

PRODUCTION EXCELLENCE —AN APPROACH TO INNOVATIVE PLANT OPERATIONS—

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INTRODUCTION

In Japanese industries which grew rapidly until the early 1990's, solid production techniques for creating high-quality products supported the development of manufacturing industries. However, the economic environment has been changing rapidly and tough global competition has become unavoidable. Particularly, the manufacturing industry must adapt not only to changes in economic environments but also to changes in social conditions such as emphasis on health, safety, and environment (so called HSE). For the manufacturing industry to grow under this environment, it is crucial to develop competitive, value-added products, and to install flexible production systems that can quickly follow market changes.

Meanwhile, at production sites, plant operations have come to a turning point. The operations are expected to be made more efficient due to competitive market pressures, while maintaining

safety and stability, but with less manpower and attention to environmental measures.

This issue describes the 'Production Excellence,' which is an approach to innovative plant operations, designed to ensure the continued development of the manufacturing industry under the VigilantPlant concept proposed by Yokogawa Electric Corporation.

VigilantPlant CONCEPT

In 2005, Yokogawa Electric Corporation announced the 'VigilantPlant' concept for achieving ideal plant operation for customers. The main mission of VigilantPlant is to maximize the customer's corporate value by continuously increasing the growth potential and productivity of each customer by using a solution (Operational Excellence) which increases operation efficiency, designed and supplied by Yokogawa for that customer's plant (Figure 1).

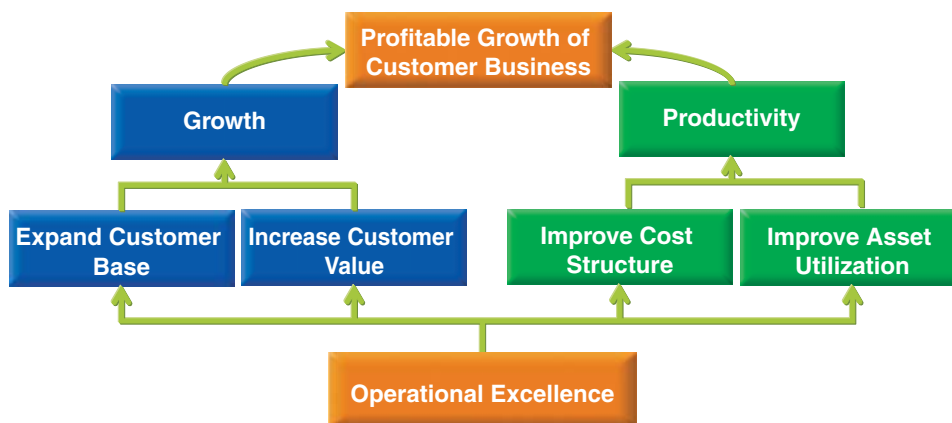


Figure 1 Targets of VigilantPlant

*1 President



Figure 2 Operational Excellence Achieved by VigilantPlant

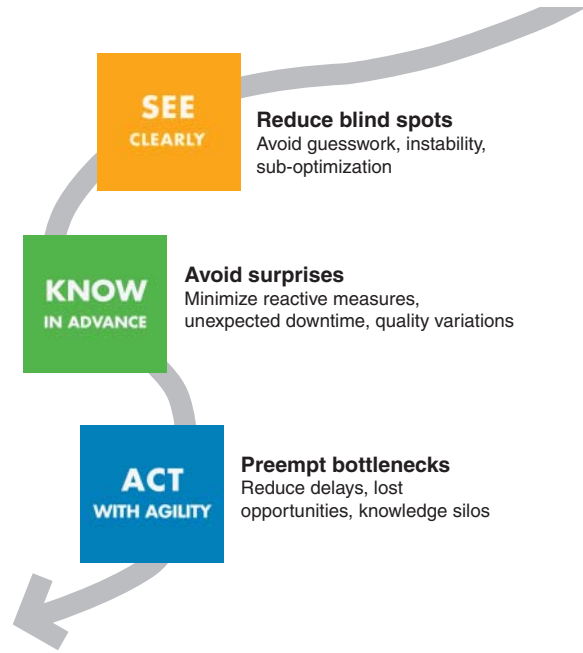


Figure 3 Progression of See/Know/Act

Yokogawa believes that ideal plant operation for customers can be achieved by providing a product group, a solution group, and a service group, and tailoring them to customer's needs. Each group corresponding to three aspects: asset management solution (Asset Excellence), production management solution (Production Excellence) and safety management solution (Safety Excellence), in terms of Operational Excellence proposed by Yokogawa. Yokogawa recognizes that these solutions must consider the

customer's plant operation in terms of lifecycle and must continuously improve and expand it (Lifecycle Excellence) (Figure 2). When providing four solutions for a customer, Yokogawa follows the three cycles of SEE CLEARLY (looking out a plant in every nook and corner), KNOW IN ADVANCE (foreseeing the future using known information), and ACT WITH AGILITY (supporting the future growth with agile operations) to remove blind spots in the customer's plant, protect the plant from

