Automation India

Enabling Global Competitiveness

AUTOMATION INDUSTRY ASSOCIATION

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Dear Friends,

The application of automation is currently transitioning from the traditional productivity enhancement and cost reduction thrust to more encompasing areas like quality, flexibility and time-to-market.

Another major shift in automation is the increased emphasis on reliability of operations & "convertibility" in the industrial process. Business owners are increasingly demanding the ability to easily switch from producing Product 'A' to Product 'B' without having to completely rebuild the production lines.

As market conditions continue to change, manufacturers are looking for any extra advantage they can get to differentiate themselves in their competitive space. World-class organizations are spending considerable effort and money to invest in real-time data connectivity, aligning their manufacturing with the rest of their supply chain to gain strategic advantage and make their manufacturing operations drive business leadership. Automation technologies can empower manufacturers with the intelligence and ability to "sense" critical activity at the equipment, factory and enterprise levels as well as fluctuations in the supply and purchase pipelines; "analyse" how to leverage production resources throughout the manufacturing system; and "respond" by executing informed, automated commands — all in real-time.

AIA represents a rapidly expanding body of technology providers who encompass all three facets in their value proposition. This edition of our newsletter showcases some interesting applications across various industry segments. The ideas presented would, we hope, encourage both users and system integrators to innovate further in their respective domains.

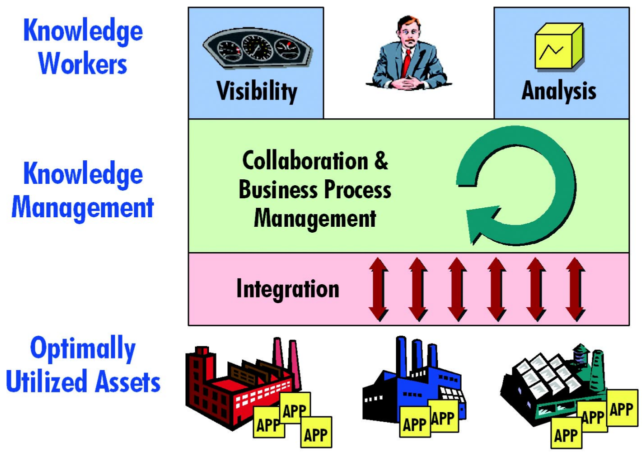
With best wishes,

JP SINGH
Hon. President, AIA

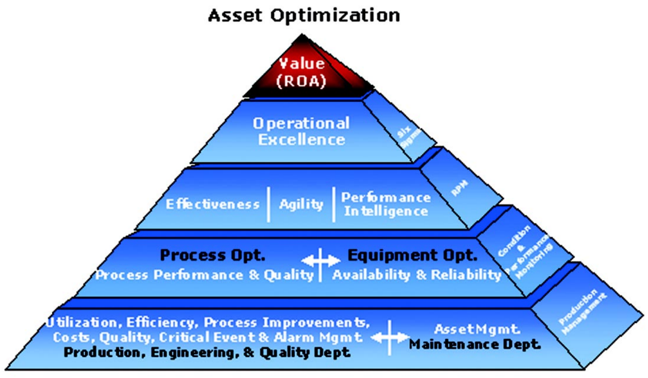
Driving CAPTIVE POWER PLANT Operational Excellence

The grim power scenario in India, affecting the manufacturing industry's competitiveness, forces power intensive process and discrete industries such as aluminum, automotive, cement, chemicals, metals, refining, and textiles to establish Captive Power Plants (CPPs) to generate power to meet their internal demand. Typically, CPPs, while providing reliable power to the mother unit, operate as cost centers, but after the promulgation of the Indian Electricity Act 2003 following the deregulation of India's electric power industry and its unbundling, the situation has changed dramatically. Stakeholders of CPPs can now sell the excess power from CPPs by entering into power-trading arrangements. CPPs can potentially earn revenues and thereby provide manufacturing companies opportunities to maximize the return on investments. While operating a captive power plant always posed serious challenges relating to their operation, optimization, and maintenance, the business challenges have added new dimensions.

India has not been able to attract investments from pure play independent power producers, and large utilities are under tremendous financial and other constraints. Viewed in this context, CPPs can play an important role in easing the power position. The country is expected to add close to 10,000 MW of generating capacity through the CPP route in the next five years, involving a capital investment of close to Rs. 350,000 million. Presently, the country's demand for electric power exceeds the



RPM Key Enablers



RPM Provides the Foundation to Increase Return on Assets

generating capacity by about 7-10 percent, and with the acceleration of India's economy, the manufacturing industry has only one recourse — build and operate CPPs. With close to 2,000 MW of generating capacity being added in the CPP sector, we see signs of that happening. The country has enough manufacturing and engineering capacity to support this augmentation. With industries being in a position to find adequate capital and medium-size CPP projects being commissioned within 15 to 24 months timeframe, this sector will witness rapid growth.

Automatically regulating the plant process is typically addressed by plant automation systems. A conventional multi fuel-fired power plant operating at variable loads involves designing a control system subjected to multiple constraints. The process cycle in a typical boiler-steam turbine plant is tightly coupled. For example, the flue gas heats the combustion air and transfers heat energy to the feed water through boiler economizer. The turbine steam extractions also heat up the boiler feed water. The super heated steam temperature involves water attemperation and possibly flue gas by pass controls or burner tilt controls. Control valves, used for controlling the feed water or the attemperation, do not provide controllability over the entire load bandwidth. Superimpose on these interconnected process cycles and final control equipment constraints, the multiple fuels that may be used and variable load operational requirements to appreciate the operational challenges from the plant automation perspective. While automation solutions are available to address these traditional control engineering challenges, achieving operational excellence in the case of a captive power plant go far beyond these.

