Capital Ideas for the Times

Manufacturers must free working capital and re-commission fixed assets to enhance competitiveness and position their balance sheets to support an economic upturn.

Wayne Filichowski
AVS SYSTEMS, INC. ®

Contents

Executive Summary

This paper was written for business leaders now faced with the extremely difficult operating challenges thrust at them by today's economy. The bombardment of economic news we receive each day requires little more to be said about the severity of the 2009 economic "Tsunami." This global economic downturn has senior managers re-evaluating operational strategies from "A" to "Z." So, the intended audience for this paper is those executives and managers in manufacturing businesses that are looking for additional preemptive moves in the face of this storm. We hope our "Capital Ideas" are of solid assistance.

Manufacturers have seen total order volumes drop, accompanied by variability in demand and smaller lots. Supply chain disruptions, plus energy and raw material cost increases have served to exacerbate the situation. With lower order volumes, there are diminishing returns in focusing predominately on unit cost reductions. In any economy, we know that generating cash is the life blood of the business, but today, it's far tougher to generate cash through profit leverage. So, on the subject of cash, we submit that now is a perfect time to look at the capital side of the balance sheet. Keeping outside investors in mind, this is an outstanding time to be positioned with more cash.

Our premise is that if capital is not being leveraged from sales margins, then it alternatively should be generated through working capital reductions. Moving to also cover fixed assets on the capital side, another area of opportunity is associated with the total cost of ownership (TCO) of machinery and equipment. In past boom times, companies invested heavily in new machinery and equipment and made acquisitions that led to added capacity. As we move through this recession it is advisable to reassess current operations and cull assets that are "over the line" in terms of TCO. After making this cut, even "keeper" assets may need a re-commissioning tune-up to insure that they are as productive and efficient as possible.

So, the current environment provides an opportunity for manufacturers to strategically reposition their respective businesses - with a more distinct emphasis on the utilization of assets and the agility it takes to manage them.

AVS has intended this document as a roadmap. Rather than a general whitepaper on theoretical approaches to lean transformations or software strategies, we chose to utilize our industry knowledge to provide specific ideas on how leaders can better position their operations in this economy. Thus we named this paper, "Capital Ideas for the Times." Our five capital ideas for optimizing manufacturing performance focus on these outcomes:

- Pull working capital out of your operations;
- Raise fixed asset turnover rates;
- Go green;
- Optimize your total cost of quality; and
- Fully utilize your human capital.

Each of these five is presented with a solid focus on driving short-term ROI with sustained long-term operational improvements. Integrated with each, are specific examples of how information technology can be used to first leverage and then sustain improved operational results. Through this paper, the reader has access to best practices from a variety of industry verticals and manufacturing styles. Best of breed software solutions are presented, as well. We hope our readers will find this material valuable. Our contact information is included on page 14 and we hope our readers will contact us with any questions or comments they may want to share.

First, as a Way of Cutting Costs, Let's Take a Look at a New Breed of Software

It may seem counter-productive to recommend investment spending at this time, especially for IT. But, now is a great time to extend the capabilities and value of sunken investments in enterprise systems and infrastructure. We want to quickly point out, that all solutions discussed in this paper are representative of what we term a new breed of software. What make this breed, a "new breed," are the value propositions possible with the installations. Also, they are vendor agnostic when it comes to existing enterprise software. So, we're talking about rapid time-to-value and simpler, less costly deployments. And the best part, is, they are directly configurable to user-defined business needs.

These newer solutions represent a distinct opportunity to unshackle software users and CIOs alike from the high cost and inflexibility of conventional enterprise apps and/or legacy systems. Today's CIOs are seeking tangible, short-term results from their IT investments. With this new breed, it is possible to cost-effectively deliver solutions to very demanding needs – even in this economic environment.

Many of our suggested solutions are based on the use of Services Oriented Architecture or SOA for short. SOA-enabled applications can be installed to run literally anywhere as a platform. They have the capability to interoperate with both enterprise and plant floor apps through web services running on what is called an enterprise service bus (ESB). While this may be too much technical detail for many readers, it is important to make a critical point about ESB's here. Direct interoperability between the enterprise and plant floor systems has been sought as the route to true system integration. ESB frameworks enable this integration and provide the bus and messaging capability for complete data exchange that is scalable throughout the enterprise. So in the opening paragraph of this section, when we mentioned "extending existing infrastructure," this is what we had in mind.