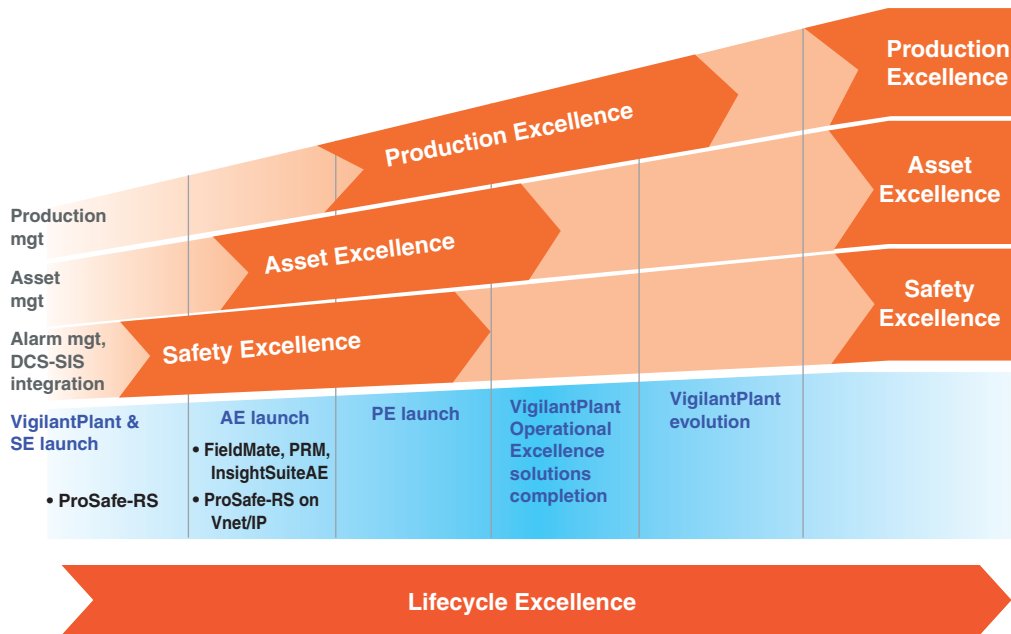


Figure 4 Roadmap of Operational Excellence

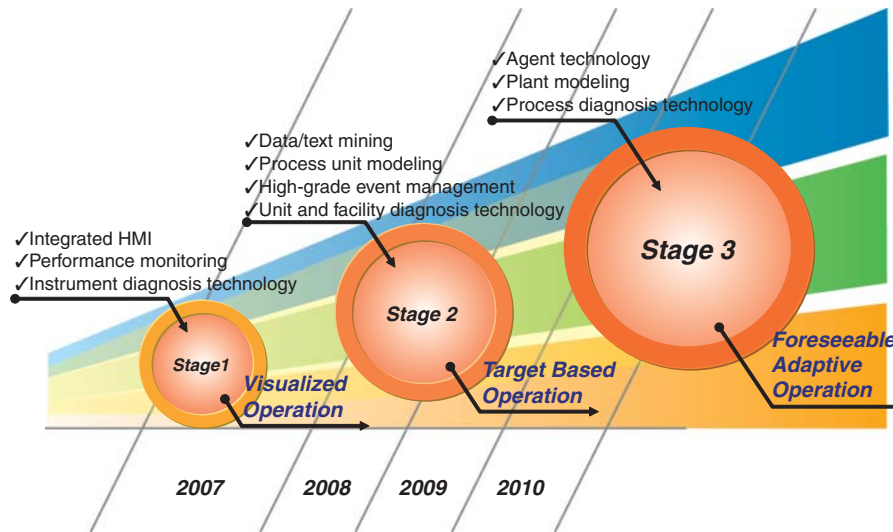


Figure 5 Roadmap for Achieving Next-Generation Production Control System

unexpected problems, and help achieve the optimum plant operation without bottlenecks (Figure 3).

Figure 4 shows a roadmap toward achieving these solutions. Safety Excellence started in 2005 when the safety system ProSafe-RS, the alarm management system AAASuite and others were marketed. Asset Excellence and Production Excellence will be released in 2006 and 2007 respectively, but there are already many groups of products available for each solution.

