



SAP White Paper



IN PURSUIT OF THE PERFECT PLANT

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EXECUTIVE SUMMARY

Manufacturers today operate in a highly complex, distributed, and fragmented environment. On one hand, globalization has created tremendous opportunities to develop new products, serve new customers, and pursue new markets. On the other hand, competitive stakes are getting higher than ever. You face unprecedented pressures to cut operating costs, deliver on time, optimize use of available assets, and adhere to regulatory and compliance edicts.

Whatever your role in the manufacturing network – as a global manufacturer with several plants or a contract manufacturer serving multiple masters – you must coordinate activities across many distributed plants, integrate hundreds of legacy systems and applications across plants and the enterprise into cohesive workflows, and produce thousands of product variations in ever-shortening lead times.

The “flattening” of the world has paved the way for globally dispersed supply chains and manufacturing operations that must be synchronized across a dozen time zones. Several decades of continuous process improvement have made these chains lean indeed, and the demands of just-in-time inventory have ratcheted up the pressure to resolve any assembly-line disruptions or outright equipment failures in as close to real time as possible. Addressing these challenges is becoming more and more difficult – with higher stakes for the factory and the company as a whole.

As supply chains have become leaner, the pressure on manufacturing to respond quickly, profitably, and efficiently has only increased. For that reason, senior executives are more eager than ever to become as omniscient as humanly possible in the moment-to-moment activities of manufacturing.

ADDRESSING MANUFACTURING CHALLENGES TODAY

On the plant floor, the rampant proliferation of localized deployments has led to disparate but dedicated systems for manufacturing planning, execution, process control, and tracking and tracing for each plant. This creates an environment that is inefficient, difficult to integrate, and inherently expensive, as maintaining interfaces for all these systems is ongoing and time consuming. At the same time, increasingly lean supply chains apply constant pressure on manufacturers to respond quickly and efficiently in order to maintain and increase profitability. Consequently, managing and scaling manufacturing processes and IT solutions globally is a constant challenge.

This state of affairs has become unacceptable to CIOs and senior operations executives, who have intervened at last. “Ripping and replacing” the existing landscape, however, is a nonstarter. The challenge, then, is how to “leave and leverage” existing systems and flexibly integrate them with enterprise applications and each other so that strategic decisions from the top cascade smoothly to the shop floor, and information and intelligence originating within the plant are aggregated and seamlessly passed to management above.

Lack of integration is only part of the problem. The challenges become even greater when you consider that manufacturers must drive continuous improvement programs such as lean manufacturing, support compliance and regulatory directives, and enable quality management and process improvement initiatives to improve tracking and tracing, all while managing groups of distributed manufacturing assets at optimal cost.

On the surface, these problems seem intractable. You can take small steps forward, integrating a few systems or initiating a few programs to support individual plants or corporate objectives, but toward what end? The touted benefits of these projects – visibility, process efficiency, lower total cost of ownership, improved quality, and the like – mean little if they fail to address the larger challenges facing your business as a whole.

To meet today’s demanding paradigm of “design anywhere, manufacture anywhere, and deliver anywhere,” manufacturers must drive production performance with operations metrics and corporate strategy. IT plays an important role as a key enabler in tightly integrating manufacturing execution with business workflows.

As Figure 1 shows, the perspectives of corporate executives and plant managers are necessarily different, but they must be harmonized for the sake of efficiency.

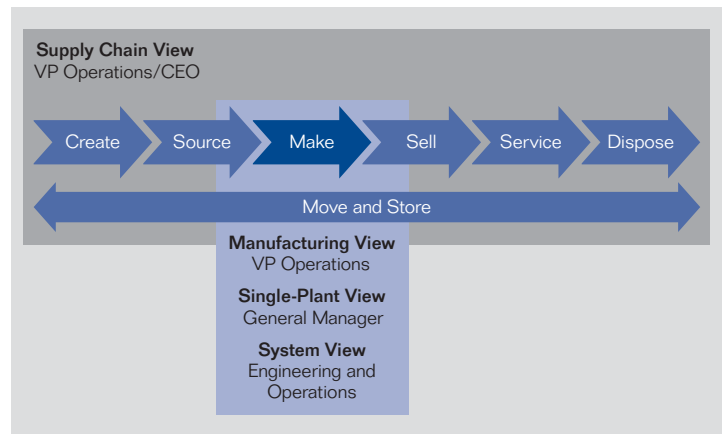


Figure 1: View of Manufacturing Processes Based on Role

To be successful in this environment, manufacturers must do the following:

- Coordinate seamlessly across network partners, suppliers, and customers
- Offer real-time visibility into all aspects of production operations to capture, contextualize, and deliver real-time information to enable informed decisions
- Enable proactive, responsive planning and execution on the plant floor to achieve cost, quality, and delivery objectives

FINDING THE WAY FORWARD

To achieve these objectives, what's needed is a holistic transformation of manufacturing operations. The transformation should be uniquely tailored to supporting your end objectives, or your "perfect plant," ideally enabling you to take a measured approach to improve the key performance metrics on customer delivery, quality, and costs.

The perfect plant is your vision of a fully integrated, seamlessly operational factory in its purest state. Every key process has been identified and optimized, while the systems supporting it have been simplified, streamlined, and stabilized. It's an ideal meant to serve as a blueprint for your own transformation, helping you prioritize when and where you should devote resources to produce steady, incremental improvement. In the perfect plant, you have visibility into all aspects of your manufacturing operations to drive the transformation.

The perfect plant optimizes utilization of your manufacturing assets and drives increased production performance in concert with the enterprise plan and objectives. It provides the ability to respond in real time so you can drive increased yields, asset utilization, and order fulfillment. Furthermore, a perfect plant does the following:

- Leverages the investment in your enterprise applications
- Delivers simplified business processes to the front-line operator
- Exploits the existing manufacturing infrastructure and data sources

In a perfect plant, plant personnel no longer waste effort in constantly reacting to line failures, supply network disruptions, and operations emergencies. They are empowered to anticipate change and devise innovative solutions that improve production efficiency, optimally use assets, and reduce waste. Information and processes running across your production network are fused together to deliver timely, context-sensitive, actionable

intelligence. Production managers, supervisors, and operators can use this intelligence to plan and drive responsive execution that consistently exceeds your delivery, quality, and cost objectives.

Having a common vision helps people in your company align their efforts, while having a shared language for the effort improves communication and heads off misunderstandings. The perfect plant is as much a rallying cry as it is the ability to meet a set of performance metrics.

But what metrics matter most in manufacturing? How should you measure your pursuit of perfection? Figure 2 depicts the metrics that matter most to plant managers and their direct reports and to the vice president of operations orchestrating multiple plants. These individual metrics fall into the following four categories that concern every manufacturing-based business:

- **Minimizing operating costs**
How do you measure overall production performance and create processes that can be continually improved?
- **Optimizing return on assets**
How do you measure overall equipment effectiveness and ensure you are generating a sufficient rate of return?
- **Meeting customer delivery targets**
How do you increase your visibility into scheduling and capacity requirements? How do you improve cycle times and guarantee supplier performance? And how do you compensate if suppliers fail to perform?
- **Meeting quality and compliance standards**
How do you minimize waste, measure and hit quality targets, and have processes in place to ensure that operations comply with regulatory standards?

