



Invensys Business Value Solutions Overview

Author: Peter G. Martin PhD, Vice President and Invensys Fellow

What's Inside:

1. Background
2. Key Industrial Driving Forces
3. Maximizing Profitability in the Emerging Industrial World
4. Real-Time Profit Control Model
5. Summary

Invensys Business Value Solutions Overview

1. Background

Over the past three decades many industrial companies have implemented a significant level of technology to automate their manufacturing and production processes in order to maximize the efficiency of those processes. For most of that time maximizing efficiency was essentially equivalent to maximizing the profitability of those operations. Over the past five years though, something in the industrial segments has changed drastically. Today, maximizing efficiency may not, by itself lead to improved profitability.

Leaders of industrial operations are often frustrated and stymied that their business appears to be out of control even though they have invested in the same approaches and technologies that have worked in the past. It is essential that the forces driving this situation in the industrial sector are clearly understood and that an appropriate and effective response is employed. This is required to improve the profitability of these industrial operations and enterprises and is precisely what the Business Value Solutions Team at Invensys has been formed to accomplish for our clients.

2. Key Industrial Driving Forces

The business of industry is in the process of undergoing a fairly significant transition that is going to require that industrial companies modify their business approach in order to survive and thrive over the coming decades. Although there are many aspects to this transition, it can be effectively characterized by five forces that are becoming the catalysts for change. These five driving forces are:

- 1. The transition from labor workers to performance managers** – since the industrial revolution, industrial companies have tended to view the frontline personnel as laborers rather than as skilled craftsmen and have been working to reduce and eliminate as many of these laborers as possible. Today, many frontline personnel are very experienced and very well educated as compared with their predecessors. Also, after decades of downsizing, the frontline staff is typically below critical mass for the operation of the plant. This combination is leading industrial managers to try to get more value from this critical resource base, rather than just eliminating them. This value can be realized when these talented people are empowered to not just operate the plant, but also to help manage the business performance of the plant.
- 2. The transition from process to profit management** – traditionally, many manufacturing operations have been set up to accomplish their missions by automating each manufacturing process in the plant, and counting on the operation of the automation systems to drive efficient plant business operations. Although this approach had been very successful for decades, as the profitability of many industrial operations is being squeezed, managers are striving for higher levels of profitability through higher levels of control. This will lead to a refocusing of control from just controlling processes to a higher level of control focused on truly maximizing the profitability of the operations in an ongoing manner.
- 3. The transition from transactional to a real-time business environment** – ever since the inception of the industrial revolution, the primary business variables of industrial operations have been reported and managed on a monthly basis. Monthly business management had been adequate because the business variables did not experience very frequent change. For example, up to just a few years ago most industrial companies were able to develop contracts with their energy suppliers that covered a period of six months or even a year. These contracts essentially relegated the price they paid for the energy they consumed to a constant value over that time period. If a value is not changing there is certainly no need to control it. Over the past few years, triggered by the opening of the power grids throughout the world, this situation has started to change drastically. Business variables that had been constants over extended time periods are starting to experience considerable variability, some changing multiple times within a single day. This means that the business of industry is truly transitioning toward real-time variability and systems currently in place are not geared to dealing with these real-time business variables.
- 4. The transition from an island to a holistic business perspective** – as industrial operations, technologies and organizations became more and more complex during the industrial revolution, the people leading these enterprises found that the only effective way to deal with the complexity was to partition the operations into areas of specialty. This led to the development of islands of automation, islands of information and islands of organization. Each island may have performed its tasks adequately, but the coordination and collaboration between the islands was insufficient. Specialists dedicated to one island could not understand the technology or even vernacular of the other islands. This has become a daunting challenge to industrial companies and this challenge will have to be met for companies to gain the necessary business improvements.

Invensys Business Value Solutions Overview

5. The transition from rigid to agile operations – many industrial operations were designed and built in an era in which more was better. Plants were designed to produce as much output as possible over any given time frame. The markets were such that they could typically absorb whatever was produced. The marketplace has changed for many industrial concerns with industrial supply often outstripping demand. Profitability can only be maximized by producing the right volumes of each product made to meet demand over a rapidly fluctuating demand base. The challenge is getting a rigidly designed plant or set of plants, that had been designed for full production objectives to become more agile.