PRODUCTION EXCELLENCE

Production Excellence is a solution designed to increase the value of a customer's production activity and is configured with the hardware groups and the software groups. Yokogawa has supplied a number of products and solutions, such as "Production Control System CENTUM CS3000 R3" which remains a cornerstone of plant operations based on its long track record and ultra-high reliability for over 30 years since release; "Network-based Control System STARDOM" which connects control, operating and monitoring components flexibly and with scalability; "Operation Efficiency Improvement Package Exapilot" which dramatically improves the operating efficiency by gathering and formalizing knowledge and know-how in production sites; and "Plant Information Management System Exaquantum" which converts various data for plant monitoring and control to the higher grade operating information, and stores and utilizes this information. In addition, sophisticated control techniques help make manufacturing processes more stable, efficient, and profitable. Further, "Robust Quality Estimator Exasmoc" increases the stability and efficiency of processes by predicting process behavior using plant dynamic characteristics,

and by optimizing multi-input and multi-output processes. "Properties and Condition Estimating Package Exarqe" analyzes the properties and conditions of products in real time using process data such as temperature, flow and pressure based on soft sensor technology.

NEXT-GENERATION PRODUCTION CONTROL SYSTEM THAT ACHIEVES INNOVATIVE PLANT OPERATIONS

Production control systems so far have only stabilized plants by measuring and controlling physical quantities such as temperature, pressure and flow. Although the production management systems and facility management systems, which belong to the scope of plant management information, such as so-called Manufacturing Execution System (MES), use the data supplied by production control systems and field instruments, they were mutually independent. The next-generation production control system, toward which Yokogawa Electric Corporation aims, makes it as the target to abstract various data located in production sites to information that helps to increase plant operation efficiency (creating Key Performance Indicator, KPI) and integrating control and plant management information seamlessly. Further, Yokogawa believes that if a plant's future behavior becomes foreseeable, then ultimate optimization of plant operations can be achieved. Figure 5 shows a roadmap for achieving the next-generation production control system.

In stage 1, a structure, in which various plant data can be visualized as higher grade information based on highly reliable and robust production control systems cultivated so far, will be supplied. This can achieve Visualized Operation with which



Figure 6 Control Room of CNOOC and Shell Petrochemical Company Ltd. (CSPC)
(CNOOC: China National Offshore Oil Corporation)

customers can access information necessary for plants regardless of site location and time.

Key technologies to be established are:

- Instrument diagnosis technology for quickly detecting faults of sensors such as flowmeters, thermometers, etc.,
- Controllers which perform optimal control to be fitted to a variety of control objects,
- Performance monitoring for estimating Instrument statuses that cannot be measure with sensors only,
- Human-Machine Interface (HMI) which is integrated irrespective of applications and hardware platforms.

In stage 2, a structure, in which abstraction of indices for operation can be increased at the levels of control to information based on various types of information for the plants visualized in stage 1, will be supplied.

This will change plant operations to the Target Based Operation with which instruction of production and management by actual results using KPI becomes possible.

Key technologies to be established are:

- Unit and facility diagnosis technology,
- Event management function which comprehensively handles various events generated at the control level or information level,
- Technology for modeling complicated process units for simulation,
- Data/text mining technology which immediately gathers requested information efficiently out of a number of visualized information and abstracted information.

In stage 3, Foreseeable Adaptive Operation, which is flexible and highly adaptive to a variety of changes, will be achieved by not only supplying actual production result information, facility preservation information and the current operation status as abstracted information but also predicting plant behavior in the

near future.

Key technologies to be established are:

- Process diagnosis technology,
- Comprehensive simulation technology for grasping production status in the near future based on the current production capacity and preservation program of a plant,
- Agent technology which acts autonomously and supplies requested high-grade information based on a variety of information.

CONCLUSION

The world economy remains unstable due to rising energy prices, yet it continues to grow, increasing the demand for future production facilities, and active investment in plant and equipment relative to energies are presently being made.

Specifically, the process industries in China and India are booming (Figure 6), while the Japanese economy, which has been sluggish, is showing signs of improvement. The process industries will therefore face tougher competition than ever in such a background, even though helped by global market growth. It will thus become more important to adapt to changes in the market more rapidly and flexibly in production sites placed under such environments. Yokogawa will continue to innovatively improve the productivity of customers' plant operations and create their profits, by utilizing the latest technologies based on its long track record and supreme reliability. ◆

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