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Background

This white paper explores the opportunities, demands and challenges of implementing enterprise-level point-of-use (“POU”) automation on a large scale in conjunction with integrated supply programs.

Each of these programs can independently have a major, positive impact on organizational efficiency and performance metrics. When implemented in tandem, the synergistic opportunity to achieve quantum gains is enhanced dramatically. This white paper does not present the business case for the tandem implementations. It addresses opportunities and considerations that exist for large organizations planning to implement these strategies on a large scale.

The potential for improved operational efficiencies and cost reduction is profound. However, organizations aspiring to launch broad-based initiatives must recognize that each of these strategies is intrinsically complex. The implementation of these programs concurrently requires that the enterprise, the point-of-use automation supplier, and integrated supplier(s) work together closely to optimize the opportunities and to eliminate redundancies.

Many factors must be considered to effectively implement automated point-of-use systems at the individual plant level. Effective implementation of plant-level integrated supply programs requires that careful planning be completed and strategic directions be clearly set forth in advance of implementation.

When both point-of-use automation systems and integrated supply programs are implemented concurrently at the plant level, the considerations are compounded. Rolling out these programs on a large scale compounds the considerations further. Among the opportunities to be considered are:

› Demand Management will become increasingly important; new possibilities will improve efficiencies throughout the supply chain.

› Transactions (issues, returns, replenishment) will move from the tool crib or supply room to the point-of-use; manual transactions will be automated and digitized.

› Inventory will be transformed and virtualized; information will replace physical inventory.

› Supply Chain Management will be streamlined and automated; seamless data flows enabled by the collection of clean, actionable data at the point-of-use will automate the replenishment process.

› Data-Driven Decision-Making Capabilities will be enhanced through better visibility to usage, replenishment, and process information, visual information display, trend analyses and real-time alerts.

These factors, among others, will cause management at the enterprise and plant levels, integrated suppliers and their tiered commodity suppliers to embrace new operating paradigms and work-flow processes. From a systems perspective, historical IT models must also be reviewed and in most cases refreshed to efficiently support the new operating structure.

Definition of Terms

For the purpose of this white paper, the following terms will be used as defined in this section:

Enterprise and Local End-User Systems

Enterprise and Local End-User Systems, or “ELS,” refer to software programs used for the primary purpose of performing administrative functions such as inventory management, procurement, ERP, HR, tool control, cal/cert management or transaction processing, which is not located directly in production areas.

Integrated Supplier Systems

Integrated supplier systems, or “ISS,” refer to software programs used by integrated suppliers for the primary purpose of performing administrative functions such as inventory management, procurement ERP, HR, tool control, cal/cert management or transaction processing, which is not located directly in production areas.

Point-of-Use Execution Systems

Point-of-Use Execution Systems, or “PES,” refer to hardware control means and software programs used for the primary purpose of controlling inventories, managing dispensing and return transactions, and executing business processes relating to the distribution of tools, MRO and safety supplies and other items of direct and indirect material at point-of-use locations and other production areas.

Point-of-Use Devices

Point-of-Use, or “POU,” devices refer to hardware control means used to maintain physical control of tools, MRO and safety supplies and other items of direct and indirect material at point-of-use locations and other production areas. These may include tool vending machines, “smart drawers,” automated locker systems, access-controlled bins and cabinets, self-service tool cribs and bar-code scanners, RFID or similar digitization means and other controlled storage means that are used to provide physical control in a POU System.
New Operating Paradigms, Redefinition of Roles/ Responsibilities/ Process Change

At first glance, it might appear that integrated supply programs are simply an outsourcing of storeroom operations, inventory management and procurement functions. Deeper examination, however, reveals that integrated supply implementations change operating paradigms and relationships internally within a client’s organization and externally throughout the entire supply chain.

Traditional interactions between employees of the client company, such as tool crib window transactions, purchasing functions and supplier interactions, are transformed as an integrated supplier takes over functions that have historically been handled by the client’s personnel. In the new world, the Integrator becomes the “face” that employees and suppliers see and deal with in day-to-day business interactions.