A process plant may actually have more than one CPP. While this provides many operational options to the main process plant, ensuring that they are operated at their best productivity levels or most efficiently calls for unit optimization controls. The operational imperatives dictate optimal load distribution in the case of the multiple generators, plant operation at the best possible heat rate, while maintaining combustion and emission control. Applying optimization control necessitates the integration of operational information from different units into model based optimization control systems. The equipment and other plant assets have to be managed efficiently to maximize the return on assets.

The challenge before CPPs is to produce power at lowest cost, deliver reliable power to the industry, and export power to the grid while maintaining grid discipline. Essentially for a CPP to deliver full value as a profit center calls for optimizing its ability to meet the internal demand for power while making available to the external grid the committed power. The other imperatives are to operate CPPs at the highest efficiency levels, maximize plant availability, reduce downtime, schedule electricity generation to meet in-house and export demand. The CPP has to be operated optimally to balance its revenue generation potential while meeting the in-house demand for electric power. Downtime is expensive and the challenge is to maximize plant availability through the adoption of predictive maintenance techniques. These operational challenges demand that CPPs adopt state-of-the-art process control, implement process optimization, and manage the plant assets to increase returns.

While achieving operational excellence is the goal of CPP stakeholders, the means include real-time performance management by setting key performance indicators. Kilocalories of fuel consumed for generating one unit of power may act as a key performance indicator while measuring the CPP operational efficiency, but in the case of plant operator, the key performance indicators may include maintaining the controlled parameters within the operating limits. While the plant availability could act as a performance indicator in the case of plant maintenance department, the CEO of the company is interested in plant profitability, return on assets, and such other business goals. Captive Power plant is part of the main plant and comprises of other auxiliaries such as water treatment plant, ash handling plant, coal handling plant and such others. The main plant has disparate centers of plant parameter and business information monitoring systems. While plant level automation involves dealing with real-time information and control, the business level information may be predominantly transaction-based activity influencing the business aspects of the company. The execution level activity involves synthesizing the business level information and goals with the operational decisions.

Dictated by operational and functional requirements, implementation strategies, procurement policies, design considerations, and such others, the main plant might have adopted disparate automation systems and IT solutions such as ERP, CMM, and others implemented at varying times. Integrating all the information and creating a unified real-time database is the basis for arriving at KPIs, which act as internal benchmarks for different decision makers, spanning plant floor decisions to board-level decisions. Empowering people with production floor, execution layer, and board-level information effectively results in Real-time Performance Management (RPM). Continuous tracking of KPIs, their analysis, initiation of appropriate corrective measures, and reckoning with the feedback results in CPPs achieving operational excellence.

— Rajabahadur V Arcot
ARC Advisory Group

Turning Machine Data into Actionable Information

Optimizing existing systems and turning data into actionable information for real-time decision-making is the underlying goal of all solutions.

Dozens of information and automation vendors claim some form of an integrated architecture and promote products based on open standards. But when users peel away the hype to focus on the tangible value, they discover that what they need is an integrated architecture, control platform, network structure, visualization platform and communication services.

An automation company's chief goal is “the ability of our customers to optimize equipment, processes and the supply chain.”

Integrated architecture is designed for scalability and ease-of-use. Its pre-integrated components and systems include:

- Hardware and programming software;
- Open Network Architecture;
- Integrated motion hardware and software; and
- Visualization hardware and software.

Tools and functions used by Integrated Architecture — simplify programming efforts. Data tags, for example, do not have to be individually created, and they can be reused. A tag is "born" by connecting a drive, proximity sensor or any other device directly on a network, or by simply naming a point of interest in the controller.

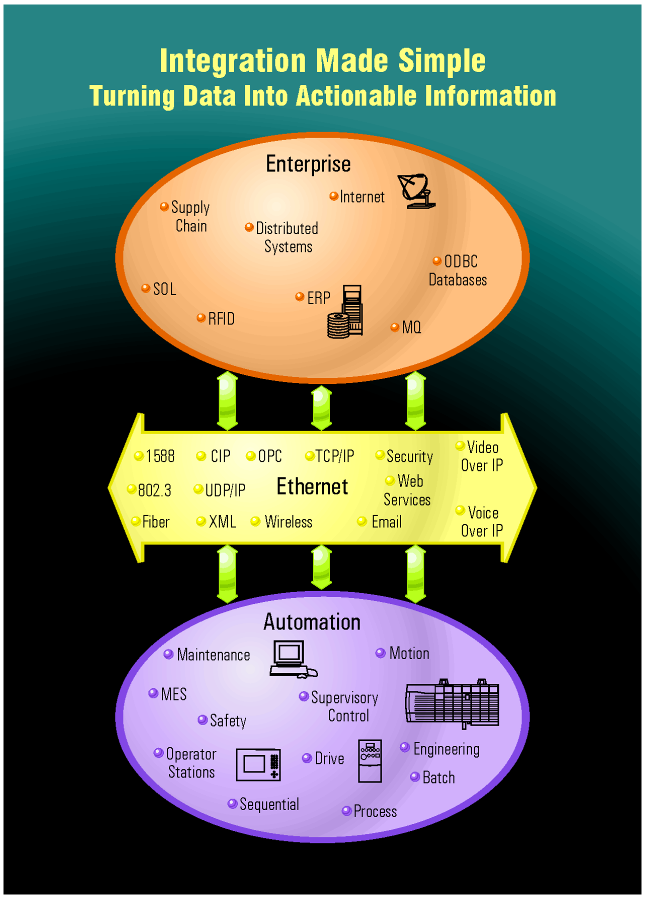
The tag can then move seamlessly throughout the architecture, from controller to human-machine interface to business system — even to supply — and distribution chain programs. The tag's information is automatically available to applications and users in various formats.