With the new breed, true visibility is possible across the enterprise through web portals. This feature allows for direct configuration to the operational needs of the users, faster installs, and new levels of organizational agility, plus higher returns on IT investments. Figure 1 below, provides a side-by-side comparison of SOA-enabled apps to the conventional enterprise genre. There is a huge difference in architecture, and this fact may or may not be important to the reader, but the value proposition offered by the new breed should be.

Comparative Factor	Distributed Component Architecture	Services Oriented Architecture
Typical Uses	Enterprise Business Applications (ERP, SCM, CRM, etc.)	Process-centric, event-driven tracking and control.
Application Composition	Business apps built from rigid code	Workflows modeled to the process
Data Exchange	Object-oriented (e.g., shared document)	Services-oriented (e.g., Web services message)
Business Logic Adaptability	Inflexible	Flexible
Plant-to-Enterprise (P2E) Interoperability*	Limited by proprietary API's and message brokers	Highly enabled by open connectivity via extensible web services & messaging
User Interfaces and Portals	Constrained by access to application platform	Freely enabled by web services
Time-to-value	Extensive integration projects followed by multi-year investment recovery periods	Finite integration projects with investment recovery in months
Total Cost of Ownership	Comparatively high	Comparatively low

* P2E Interoperability refers to connectivity, data exchange, and business logic abstraction between enterprise-level and plant floor systems.

Figure 1 – Distributed Component vs. Services Oriented Architecture Models

With the SOA-enabled apps, "out," go the armies of consultants and complex project management charts. "In," are rapid deployment teams that focus on addressing real business problems and fast solution delivery. Often these solutions are implemented first as proof-of-concept pilots, so as to prove their worth. Then, as the value proposition is better defined, full scale implementation occurs with high levels of organizational confidence and buy-in.

Companies are moving away from large scale IT projects in favor of business focused solutions. These solutions drive immediate value and meet real and identified business needs as defined by the process owners and software users.

Admittedly, we have given much attention to IT and the new SOA approaches. Perhaps too much, but keep in mind that the playing field for driving operational improvement through information technology has changed radically. We're witnessing an established trend that has been confirmed by a recent research report published by Gartner EXP. Excerpts from the Gartner report are included in the adjacent box.

Gartner specifically detailed CIO priorities and found that the CIOs are universally looking for short-term, tangible results through applications like business process optimization and extensions of their existing IT infrastructure. Gartner also found that a parallel drive is underway in this economy to reduce the total cost of ownership (TCO) for enterprise applications like ERP.

Earlier in this paper, we introduced the subject of TCO for assets. Related to IT assets, It would be appropriate to cover one final point. Heretofore, Software as a Service (SaaS) and Cloud Computing have not been mentioned. They are viable alternatives to conventional approaches for licensing and running software. Certainly the approaches lessen IT infrastructure costs. Due to the scope of this paper, a further evaluation of these server strategies is left to the reader, with the mention that SaaS is definitely a cost effective strategy that demands a closer look. In writing this paper it was decided to focus more on the functionality of software apps, as opposed to where the source code should run.

Gartner EXP Worldwide Survey

A 2009 worldwide survey of 1,527 corporate and public-sector CIOs conducted by Gartner EXP examined both IT spending levels and priorities. In a press release dated January 14, 2009, Mark McDonald, group vice president and head of research for Gartner EXP commented: "In 2009, executives face challenging global and economic conditions that have not existed for more than 50 years. This environment is reflected in IT budgets, priorities and strategies as one third of CIOs reported no change in their budget from 2008, while 46 percent reported a slight increase, and 21 percent reported a cut in IT budgets. Enterprises expect IT to contribute results in an uncertain economy." The report went on to reflect the priorities of the surveyed CIOs.

