

ASSET EXCELLENCE –AN APPROACH TO INNOVATIVE ASSET MANAGEMENT–

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This paper describes the main components of Asset Excellence Solution, followed by the concept and technological background of AE as an introduction to the special issue of Asset Excellence Solution. The paper also summarizes its advantages and the trend toward cooperation with other companies.

INTRODUCTION

In 2005, Yokogawa announced “VigilantPlant” as a concept to ward the realization of a type of plant operation that is considered ideal by our customers. To bring this concept to fruition, we proposed a group of solutions seen from the three perspectives shown in Figure 1, and another group of service solutions that are common to these perspectives. In this special issue, we introduce one of the solutions, namely the “Asset Excellence Solution”, which is an approach that updates the management of devices and facilities. Readers can also refer to Yokogawa Technical Report (Vol. 50, No.3, 2006) in which we featured “Production Excellence”, with the concept of VigilantPlant.

ASSET EXCELLENCE

Production at customers’ plants is supported by two main activities: operation and maintenance. In Japan, these can be exemplified as an arterial system and a venous system, respectively, and are inextricably linked activities. Since the release of CENTUM, the world’s first Distribution Control System (DCS) in 1975, we have been working toward developing an operating field. Centering on process control by the DCS, we provided software packages that included flowmeters, differential pressure and thermo transmitters, sensors, operation

support, and advanced control and operational efficiency improvement support to promote operational automation. We are proud of the great contribution these developments have made to plant modernization since the 1980s. However, it is an undeniable fact that human resources are indispensable in the maintenance field. The maintenance field is supported by the efforts, intuition and experience extended by those who are involved in it. As a technical breakthrough that has furthered the automation of maintenance activities, we must also mention the emergence of fieldbus technology, as well as the development of intelligent sensors and valves. For example, in traditional configurations, sensors and the DCS were connected by analogue signal wires of 4 to 20 mA, and only measured values from the sensors were



Figure 1 Group of Solutions to Realize VigilantPlant and Positioning of Asset Excellence

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conveyed one-way as current values. However, the emergence of the fieldbus enabled intercommunication between the sensors and the DCS, and also allowed information in addition to measured values from the sensors to be communicated to the DCS. Downloading communications from the DCS to the sensors was thereby made possible. By utilizing these functions, we are able to conduct process diagnosis, remote online setting of field sensor parameters from the DCS in the control room, and status management.

To realize an optimal fieldbus for process control, we are continuing to extend efforts toward the development of a standardized FOUNDATION™ fieldbus and are promoting it to users. At present, FOUNDATION fieldbus has been adopted at most of the new large-scale plants overseas that we are in charge of, and in recent years we are seeing an increase in the adoption of FOUNDATION fieldbus in Japan as well.

Given this background, we have proposed an Asset Excellence (AE) Solution to automate maintenance work while at the same time enhancing its quality and efficiency. The goal of this AE Solution is to realize an extremely reliable plant with a highly operating rate of production — an ideal plant for users.

The AE Solution provides a group of solutions by combining the following hardware and software:

- ① Hardware that we are proud of; sensors and a control system and fieldbus that are highly reliable.
- ② FieldMate —which facilitates the configuration of single devices using field tools, as well as comprising a device operation and maintenance and diagnostic functions such as changing parameters.
- ③ PRM —which conducts extensive configurations to all system devices using tools from the center, and device operation and maintenance and diagnostic functions such as changing parameters. With the device management function, such results can be managed as a database by each device in the form of static, dynamic and historical data. Other functions can convey diagnostic functions and diagnostic results in sensor field devices as alarm messages to operators or engineers. There is also a function which enables the monitoring of devices from the centers on a regular basis.
- ④ InsightSuiteAE is deeply involved with users' plants. We propose and implement added value service activities for the improvement of their plant operations. This will be shown in Figure 2. Each essay will explain further details, and in this special issue, we will briefly explain the main factors constituting the AE Solution as follows.