Transactions and Data Capture
Streamlines transactions and ensures real-time data capture

Before: Manual Tool Crib Transactions
Retrieving needed supplies is complicated by distance, interruptions and distractions

After: Automated Point-of-Use Transactions
Needed supplies are dispensed in just minutes

Benefits of POU Automation and Integrated Supply
› Reduces Supply Room Workload
  More than 80% of tools, parts, materials and supplies can be distributed at the point-of-use

› Managed Returns
  Point-of-use returns save time and automate calibration, certification and maintenance schedules

› Automated Replenishment
  Real-time supplier alerts keep stock at optimum levels

› Data Capture
  Replaces manual recordkeeping with real-time automated data capture
The Changing Character of Inventory
As POU automation and a fully integrated supply chain are implemented, real-time, accurate and actionable information becomes ubiquitously available for:

› Usage
› Replenishment requirements
› Supplier performance metrics

This information availability, including real-time exception alerts, enables a redesign of the supply chain that can eliminate inventory inefficiencies and waste such as buffers, bloated inventory, shop-floor hoarding and inventory obsolescence.

Increased availability of reliable information improves confidence throughout the supply chain, enabling all supply chain members from the shop floor to inventory managers to the integrated supplier and its suppliers to manage the flow of materials more effectively.

The effect is to dramatically reduce inventory levels (often by 50% or more) and to virtually eliminate obsolescence and shop-floor hoarding. Inventory turns are accelerated and stock-outs are reduced or eliminated.

### Inventories
Eliminates bloated inventory, stock outs and waste while controlling use

#### Before: Manual Inventory Management
Lack of real-time data and poor control over loss and hoarding

- Inventory Data Less Than 85% Accurate
- Inventory Obsolescence Exceeds 50%
- Inventory Turns 1-2x Annually
- 100% of Inventory Stocked

#### After: Automated Point-of-Use Inventories
Real-time usage data and greater control eliminates inventory inefficiencies

- Inventory Data May Exceed 99% Accuracy
- Inventory Obsolescence Reduced to Almost Zero
- Dramatic Inventory Level Reduction
- 80% of Inventory Data and Transactions Moved to POU

### Benefits of POU Integrated Supply Management

› **Efficient Workflow**
  High-use inventory moves to point-of-use for quick retrieval

› **Lean Inventory**
  Turns for high-use items increase to 25+ per year

› **Reduced Waste**
  Enhanced usage visibility greatly reduces hoarding, theft and obsolescence

› **Enterprise-Wide Visibility**
  Exceptional data accuracy optimizes supply chain and virtualizes inventory
Execution and “Controlled Demand Pull” at the Point-of-Use

Successfully managing the distribution of tools, supplies, parts and other critical materials to the point-of-use requires the application of controls and processing that have not been historically required for traditional attended supply room operations. Regardless of whether a tool crib is operated by the client or by an integrated supplier, POU distribution places new demands on information processing systems.

Enterprise and Local End User Systems (ELS) and Integrated Supplier Systems (ISS) were not designed specifically to manage POU transactions and inventories. These ELS and ISS systems (frequently made up of several interfaced systems) are the legacy information processing tools in place as the implementations begin. Typically some, but not all, of the needed future functionality is existent in these legacy systems. Therefore, optimization of the potential benefits of POU automation requires the introduction of a new layer of functionality to provide robust transaction processing capabilities and to manage inventories in a true “pull” environment.

The needed functionality is enabled through the implementation of Point-of-Use Execution Systems (PES) including hardware (Industrial vending systems, automated locker systems RFID cabinets, etc.) and POU execution software. POU execution software is purpose-designed to efficiently manage all of the complex transactions that occur at the POU and to seamlessly integrate with an implementation environment of both client and integrated supplier systems.

POU Execution, Transactions and Related Functionality

To enable a PES system to execute this functionality, consideration must be given as to which ELS and ISS systems contain the data required to authorize transactions, where particular business rules are most appropriately resident and which ELS and ISS systems must be refreshed or updated when particular transactions or events are processed.

These considerations will affect both the selection of POU automation technology and the system architecture. Further, they will dictate which ELS and ISS systems must be considered in the system design and linked to the PES system. Following are examples of the POU business rules typically required for authorizing and processing transactions for PES systems:

- Dispensing of consumables
- Restock alerts and reports, with printed restocking guides
- Return of returnable items to pre-assigned locations and to available locations
- Re-issuing of returned items managed against criteria in established business rules
- Management of Consigned or Vendor Managed Inventories (VMI)
- Tracking of serialized tooling or assets
- Lock-down for damaged or out-of-cert tools, correct crediting of returned tools
- Restrictions on employees delinquent in returning tools
- Tool loan options
- Comprehensive reporting on history and status of serial and lot number
- Re-configuration of dispensers to efficiently accommodate a variety of tool sizes
- Inventory management and contro
- Accurate, detailed transaction logging to help resolve disputes
- Interface to metrology applications
- Special handling for the dispensing of safety items

Moving Beyond “Demand Pull” to “Controlled Demand Pull”

It is widely understood that advanced manufacturing practices such as Lean Manufacturing cannot be properly supported by traditional “push” materials management modalities. While “Demand Pull” models, including Kanban, are better suited to efficiently managing the replenishment of deployed inventories, they cannot fully support the needs of today’s optimized manufacturing environment. These challenges increase as POU automation and integrated supply are implemented concurrently.