3. Maximizing Profitability in the Emerging Industrial World

The five aforementioned industrial driving forces will have a huge impact on industrial operations. Companies taking a business as usual approach will find it difficult to compete in the emerging industrial environment. Industrial companies that continue to operate according to the traditional assumptions are going to become the laggards of industry. Although it is quite straight forward to understand that change is required, it may not be as clear to identify what the change really needs to be.

The primary objective of any industrial plant is to maximize the production value produced by the plant. Over the past decades, most industrial operations have undergone a fairly drastic leaning out process. Today, the fixed costs of a majority of plants are very tight as a result. Today's primary opportunity is to reduce in the variable cost of the operation which is predominantly comprised of energy and material costs. This means that the primary business objectives for most plants are to maximize production value while minimizing energy and material costs. As plants are operating, the primary constraints on meeting the business objectives, aside from the equipment constraints, are safety and environmental impact. This leads to a very simple business model that applies to most industrial operations and is shown in figure 1.

Real-Time Industrial Profit Model

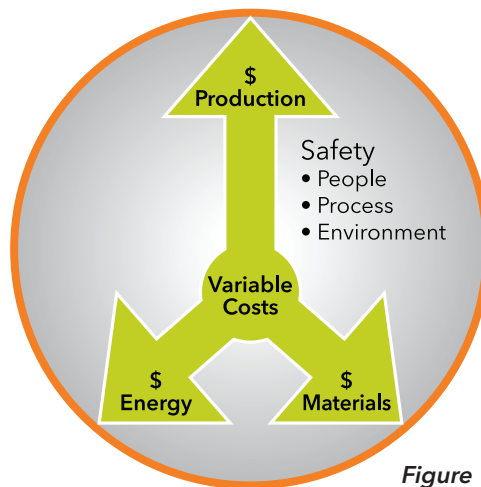


Figure 1

What makes this simple model so interesting is that it can be used to demonstrate the impact of the impending driving forces on industry. For example, the transition of the business of industry from transactional to real-time essentially means that the five variables displayed in this model did not change very frequently in the past which enables industrial companies to manage business concerns fairly well just by controlling the process well. Today, all five of these variables (production value, energy cost, material cost, environment and safety) can fluctuate multiple times a day. This real-time variation of business variables presents an emerging business control problem to industrial companies that essentially did not even exist 5 years ago.

Invensys Business Value Solutions Overview

The model clearly shows that all five variables are highly dependent and addressing them independently will lead to sub-optimizing the operation. For example, an energy cost management team might most effectively meet their objectives by turning the plant off. Plants that are not running do tend to use less energy. But this action would clearly have a drastic consequence on both production value and the overall profitability of the plant. Optimizing the profitability of an operation requires effectively balancing all five of these real-time business variables in a manner that maximizes profit on an ongoing basis. This is the only approach that will allow industrial companies to continually maximize profitability in an ongoing manner.

Controlling the Business as well as Efficiency

Control theory has been applied for decades to effectively maximize the efficiency of manufacturing operations. Years ago the primary controlling elements for most operations were the plant operators. As technology developed and human resource costs increased, human controllers were replaced by automatic controllers with human overseers. This resulted in very efficient manufacturing and production operations. The primary objectives for a process efficiency approach are increasing production throughput while reducing energy and material consumption all within a safe and environmentally responsible environment.

In recent years, even when the manufacturing operations were operating very efficiently, industrial managers found that the profitability of their operations appeared to be out of control. The reason for this is that the business variables of the operations, which had historically been highly stable, started to real-time variability. Minimizing overall energy consumption, for example, may no longer resulted in minimizing energy cost if the bulk of the energy is consumed during high cost periods. The cost may actually increase even though the overall consumption has been reduced. The net result is that profitability is no longer as directly tied to efficiency as it was in the past.

