

LEAN MANUFACTURING

**WHITE
PAPER**

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GOING LEAN, STEP BY STEP, WITH IFS APPLICATIONS™

Executive Summary

In the relentless pursuit of profitability and competitiveness, more and more companies are turning to lean manufacturing to reduce or eliminate waste in their production processes. Once confined to the automotive industry, lean principles are becoming standard operating procedure in many industries today. The reason is simple: When implemented with a good performance management system, lean principles have a proven track record of operational and strategic success, which ultimately translates into increased value to the end customer.

This paper illustrates how IFS Applications supports lean principles, particularly in the many manufacturing environments that require both rate-based (takt-driven) and order-based shop-floor execution. This hybrid, or mixed-mode, approach lets you go lean step by step as you are able, not because an inflexible system forces you to do so. IFS Applications supports lean planning and execution of your operations all the way from forecasting demand, customer scheduling, and leveling production to setting line rates and pulling parts using Kanban signals at the pace of actual demand. Add integrated quality management, document management, design and engineering change management, and Kaizen costing, and IFS Applications gives you all the support you need to eliminate waste in the form of defects, unnecessary processing, and inventory. And with IFS' lean scorecard you can easily set performance baselines, track continuous improvements, and communicate progress as you pursue perfection.

What is Lean Manufacturing?

Much as mass production was the production system of the 20th century, lean manufacturing, which focuses on the elimination of waste in the production process, has been heralded as the production system of the 21st century. Although the Japanese automaker Toyota pioneered the concept, the term *lean manufacturing* itself was coined in the early 1990s by three researchers from the Massachusetts Institute of Technology.¹

The National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership's Lean Network offers the following definition of lean manufacturing:

“A systematic approach to identifying and eliminating waste through continuous improvement, flowing the product at the pull of the customer in pursuit of perfection.”²

Although the NIST definition is brief, it is packed with information. First, the approach to becoming lean must be systematic. You can try to improve certain areas of the business and have some degree of success, but to truly realize the benefits of lean, you must start with an overall strategy and put it into place in the right order. Second, a lean strategy focuses on eliminating waste. Later in this paper, you will learn about common types of waste and the methods used to identify and eliminate them. Third, note the phrases *continuous improvement* and *pursuit of perfection*. Perfection can never be achieved, but each step closer increases the profitability and viability of your company. The process of developing a lean enterprise never ends. Lean is not a destination but a journey. There is always something else that you can do to reduce waste or improve a process.

The Principles of Lean Manufacturing

As with most other production philosophies and management practices, lean principles cannot be universally applied. However, because they are fundamentally customer value driven, they are suitable for many manufacturing environments³. There are five basic principles of lean manufacturing:

Understanding Customer Value—Value must be externally focused. Only what your customers perceive as value is important.

Value Stream Analysis—Once you understand the value that you deliver to your customers, you need to analyze all the steps in your business processes to determine

which ones actually add value. If an action does not add value, you should consider changing it or removing it from the process.

Flow—Instead of moving the product from one work center to the next in large batches, production should flow continuously from raw materials to finished goods in dedicated production cells.

Pull—Rather than building goods to stock, customer demand pulls finished goods through the system. Work is not performed unless the part is required downstream.

Perfection—As you eliminate waste from your processes and flow product continuously according to the demands of your customers, you will realize that there is no end to reducing time, cost, space, mistakes, and effort.

These five lean principles work together and are fundamental to the elimination of waste. You can revisit each of them as improvements in one provide an opportunity for improvements in another.

All five lean principles can be applied nearly anywhere, but lean principles do not always apply when customer demand is unstable and unpredictable. Kanban sizing and takt-time require level demand and accurate forecasts. Later in this paper, you will learn how IFS Applications supports lean manufacturing on both a stable rate-base and a variable order-base.