(1) PRM (Plant Resource Manager)

PRM is an integrated device management software package and the core of the AE Solution. Its basic function is device data base control, and it can store device data on an individual device basis, including the static data of model name and manufacturer, the dynamic data of device parameters, and historical data such as device alarms and operational records. In this context, the devices are the equivalent of elements of the plants, and in principle indicate instrumentation devices such as the sensors and valves. We are also expanding our target to include rotary machines and other devices, which we

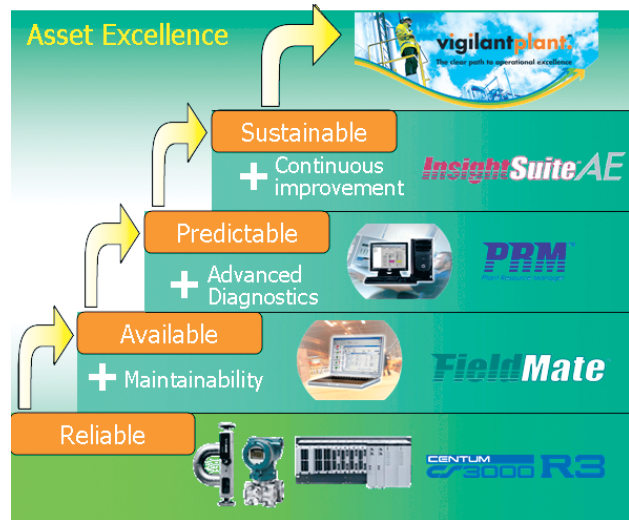


Figure 2 Yokogawa Asset Excellence Model

will mention later.

With PRM, we provide Advanced Diagnostics as an expanding function. Here, the diagnostic function is presented as a plug-in for the device management function. There are several kinds of plug-ins that realize diagnostic functions, such as FDT/DTM (Field Device Toll/Device Type Manager) and Yokogawa's own PAA (PRM Advanced Application). These plug-ins are customized to meet individual function requirements.

We also provide both diagnosis of the device alone, and a process diagnosis as seen from the device. Furthermore, in addition to results that detect defects, predictive diagnosis foretelling impending defects are also offered. PRM features facilitate the management of all devices that are connected to the system from the instrumentation room center. By making intelligent devices and creating devices in line with the FOUNDATION fieldbus concept, the resultant devices are capable of sending alarm messages. Depending on the contents of the message, PRM can also selectively dispatch the message to operators or maintenance engineers.

(2) FieldMate^(*)

While PRM targets entire devices from the center, FieldMate is pc software that offers functions such as the configuration of devices that are designed to be used by direct connection to field devices. FieldMate functions can also display the internal status of devices. Fieldmate features support both Electronic Device Description Languages (EDDL) and FDT/DTM technologies. A single FieldMate unit can support all devices and field networks including FOUNDATION fieldbus, HART and Profibus. In this field, handheld terminals have been the mainstream for a long time. However, FieldMate is based on a portable pc that can respond to everything in just one unit, while providing dramatically intensified operability. FDT/DTM is plug-in software provided by the device manufacturers that makes possible the Read/Write of the devices' setting values such as sensors, as well as the display

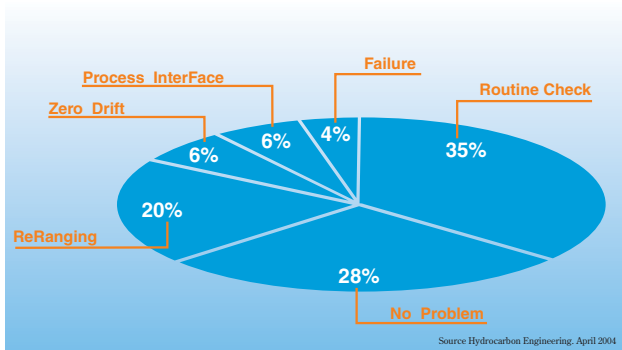


Figure 3 Instrumentation Maintenance Man-hours

of the internal status of the devices. Further details on FDT/DTM will be presented in a separate research paper. DTM provided by manufacturers who know best about their devices are the easiest to use.

The results of maintenance work executed using FieldMate can be temporarily stored and managed in PRM by being allied with the PRM (to be developed).