Business Control Cascaded to Process Control

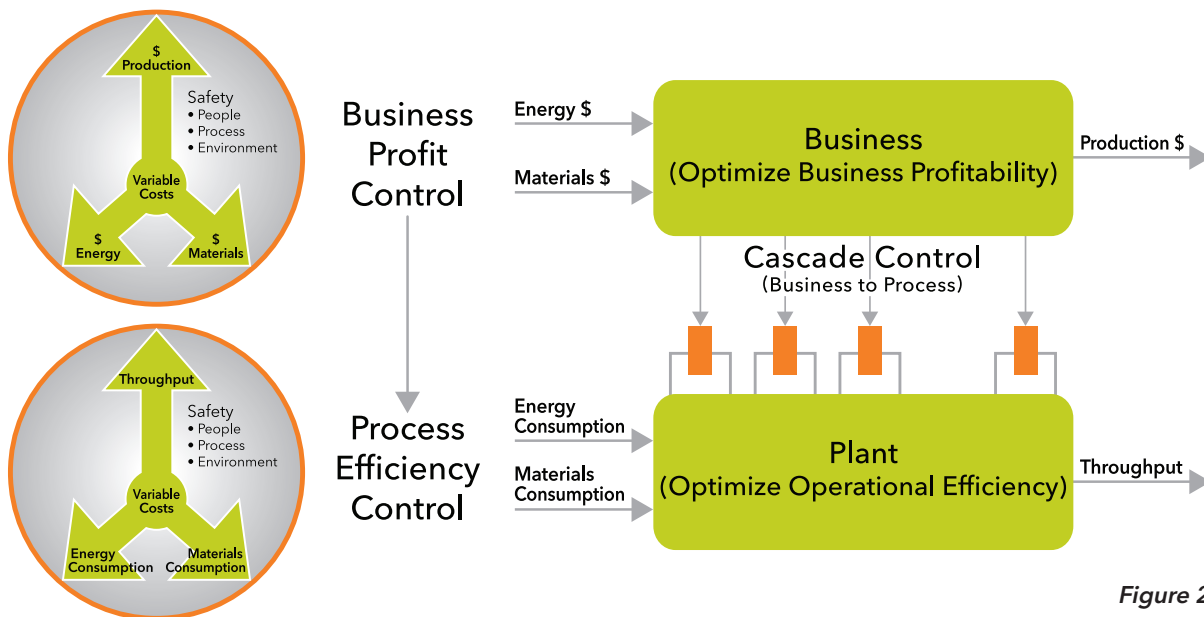


Figure 2

This is a control problem. But rather than it being a process control problem it is a profit control problem. Solving control problem requires the effective application of control theory. In this instance, if the efficiency of an industrial plant is under control, an additional higher level profit control strategy is required to bring the profitability of the operation under control. In control terminology, this is profitability control cascaded to process control (Figure 2). This expanded control view is exactly what is required to meet the daunting challenges facing industrial operations today.

4. Real-Time Profit Control Model

The control model for real-time profitability control is not much different from the control model for any other control problem. It involves three key elements: measure, empower and improve (Figure 3). This represents a typical feedback control loop, but it is directed to controlling profitability rather than a physical or chemical variable.