Here are the Highest 5 from the Top 10 CIO Business Priorities in 2009:

Ranking	Business Priority
1	Business Process Improvement
2	Reducing enterprise costs
3	Improving enterprise workforce effectiveness
4	Attracting and retaining new customers
5	Increasing the use of information/ analytics

Source: Gartner EXP

Likewise, CIOs are moving their technology spending to a focus on business processes. They are also planning to leverage their sunken investments in enterprise infrastructure while reducing the number of ERP instances, license costs, and vendors. Server and storage technology spending is expected to be geared to meet enterprise-wide demand.

The report concludes that "CIOs must be decisive and resourceful in 2009." McDonald said: "CIOs need to lead and have the foresight to look at IT in new ways. They will demonstrate leadership through four imperatives:

- Be decisive in setting priorities on actions that raise enterprise effectiveness, with a focus on improving business process, using business intelligence to raise visibility, and enhancing workforce effectiveness.
- Do the "first things faster," as changing economic conditions render a large project irrelevant. CIOs need to apply a prioritization process to their schedule and recognize that other important priorities can wait. They need to place greater emphasis on the schedule (when) rather that the priorities (why).
- Be resourceful in restructuring IT to raise its productivity and agility, because the business will not reduce its demand for IT just because the CIOs have fewer resources.
- Modernize the technical infrastructure, as new technologies offer lower cost, use less energy, deliver better performance and provide greater capacity; the business will need all of these in the immediate future."

Our Five Capital Ideas

Idea #1 - Pull Working Capital Out of Your Operations

Significantly lower order volumes, especially with shifts to a high mix of products, expose any company's real limits on agility. Lower volumes also mean the likelihood of under-absorption of factory overhead. Unit costs then tend to gravitate upward. In lieu of this, our first strategy, deals with accelerating material velocity or rather throughput, so as to increase WIP inventory turns.

Tips on executing Idea #1 -

Increase Throughput Rates

This idea is made actionable by focusing on increased agility through: the application of IT-driven production execution methods, the use of real-time factory monitoring and control systems, plus the synchronization of suppliers to current demand.

With process cycle times and method requirements notwithstanding, how do you accelerate the flow of productive materials through your factories while meeting volume, mix, and sequence requirements? WIP velocity drives higher inventory turns and thus profit leverage from salable finished goods. In addition, when it comes to production execution, higher levels of agility allow for working capital to be freed that would otherwise remain in WIP.

So, to answer the foregoing question regarding accelerated flow, we begin with the 80/20 rule applied to productive assets. It's no revelation that every plant has bottleneck and constraint operations. These are the machines that typically represent 20% of the asset base, but cause 80% of the delays, WIP bloat, and needed expediting effort. Every plant has constraint operations, but many times the actual constraint causes are evasive and tend to migrate up and down production lines. So the proposition is one of installing the capability to manage these lines so that they run at the throughput rates and with the agile responsiveness for which they were purchased.

There is another factor to consider in this throughput quest. One of the most controllable causes of lost production and/or WIP bloat is associated with events that happen while the production equipment is in an operational state. These "uptime" losses are routinely caused by material delivery shortages, ill-timed product changeovers, scheduling errors, sequencing delays, blocked machine states, and stoppages for chronic tool/recipe adjustments. While good old unscheduled equipment breakdowns can be a killer to throughput and productivity, the most insidious losses are the productive capacity losses that occur when the lines are scheduled with orders and are available to produce, yet are not doing so. These losses are often labeled "uptime" or "availability losses."

Here are three ideas on how technology helps organizations achieve higher working capital turnover rates while also reducing throughput losses.

Real-time Manufacturing Intelligence Systems

Manufacturing intelligence systems provide real-time views through direct connectivity to the operating environment. Constraints can then be isolated and corrected literally as they occur. Additionally, innovative software like *Activplant's Business Intelligence for Manufacturing Operations* can extend enterprise systems both horizontally and vertically in order to capture events and alarms throughout the

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operation. This means that the goal of being a real-time enterprise can be achieved without the huge expense of extending enterprise solutions like ERP or SCM systems. Plus, a system like *Activplant's* can be equipped with integration tool kits (ITKs) and web services for direct interoperability with enterprise systems.