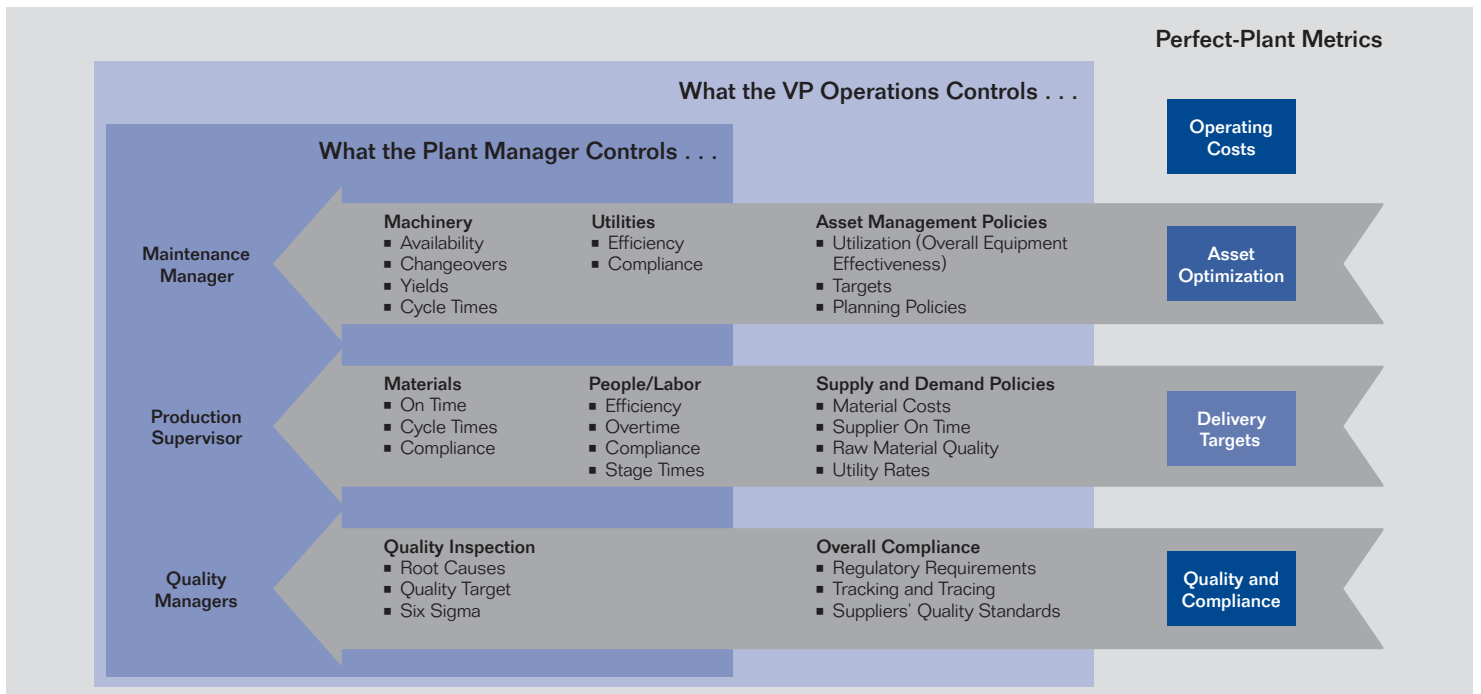


Figure 2: Performance Metrics for the Perfect Plant

When you create your road map to the perfect plant, you must define the priorities and subtleties of these objectives for your business. A consumer electronics manufacturer, for example, focuses on the high degree of variability in demand, supply, and product variation, which includes a need for rapid product development and a carefully managed product life cycle. This manufacturer's success depends on clear visibility into its supply

chain, lean capacity scheduling, and maximized asset utilization. By contrast, a chemicals producer may face only moderate demand for its products but has to cope with even higher variability and compliance hurdles. Asset optimization and compliance, therefore, are its primary concerns.

WHAT THE PERFECT PLANT DELIVERS

The perfect plant itself, as seen in Figure 3, represents the most effective coordination of an inherently local, contained operation (the plant itself) with a potentially global, complex, and highly integrated one (the enterprise).

The drive toward the perfect plant includes the following core elements to bring about manufacturing transformation.

Coordination represents the perfect aggregation and analysis of global demand. Whether it's enabled by shelf-mounted radio frequency identification scanners that automatically report retail stockouts or by sensors implanted within chemical tanks, having "perfect order" means being able to clearly see demand across every market, and tying that demand into production.

Integration of data flowing from enterprise applications and planning and execution systems into a single, harmonized flow of information is critical to achieving a single version of the truth and having perfect order. In addition, the ability to combine and

recombine systems to support new processes without ripping and replacing the underlying functionality is the technological underpinning of the perfect plant, paving the way for solutions that address business needs.

Planning accuracy improves immensely with complete systems integration in place and clear demand signals arriving from enterprise systems. Redundant data and unconnected systems are no longer problems, thanks to integration, while the advent of perfect order means clear demand information is continually available. For the first time, a productive meshing of global and local planning is possible: Real-time updates from enterprise systems keep the plant abreast of strategic changes, while local events and disruptions are relayed automatically to decision makers, allowing the entire company to react more responsively.

Intelligence is vital for both planning and execution systems. They depend on embedded intelligence that can parse, aggregate, and analyze raw data arriving from the shop floor and present it in context-appropriate forms for plant managers, the vice president of operations, and so on up to the CEO. Real-time responsiveness requires this type of seamless intelligence.

