DEVELOPMENT CONCEPT OF THE CENTUM VP NEW INTEGRATED PRODUCTION CONTROL SYSTEM —OPERATIONAL EXCELLENCE BY VigilantPlant—

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Real-time management by evaluating the current on-site activities is crucial to maximize the customer's management efficiency and corporate value. The ideal form of real-time management is the ideal plant where all plant operations are perfectly optimized. In 2005, we launched the VigilantPlant concept to achieve this ideal plant. The mission of VigilantPlant is to maximize the customer's corporate value by continuously increasing the growth potential and productivity of each customer by supplying a solution (Operational Excellence) which increases operation efficiency.

Our newly developed CENTUM VP is an integrated next-generation production control system to attain the purpose of VigilantPlant. The functions of CENTUM VP cover a wide range such as plant resource management, safety control, and operation control, not only the process control of conventional DCSs. This paper describes the concept and system architecture of CENTUM VP.

INTRODUCTION

The manufacturing industry has grown based on solid production technologies for creating quality products. However, the economic environment is changing dramatically, forcing manufacturing firms to face tough global competition; firms must ship the right products at the right time as the market requests. Production sites must therefore improve manufacturing efficiency, while also considering HSE (Health, Safety, and the Environment) as a corporate social responsibility.

We advocate VigilantPlant[(1)], whose main purpose is to maximize the customer's corporate value in this rapidly changing environment by offering solutions for operation efficiency (Operational Excellence) for continuously increasing the growth potential and productivity of the customer. Operational Excellence is achieved through three aspects: production

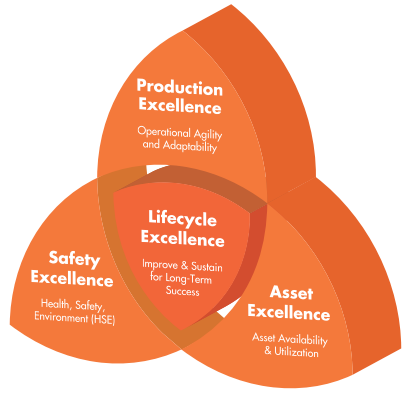

Figure 1 Operational Excellence by VigilantPlant

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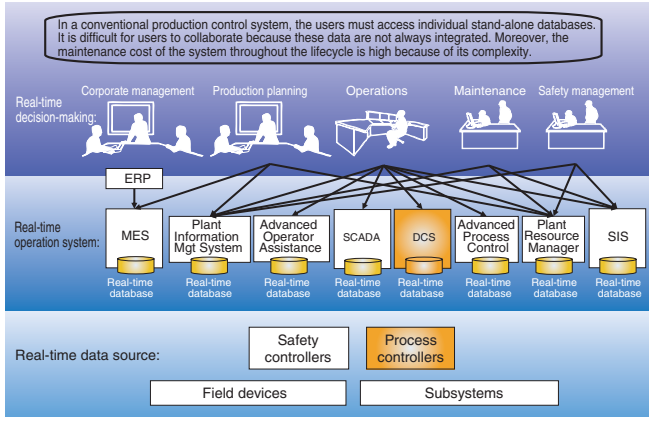

Figure 2 Functions of Conventional DCSs

management solutions (Production Excellence), asset management solutions (Asset Excellence), and safety management solutions (Safety Excellence). Each aspect has its own products, solutions, and services. It is also important that, throughout the life cycle of the customer's plant (Lifecycle Excellence), these three aspects are continuously improved and developed (Figure 1).

The newly developed CENTUM VP is an integrated next-generation production control system designed to achieve Operational Excellence for customers through these four Excellences. Existing production control systems have only focused on process control to stabilize the operation of the plant. Therefore, to achieve optimal operation in the entire plant, the user must access individual systems for different purposes such as asset management, production management, and safety management (Figure 2). The CENTUM VP covers broader areas around process control, such as asset management, production management, and safety management, allowing the user to handle individual systems as a single system through the CENTUM VP. The CENTUM VP achieves Operational Excellence for customers by offering stable/safe control and operations that swiftly reflect the actual situation of the plant and the decisions of the management (Figure 3).

CONCEPT OF CENTUM VP

This chapter describes the concept of the CENTUM VP in terms of the four Excellences: production management solutions (Production Excellence), asset management solutions (Asset Excellence), safety management solutions (Safety Excellence), and lifecycle solutions (Lifecycle Excellence).

(1) Production management solutions (Production Excellence)
Production management solutions (Production Excellence) aim to continuously improve and maintain production efficiency. Above all, the control function must be improved. Reliable hardware is necessary to execute high value-added applications such as APC (Advanced Process Control), online analysis, and process diagnosis. An operation monitoring function provides necessary information at the appropriate timing at any place to assist quick decision-making. In addition, operation efficiency is improved by direct connection with the corporate management system and the production system to allow operations to be based on business data.