(3) InsightSuiteAE

InsightSuiteAE is profoundly involved with users' plants, in addition, we propose and implement value-added service activities to improve their plant operations. With InsightSuiteAE, problems inherent in user's plants become transparent, making it possible to offer value-added services to solve them. InsightSuiteAE aims to share know-how about plants with respective customers, and to maintain them in the best possible condition while continuously improving the status of the plant.

ADVANTAGES OF INTRODUCING THE AE SOLUTION

Users can benefit by introducing the AE Solution as follows:

- (1) Reduction of loss expenses due to unexpected failures
AE Solution offers predictive diagnosis such as the detection of impulse line blocking of differential pressure transmitters. With predictive diagnosis, advance notification is received of impending device failure. For example, the blocking diagnosis gives advance notification of the fact that the impulse line is about to become blocked before the line is completely blocked. Conducting immediately relevant maintenance work prior to impending failures realizes uninterrupted operation of the plant. This contributes largely to preventing operational loss at the plant, securing the safety and the environmental maintenance measures.
- (2) Reducing unnecessary maintenance
Figure 3 shows statistical survey results for time spent on maintenance work for instrumentation in the chemical industry. We conducted investigations and carried out a "Routine Check" (i.e. a conventional check of instrumentation). If we add the time for determining "No Problem" situations (i.e. no problems were found in the

instrumentation), the actual working time is 63% of the total. In other words, this much time was spent in order to confirm that there were no problems in the instrumentation. The diagnostic functions and predictive diagnosis functions of field devices such as sensor or valves provided by AE Solutions enable a shift from Time-based Maintenance (TBM) to Condition-based Maintenance (CBM) for traditional field devices. These functions also reduce the time spent on maintenance work dramatically while maintaining plant safety at a high level.

(3) Ensuring the succession of expertise and experience in maintenance and diagnosis

In Japan a major problem in the year 2007 is the decreasing number of veteran operators at operation sites. Yokogawa has been quick to address this issue, and is currently marketing ExaPilot, an operation efficiency improvement support package that memorizes skilled workers' operation procedures and ensures their succession in the operation fields. This product has met with enthusiastic response from many customers. In the maintenance field, Yokogawa also presents PAA, an element of the AE Solution that backs up and supports maintenance work. This system facilitates the sharing of skilled maintenance personnel's expertise, thereby ensuring the succession of know-how.

COOPERATING WITH OTHER COMPANIES USING OPEN INTERFACE

The AE Solution aims to realize highly reliable plants; however there are various devices in actual plants such as rotary machines that incorporate control valves, motors and inverters using other than Yokogawa's control systems and sensors. To reinforce the reliability of whole plants, it is essential that Yokogawa's devices that include diagnostic functions are managed in such a way as to achieve the integrated management of the whole plant. Yokogawa's AE Solution has been developed to address these situations, and realizes the integration of devices and diagnostic functions that are offered by other companies with Yokogawa's device management. Open Interface (an international and industry standard interface) is pivotal in such applications, and FDT/DTM and OPC are also incorporated into the AE Solution. In the AE Solution, we cooperate with representative manufacturers in each field and actualize PRM as a platform by bringing about an integrated solution using Open Interface. This is shown in Figure 4.

(1) Valve Solution

Under the Vigilant Partnership Program (VIP) name, we offer an integrated solution that focuses on FDT/DTM functions, in alliance with four other main valve manufacturers operating globally. We put an emphasis on valves, and in particular the predictive diagnosis thereof. By integrating these valves with PRM, high quality device management and diagnosis are realized.

(2) Diagnosis solutions for rotary machines

Yokogawa and the world's top developers of rotary machine diagnosis are working on an integrated solution using an OPC interface (to be released in 2007). By employing this