Production Execution Systems

Manufacturing Execution Systems (MES) have been proven to provide exceptional value, especially for discrete manufacturers. MES solutions can be implemented as independent platforms with full functionality necessary to dispatch, track, and report production activities. *OnTrack's Manufacturing System* has continued to be refined over the years from its start as a leader of the MES movement. By abstracting requirements from ERP systems, *OnTrack's* platform allows order execution and allocation of resources for optimum utilization of WIP inventory.

Line-side Sequencing Systems

Stand-alone sequencing systems are now used by high performance companies to broadcast assembly department demand and synchronize supplier feeds to real-time execution sequences. Such systems give 360 degree visibility and error-proof inbound materials in order to verify counts, part numbers, and load sequences, while also allowing for faster corrective actions for quality issues. These systems radically improve material velocity and supplier responsiveness. Interestingly, the systems are also placing the real value of some logistics optimization centers into question.

Results Achievable

The visibility and real-time intelligence provided by correctly engineered IT solutions are invaluable in reducing working capital. The value proposition only gets better in mixed model production environments. Supplier synchronization to real demand is greatly facilitated with MES apps in high mix environments, especially where pull systems driven by Kanban cards breakdown due to the complexity of high variety manufacturing. In summary, the above apps provide an improved level of agility that drives these specific benefits:

- Increased WIP inventory turns
- Reduced order-to-cash cycles
- Lower operating cost variances, especially the under-absorption of overhead
- Improved customer service levels
- Reduced indirect labor expenses

> **Best Practices Related to Working Capital Utilization**
>
> *Leading edge companies maintain real-time displays and event notifications for all their facilities so that starved operations and major process upsets are immediately signaled to both internal and external managers. This capability avoids the scenario of a $1 feeder part shortage creating a short-term inventory bloat of $10,000 worth of end item assemblies. This real-time display and notification system is like a huge Andon Board from the Toyota Production System, except it's implemented across the enterprise.*

Idea #2 - Raise Fixed Asset Turnover Rates

In previous boom times, companies expanded rapidly. Now, many have installed bases of fixed assets that may represent an unsustainable cost burden, not to mention excess capacity and the albatross of specialized service capabilities required to sustain and maintain them.

Tips on executing Idea #2 -

Re-commission your asset base to generate real value.

This idea is made actionable by installing asset management practices needed for maintenance effectiveness and for evaluating and reducing the Total Cost of Ownership (TCO).

By re-commissioning fixed assets and using TCO analytics, executives can accomplish an objective evaluation and rank which assets are really providing the highest asset turnover rates. This process will also identify those assets which are merely costing money and taking-up space. For an accurate TCO rollup, managers should look at actual maintenance costs, operating labor, comparative machine efficiencies, tooling and other indirect costs, waste streams generated, environmental impact costs, actual utilization rates, and depreciation expenses.

Here is how technology can help organizations achieve higher asset turnover rates.

Event-driven Maintenance Execution Systems

Forward thinking companies recognize the value of SOA and ESB frameworks at the core of their IT architecture. Event tracking and messaging software applications such as *As One's Catalyst SDP™ System Development Platform* can be cost effectively developed with this architecture. Interoperating over an ESB, "sense and respond" agents can be deployed to manage specific assets and perform data collection functions that lead to informed decisions, and to trigger preemptive maintenance tasks. These agents are like having added staff members to focus on specific critical conditions and faults. Thus, reaction to unfavorable and developing non-standard conditions is possible, often, so as to avoid catastrophic breakdowns.

Throughput Tracking Systems

Applications that track throughput and isolate causes of lost production are being used by leading manufacturers in many different verticals including automotive, pharmaceutical, semiconductor, food & beverage, and consumer packaged goods. Best of breed systems like *Activplant's Throughput Analyzer* readily identify throughput constraints and enable the smoothing of flow turbulence. Conditions that rob lines of throughput tend to move up-and-down production lines. Line balance can be maintained without requiring time consuming industrial engineering restudies. With these systems, it is possible to manage constraints and more fully utilize "as purchased" or "as designed" machine capacities.