Some of the shortcomings of a pure “Demand Pull” system in this context include:

- Free-issue stock increases usage
- Lack of visibility and actionable data increase
  - Cost of replenishment for the integrated supplier
  - Frequency of stock outs
  - Need for expedited and emergency orders
  - Need for safety and buffer stocks
- Data-driven decision making cannot be executed due to
inadequate information availability, resulting in:
• No visibility to individual users
• No ability to link usage to process data (work orders, job numbers, cost centers, etc.)
• Limited ability to implement product consolidation strategies particularly on a large, enterprise level
• Real-time data not available to identify changing patterns

Lack of control denies the ability to:
• Automate management of returnable tools and other assets at the POU
• Standardize product usage or processes
• Manage process or standards compliance

“Controlled Demand Pull”
The move to POU automation requires the implementation of a “Controlled Demand Pull” model. This provides the advantages of a “Demand Pull” system while adding the information availability and controls necessary to optimize the operations of the integrated supplier and realize the full range of possible benefits.

By controlling access to individual items by user and making actionable data available throughout the supply chain, a “Controlled Demand Pull” system provides the necessary levels of support that are required to effectively move transactions and inventories to the POU while achieving targeted inventory reduction and increased turn rates.

“Controlled Demand Pull,” by definition, begins with the addition of physical control of POU inventories and transactions through the POU devices. Then a layer of execution software is added to provide the necessary transaction processing, executing business rules, data capture and redistribution and work-flow management functionality to complete the “Controlled Demand Pull” model. The hardware/software combination comprises the complete PES system.

Characteristics and Requirements of Software at the PES Layer
Software at the PES layer should be designed with a primary purpose of processing transactions, controlling access, and executing business rules in a “Controlled Demand Pull” environment. While crib management, tool management, ERP, warehouse management, and CMMS software may offer some of the needed functionality of a PES system, these software programs are not optimized to execute at the PES level and typically are driven by traditional inventory management models that do employ “Demand Pull” or “Controlled Demand Pull” modalities.

It is common for ELS and ISS systems to be built around the types of legacy software described in the preceding paragraph. Though less common, these types of software programs are sometimes used to manage POU programs as well.

When POU automation and integrated supply programs are implemented concurrently, the addition of purpose-designed software optimized for the PES layer is necessary. The illustration below shows the role of PES in the overall system architecture.

Identifying Functional

The Expanded Role of POU Execution Systems (PES)
Providing required functionality for seamless integration of supplier and client systems
Redundancies, Data Synchronization and System Overlap

In any enterprise-level implementation of POU automation in conjunction with an integrated supply program, particularly on a large scale, clients and integrated suppliers will have systems in place that must be retained.

Typically, instances of these systems will present varying capabilities and opportunities. When adding software at the PES layer, there will be functional redundancies and system overlap.

Successful execution will require careful planning and communication between the client, its integrated suppliers and its POU automation technology supplier. A thorough analysis of the systems should be conducted collaboratively to determine where functional redundancies exist and to map the optimal data flows and processing hierarchies.

From this effort, clearly articulated “rules of engagement” can be developed to guide the technical teams from all of the players as they develop interfaces and/or integrations of the systems.

Enterprise PES Systems

Many currently marketed PES systems are either single-site solutions or systems that rely on the replication of site-based data to a web server (as contrasted to native Internet solutions). Some of these systems require the purchase of costly data warehouse software in order to provide enterprise-level data consolidation.

Replication of site-generated transaction data to a web server introduces the potential for synchronization errors and increases ongoing support requirements and costs. Next-gen POU technology has made POU devices easier to use, easier to implement, and much less expensive than prior generations. These next-gen systems are native Internet appliances. This eliminates the need for data replication or synchronization and simplifies ongoing support.

Most importantly, next-gen POU systems provide real-time visibility to usage, inventory and replenishment data beyond the walls of individual sites. This enables enterprise users to easily identify usage patterns and opportunities beyond these individual sites.