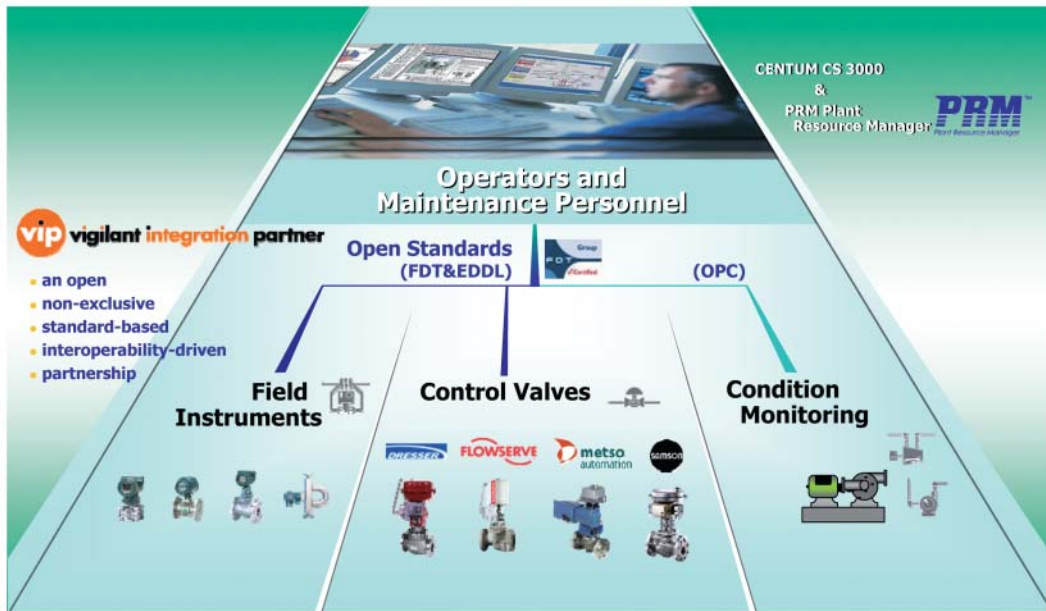


Figure 4 Valves and Rotary Machine Diagnostic Functions Alliance

function, we will be able to display the status of motors and pumps and the like not only on instrumentation devices, but also on PRMs. Moreover, it will be possible when defects occur to confirm messages with the DCS via PRM, including those pertaining to predictive alarms.

(3) Interoperability

Users are concerned about whether combinations of different manufacturers' devices are capable of normal operation, especially in cases involving combined solutions for intelligent devices. To eliminate such users' concerns, we set up an FDT/TDM interoperability test laboratory to conduct interoperability testing. In this laboratory we verify whether VIP valve makers' DTM can operate normally under conditions that combine PRM and FieldMate, and the results of such testing will be disclosed to reassure users.

FUTURE DEVELOPMENT

While automation history in the operational field centered on DCS exceeds 30 years, automation in the maintenance field has just begun. Forging ahead, we hope to provide a wide range of quality AE Solutions as follows:

(1) Expansion of VIP

As mentioned in the section on valve solutions, we have commenced the development of an integrated solution VIP with other companies centering on FDT/DTM functions. In addition to valves, we intend to offer an integrated solution with other intelligent devices in many other areas in the future.

(2) Integrated solutions with various types of diagnostic packages

In rotary machine diagnosis, we have realized integrated functions utilizing OPC as the Open Interface. This applies to

many different kinds of devices, such as instrumentation devices, rotary machines and other thermal exchange devices. As for rotary machine diagnosis, next we will provide an integrated solution with PRM. This will be a package using a system developed in cooperation with other companies that offers such diagnostic functions as of devices and processes.

(3) Wireless sensor network

We intend to provide a field wireless sensor network utilizing field wireless technology. Currently we are working toward the standardization of this network, as well as the development of added-value solutions that apply this technology. The solution to the application of this wireless sensor network is not the replacement of existing control sensors, but the making good use of wireless characteristics. In other words, this is not a control sensor that measures the inside of the pipe. Rather, it applies to the sensors by measuring temperature, corrosion and vibration outside the pipe in order to maintain and manage production facilities. Traditionally, to maintain plant facilities, gauges were extensively deployed, and field operators checked them on a daily basis. Gauges were replaced by wireless sensors, and by collecting the generated numeric values from the centers, statistic processing as well as individual diagnoses were thus made possible. These factors contributed significantly to the automation of maintenance work. We have high expectations for this technology, especially with regard to the wireless aspect as field wire expenses can be reduced dramatically.◆

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