Asset Management Systems

Computerized Maintenance Management Systems (CMMS) do take time and discipline to install, but the results can be astounding. Companies have found that as they convert maintenance work from reactive to preventive, their maintenance labor and materials expenses drop significantly. Another high leverage tactic is Total Productive Maintenance, a practice that grew out of the Toyota Production System Kieretsu (supplier base), namely from Nachi Fuji-Koshi Bearing Company. In using TPM techniques, companies can convert their maintenance activities to the preventive mode, while also benefitting from reduced operating costs, the generation of fewer defects, and less frequent downtime occurrences.

Results achievable:

Two factors are important in assessing the performance and utilization of assets. The first is the actual productive throughput, measured as overall equipment effectiveness (OEE). The second is TCO. It takes a comprehensive approach to correctly dimension these factors. The above applications discussed in the text box can provide extremely valuable OEE and TCO intelligence in addition to driving these results:
- Higher return on assets (ROA)
- Reduced maintenance department costs
- Lower variances related to factory overhead absorption
- Reduced overtime premiums and idle time charges
- Improved delivery reliability

Idea #3 - Go Green

It's entirely possible to reduce both the environmental impact of an operation and its required factory overhead spending, as parallel activities. Somewhere in between consumer buying preferences, social conscience, looming new government regulations, excessive operating costs, and shortages of natural resources, lay the compelling reasons for green strategies. Considering this rationale, it's not really a question of "why," but more so one of "how." In going green, many companies follow a WAGES template (WAGES stands for water, air, gas, electricity, and steam) to guide the breadth and depth of their initiatives.

Tips on executing Idea #3 -

Drive eco-efficiency gains in parallel with overhead spending reductions.

The US EPA defines eco-efficiency as the ability to simultaneously meet cost, quality and performance goals; reduce environmental impacts; and conserve valuable resources. This idea is best implemented, in our opinion, under the adage: "what gets measured gets done."

 The direct linkage between eco-efficiency and overhead costs is irrefutable. So, a real key to eco-efficiency is to analyze and reduce excess and wasteful overhead spending. Note, as production volumes drop, absorption costing will apply the pooled overhead expenses over fewer products and costs go up. Gross overhead spending needs to be retracted. The question needs to be raised to all managers as to whether there are hidden and unnecessary internal "consumers" of resources quietly at work? By using a zero-based budget mentality and eco-efficiency metrics, decision makers can be in touch with all appropriate considerations required for rationally going green.

As this paper is focused on Tsunami fighting short-term strategies, it would be appropriate to acknowledge that most truly green products, and the operations that produce them, are the result of product lifecycle management (PLM) initiatives that extend over years. Truly green products begin with the design engineering phase. Figure 2 illustrates a typical PLM cycle.
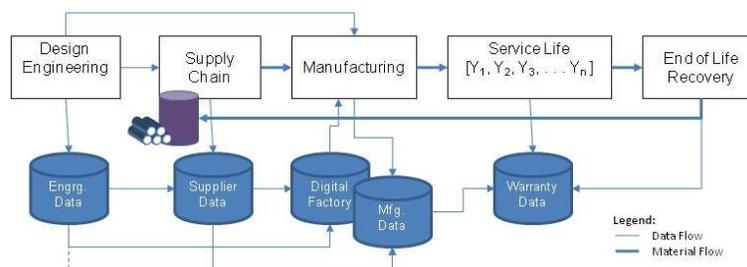

Figure 2 – Product Lifecycle Management

Companies are finding their way to improved PLM through product development cycles that consolidate product information in one part master database called a Bill of Process (BofP) covering routings, methods, bills of material, and engineering drawings. As Figure 2 illustrates, all too often, engineering databases and equivalent manufacturing databases are separate. Seamless translation of BofPs to manufacturing documentation is a practice that will accelerate green product launches, but again it is a longer term strategy. Additionally, PLM software vendors now provide the ability to "virtualize" new products. This means that the product can be modeled, manufactured and tested in a digital factory. With this tool engineers can evaluate options relative to alternative materials and assembly methods in order to achieve the highest levels of eco-efficiency. Unfortunately companies with products under manufacture today can hardly return to the earlier design and sourcing phases. It is also recognized that end of life recovery activities are beyond the timelines of a short-term focus.