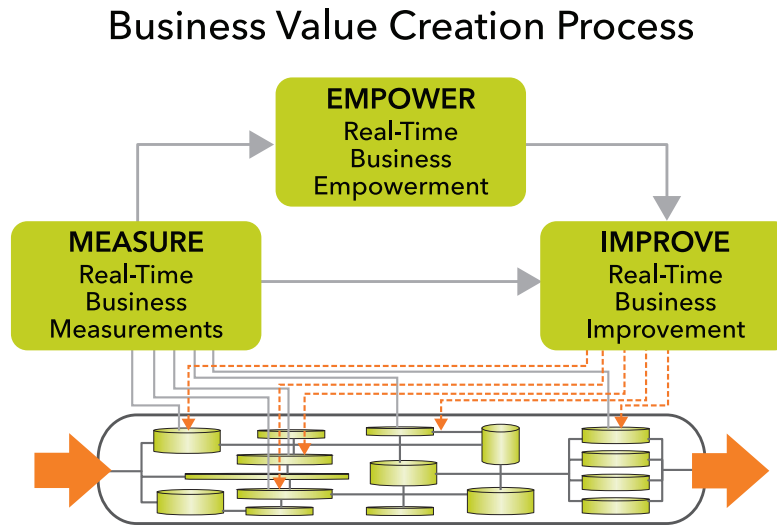


Figure 3

The first element of the loop is the measurement. No variable can be controlled if it is not effectively measured. Invensys pioneered real-time business measurements and owns the patents for both real-time activity based accounting and dynamic performance measures. Many operations have tried to solve the measurement problem by developing daily operational metrics – or key performance indicators (KPIs). Although this is a noble attempt, daily measurement is just too slow for effective decisions support and operational measures, although necessary, are not sufficient, and many are not actionable. What are required are real-time operational and financial performance measures. These are what Invensys refers to as Dynamic Performance Measures. Invensys has discovered how to develop these measures from a combination of real-time sensor based data and external data sources, providing an accurate and auditable real-time business measurement system right down to the process unit or work cell level in industrial operations. These measures provide the information required to discern where the operation is making and losing money at any time. This information is absolutely essential to a profitability control strategy.

The second element in the model is empowerment. This involves providing all personnel in the organization, from the frontline operators through corporate management, who have a direct impact on the profitability of the operation with the information necessary for them to make better decisions in order to improve profitability. Much, but not all, of the information required for effective real-time decision support comes directly from the real-time business measurements. But most effective decision support systems also require event based information to alert the personnel when something has happened or may happen that requires their attention right now. The information presented to the personnel must be both prioritized to the manufacturing or production strategy and contextualized to each individual's capability and domain of responsibility. The idea of empowerment is certainly not new, but the idea of empowering the traditional labor force, operators and maintenance personnel, has been extremely anti-cultural across industry. This cultural perspective has severely limited the business value produced by industrial operations and can only be reversed by treating the operators and maintenance people as performance managers rather than laborers. Once the frontline personnel are effectively empowered through the Dynamic Performance Measure, the empowerment can continue up through each profit-impacting person in the organization, right up the corporate executives. Invensys Business Value Solutions offer both the real-time decision support systems prioritized to strategy and contextualized for every persons domain of responsibility from the front line to the executive suite, to empower for profitability.

Invensys Business Value Solutions Overview

The third element in the model is the Improvement aspect. Invensys Business Value Solutions not only drive improved profitability through empowerment, but also by identifying the key bottlenecks to profitability across the operation and developing solutions to free those bottlenecks creating areas of improvement opportunities. The result is unleashed bottom line value that has been bound up in the operation for years. When each bottleneck is discovered, the Business Value Solutions team determines the true potential for improved profitability that will result from freeing the constraint. The total opportunity for improved profitability across the site and enterprise can also be identified. The Business Value Solutions Team will then provide a prioritized list of potential solutions, the cost to implement each solution, and the expected increased value that the operation will realize through each solution. One nice aspect of this model is that the value of every improvement is measurable and visible due to the Measure and Empower elements. No longer does a client have to guess whether a solution created the expected value, the system reports on the exact value produced.

Business Value Processes

Being able to deliver on the promise of Invensys Business Value Solutions requires both top talent and excellent and repeatable business processes. Invensys has both. There are formal biographies available on request for each consultant on the team. The following is a high level summary of the Business Value Solution processes proven to be successful across many engagements.

The overall Business Value Solution Process is a classic continuous improvement process (Figure 4). Prior to engaging with a client the Business Value Solution (BVS) Team conducts a General Business Analysis to understand the key business drivers and issues in the clients business and determine if the client would be a good candidate for a BVS engagement. Once the company is determined to be a good candidate, a meeting with the most appropriate executive in the client operation is arranged. Since the profitability of an operation is part of most executives' responsibility, it is essential that the BVS engagement is supported at executive levels.

