment downtime or avoiding a troubleshooting trip (see Figure 1). A simple example of this would be a steam valve that is left open after a production process has been completed. The quicker an operator is made aware of that event and reacts to it (by closing the valve), the less energy will be used, saving money.

This is an example of an “Active Performance Management” program. Proper execution must focus on putting the appropriate tools directly in the hands of its workforce while matching those tools to existing business processes. One method is to provide real-time alerts to the right person, no matter where he is. Faster operational decision making drives productivity gains, and those decisions can be enabled by providing real-time, actionable information on mobile devices.
The remainder of this paper explores how one process manufacturing company designed and executed an Active Performance Management Program, making those personnel and the overall organization more productive. In addition to the productivity increases gained by moving from reactive to proactive decision making, job satisfaction was also improved.

**Competitive Pressures, Fewer People**

Competitive pressures were forcing the company to deploy their managers, engineers and operators more effectively. As with many process manufacturing companies around the globe in this economic climate, they had fewer people within plant operations and engineering to analyze data and make insightful decisions. Key opportunities to adjust plant operations were being regularly lost. Information latency caused decisions to be delayed, resulting in downtime. This reactive decision-making was clearly inefficient, negatively impacting both operational and financial performance.

![Figure 1: Active Performance Management Value Gained.](image)

Active Performance Management shortens the delay time, which increases the value of the right decision to be acted upon.

Often the best information, alerts and performance data, the key information for proactive decision-making, was available only at the employees’ desks, in their desktop computers or operator consoles. The issue was that the managers and engineers were no longer at their desks; they were out in the plant. Consequently, by the time anyone knew that the plant was performing inefficiently, it was too late to make a proactive, informed decision.

Recognizing the problem, the company searched for solutions and business processes that could be utilized to monitor performance, regardless of an employee’s location. To accomplish this goal, managers and engineers would have to be provided access to operational data across the facility. Further, the selected solution must be easily viewed and analyzed, so that actionable decisions could be made quickly. This began their project to identify a mobile solution for operational information.
The Solution – Data Historian Access via Smartphone Devices

The selected solution provides process data anytime, anywhere to managers and engineers via smartphone devices. The basis of the solution is a “data historian” capable of recording and organizing the data needed to document and analyze normal plant operations. In addition, the solution includes an application capable of providing data access from mobile devices. This real-time information is then provided to the workforce, regardless of their location, along with alerts, the ability to monitor performance of data tags and visualization of trends and KPIs.

The solution also allows specification of role-based access privileges, along with a customizable hierarchical user interface. Users can also configure email and SMS notification alerts, all while leveraging industry standard security technologies and protocols.

Ease of Navigation

The primary directive of the project was that application navigation and data access needed to be simple. Having real-time plant data would mean nothing if users could not find it or if it was too complicated to access. It was also mandated that the data presentation must be matched specifically to the form factor of today’s typical smartphone devices.

The following goals were used in the identification of the mobile solution:

- Ease of navigation: if users cannot make the tools work, they are of no value
- Ease of monitoring: monitor the performance of system tags and KPIs in real-time
- Ease of configuration: based on job specifics and personal preferences
- Quick alerts: provided to specific users when specific error conditions occur
- Ease of analysis: allow for fast, simple analysis of error conditions
- All functionality should be available anywhere, anytime on a variety of mobile devices
- Given diverse plant locations and staff mobility, data must be available both internally and externally to plant locations

Figure 2: Choose multiple views of information.
The user interface was designed to provide managers and engineers (users) with the visual cues needed to quickly determine if their areas are performing according to specifications. The optimal hierarchy of tags and KPIs was implemented within their data historian, along with appropriate security protocols. The interface presented this hierarchy to the users according to their security rights and individual preferences. Users have multiple pre-defined views of the information, allowing different methods of analysis (see Figure 2).

**Example of Drill-Down Hierarchy**

Users are alerted to error conditions through email notifications. The application allows users to define their own alert conditions and when they want to receive alerts. While alerts are sent via email, they can also be accessed by clicking on the alert box on the top of every screen. The alert details will show the condition of the tag at the time of the alert and provide tools to perform further analysis (see Figure 3).

Visual cues, such as hierarchical drill downs and email alerts, are the expected norm with smartphone applications. Using these capabilities, users are able to quickly respond and take appropriate action, improving plant performance.

![Image of alert received via email, with ability to drill down.](image)

**Deployment Security and Architecture**

**Security**

At a recent seminar by *Network World*, “mobility” was flagged as one of three areas posing the most security risks to businesses, partly because there is no accepted set of best practices yet to protect them. Since the solution must be available 24/7, it must allow for data access outside the corporate network via either cellular or the wide-area networks, leading to potential security issues.

Consider a scenario in which a manager loses his smartphone. There is clearly a risk that an unauthorized user could access critical operational and enterprise data. This type of security concern must be explicitly addressed within the solution design.