So, here are some ways that information technology is helping leading edge companies to track and manage green initiatives today.

Energy Management Systems

Systems are available as standalone platforms that seamlessly integrate with current infrastructures. *As One's Catalyst* platform offers an extensible solution to track resource consumption, power readings, critical equipment conditions, plus faults and alarms. A great percentage of the time it takes for manual monitoring and control is saved, thereby increasing staff productivity. *As One's* system allows for closed-loop control of conditions via a sense and respond agents and web service messaging. Managers and analysts are applying this new breed of event-driven software to automatically collect real-time data, perform business-rule based decisions, interpret trends, and proactively react to exceptions. And, under the above stated premise of "what gets measured, gets done" strong green transformations can be driven by tracking and posting actual consumption and waste stream costs under a WAGES template for all employees to see.

Database Management Systems

With the evolution of lean manufacturing and Six Sigma practices, quality system approaches deployed by manufacturers have universally improved. One continuing challenge, though, is the predominance of disparate quality related databases. Quality databases can number in the hundreds or even the thousands in a large company. Also, as indicated in Figure 2, the gap between engineering and manufacturing systems was illustrated. In the case of both manufacturing and in-service warranty data, the database gaps are equally as pervasive. Business intelligence solutions are available as middleware platforms to layer over the existing databases in order to query, contextualize, and display needed data from all these disparate databases.

Supply Chain Optimization Systems

Standard supply chain management systems find it difficult to handle delays and delivery upsets in real-time. Materials, planning, and logistics (MP&L) personnel then have to spend inordinate amounts of time expediting orders and supervising subsequent workaround plans. This is where overhead cost rise, especially when production lines are starved. Today, event-driven solutions are available to provide improved control of disruptions and events that tend to upset the flow of materials throughout the supply chain. These systems are enterprise software vendor agnostic, and interoperate as stand-alone platforms. Through the use of business event tracking and the application of business-rule sets, managers now have the portal-based visibility and query control required to continuously assure supply chain performance across the globe. Assured deliveries and corrective actions drive improved productivity at all levels of the organization and reduce factory waste.

Results achievable:

Solid results are possible with real-time energy management and business intelligence systems. Another positive aspect deals with the tactic of automating the heretofore manually executed processes of "go see" meter monitoring, data entry, and report compilation. Here are just a few of the direct benefits of real-time factory intelligence applied in a green technology strategy:

- Reduced overhead spending – especially for energy
- Reduced waste discharge costs
- Increased productivity, especially in support departments
- Reduced maintenance expenses

Best Practices in Driving Eco-efficiency

Leading edge companies are recognizing carbon-dioxide-equivalents in prioritizing their energy efficiency programs. According to an article in the March 6, 2009 edition of The Wall Street Journal ("Packing Heat: The Firepower of the Lowly Caulk Gun"), a focus on simple industrial efficiency was projected to globally yield a savings of 5.2 billion tons of carbon dioxide equivalent by 2030 for a cost savings of $10 per ton. Alternatively, the use of solar photovoltaic devices similarly offers a potential reduction of only 1.3 billion tons with a cost increase of $24 per ton! The key to eco-efficiency is most clearly associated with smart energy use.

Idea #4 - Optimize Your Total Cost of Quality

Total Cost of Quality (TCQ) provides a holistic view of operations. TCQ balances prevention and appraisal costs against internal and external failure costs. Optimum balance is achieved through high process capabilities. This reduces the need for prevention and appraisal resource deployment. Higher capabilities also reduce the operation's exposure to adverse outcomes resulting from the production of defects. The combined effect of these moves allows for an optimum TCQ balance.

Tips on executing Idea #4 -

Improve production yields through higher process capabilities.

This idea addresses value adding processes and improves performance by reducing process variance while also eliminating the root causes of defects.