Overall Business Value Solution Process

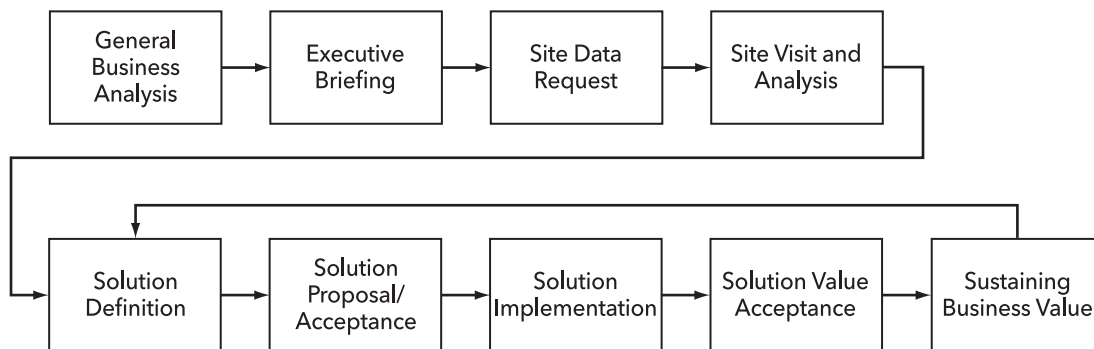


Figure 4

Typically the outcome of an executive meeting is to engage with a specified industrial site to determine the potential improvement at a specific location. Prior to the site visit, the BVS team requests specific site data, including some historical operating data from the site. This allows the BVS Team to be as prepared as possible for the site visit. This is critically important because the BVS Team understands that it is very important to be as non intrusive as possible in the operations of any operating plant. The BVS process is designed to ensure maximum results with minimal intrusion.

The next step is the Site Visit & Analysis. This is a critical step in the process. Figure 5 shows the detailed process the BVS Team utilizes during the site visit. Understanding that it is essential to get all key site participants to understand the intent and purpose of the visit an initial presentation is provided for all site people who will participate in the process. The site manager must be at the meeting to demonstrate executive support. Next the BVS Team will do a plant walk-through to develop a deeper understanding of specific plant issues and culture. After the walk-through the BVS Team will conduct a series of interviews with the site management, starting with the site manager, to determine the plant strategy, business objectives and performance measures, and to decompose those performance measures through the operation.