(2) Asset management solutions (Asset Excellence)
Asset management solutions (Asset Excellence) aim to improve the operation and utility value of the facilities[2]. For this purpose, Condition Based Operation and Condition Based Maintenance should be achieved by using a field digital function and by integrating the operation and facility management at the HMI (Human Machine Interface) level. These concepts are advocated by the Open O&M Initiative[3]: Condition Based Operation means drawing up the production plan depending on the state of the facility, and Condition Based Maintenance means reducing unnecessary work by maintenance depending on the state of the facility.

(3) Safety management solutions (Safety Excellence)
Safety management solutions (Safety Excellence) aim to reduce the safety cost. To do this, it is necessary to develop the HMI (Human Machine Interface) to improve the functions of controllers and to prevent operational errors. It is also important to create mechanisms such as the Partial Stroke Test to confirm the safety of operations without interrupting them.

(4) Life cycle solutions (Lifecycle Excellence)
Life cycle solutions (Lifecycle Excellence) aim to reduce the maintenance cost of the plant throughout the life cycle. To achieve this purpose, engineering functions should be provided corresponding to the life cycle of the plant: construction, operation, and renewal.

CENTUM VP COMPONENTS AND FUNCTIONS

In the preceding chapter, we described the concept of the CENTUM VP in terms of the functions to be achieved in the four Excellences. These functions are implemented in the entire CENTUM VP components.

In this chapter, we describe how to deliver the functions required by the four Excellences in the CENTUM VP

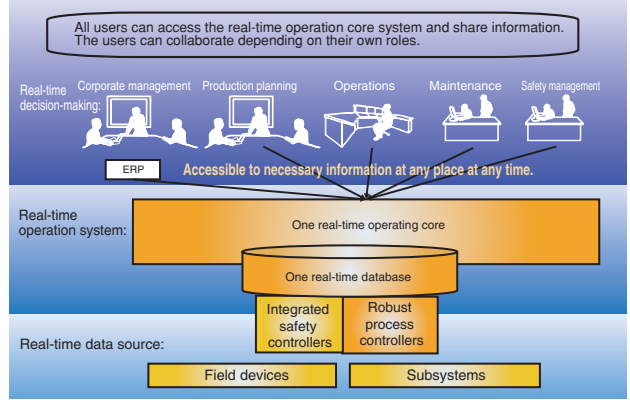

Figure 3 Functions of the DCS That CENTUM VP Will Change

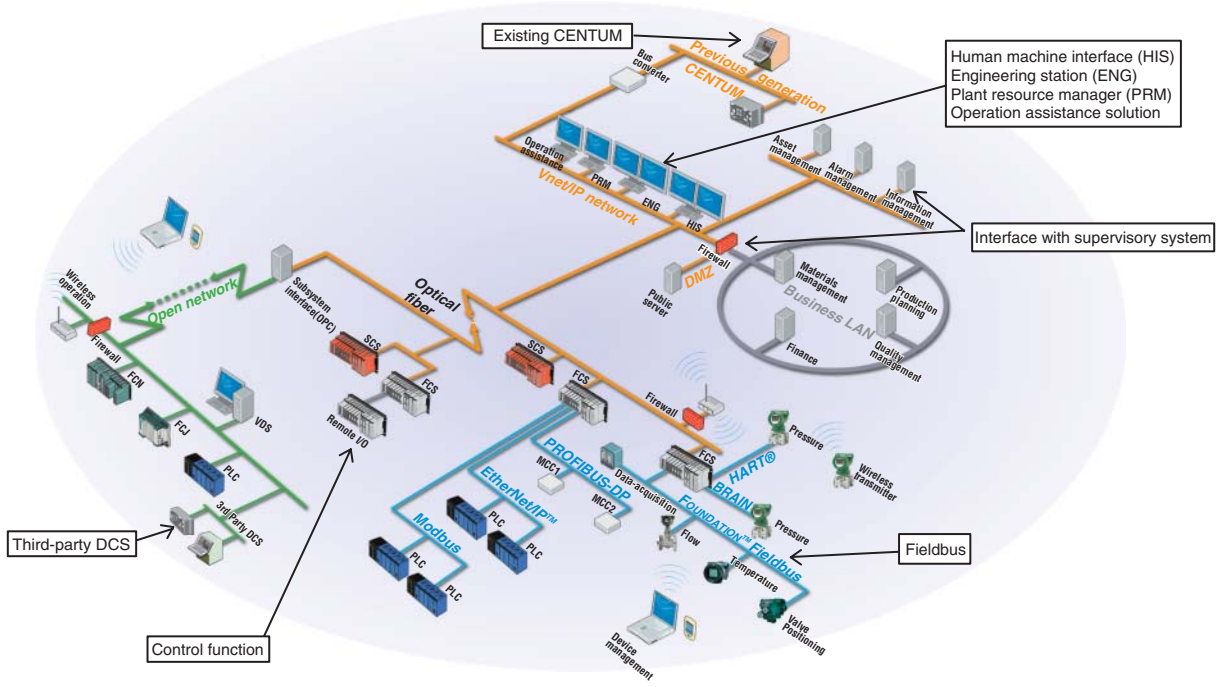

Figure 4 Configuration Example of Process Control System Using CENTUM VP

components.