Architected for Success

The integrated architecture reduces customers' total cost of ownership by using a single control infrastructure for the entire range of factory automation applications, large or small. Integrated Architecture solutions can easily be utilized in new or existing installations.

Previously, customers could not start with a feature-rich small system. They had to invest a lot of money in a large system they did not need or sacrifice features to keep within their budget.

For manufacturers interested in Integrated Architecture



solutions, the challenge today is to view the total cost of ownership of their system as a competitive advantage in the market. Whether an OEM or an end user, if the customer is focused on improving the economic effectiveness to deliver more value at lower cost, then it is easier to appreciate and implement the Integrated Architecture solution.

Turning Data into Action — Case Study

An Indian appliances manufacturer has implemented an Integrated Architecture solution — and now turns data into actionable information. The manufacturer built a new plant to assemble refrigerators; however, it experienced problems in keeping the assembly line up and running — until the company adopted a fully automated system — built upon Integrated Architecture components and systems — to smooth movement throughout the

complete assembly process. The assembly line now has over 50 conveyors driven by variable speed AC drives networked with all drive parameters monitored and controlled from one location in manual or auto mode.

The system stores and displays diagnostics information and electrical parameters for each motor, thereby reducing troubleshooting time. And, if a drive fails, the replacement drive can self-configure and automatically load the required parameters from the system, cutting downtime to a minimum.

Tracking the Health of City Utility Assets

Sydney Water is the largest water utility in Australia, supplying water and treating sewage for the four million residents of Sydney, the Illawarra and the Blue Mountains. One of the facilities that Sydney Water Corporation (SWC) operates is responsible for processing nearly half of the city's sewage.

Five raw sewage pumps (RSPs) keep the facility running. Large, two-story pumps, with one-megawatt (MW) motors, drive the sewage through the plant. After raw sewage is subjected to screening and grit removal, the RSPs lift the flow into chemically assisted sedimentation tanks, which remove smaller particles by “flocculation”. The final treated wastewater then gravitates to a deep-water ocean outfall, roughly four kilometres from the shore.

Previously, condition monitoring of the facility’s plant was carried out manually on a periodic basis — until they installed an online condition surveillance system and tested the concept of online condition monitoring as a maintenance tool.

Accelerometers were connected to five RSPs and three centrifuges at the plant. Surveillance monitors were used to automate data collection. Links between the central control room network server and the running equipment were achieved through the use of Ethernet hubs and fibre-optic cable for the pumps, and a wireless link to the more distant centrifuges.

To pass the monitoring information from the plant control room to Sydney Water’s asset management database server — located 40 minutes away — a transfer station, responsible for storing the collected vibration data, was configured to send vibration data via the corporate wide-area network to the live database every 10 minutes. A user-friendly interface provides a graphical representation of the health of all machinery being monitored online.

Greater visibility of the health of the RSPs and centrifuges, and regular analysis performed online are the immediate benefits. By having the online monitoring 24 hours a day, 365 days a year, they are able to detect changes that may be a trigger for a potential failure.

The greater effectiveness in maintenance planning could translate into a 10 percent to 15 percent overall saving in maintenance costs for these units.

— A. Bhaduri

The Real-Time Enterprise

Every leading business today is driving for better performance: higher return on invested capital, lower costs, better asset utilization, faster delivery, greater customer retention, higher perfect order rates, reduced working capital needs, faster product innovation, greater sales and marketing productivity, higher quality, and more agile and dependable infrastructure (AMR, 2003).

In order for organizations to be competitive in this highly dynamic business environment, decision makers in the organization need to make quick information driven decisions. Immediate responsiveness to business volatility should be at peak operational efficiency at every scale - from machine, to line, plant, enterprise, and supply chain to improve return on time and investment. . Though many businesses have made huge investments in ERP (Enterprise Resource Planning) and SCM (Supply Chain Management), there has been little emphasis on manufacturing systems. The manufacturing activity in any organization is usually characterized by changes and variations leading to difficulty in estimation and planning, inefficiencies and chaos.

Today's technological advances are capable to solve any kind of problem. It can really solve problems only if it is applied and used properly. The speed of computers, the space available, etc is reducing the time it takes to analyze a situation. The classic management model is represented in the following figure:

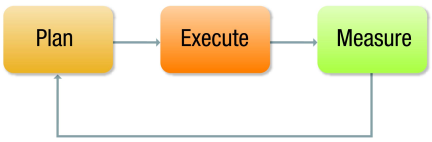


Figure 1: Classical Management Model

Before the advent of computers this cycle from planning to execution to getting a feedback took a long time and hence heuristics, thumb rules, approximations, intuition etc was applied to decision making. Also erroneous data was collected using notepads and hence huge amount of time was spent on collecting and analyzing data and changing plans, by which time the organization possibly incurred huge losses.

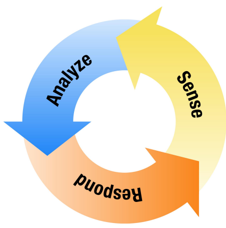


Figure 2: Latest Management Model — Sense-Analyze-Respond

But now with the technological advances made in the field of electronics and computers, the ability to analyze immediately (i.e get the feedback of execution immediately into the next planning cycle) with real data (no approximations) is possible. The use of heuristics, thumb rules etc can disappear. Though, this situation can arise only if "Manufacturing Execution Systems" are interoperable with "Enterprise Planning Systems". This would lead to a closed loop between planning and execution and will hence create value by allowing quick automated decisions to be communicated