<p>Order-based production Complex flows</p> <ul style="list-style-type: none"> • Detailed operations are used to define and cost every step of the process. • MRP controls subassembly replenishment orders. • MRP controls priorities on the shop floor. (dispatch list) • Production is scheduled in batches to minimize setups. • Action is based on MRP exception message on vendors. • Detailed operation reports. • Designed for lumpy demand. 	vs.	<p>Rate-based production Streamlined flows</p> <ul style="list-style-type: none"> • Takt time regulates process flow, costs are based at product option level. • Kanbans pull lower-level items through process. • Pull sequences dictate priorities on the floor. • Setups are reduced to enable repetitive manufacturing. • Suppliers are part of the pull sequence. • Operations and materials are backflushed. • Designed for stable demand.
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NEED FOR MIXED APPROACHES?

The Benefits of Lean

Whether you are looking to cut costs, gain a competitive advantage, or remain viable in the face of competition that has gone lean, there are many reasons to adopt lean manufacturing techniques in your company. Lean benefits include reduced work-in-process, increased inventory turns, increased capacity, cycle-time reduction, and improved customer satisfaction. According to a recent survey⁴ of 40 companies that had adopted lean manufacturing, typical improvements included⁵:

Operational Improvements

- A 90% reduction in lead time (cycle time)
- A 50% increase in productivity
- An 80% reduction in work-in-process inventory
- An 80% improvement in quality
- A 75% reduction in space utilization

Administrative Improvements

- Reduction in order processing errors
- Streamlining of customer service functions so that customers are no longer placed on hold
- Reduction of paperwork in office areas
- Reduced staffing demands, allowing the same number of office staff to handle larger numbers of orders
- Documentation and streamlining of processing steps, enabling noncritical functions to be outsourced and allowing the company to focus its efforts on customers' needs
- Reduction in turnover and the resulting costs of attrition
- Implementation of job standards and pre-employment profiling, ensuring the hiring of only above-average performers (imagine the benefit to the organization if everyone performs as well as the top 20%)

Strategic Improvements

Reduced lead time, reduced costs, and improved quality provide opportunities for new marketing campaigns, allowing your company to gain market share from competitors that are slower, have higher costs, or have poorer quality.

How IFS Applications Supports Lean Manufacturing

Although lean principles can be implemented manually, a lean manufacturing IT solution can make any lean initiative even more successful, as AMR Research observed:

“Software applications complement lean manufacturing with improved data visibility, speeding information flow for problem resolution, design changes, quality issues, and changing customer demand.”⁶

IFS Applications supports lean initiatives in three main functional areas:

- Performance management
- Planning and execution
- Waste reduction

Performance Management

The Lean Scorecard is designed to assess your current level of maturity in lean implementation by examining your current practices relative to several benchmarks. In doing so, you can put together an orderly step-by-step implementation plan and easily measure your progress at any time during the implementation. The scorecard is a starting point from which to generate awareness and understanding in the workplace of specific concepts and techniques. It's a tool that helps you integrate people and processes—and ultimately generate a sustainable competitive advantage.

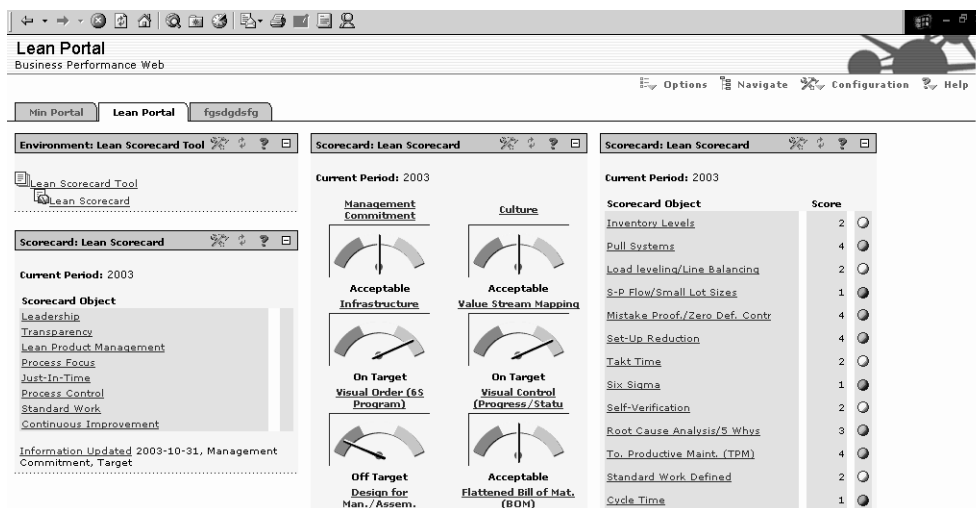


FIGURE 1. LEAN SCORECARD VIEW.