(1) System configuration

The CENTUM VP consists of the following components:

- Human machine interface (Human Interface Station: HIS)
- Control station (FCS, SCS)
- Engineering station (ENG)
- Plant resource manager (PRM)
- Operation assistance solution
- Interface with supervisory system

Figure 4 shows an example of the system configuration.

(2) Human machine interface

The human machine interface (HIS) of the CENTUM VP aims to dramatically improve the operation efficiency on an ongoing basis.

To do this, HIS aims to allow operators to find the necessary information at any place at any time. This function shows the data scattered in the plant in an integrated manner that suits the user's purpose and eliminates operational errors and losses by using the latest ergonomics with the users' mental model. As a result, everyone in the plant can access the information necessary for their roles through the same interface; this facilitates cooperation among people.

HIS runs on Windows Vista, the latest operating system of Microsoft Corporation, and employs the latest look & feel integrated operability. The graphic functions are fully compatible with the existing CENTUM CS 3000 HIS, so the CENTUM CS 3000 system can be upgraded to the CENTUM VP without changing the graphic screens.

We will strengthen this function to appropriately display the data in the four Excellences, which will be useful for not only operation but also maintenance, production management, and safety management.

(3) Control station

The control stations (FCS, SCS) of the CENTUM VP inherit the outstanding reliability, high performance and flexible control functions of the reputable CENTUM CS 3000. An existing system can be upgraded to the CENTUM VP without changing the control applications. The CENTUM VP can be equipped with a high-speed control I/O module, enabling it to control both turbines and peripheral devices which in the past were controlled by individual systems.

We will extend applicability to field digital functions like Fieldbus, integrate the field data at the controller level, and raise the speed of the controller. These innovations will make the CENTUM VP a platform with highly reliable hardware that can execute solutions such as APC.

(4) Engineering station

The engineering station of the CENTUM VP aims to continuously improve productivity at low cost. The CENTUM VP inherits the powerful engineering functions of the CENTUM CS 3000 such as the virtual test function and concurrent engineering function. The graphic builder of the human machine interface offers a state-of-the-art and user-friendly interface similar to Microsoft Office 2007. We have simplified the engineering of each component and created a seamless engineering environment across multiple components.

We will offer suitable engineering functions to reduce the maintenance cost of the plant throughout the life cycle: construction, operation, and renewal.

(5) Plant resource manager

The Plant Resource Manager (PRM) of the CENTUM VP

aims to continuously improve and maintain the operating rate of the facility. In other words, the CENTUM VP offers a basic database called an instrument ledger to manage the state of the instruments and accumulate information. PRM also serves as the center (portal) of operations such as device diagnosis and adjustment.

We will offer a powerful diagnostic engine and make possible instrument diagnosis over a wide area and various diagnostic applications. We will also develop functions that improve production efficiency such as CBM (Condition Based Maintenance) and CBO (Condition Based Operation) by using the field digital function, information technology, HMI function, and interface with supervisory systems.

(6) Operation assistance solutions

The operation assistance solutions of the CENTUM VP aim to continuously improve and maintain operation efficiency. Specifically, the system offers information management by PIMS (Plant Information Management System) and operation assistance and operation analysis functions.

We will strengthen the PIMS function as the basis of the operation assistance solution, offer mechanisms that handle not only process data but also asset data in real time, and deal with alarms in the process and asset in an integrated manner, and make possible its analysis and improvement.

(7) Interface with supervisory system

The interface with the supervisory system of the CENTUM VP allows production to be connected directly with the corporate management system. Specifically, we connect the CENTUM VP with management systems such as ERP and MES or with software from various venders through interfaces such as OPC.

We will strengthen the interface lineup to deliver operation based on business data by connecting management systems such as ERP and MES and production systems. We will also maintain the function to achieve a secure connection with minimum engineering.

(8) Continuity from the CENTUM CS 3000

The CENTUM VP, as the successor, offers full interchangeability and system continuity with the CENTUM CS 3000. Specifically, the CENTUM CS 3000 can be upgraded to the CENTUM VP without changing control applications or HMI graphic screens, etc. The CENTUM VP can coexist with the CENTUM CS 3000 on the same control bus.

CONCLUSION

The CENTUM VP has been developed as a new integrated production control system that exceeds the scope of existing DCSs. This system inherits the specifications and architecture of the CENTUM CS 3000 such as reliability, long-term operation, and operation safety. The CENTUM VP brings innovation to achieve the four Excellences of Asset Excellence, Production Excellence, Safety Excellence, and Lifecycle Excellence, all for the customer's Operational Excellence.

This paper described the concept of the CENTUM VP in terms of the four Excellences, the direction of growth, and the functions that will be realized in the future.

We will enhance the functions of the CENTUM VP to continuously improve the growth potential and productivity of customers. ◆

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