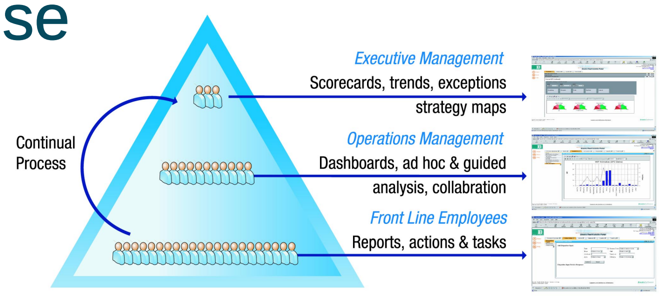


Figure 3: Manufacturing Intelligence Dashboards

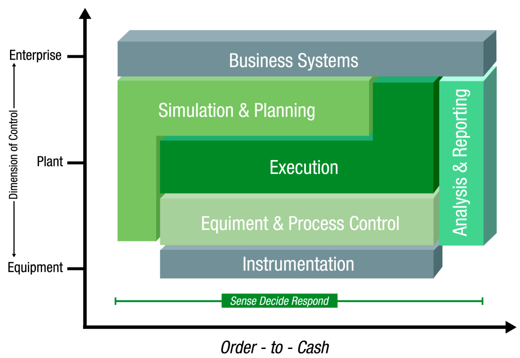
between ERP and plant floor systems.

If manufacturing systems are implemented and linked to other systems (like ERP, SCM etc), the decision makers will be able to have a "Real-Time" dashboard that provides all required information to make effective decisions. Also, automated scenarios can be mapped to respond with decisions automatically. In effect "Manufacturing Intelligence" needs to feed into business systems to provide real-time "Business Intelligence". The intelligence derived will be a result of data consolidated from different sources and systems that are provided by different vendors and that work on different platforms. The following figure shows that decision makers at different levels in an organization could possibly have access to different dashboards that present this consolidated data.

To get real value for the IT investments made by organizations, the execution systems need to be linked into ERP. ERP alone cannot deliver value. In a manufacturing organization, manufacturing data could be collected from PLCs, CNC machines, manual inputs, from MES, from Maintenance Systems (CMMS), or from RFID systems.

In today's world there are number of products that could possibly be used in a manufacturing organization. The IT managers, today need to select products based on how interoperable they are and how easy it is to link it up to systems. They need to select integration adapters and products that have been designed using the thinking process defined by Service Oriented Architecture (SOA). The SOA approach makes business requirements drive software architecture and selection of tools and hence provides flexibility and business value to the software product.

The following diagram is a representation of the value an organization can get if they link ERP systems to the plant floor instrumentation level systems.



— Vaidee Sampathkumar

On the move

Mobile control room for quick and effective problem solving

Advances in communications technology have certainly made the world a smaller place. Sophisticated mobile phones and personal digital assistants (PDAs) with ever-increasing functionality and e-mail make it possible for many people to access documents at any time in almost any place. Such quick access to information has resulted in increased efficiency in many aspects of business life.

Automation companies are constantly innovating to leverage the benefits of such developments in an industrial environment and have developed solutions that give mobile access to a factory's process control system.

In most industrial plants, control systems are used to monitor and control many device parameters, for example, the level of a tank, the temperature of a fluid in the process or the opening of a valve. Most plants have one or more centralized control rooms and in each room, the user typically has access to several operator stations with large 20-inch monitors. Using the graphical user interface of each station, the operator can supervise a process by means of graphical representations of real world devices. The system returns alarms and events from these devices as well as giving the operator device control, eg, motor stop and start.

It is often necessary for operators, process engineers and service personnel to visit the production area for troubleshooting, commissioning of new system parts or during scheduled inspections, etc. Problem solving usually means that the person in the production area has to be assisted by a person in the control room. Communications are carried out by means of a walkie-talkie, telephone and even by miming or simply shouting. Naturally, the risk of miscommunications is quite high.

This dependency can be significantly reduced, or even eliminated, if staff could move around within the factory and still have access to the tools and information they need. Think of the time saved trying to explain complicated instructions and the reduction in downtime when a problem occurs.

This potential has now been realized with the development of a solution that allows factory employees mobile access to the plant’s process control system. The solution now termed ‘the mobile control room’ is perceived as a new and future way of working.

Challenges faced

Mobility can be achieved in a number of ways, ranging from a laptop via Tablet PCs and Pocket PCs to a mobile telephone. From a human-computer interaction perspective, mobility in general, and the use of small devices in particular, has some special requirements. Because of their size, pocket PCs and telephones cannot display the level of detail seen on 20-inch monitors in the control room. For an operator working in the production area, such detail is not really necessary. Engineers are therefore faced with the challenge of filtering out the most important and relevant information available in the control room to a normal operator and structuring it for use on a mobile device.

With this in mind, the designers focus on the display of dynamic information such as the state of a device, measured values and set points, while using only graphical symbols for all devices.

The solution

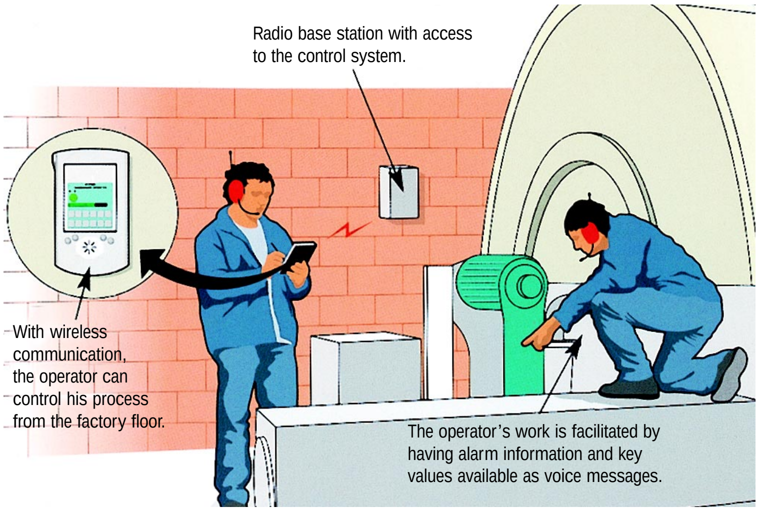
A good solution gives a mobile user (eg, an operator or service technician) real time access and control to all devices in the control system by means of hand-held computers and wireless communication.