Planning and Execution

With lean manufacturing, finished goods are not built to stock. Instead, customer demand pulls them through the system. Work is not performed unless a part is required downstream. Lean systems provide flexibility in production so that any product can be produced in any combination. Customers know they can get what they want when they want it; therefore, demand becomes much more stable. IFS provides a complete range of options for a pull system depending on your type of business.

But you may not want or be able to implement lean manufacturing throughout your business. For certain parts of the business or for some products, you may need to run an order-based flow. Therefore, you need a system that allows you to mix rate- and order-based production. This is what IFS calls the *hybrid-lean* approach, and it's one of the advantages of IFS Applications.

IFS supports planning and execution with functionality for demand leveling, Kanban planning and execution, vendor-managed inventory, repetitive production, and cellular manufacturing.

Demand Leveling

IFS gives you a variety of forecasting tools to help you predict and level the load. IFS IFS/Demand Planning™ offers advanced capabilities for sales forecasting. Using algorithms, you can create different scenarios that allow for history, seasonality, and delivery schedules to create forecasts at a variety of levels. This tool is especially useful in organizations in which the items' lead times are longer than the customers' expected delivery times. The system displays the differences between forecast and actual sales volumes.

IFS Applications contains powerful, flexible functionality for the vital flows of delivery schedules. Forecasts from IFS/Demand Planning™ and IFS/Customer Schedules™ can be imported to IFS' master scheduling tool.

You can run complete customer-driven pull flows yet still build to stock if desired. IFS provides complete functionality to support a typical build-to-stock environment, including forecasting tools, master scheduling, rough-cut capacity planning, material requirements planning, and capacity requirements planning. A master schedule and bill of material (BOM) explosions give you input data to balance the Kanban circuits in IFS' Kanban solution.

IFS gives you the best of both worlds so you can go lean as you are able, not because the system is forcing you to do so all at once.

Kanban Planning and Execution

Kanban is a method for maintaining an orderly flow of material. Kanban cards are used to indicate points at which material should be ordered, how much material is

needed, from where the material should be ordered, and to where it should be delivered. With IFS' Kanban solution, you can perform an advanced Kanban calculation using an actual demand profile to determine whether an inventory stockout is likely to occur with the current system settings. The system can calculate Kanban quantities or the number of Kanbans based on past usage of parts. You can recalculate and redeploy your Kanban circuits within a day when demand shifts.

IFS' Kanban solution lets you perform stockout simulations by retrieving demands from a variety of sources and for different time spans to determine whether your Kanban quantities are balanced.

You can use either visual or electronic signals for replenishment. Kanban replenishment can be from a supplier, a sister plant, an inventory location, a location group, or a production line. Options for demand type, Kanban formula, safety factor, signal type, and replenishment type let you adjust the use of Kanbans to best match your environment.

IFS' Kanban solution helps you maintain your Kanban cards. You can easily keep track of the number of cards used in the system, add or subtract cards during seasonal changes in demand, or print or replace cards.