Site Visit and Analysis

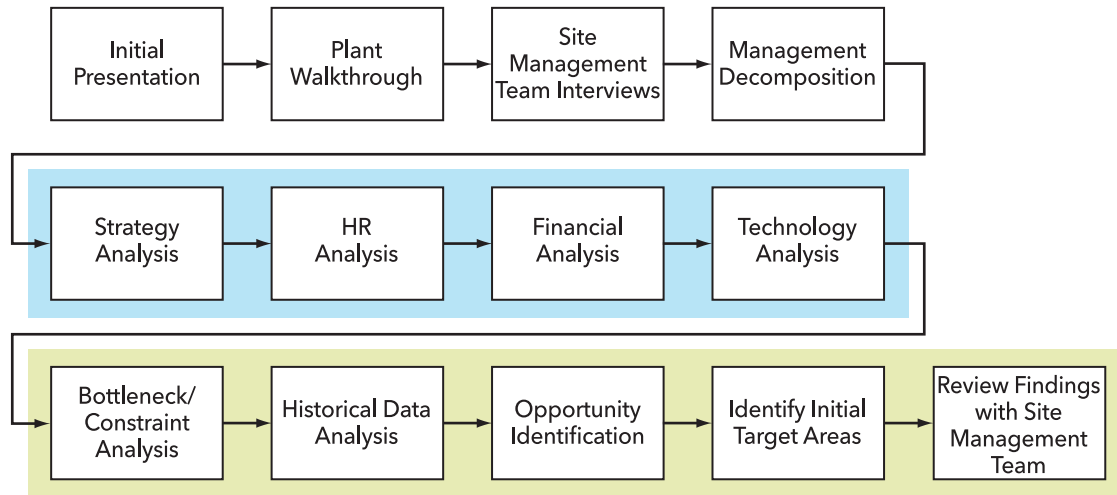


Figure 5

The next phase in the site visit is the Business Measurement Analysis phase (in blue). This phase is led by a BVS Business Measurement Consultant. The Business Measurement Analysis involves four key decompositions. First is the strategy analysis and decomposition to determine the prioritized measures for each node in the operation for each of the potential manufacturing or production strategies. Second is a Human Resource decomposition to determine the educational and experience level of the personnel who will be impacted by the real-time decisions support system. This information is critical to designing effective performance dashboards. Next, the BVS Team engages with the accountants on site to do a financial accounting decomposition. Finally, a technology analysis is undertaken to determine the level of installed technology on site. This is very important because the BVS Team often finds that it can implement solutions on the technology already installed.

After the Business Measurement Analysis phase is completed, the Business Improvement Analysis Phase is undertaken. This phase involves five basic, but somewhat flexible steps. The flexibility is due to the differing conditions encountered at every site. This phase consists of a Bottleneck/Constraint Analysis to identify any bottlenecks in the operation that may limit profitability. Once a bottleneck is identified the BVS Team conducts a Historical Data Analysis, usually involving one year's worth of historical data, to determine the impact each bottleneck has had on the operation. Next a solution Opportunity Analysis is executed to value the potential benefit and high level solution approach for each identified bottleneck. The areas of initial target for solutions are then compiled and the findings reviewed with the Site Management Team.

Once the site visit and analysis is completed the BVS Team enters into a continuous profit improvement loop. The first step in this loop is to develop a Solution Definition for each opportunity identified in priority order. The Solution Definition step involves eight steps and is detailed in Figure 6. First is going over the findings from the site visit and analysis with the entire BVS Team to ensure that each team member is in agreement. Next a Detailed Measurement Analysis is conducted for each business measurement to be modeled in real time. A detail Measurement Definition is developed right to the algorithm level and the Measurement Design is developed to tie the measurement model into the sensor-based and external data sources to ensure the business measurement model can be executed.

Solution Definition

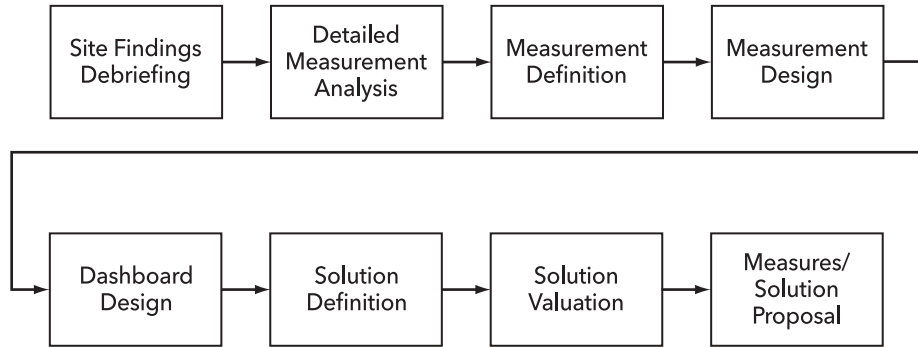


Figure 6

Once the real-time business measurement models are designed the prioritized and contextualized dashboards for each person in the operation are developed. These dashboards may have very different appearances for different functions and personnel in the operation. This ensures maximum impact for decision support and is based on the educational and experience levels of the personnel.

Once the dashboard design is complete, the detailed Solution Definition for each identified solution is developed and the valuation of each solution established. All aspects of the Solution Definition to this point are completed to the point of design specification so they can be effectively implemented by a skilled implementation team. At this point a detailed proposal for the implementation of the real-time performance measures, real-time decision support system and each identified solution is developed and presented to the client. The cost and expected benefit is presented for each of the identified solutions.

When the Solution Definition step is complete, the BVS Team will schedule a meeting with the Site Management Team to review the results and proposal. The Site Management Team will determine whether to move forward with solution Implementation, and, if so, which aspects of the proposed solution set to move forward with. At this point the Solution Implementation step of the BVS Process will be executed. The Solution Implementation Step is detailed in Figure 7.