A process portal server acts as:

- A connectivity server to access data from the process controllers (through OPC).
- An access server for mobile clients (by means of the Microsoft Internet Information Server IIS).

This solution ensures the following functions are available to users:

- Process overview: This allows the user to monitor the state of his process.
- Process control: Using faceplates, the operator can interact with the process.



- Alarm list: The user is always notified and can evaluate and acknowledge whenever there is an alarm.
- Device search: The operator can do this using an object request function.

Technical overview

- When the device is turned on, the mobile user is automatically connected to the local area network (LAN) using, for example, wireless LAN (WLAN), Bluetooth or GSM/GPRS/3G.
- The client software requests information using an http-type request. In fact, the graphical user interface is in the form of a web page.
- The server in turn queries the process controller(s) for dynamic information using OPC.
- The user is then presented with continuously updated real-time information.

One of the key objectives when designing such solutions is to ensure that they are 'terminal independent'.

The User experience

In a highly automated environment, operators very often become so dependent on operator stations that it becomes nearly impossible for them to move outside the control room. Yet, highly automated processes require inspection and control by a person on the move. When a problem has been detected in this way, quick and effective action means equipping the operator with tools that enable the execution of various tests that give immediate visual feedback.

Adopters believe operators and service engineers should have the proper tools available to enable them to carry out their jobs effectively. In addition, they carry a reputation for adopting new technologies, and off-the-shelf type Pocket PCs with relatively few teething problems.

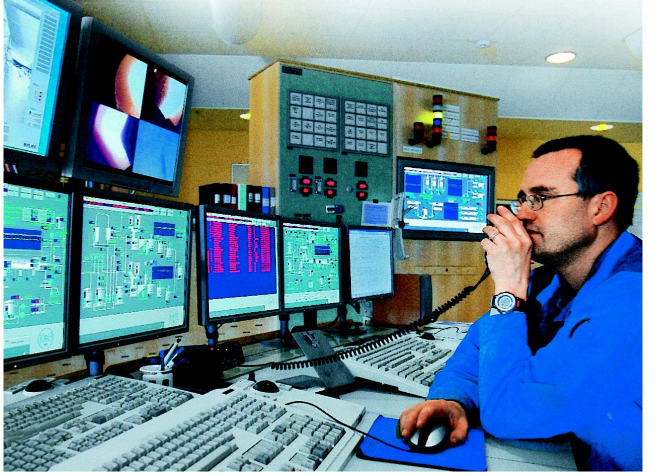
Users observe that:

- It is very important to realize that mobility means a new way of working. Work processes and thus the tasks the user performs, must be changed.
- From a design and implementation point-of-view, it is important to focus on what functionality is really needed and what can actually be accomplished on a small device. In addition, it is critical to maintain the same look-and-feel as a normal control system. The mobile device is after all a complement to operator stations.

Benefits

The benefits users experience include the following:

- Problem solving is somewhat easier and quicker when operators are next to the machine and are able to run the equipment manually.



- Access to the alarm list has been of vital importance.
- Production is quickly back to normal after certain disturbances.
- Problems are spotted earlier, thus improving preventive maintenance.
- The commissioning and testing of new process equipment is easier.
- There has been a very noticeable reduction in communications traffic between the factory floor and the control room.
- Operators found the use of the standard voice record function, available on most Pocket PCs, to record memos very useful.

In the long-term, some companies believe this technology will minimize or even eliminate the need for special purpose panels (for manoeuvring). Minimizing the use of local panels, buttons and indications could save costs in a number of different aspects including electrical design, installation and commissioning, actual material, programming and maintenance. In fact, when it comes to the design of a new process section, the 'mobile control room' concept can reduce costs over the complete life cycle.

Functionality in the future

In the not too distant future, it is anticipated that the following functions will become part of a mobile control room:

- Video transmission to enable communication with a remote expert when problem solving.
- The use of video sequences to demonstrate work procedures, for example for certain maintenance tasks.
- Access to maintenance systems in order to create, receive and finalize work orders.

Some companies strongly believe that use of this type of technology will help them remain very competitive. They see new technology as a means of improving work processes and therefore productivity and efficiency.

— Pierre Öberg, Christoffer Apneseth

Convergence in the Control Room

Integrating transmission, distribution and outage management systems

For several years now, a confluence of industry restructuring and advancing technology in the electric power arena has created an environment for innovation in utility control systems. On the one hand, restructuring has moved many utilities from a regulated environment where return on investments was guaranteed through a cost-of-service model to a more market-oriented paradigm where investments must be justified to shareholders. At the same time, IT systems that support transmission and distribution operations have become increasingly more robust. They have also begun to converge, bringing previously separate applications onto a single platform.

This changing environment is ripe for innovation. The result is the integration of distribution and outage management capabilities (DMS and OMS) with the traditionally separate supervisory control and data acquisition (SCADA), and energy management systems (EMS).

A brief history of power systems control

Although the roots of power control go back to the 1920s, it was not until the 1960s and the advent of computerized process control that modern power network control systems, as they are known today, became possible to realize.

Most SCADA/EMS systems at that time were designed exclusively for a single customer. They were proprietary systems, closed off from one another in keeping with the structure of the industry. Regulated utilities presided over specific control areas with only small amounts of power being traded between them. Interconnection was mostly a means to achieve greater reliability by pooling reserves. But power systems were still vulnerable, and there was a need to develop applications and tools for preventing faults from developing into large-scale outages like the New York blackout of 1977.