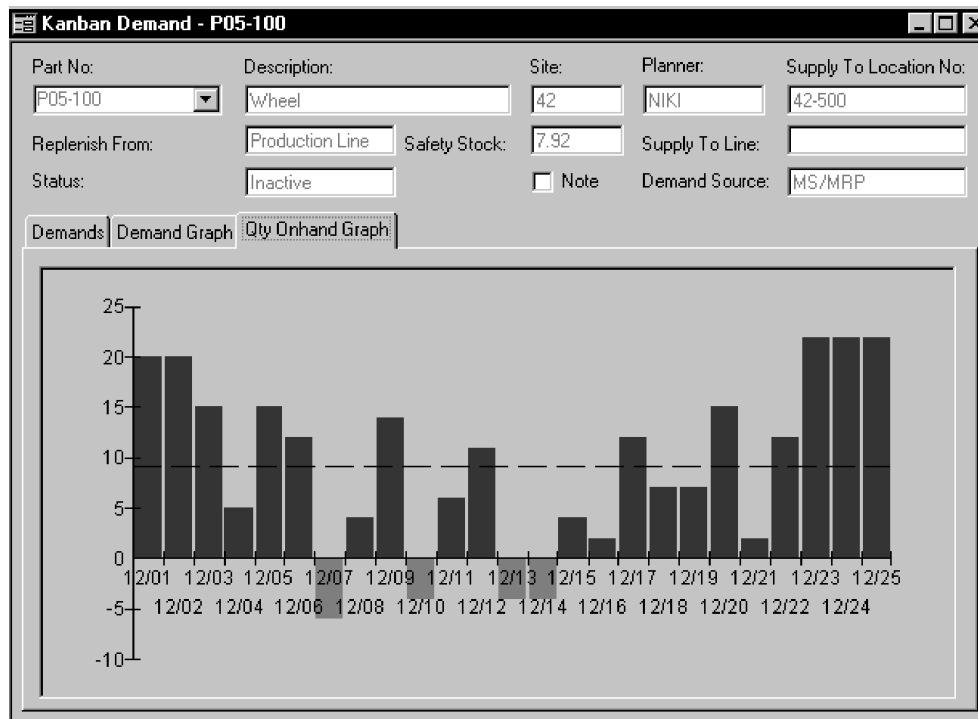


FIGURE 2. SHOW KANBAN DEMAND VIEW—QUANTITY ON HAND GRAPH

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Vendor-Managed Inventory

Instead of sending Kanban signals to your suppliers, you can give them responsibility for and authorization to replenish goods. IFS' vendor-managed inventory capabilities and web-based portal technology make it is easier to collaborate with your suppliers. Instead of sending information back and forth, customers and suppliers can access inventory balances and future demands through a convenient portal, and the supplier can replenish stocks as required. The supplier can also use the portal to enter or search for information and update documents. The supplier becomes another application user, but with limited access.

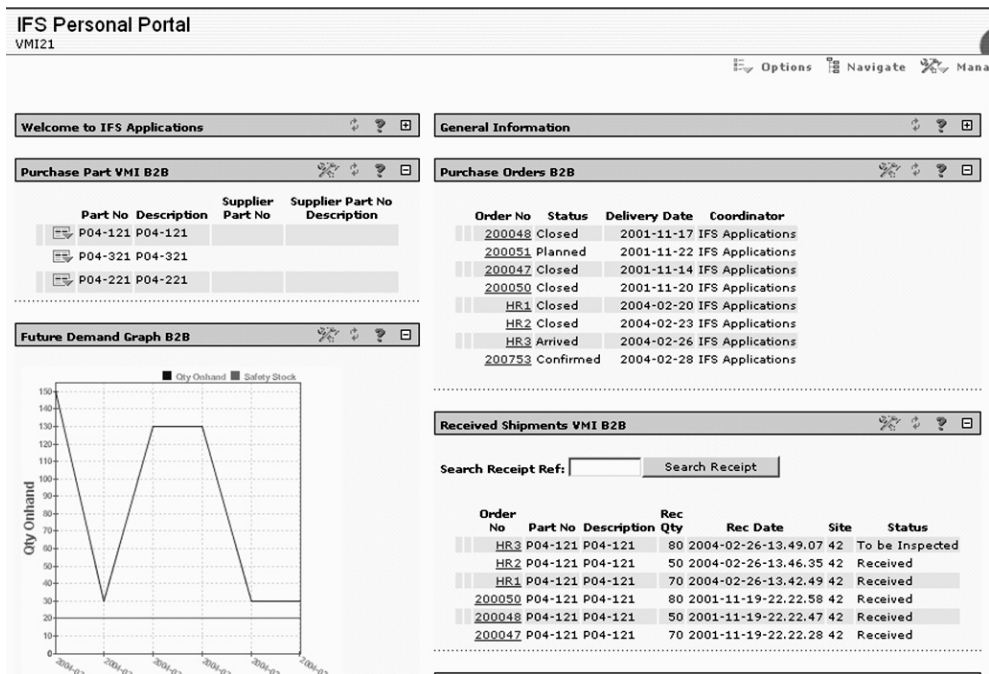


FIGURE 3. VENDOR MANAGED INVENTORY PORTAL VIEW

Repetitive Production

With IFS' production scheduling functionality, you can perform orderless, rate-based production. This reduces the number of report points, and simplifies and automates the production process. Final reporting of finished items is the only production reporting required, and all components are automatically issued (backflushed). You get reduced transactions throughout the flow, short cycle times, and less work-in-process inventory. As a result, you can focus on ensuring enough material.