Solution Implementation

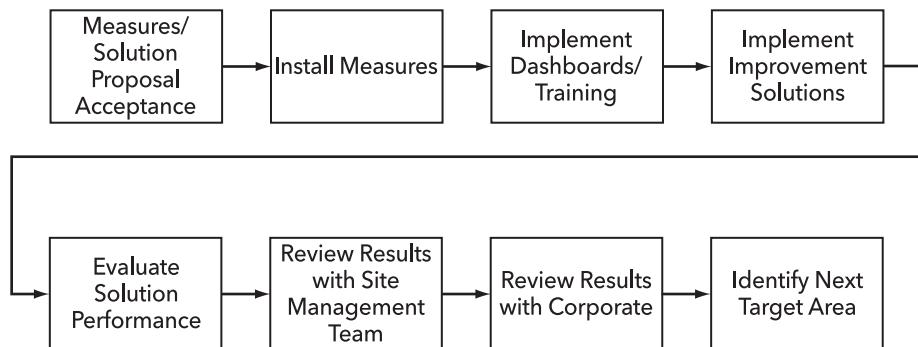


Figure 7

Invensys Business Value Solutions Overview

There are seven steps to the Solution Implementation process once the proposal has been accepted. The real-time business performance measures are installed first. This allows the BVS Team and the client to baseline the performance of the operation prior to the implementation of the dashboards or any of the performance improvement solutions. This is essential for determining the overall value of the BVS engagement for the client. The baseline period is selected by the client, but the BVS Team typically recommends at least one month. Once the baseline of performance is established the dashboards are implemented and the dashboard use and change management training is conducted. The dashboards actually represent the first of the improvement steps in the BVS process and the value of the empowerment can easily be discerned by monitoring the performance measure values once the dashboards are up. An immediate improvement is not typically expected from the empowerment phase since the operations personnel must learn how their actions and activities impact the performance of the operation. This learning takes time. It is not unusual to find that the performance during the second month of operation is significantly better than that of the first month. This is the inherent nature of a learning-based system.

Once the dashboards are operating and stable, the BVS Team will install each additional solution on the client's schedule. The business value improvement generated from each solution is discerned through the performance measurement system. If it is important that each individual solution is valued by its own contribution to improved profitability, the BVS Team recommends implementing the solutions independently and one at a time. If the overall value improvement is the objective, the BVS Team recommends implementing as many of the Solutions as can be effectively implemented as quickly as possible. After each solution is installed, the BVS Team will work with Site Management to converge on the improved business value generated by each solution. The real-time business measurement system will be used to determine the value. Finally the BVS team will work with Site Management to drive a continuous profit improvement process by developing a schedule for the implementation of subsequent solutions and executing to that schedule according to the Solution Implementation process of Figure 7.

5. Summary

The Invensys Business Value Solution Team offers a proven, unique approach and methodology to measurable and continuous profitability improvement for all manufacturing and production operations. This approach is based on applying control theory to the key business variables associated with the real-time profitability of the operation. Invensys' unique and patented approach to real-time business measurement, as well as its proven approach to real-time business empowerment and improvement is the key to driving improved profitability from existing industrial assets. The Business Value Solutions Team has the talent, experience and proven processes that lead to increase profits.



Invensys Operations Management • 5601 Granite Parkway III, #1000, Plano, TX 75024 • Tel: (469) 365-6400 • Fax: (469) 365-6401 • iom.invensys.com

Invensys, the Invensys logo, ArchestrA, Avantis, Eurotherm, Foxboro, IMServ, InFusion, SimSci-Esscor, Skelta, Triconex, and Wonderware are trademarks of Invensys plc, its subsidiaries or affiliates. All other brands and product names may be the trademarks or service marks of their representative owners.

© 2010 Invensys Systems, Inc. All rights reserved. No part of the material protected by this copyright may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, broadcasting, or by any information storage and retrieval system, without permission in writing from Invensys Systems, Inc.