In the 1980s, as computing technology advanced, it became possible to model large-scale distribution networks in a standardized way. Similarly, SCADA/EMS systems became more sophisticated, providing transmission operators with better tools to control bulk power flows. In the business world, this was also the era of deregulation. The airline, telecommunications and natural gas industries were all liberalized, and regulators and utilities alike naturally began to consider doing the same for electric power. For this, an entirely new set of IT systems would be needed (mostly to administer the wholesale markets), in addition to enhancements to existing SCADA/EMS technology. Perhaps not coincidentally, the new generation of control systems that emerged by the early 1990's made the prospect of deregulation feasible.

Distribution management systems (DMS) and outage management systems (OMS) have undergone similar changes over the years, largely due to advances in computing technology. DMS originated as distribution-level extensions to SCADA/EMS systems or as stand-alone systems. What distinguishes them from their transmission-level cousins is the addition of applications specific to distribution operations. For example, the ability to model line cuts is very common at the distribution level. Distribution networks are also constantly being reconfigured to accommodate new construction, maintenance and unplanned local outages. They also contain many more power system objects than transmission networks. The unique demands of distribution operations drove the development of DMS to the point where these systems became clearly distinct from SCADA/EMS.

Technological advances also drove the evolution of Outage Management Systems (OMS). Initially, outage management was a fully manual process. Customers would call their local utility to report an outage and paper tickets were used to analyze the calls and define the location and extent of the outage. Ironically, though the data would initially be entered into a computer, the system would print the tickets to be analyzed by human experts. Planned outages (for maintenance, new construction, etc.) were similarly handled using manual processes. Over time, of course, computer network models and analytic algorithms replaced the human "analyzers", and OMS systems developed into the sophisticated tools that they are today.

State of the industry

It's safe to say that restructuring of the electric power industry has not turned out the way anyone would have predicted. But whatever the fate of competitive power markets, it is clear that the business of operating transmission and distribution networks is only becoming more complex. The grid itself becomes more so every day as new generators come online and new transmission and distribution lines are added. This ever-increasing complexity, combined with certain business realities, is forcing utilities to reassess their IT requirements.

Drivers for integration

The adage "necessity is the mother of invention" certainly applies to the electric utility market. Depressed revenue streams, regulatory uncertainty and competing investment alternatives have all conspired to make utility resources scarcer than ever, and as a result all departments are being asked to do more with less. In this climate, utilities are looking for investments that will improve the performance of existing infrastructure and reduce costs over the long term.

Better information sharing, more coordination between transmission and distribution operations, enhanced customer service and improved safety are also priorities. Automation, and specifically advanced monitoring and control systems, have delivered improvements across all of these areas. Now, the technologies that enabled those improvements are beginning to converge.

The objectives of the integration of SCADA/EMS with previously separate distribution and outage management functions were multifaceted. The solution was envisioned as a means to deliver several operational improvements that would in turn have a positive impact outside the control room. These included:

- Integrated work flow management - With one system to contain operational data, various work groups with different needs (e.g., operation center, field crews, engineering design) could all work from a single data source.
- Connectivity analysis - Large, diverse electrical networks could be managed more precisely, more efficiently and more safely thanks to more comprehensive analyses.
- Greater productivity - The utility workforce would spend less time gathering information and more time applying it.
- Integration of enterprise-wide data — Information flow among customers, operations, engineering and executives would be enhanced.
- Immediate capture of network status — Utilities would have a much better understanding of system conditions at any given moment in time.
- Optimization of network operation — The utility's power delivery system would be utilized in the most effective way from an engineering perspective.

Of course, there is a certain amount of overlap between these items, but that fact merely underscores the significance of integration of utility control systems. The benefits of convergence run to many end results.

Integration examples

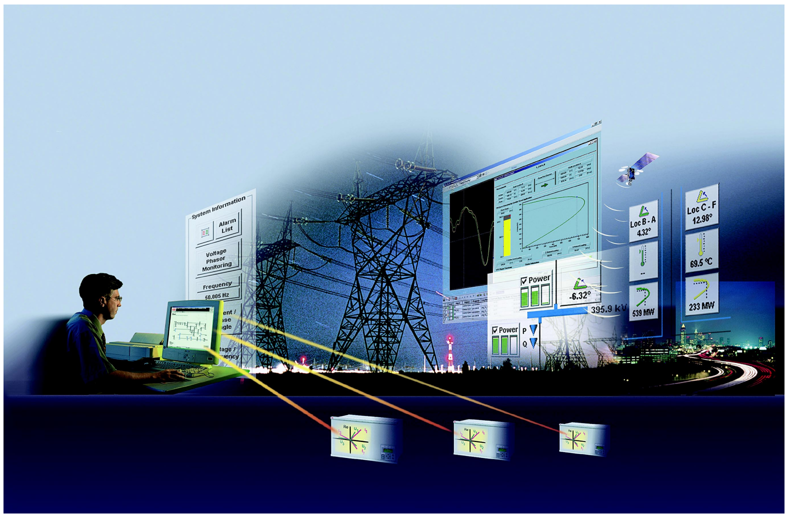
To better understand the impact of integration, we can look to two specific examples. The first is tagging, the practice of identifying a particular substation breaker for service, and thus indicating that the network operator must make adjustments to accommodate the planned outage. The substation breaker is typically the boundary between transmission and distribution and thus requires coordination between the two entities.

In the past, the EMS (transmission) and DMS (distribution) were separated both functionally and, in medium and large sized utilities, physically as well. When, for example, a particular substation breaker needed to be taken out of service, the EMS operator was dependent upon his DMS counterpart to inform him of the outage. This was - and in many locations still is - accomplished using manual processes like phone calls and email. The transmission operator would then tag the corresponding substation breaker on his system and make whatever operational adjustments were needed.