Cellular Manufacturing

Arranging operations and/or people in a U-shaped production line allows for better utilization of people and improves communication. Product flows smoothly from

one operation to the next rather than running in a batch and then sitting in a queue at the next work center waiting for that operation to begin. IFS Applications™ lets you define an unlimited number of production lines, each with its own dedicated inventory storage area. Incoming materials are routed directly to the production line at which they will be consumed. Finished goods completed at the production line can be stored there until being shipped to the customer.

Waste Reduction

Waste is commonly defined as *non-value-added activity*. Lean practitioners identify seven types of waste:

- **Excess (or early) production**—Producing more than the customer demands, or producing it earlier than the customer needs it. This ties up valuable labor and material resources that might otherwise be used to respond to customer demand.
- **Delays**—Waiting for materials, tools, information, equipment, etc. This may be a result of poor planning, late supplier deliveries, lack of communication, over-booking of equipment, or erratic demand.
- **Transportation (to/from processes)**—Moving material more often than necessary. Material should be delivered and stored at its point of use. Why receive material at a receiving dock, move it to an inventory location, and then move it to the production floor when it can be delivered and stored where it is used?
- **Inventory**—Storing more material than is needed. This wastes valuable space and cash. By reducing inventory, plans for warehouse expansion can usually be postponed or canceled.
- **Processing**—Doing more work on a part than is necessary, including inspection and reworking. This wastes time and money. Quality must be built into the manufacturing process so that parts are produced correctly the first time.
- **Defects**—Defective parts. Defects consume considerable resources. In addition to the original materials and labor used to manufacture the part, extra labor and machine time are required to fix the defective part. If the defective part is sold to a customer, not only will unnecessary shipping costs be lost, but more resources will be consumed to resolve the eventual complaints.
- **Movement**—Excess motion of employees in getting tools, picking parts, or moving from one point to another. This is usually the result of poorly planned work layout and workflow.

A variety of techniques are available for reducing or eliminating waste. These techniques include value stream analysis, total quality management, total productive maintenance, Kaizen costing and cost analysis, engineering and change management, and document management.

Value Stream Analysis

Value stream mapping is an excellent place to begin your lean journey because it will help you and your employees understand the big picture of your business enterprise. You begin by mapping your current state, showing all actions (both value-added and non-value-added) currently required to bring a product from the design phase through customer delivery. IFS Business Modeler™ is an excellent tool for creating value stream maps (see fig 4).

Once your current state is mapped, you have a clearer picture not only of where waste appears but also of what the sources of this waste are. You can then map the desired future state of your business, showing more efficient, smoother-flowing processes.

The final step is preparing and beginning to actively use an implementation plan that describes, on one page, how you plan to achieve the future state. This is an iterative process since your value maps must be reviewed regularly to find additional ways of improving the flow of material and information.