These may include:

- Opportunities for product consolidation

The Importance of True

Integrating ELS and ISS Systems Within a PES System

Careful planning ensures optimal data flows and processing hierarchies
Implementing Enterprise-Level Point-of-Use Automation In Conjunction with Integrated Supply Programs

- Increases or decreases in usage rates
- Opportunities to optimize inventory levels and turns
- Identification of maverick or non-compliant usage
- Identification of variances between similar work groups across the enterprise

True enterprise systems provide further advantages over site-based, replication-driven systems with respect to scalability and reliability. Built with enterprise-grade tools such as IBM WebSphere, Java, J2E and Oracle databases, these systems are designed to process large numbers of transactions and scale to support large, high-availability enterprise implementations.

Cost of POU System Acquisition and Implementation

The cost of hardware and software acquisition is a significant driver in determining the economic benefits realized through an implementation of POU automation technology in conjunction with integrated supply. It is also important to consider the out-of-pocket costs for implementation and installation, as well as the "hidden" costs expended in the form of internal resources and management oversight required for implementation, and the ongoing costs of data management, support and maintenance.

A list of considerations relative to the total cost of ownership (TCO) includes:
- Hardware pricing
- Software costs
- Implementation costs
- Installation costs
- Ongoing support costs
- Internal resources required for support
- Additional costs to add enterprise functionality

Realizing the Promise

Implementing an enterprise-level PES system on a large scale in conjunction with integrated supply programs presents significant opportunities for productivity gains and cost savings; however, realizing the promise of the opportunity is a function of the project’s execution. The complexities of such a project should not be underestimated.

The collective knowledge base that has been gained from large, enterprise-wide implementations of both POU automation and integrated supply projects that have been completed independently and together over the past decade provides many "lessons learned" that can guide implementers as they address massive projects.

Some historical models and operating practices can be preserved, but new thinking will be required from clients, their integrated suppliers and their POU technology provider. In addition to the opportunities and considerations already discussed in this white paper, a fresh view of the following areas is merited.

Inventory Ownership, Virtualization and Management

The age-old debate between clients and integrated suppliers as to who should (or shouldn’t) own inventory can be looked at in a new light. When properly applied, POU automation can enable inventory rates of 30 or more turns per year. Clearly, not all inventory items can be turned rapidly. Certain maintenance items may turn one or fewer times per year under the best of circumstances, but a very high percent (often greater than 85%) – both in terms of dollars and units issued – can be managed to achieve very high turn rates.

This effectively “virtualizes” the inventory. Put simply, the inventory can be turned within standard trade payment terms, thus eliminating the burden of carrying costs from both the client and the integrated supplier. Further, the controls provided by the PES system provide the client and integrated supplier with access to the same information and enable both parties to have confidence in the whereabouts of all materials at all times.

The total accountability provided by the PES system obviates the most challenging barriers to consignment and Vendor Managed Inventory (VMI) programs. Both clients and their integrated suppliers have real-time visibility to accurate information on what material has been used, when it was used, who used it and for what purpose the material was used.

Where Should the Process Start?

The question, “Should we start with the implementation of integrated supply or the implementation of PES systems?” is
frequently asked as organizations develop their strategies. The answer to this “chicken or egg?” question varies depending on the particular environment.

Ideally, integrated supply and PES systems will be introduced to a plant concurrently; however, each program can bring important benefits independent of the other. For plants where integrated supply has been implemented, PES systems can be added as a second phase.

The Learning Curve

Organizations contemplating large-scale rollouts of PES automation in conjunction with integrated supply should acknowledge that this process is relatively new. Meaningful knowledge bases exist for both integrated supply and PES automation implementations and, to a lesser extent, for concurrent implementations.

Accordingly, care should be used to draw upon the aggregate knowledge of the client, the integrated supplier, and the POU technology provider. By establishing a comprehensive, tri-party dialogue, many of the implementation pitfalls can be avoided. Setting forth clearly defined objectives, aligning expectations and focusing on tight execution are the hallmarks of success in the execution of any project, large or small. When implementing a massive deployment of PES automation in conjunction with integrated supply, this is especially true. The illustration below shows that the relationships between the drivers are critical to successful execution.

Conclusion

Implementing enterprise-level point-of-use automation on a large scale with integrated supply programs has the potential to transform the flow of indirect materials into manufacturing plants throughout the world and to dramatically reduce costs for clients, their integrators, and throughout the entire supply chain.

As with all complex, high-impact large projects, implementing enterprise-level point-of-use automation on a large scale in conjunction with integrated supply programs requires detailed planning and execution. New business and operating models will develop and evolve as these implementations grow. This will require organizational change and agile response as the challenges of project execution push the limits of current practices and experience.

Those organizations that adopt these new operating models early and who successfully execute enterprise-wide deployments will achieve a distinct strategic advantage over their competitors.