Using an integrated system, the transmission and distribution operators both see the same information - tags only need to be applied or removed once. This reduces the amount of paperwork operators need to complete, increases accountability and improves the tracking of safety documents. Of course, the real benefit lies in the utility's ability to provide more timely and accurate information to customers.

Another example of integration is the convergence of Distribution Management with Outage Management Systems. Traditionally, these were independent of one another — DMS dealt with operational matters like switch orders and load flows while OMS was specifically concerned with trouble call analysis and crew management. Under an integrated system, the outage management function can draw on data from the DMS to pinpoint unplanned outages using advanced fault location algorithms.

Similarly, planned outages combine switch orders from



the DMS with customer information from the OMS to automatically provide notification and updates to affected customers via the utility's Customer Information System (CIS). Distribution operators can also use network calculations to avoid accidentally overloading a given line while trying to supply customers from an alternate source. Today, the seamless integration of DMS and OMS functions is a reality, providing operators with a single intuitive interface to navigate between them.

The reasons that utilities sought out an integrated solution mirror the drivers identified above: better coordination between transmission- and distribution-level operations, better customer service, and improved efficiency. These objectives will continue the trend toward unified transmission and distribution control systems, particularly for larger utilities with more complex networks. As the technology continues to advance and costs come down, smaller utilities too will begin to realize the benefits of this convergence.

Where to go from here?

If there is a single concept that represents the point of convergence between the interests of electricity customers, utility operations, and utility shareholders, it is reliability. Blackouts are not good for anyone. Modern utility control systems like Network Manager offer an unprecedented array of tools with which grid operators are able to identify, avoid or mitigate disturbances before they become widespread outages. However, limitations remain.

The next frontier in power systems monitoring and control is a group of technologies that collectively are known as Wide Area Monitoring Systems (WAMS). They are not a replacement for SCADA/EMS/DMS or any of the other applications discussed here, but rather a supplement to them. WAMS utilize sensors called phasor measurement units to take highly accurate (to one microsecond) time-synchronized readings of grid conditions at strategic points across a very large area. These readings are then sent to a central control system which runs continuous online grid security assessments.

WAMS address the time-lag issue by using a GPS satellite to time-stamp each reading as it is taken at its point of origin. Then, when phasor measurements come into the control center from far-flung points on the grid, they can be compiled to present grid operators with a very precise picture of what is happening on the system in real time. More importantly, they can see what is happening beyond their own control area - a major advancement over current methods.

In fact, WAMS can really be seen as a bridge between large sections of the grid that is analogous to the bridge between transmission and distribution that integrated systems like Network Manager provide. In the coming years, WAMS are likely to become a common fixture in utility control rooms, and eventually a wholly integrated component of power network control systems.

— Marina Öhrn, Amitava Sen

Web-enabled Condition Monitoring Keeps Shipping Fleet Afloat

- A shipping company operates a fleet of 29 tankers, carrying crude oil, oil products and liquefied natural gas around the world. It has made shipboard plant-equipment data accessible to its engineering superintendents anywhere in the world. Ship engineers manually collect data on levels of vibration and other variables, such as pressures and temperatures, for critical plant equipment on a routine basis. The data is then automatically e-mailed via the ships' satellite communications to their central database.
- At the monitoring centre, the data is collated and analyzed. Each month, reports on the condition of the plant equipment are available through a secure site, which can be accessed by personnel with the necessary security clearance. Each ship has its own Web page, which provides technical information for the vessel and collates all analysis reports, technical documents, manuals and user guides.
- At the click of a button, ship engineers can obtain help from condition monitoring experts via an online e-mail form.
- The user receives two major benefits from Web-enabling its condition monitoring data:

  1. It provides a cost-effective means of collecting and analyzing data from what are basically mobile factories. The company has already realized savings by reducing unexpected breakdowns and repairs, thereby enabling better planning of routine maintenance.
  2. It helps reduce survey costsincurred to keep the ship registered with its classification society, Lloyd’s Register. Lloyd’s Register normally requires that all ajor plants onboard be inspected on a five-year rolling basis. However, because Lloyd’s Register is able to carry out “virtual” assessments of the plant's condition just by checking the condition monitoring reports online, the approved condition-monitoring programme exempts the ships from a large portion of these costly shipboard checks.

— Pramod Kaushik

Automation in Petroleum Retailing

The business landscape of the energy sector, especially petroleum, is becoming increasingly uncertain and unpredictable. What makes this sector much more challenging is that many of the factors that directly affect profitable operations are beyond the direct control of the organizations. Protecting the Consumer against unscrupulous retailers has always been a challenge. The role of technology in petroleum retailing needs to be explored in a way that encompasses the interests of multiple stakeholders — viz. supplier, retailer and consumer.

Role of Technology in Petroleum Retailing

The Gas Station is the final 'point of sale' in the petroleum supply chain. This is the touch point with the end consumer and hence becomes the most important functional point in the entire Supply Chain.

Petro-retailing markets are evolving rapidly world wide. These markets are also becoming commercially competitive, as price controls are lifted. In many countries, the role of the government in the petroleum sector is being redefined and markets are being deregulated, i.e. state interventions such as special treatment of state-owned oil companies, price controls and restrictions to trade and are being removed. As a result the petroleum sector is becoming more and more competitive.

In a market where price is regulated and therefore almost uniform, factors such as convenience and product / service differentiation play a more important role in winning the market share. When price becomes free to move, it assumes greater importance in winning customers. As prices begin to vary for the same product, customers differentiate outlets not only by the quality of the offering and the convenience of acquiring it, but also by the price being charged. In markets such as fuel retailing that sells homogenous products, the importance of price increases considerably, as consumers are not able to differentiate between the product attributes. Therefore, within this type of market in order to successfully retain market share whilst maximizing profit, the issue of pricing is crucial and needs to be addressed.