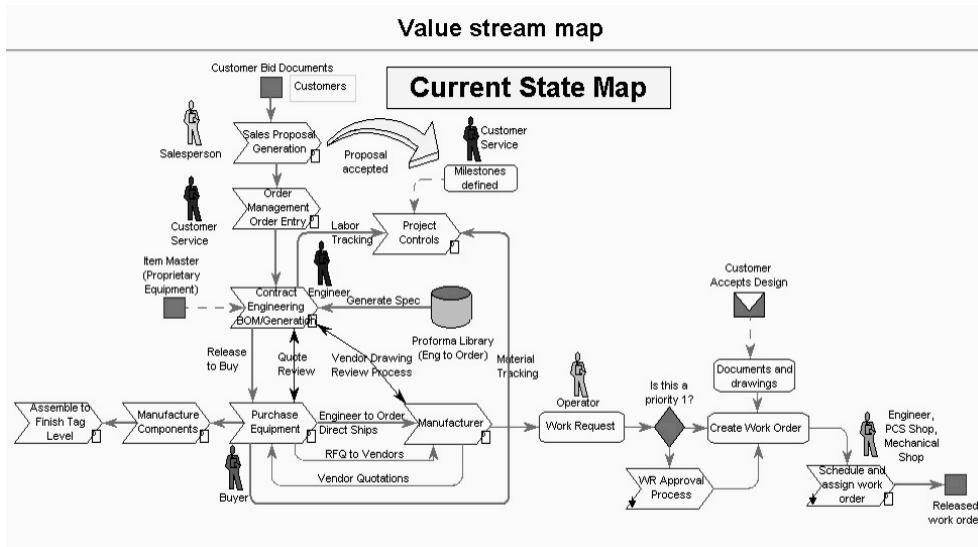


FIGURE 4. VALUE STREAM MAP CREATED IN BUSINESS MODELER

Total Quality Management

Total quality management (TQM) is a management system used to continuously improve all areas of a company's operation. Quality functionality is integrated throughout IFS Applications.

Failure modes and effects analysis (FMEA) is a systematic technique for managing risk in a manufacturing process. It involves recording and analyzing actual and potential problems with a product design or process, along with related solutions.

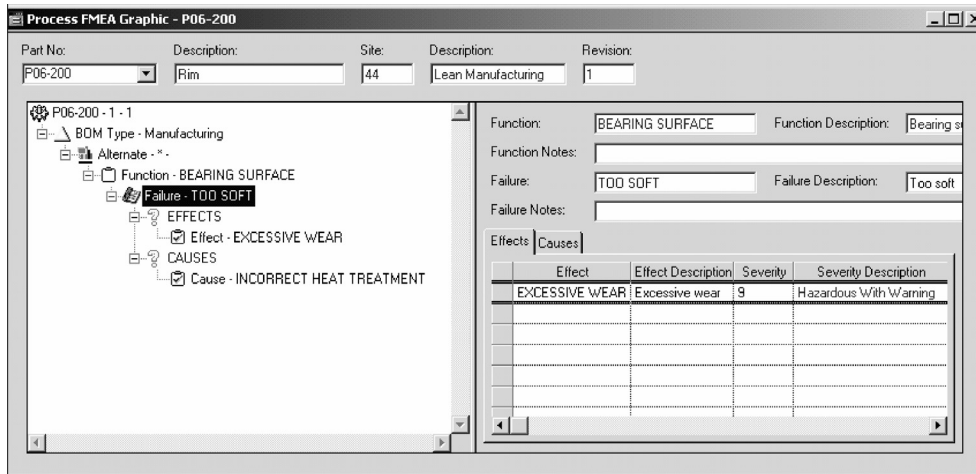


FIGURE 5. PROCESS FAILURE MODE AND EFFECT ANALYSIS

This information allows you to improve accountability, avoid repeated mistakes, and improve the quality of the end product.

Control plans can be defined to detail the measurements and tests performed at any operation of a shop order, production schedule, or purchase receipt. This helps to identify defects before any further value is added to them. Statistical process control (SPC) is a philosophy that emphasizes the use of statistical techniques, such as control charts, in all areas of a company to make continuous improvements in quality and productivity by reducing variation in processes. With IFS Quality Management™, you can create, view, and analyze X bar and R, X-bar and S, X and MR, np, p, c, and u control charts.

IFS Applications also includes material review board (MRB) functionality for handling the disposition of defective material.

Total Productive Maintenance

Total productive maintenance capitalizes on proactive and progressive maintenance methodologies and calls on the knowledge and cooperation of operators, equipment vendors, engineering, and support personnel to optimize machine performance. IFS Maintenance™ is a world-class maintenance package that is completely integrated with IFS' supply chain management solution. Both maintenance and production workers have complete visibility into maintenance and production information and schedules. Operators can regularly perform preventive maintenance on equipment and tools, with maintenance personnel handling more detailed overhauls and repairs. The result is optimal equipment performance, including the elimination of breakdowns, a reduction in unscheduled and scheduled downtime, improved utilization, higher throughput, and better product quality. Bottom-line results include lower operating costs, longer equipment life, and lower overall maintenance costs.