In production environments involving lower volumes and/or smaller lots – all the way down to one piece flows – processing yield is the challenge. Yield is a direct function of process capability. For discrete manufacturers, there are metrics of First Pass Yield or First Time Through. For batch operations there is batch yield from raw material feeds. Agile, lean operations maintain high process capabilities and quick changeover methods to assure high yields. These lean competencies drive down the costs of inspection and appraisal, as well as, reduce internal and external product failure costs.

Here are ways that forward thinking companies are using information technology to improve quality and process yields:

Product and Process Tracking Systems

Companies with high warranty and/or consumer safety risks can improve quality and mitigate their risks by strategically collecting process and product data so as to build a complete birth history profile. With track and trace systems like *Activplant's,* process variables are directly correlated to product and/or lot code identifiers. By using *Activplant's* comprehensive factory data model called the *Universal Factory*

11

Data Model, companies are able to publish end-to-end birth history reports showing the complete process through which each product/lot passed. Process capabilities can be continuously improved with this level of tracking and correlation. Most companies can only point to disparate databases with serial entries of time stamped process readings with little or no correlation to product or lot identifiers.

Tool Life Management Systems

Both disposable and reusable tools have finite lives. Solutions like *As One's Catalyst SDP™ System Development Platform* track product throughput and other wear factors and can radically improve quality yield by signaling tool change points before tool failure occurs. Production yields are significantly improved. Advanced manufacturing companies deploy *As One's* sense and respond agent software to manage specific assets and perform tool maintenance tasks. The *Catalyst* platform deploys these agents that function as tireless, 24/7/365 "proxy staff members" to focus on controlling critical process conditions and faults.

Dashboard and Analytic Systems

In recent years, business analytical and intelligence dashboards have grown in use at the enterprise-level. However, the vast majority of these systems provide intelligence more related to where the business has been, as opposed to illuminating real-time states and exposing unwanted trends while there is time to take corrective action. This is not the case with *Activplant's ActivEssentials* utility. *Activplant* offers an integration tool kit (ITK) that allows non-programmers to integrate factory data models with business systems and portal-based dashboards. Managers can then track production operations across the company. The best part is the fact that such systems can collect and respond to both real-time events and historian data. Analysts and process owners alike can use the tools to spot emerging trends and patterns, often before they become major incidents with a negative impact.

Results achievable:

While Six Sigma initiatives have flourished, leading edge companies are now driving their initiatives with solid, automatically collected intelligence. Automated data collection and software analytical capabilities render Excel-driven Six Sigma DMAIC approaches somewhat obsolete. Here are the direct benefits of the above quality solutions:

- Reduced defect levels and scrap variances.
- Improved supplier quality
- Higher levels of delivery reliability
- Reduced warranty administration and chargeback expenses.
- Real-time corrective action responses to non-standard conditions and process upsets.

> **Best Practices in Quality**
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> *Best practice companies don't simply react to defect occurrences. They apply corrective actions to assigned root causes of the defects. This methodology grew out of the Toyota Production System and is based on cause-and-effect thinking. By then addressing and blocking each root cause from reoccurring, the conditions generating defects are eliminated along with the defects themselves. This is how Five Sigma companies become Six Sigma companies.*

Idea #5 - Fully Utilize Human Capital

Given current work force reductions at all organizational levels, the following idea focuses on ways that companies can accommodate the net effects of all the personnel shifting that unfortunately accompanies layoffs. The desired compensating effect is achieved by simultaneously looking at reestablishment of skills and/or supplemental support of workers in newly assigned jobs. These

support functions are delivered through work flow assistance tools and the "intelligent" automation of business processes.

Enhance productivity through process automation.

This idea applies workflow control to achieve process throughput and productivity at all levels of the organization. The concepts apply vertically to all production and business processes, plus horizontally across all supply chain and manufacturing operations.

Forward thinking companies are process-oriented. All work is a process. Since manufacturers routinely apply automation equipment to actual production processes, why not apply operator assistance to aid the decision making and value-adding work provided by personnel across the organization, and not just in manufacturing? Now might be the best time to look for productivity improvements in non-manufacturing functions. By using Business Process Management (BPM) systems, appropriate focus can be given to automating and tracking key business processes, especially in functional areas not covered adequately by current IT systems.