A manufacturing **execution** system not only drives plant operations; it is also the source of real-time status data that is filtered all the way up through the organization. Greater integration with planning systems means the shop floor can adapt quickly to changes forced by disruptions elsewhere in the business. Each industry and each customer prioritize these individual elements differently. For example, a consumer goods manufacturer might focus on coordination and planning first, as aggregating global demand and harnessing it to develop and launch new products is a top priority. A high-tech manufacturer is more worried about rapidly ramping up production of a hot new product, which requires tight integration between planning and execution systems. A chemicals manufacturer, meanwhile, is concerned with maximizing the value of its assets day after day.

VP Operations, VP Manufacturing, and VP Supply Chain	Perfect Order Delivery Customer, partner, and supplier activity is coordinated in real time across multiple plants and supply networks.
The Perfect Plant	
Plant and Enterprise IT	Lower IT TCO Systems between plants and the enterprise are fully integrated to support a single version of the truth.
Production Supervisor	Produce Without Waste Execution consistently meets cost, quality, and customer delivery targets.
Plant Manager	Realize Informed Decisions and Empower Personnel Plant personnel have real-time visibility and intelligence into all aspects of plant and enterprise operations.
Production Supervisors, Maintenance Managers, and Planners	Improve Return on Assets Optimal use is made of assets, enabling real-time planning should disruptive events occur.

Figure 3: The Perfect Plant

HOW SAP CAN HELP YOU PURSUE THE PERFECT PLANT

SAP is already the acknowledged industry leader at the enterprise level with the SAP® ERP application and other SAP software for manufacturing. SAP delivers solutions that work seamlessly with enterprise applications but are geared specifically toward improving plant-floor operations in the areas of plant intelligence, integration, planning, and execution, helping you in your pursuit of the perfect plant.

With SAP software and services for manufacturing to support your pursuit of the perfect plant, you have core capabilities in planning, execution, intelligence, integration, quality, and labor management. The software includes templates dedicated to common use cases, while composite applications developed by SAP and its partners extend core capabilities and industry expertise. All this is supported by the deep expertise and commitment provided by SAP services to ensure that you maximize your investments in SAP.

SAP solutions are built around a common enterprise service-oriented architecture (enterprise SOA) that helps customers leverage existing investments. It allows you to craft innovative applications and workflows or plug in industry-specific requirements – such as business processes, execution workflows, and compliance and operations metrics – to deliver the next generation of manufacturing operations.

As a result of working off of a single IT backbone, solutions are interoperable: You can choose to implement only the software you need now without compromising future requirements. This approach not only accelerates returns on today's investment, but also assures you of compounded returns when you scale up on future deployments.



SUMMARY

To win in today's flat world, manufacturers must adapt quickly, profitably, and efficiently to new product, customer, and market opportunities. To better meet these requirements, supply networks have become not only more complex, but also leaner. These dynamics have pushed the limits on existing manufacturing paradigms, and organizations can no longer afford to look at manufacturing as a "black box." The ability of a manufacturer to produce consistently to cost, quality, and delivery objectives is becoming critical to the organization's ability to compete effectively in the new world.

The perfect plant is an end goal – an idealistic vision that helps an organization keep its manufacturing strategy directly in line with its corporate objectives. The pursuit of the perfect plant empowers plant personnel, operations, and IT to collectively design, prioritize, and implement plant strategies that impact core elements of production planning, intelligence, integration, and execution.

To learn more about how SAP can help your company improve its manufacturing processes toward creation of a perfect plant, please visit www.sap.com/manufacturing.

SAP® Solutions Support Your Perfect-Plant Vision

Get a 360-degree view into manufacturing operations that enables you to perform the following:

- Real-time planning so you can deliver schedules in real time to empower front-line operations
- Proactive planning so you can identify and address critical events before they occur
- Effective operations so you can optimize utilization of every asset (people, equipment, and resources)

Support the following initiatives:

- Continuous improvement and lean manufacturing processes
- Real-time enterprise development
- Improvement in overall equipment effectiveness
- Enterprise asset management
- Regulatory compliance processes
- Design-to-manufacture processes

Demystify plant information for users as follows:

- Simplify operator front end for quality management and production management
- Provide automated and manual production confirmations

Allow for disconnected operation as follows:

- Limited local survivability so that local applications continue to run when disconnected from enterprise systems
- Seamless interoperability with non-SAP environments

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