Kaizen Costing and Cost Analysis

Unlike standard costing systems, a Kaizen costing system focuses on continuous cost reduction rather than simply meeting the standard and avoiding unfavorable variances. As part of the Kaizen process, you verify that the costing target has been reached and

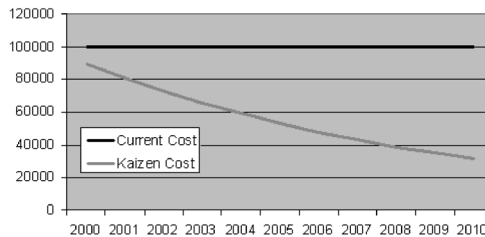


FIGURE 6. A SYSTEM OF CONTINUOUS COST REDUCTIONS. STANDARD COST COMPARED TO KAIZEN COST.

then continuously review existing production conditions to further reduce costs. In IFS Applications, you can set a cost target, calculate cost gaps, and plan activities to reduce costs. Major cost reductions can be broken into smaller reductions for which separate activities can be created that are easier to handle. Each activity is possible to evaluate from a cost reduction potential and from an investment need.

IFS Applications also allows you to perform commonality analyses. If an item is used in multiple places, commonality analysis helps you see which components are common for different structures and whether they can be used for other parts to save money. Cost/value analysis helps you analyze the costs of a component or product in relation to customer value.

Engineering and Change Management

IFS Applications manages the changes a design goes through during its lifetime in two stages: During the Engineering Change Requests stage, all change proposals from the organization are registered. These change proposals might include fault reports from the service department, the design department's own improvements, or a recommendation from the purchasing department to change supplier material. The proposals are analyzed and formally approved. Then, in the Engineering Change Order stage, the design change is planned and implemented. The product structure helps to define items and minimize the work involved in making modifications. When the work is finished, a new part revision is created.

Document Management

For most businesses, managing documentation is not an end in itself. It's an essential part of day-to-day operations—a way of ensuring that the right people get the right information at the right time. Mismanaging the flow of information can result in confusion, unnecessary delays, and costly errors. With IFS Document Management™, you get full control over your company's documentation so you can focus on the things that really matter: selling your products and services, keeping your plant and equipment in top shape, and meeting or exceeding your business goals.

Go lean as you are able – step by step with IFS hybrid approach

Lean production is viewed as the production system of the 21st century, much as mass production is recognized as the production system of the 20th century.

Many companies are reaping the benefits of lean practices. The reasons for your company going lean may vary according to your particular market circumstances. If your competition is going lean, you may have to do so just to stay in business. If they aren't lean yet, you can gain a great competitive advantage by implementing lean techniques first. No matter what your reasons are for becoming a lean enterprise, it is an exciting and profitable adventure and one in which IFS Applications can help you along every step of the way.

¹ Womack, James, Daniel Jones, and Daniel Roos, *The Machine that Changed the World*, HarperCollins, 1990

² Jerry Kilpatrick, *Lean Principles*, Utah Manufacturing Extension Partnership, 2003

³ Womack, James P. and Daniel T. Jones, *Lean Thinking*, Simon and Schuster, New York, NY, 1996

⁴ Utah Manufacturing Extension Partnership, 2003, the NIST Manufacturing Extension Partnership

⁵ Jerry Kilpatrick, *Lean Principles*, Utah Manufacturing Extension Partnership, 2003

⁶ AMR Report, *Enhancing Lean Manufacturing With Software Applications*, Michael Burkett, Jan. 2002

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About IFS and IFS Applications

IFS develops and supplies component-based business applications for medium and large enterprises and organizations. IFS Applications, which can be implemented step by step, is based on web and portal technology. The solution offers 60+ enterprise application components used in manufacturing, supply chain management, customer relationship management, service provision, financials, product development, maintenance and human resource administration. IFS offers customers an easier, more open alternative.

IFS is a leading global business applications supplier with sales in 45 countries and more than 350,000 users worldwide. The company is listed on the Stockholm Stock Exchange (XSSE: IFS).

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