Petro Retailers in any geography face the following key challenges with underlying objectives:

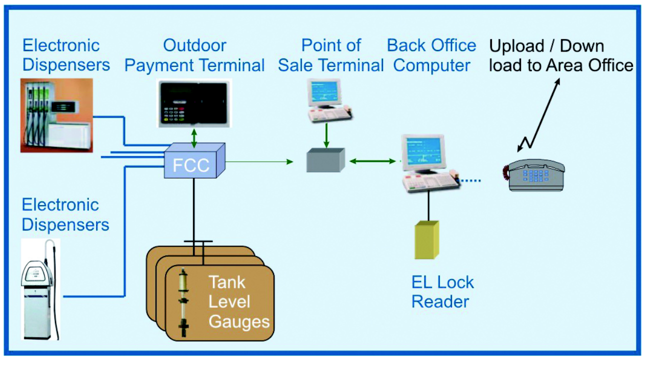
- Retain / increase market share
- Optimize profitability at point of sale by reducing operation cost throughout the supply chain
- Optimize gas station network
- Manage and reinforce customer perceptions for right quality and quantity
- Improve customer experience at the forecourt. Establish supplementary revenue stream using the same infrastructure.
- Retain and gain 'loyal customers' through brand building and promotional campaigns

To face these challenges, retail management needs to look at :

- Transaction data, sales volumes, market prices, pricing rules, asset utilization patterns
- Usage patterns, demographic characteristics with respect to customer and retail network
- Efficient and automated retail operations
- Visual evidence of right quality and quantity of the product delivered
- Remote operations monitoring
- Multiple retail propositions at point of sale
- Loyalty programs based on consumption pattern and offering various payment and filling options at isle

Complex and diverse networks of Gas Stations are often managed and controlled using Gas Station Management System, typically located at the area offices of petrol retailers. This solution enables remote monitoring of retail operations, price management, product promotions, end of day data warehousing and enhanced reporting through slicing and dicing the data warehouse.

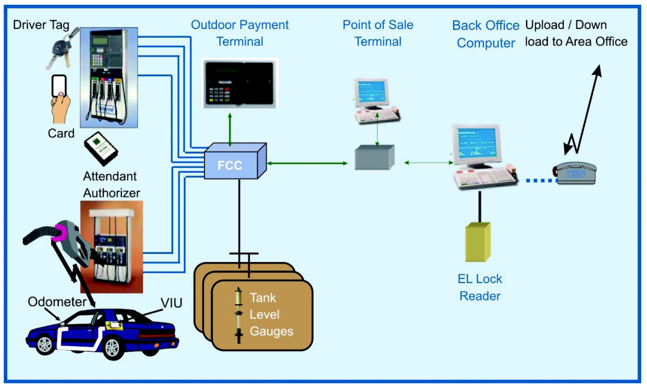
Gas Station Automation System



Gas Station Automation System provides monitoring, control and management of Gas Station with following major components:

- Forecourt Controller: To monitor and control forecourt activities
- Outdoor Payment Terminals: To provide various payment methods, enable dry stock sale on fueling isle, provide fuelling receipt, enable attendant tagging, forecourt shift management, etc.
- Tank Level Gauges: To provide measurement of product and water level, temperature and volume re-conciliation
- Back Office System: To provide management and configuration of gas station having modules for:
  - MMI Display
  - Shift Management
  - Wet Stock Management
  - Dry Stock Management
  - Financial Accounting
  - User Management
  - Reports
  - Gas Station Configuration
  - Fleet Management

Fleet Management System



Fleet Management System provides a unique way to handle Fleets at Gas Station:

VIU (Vehicle Information Unit) fitted in each fleet vehicle is hooked up to the Odometer and with fuel cap. Once connected and initialized, the VIU will keep correct log of the miles traveled and also details on the fuel type required for vehicle, registration number, etc. Whenever a fleet vehicle reaches gas station for re-fuelling; the automation system will communicate with the VIU to upload odometer reading, type of fuel permissible, etc and will grant automated authorization. Authorization will be granted in line with limits and restrictions provided for each vehicle. During re-fuelling operation, the dispensing goes on till the time nozzle is inserted in the fuel tank and communication between VIU antenna and nozzle is established, which ensure that 100% of the fuel dispensed is filled up in the vehicle authorized by the system.

Further, since the odometer reading of each vehicle is uploaded during the re-fuelling operation, fuel consumption pattern of each group of vehicles with respect to time and distance can be calculated and provided to fleet owner as report.

Fuel Delivery Management System @ Terminal

Fuel Delivery Management System manages the demand fulfillment side of the Petroleum Supply Chain. It ensures secure delivery of petroleum products from Terminal to Gas Station and as per the replenishment schedule worked out by the Secondary Distribution Planning and Scheduling System located at the Area Office.

Fuel Delivery Management System has following major components:

- Electronic Lock, operated by Electronic Key
- Electronic Lock and Key Programming Station
- Fuel Delivery Management Software
- Electronic Lock Reader at Gas Station

Control Room based Management

Integrating the various elements of data that is being collected from the field on a 24*7 basis, can be a very onerous task. Sorting and viewing that data to ensure that all business parameters are being met, is now possible in the comfort of a 21st century control room. Supervisors and analysts manage the entire retail operations using a central, vivid display system.

At the Marketing head office level, usually technology enablers like Dynamic Pricing, Secondary Distribution Planning and Scheduling and Demand Forecasting are deployed to enable quick decisions related to pricing, forecasting and replenishment across the secondary supply chain.

At the corporate level, strategic solutions like Network Planning are deployed to enable decision related to network optimization to boost the marketing gains.

— Manju Nandwani

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