Here are three ways applied technology helps leading edge companies increase productivity.

Exception Management Systems

Exceptions are undesirable, unpredictable and identifiable manufacturing related events. They are, unfortunately, also inevitable. If responded to appropriately, manufacturers can minimize or eliminate the adverse impact to operations, while improving asset utilization and product quality. *As One Technologies' Catalyst xM™ Exception Management* solution addresses the need for standardized exception handling within manufacturing operations. Plus, it automates action plans and provides manufacturers with several significant benefits. First and foremost, automation of action plans through a controlled electronic system provides compliance to Standard Operating Procedures (SOPs). This closes the loop on continuous improvement efforts and prevents manufacturers from sliding back into a mode of ad hoc responses to critical events. Automated actions within the action plan environment significantly reduce the resources and time required to execute and comply with SOP's, and help to identify and eliminate non-value added activities.

Work Sequencing Systems

As a rule, production lines are highly engineered prior to launch. At a minimum, industrial engineering standards are used to design the work center layout, methods, and work procedures. Assembly lines are often paced to a set of standard cycle rates. In lean environments, the standard rate is called the Takt Time, and continuous improvement practices are used to improve flow and reduce errors and wastes, such as excess motion. All of this combined knowhow is taken one step further by leading edge companies who use the data to assist operators in real-time work sequences. Work sequencing software like *OnTrack's Manufacturing System* allows operators to interact with flat panel displays, execute their work cycle, receive guidance at decision points, and confirm that procedures are rendered in the proper sequence. For newly assigned operators in the production environment, these assist tools are invaluable and directly enhance productivity and quality levels.

Business Process Management Systems

There are many instances where the rigidity of existing business systems limits their use for processes that require high degrees of agility and flexibility. BPM suites are perfect for these situations. High potential business process examples include outsourcing, corrective action, and compliance reporting. Some companies are using BPM as an especially effective tool to document and control their repair and rework processes.

Results achievable:

Automation of both production and business processes is the key focus of the above software apps. Through this automation, users find that IT enables agility, faster decision making, and these other benefits:

- Higher productivity
- Reduced manual data collection and reporting labor
- Faster product launches and responses to new revenue opportunities
- Reduced overtime premiums
- Lower indirect department overhead expenses

> **Best Practices in Productivity**
>
> *Leading edge companies track and improve equipment utilization down to real-time machine states. We have noted that world-class metal stamping operations not only track the time it takes to changeover presses from one part/model to another – but they also track the time it takes each operating team to place the presses back into "running mode" after the QC department releases each new setup for production. This type of agility requires a defined procedure or workflow process and the information technology to provide real-time tracking and visibility.*

Conclusion

Thank you for allowing us to share our thoughts with you. Through this paper, we have covered 5 timely ideas and 15 tactical ways to directly improve your operational performance. We hope you will take away some ideas of your own from this paper – especially ones that will be directly beneficial to you in weathering this economic storm. We also hope that you will contact us for support or assistance in moving these ideas from paper to actuality in your operations. As an example, the results presented under each "Idea" section are without dimension. The actual results will vary by company, plant, and of course, effort expended. AVS stands ready to address your specific needs and to build a plan for implementing any of these high value initiatives, especially with a focus on finite monetary results attainable in your specific situation. Put our manufacturing domain expertise to work in leveraging higher returns from your invested capital. Thus, our last "Capital Idea" for your consideration.

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About AVS Systems, Inc.®

Your Partner for Performance Optimization

AVS Systems is a value-added reseller offering leading edge information technology solutions to discrete manufacturers. By combining in-depth industrial experience with best of breed software brands, AVS delivers exceptional value to manufacturers. The AVS engagement model drives operational excellence because it is entirely needs driven and begins with our exclusive *e-Power for Manufacturers*® discovery assessment process.

Contact Information:
Wayne Filichowski
AVS Systems, Inc.®
P.O. Box 646
Lapeer, MI 48446

Phone: (810) 667-9681
Email: info@avspower.com
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