Given the importance of data security, best practices were developed in parallel with the solution. These best practices are meant to be adaptable, as the use of the mobility solution is continually evolving. For example, a mandate to password-protect the phone itself was implemented, along with data encryption and other secure access technologies.
Also, as this solution involves accessing critical operational data, it is necessary to create an audit trail of the mobile users’ access. Not only can this be important for regulatory reporting, but it also identifies anomalies in mobile use that IT should investigate and isolate, potentially shutting down a security threat.

The project team will continue to be flexible and adaptable as its mobility strategy develops. As with any new solution, security weaknesses will be regularly analyzed.

**Architecture Designs**

There are three mobility architecture scenarios depicted below. It is important to note the evolution of the architecture design and security best practices throughout the implementation. Other projects to access critical operational data will likely evolve in a similar manner.

The project team began implementing the architecture seen in Figure 4. In this design, access to the solution was through the browser on the mobile device, with web pages delivered by the server. Each user was “hitting” a dedicated Mobile Device Server in the corporate network. This method enabled IT to understand bandwidth requirements and to identify any potential security holes that may open while accessing data within the corporate network environment.

As the number of users was increased across the enterprise, it was necessary to split the UI server and Mobile Data Servers to maintain top performance (see Figure 5). Data access was still occurring within the corporate network. The IT group tested the speed of data replication and information latency with this set up, and no issues were uncovered.
Finally, once the project team was able to formalize their security protocols, they moved to the architecture depicted in Figure 6. To address potential security issues, they implemented firewalls at key points within the network. With this architecture, there were able to truly deliver operational data on smartphones anytime, anywhere.

Figure 5: Access from only within the corporate network (2 servers).

Figure 6: Access from outside the corporate network.
Administration

The administration of the application employed a SilverLight application. The administrator can connect a mobile device to any number of data historian databases, providing access to a specific set of tags and KPIs. Security access is granted based on customer-defined roles and corporate security guidelines.

The solution was specifically designed to meet the organization's varying IT environments and policies. It functions as a standalone application with native connectivity to the data historian. The architecture also allowed the team to work within the existing network and security policies while maintaining a reliable connection to the core data historian systems and the end user’s mobile device.

Conclusion: Lessons Learned and Tips

Develop a Solid Work Plan

The most important tip offered by the project team: develop a solid work plan when rolling out any type of new IT application. While it is tempting to jump right into the execution with minimal, if any, planning, this is definitely a mistake. The project should be front-loaded with the necessary time to prepare a thorough project plan. Other significant elements of the plan: a formal project sponsor, development of a project charter, and all the sections that are critical for execution (see Figure 7), such as training, especially for the end users who may see the new systems for the first time. Also, spend the time to define your documentation scheme, especially if implementation covers several sites.

Figure 7: High-level example of mobile deployment work plan.
Phased Deployment

Mobile applications can involve many users, and use of smartphone applications is extremely addicting. When word of the application’s value got out to the workforce, implementation requests increased dramatically. Deployment was intentionally started at small scale, using the corporate network first, then gradually adding users. Roll-out of access outside the corporate network was the last step.

Individual Configuration

Users placed a high value on the configurability built into the system. Because users are involved or focused on different parts of the operation, they wanted different alerts, views and KPIs, and support must be available to aid with customization. Support for multiple devices was also found to be critical as there is no one smartphone selection on which all users could agree. Focusing on the market leading device operating systems, the team selected Safari browser on iPhone and Blackberry OS 6 as the supported platforms.

Benefits

The mobility system was branded internally as the “Active Performance Management” program, providing “actionable operations data anytime, anywhere”. Reported benefits:

• Greatly enhanced start-up and shutdown consistency
• Dramatically reduced issue resolution time
• User-defined instant alerts markedly reduced the frequency and the duration of outages
• Improved response to process upsets

Plant personnel report that they are extremely happy with this solution as it now “unchains” them from their desktop, and they can now make real-time decisions right on the plant floor. Asset availability and performance have increased as well. The highly configurable views that enable the user to combine and analyze operating data, regardless of location, have improved workforce productivity and job satisfaction at the same time.

AspenTech's industry-leading application suite includes:

• Aspen InfoPlus.21® collects and stores large volumes of process data for real-time and historical analysis and reporting. This process data repository forms the core of a plant and enterprise-level manufacturing integration platform, uniting data across process control, manufacturing operations, and business systems. With rich calculation, analysis and visualization tools and an object-oriented real-time application development environment, it delivers a flexible and effective performance management and analysis solution.

• Aspen InfoPlus.21 Mobile is a smartphone application for providing users across the enterprise the ability to access and analyze real-time and historical plant data from an Aspen InfoPlus.21 database. Data can be viewed in value fields, trended, reported by exception, or accessed in KPIs so that users can format the information to maximize the value for individual job functions. Real-time access for visualization and analysis of performance data is the foundation for enhanced decision making and faster troubleshooting – delivering increased profitability, reduced variability, and improved asset utilization.
References

Tim Greene (2011), *Network World: How to deal with 3 big corporate security concerns*, [Online],

David Goldman (2011), CNN Money: *Your iPhone can be hacked in 18 minutes and other surprising cyber security facts*, [Online],
