



Service Network for Multi-Air-conditioning Systems by Internet Technology

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Overseas sales of multi air-conditioners for commercial use are increasing exponentially. There is now a strong demand for technical and service guidance on the latest products from the local stores selling and servicing the air conditioning equipment produced by Mitsubishi Heavy Industries, Ltd. (MHI). To meet this demand, MHI has developed a service operation assistance system (MASA system) based on IT. To increase its service-processing capacity in the Chinese market, MHI has established a service network made up a control service store for each region, a set of sales and service stores working under each control store, and the MHI service center working as the key component at the core of the servicing network. The MASA system supports the operation of this service network.

1. Introduction

The design of air-conditioning systems for commercial use has been advancing. Manufacturers and users in both Japan and overseas now place great importance on energy conservation and measures to reduce the burdens on the global environment. The KX4 series, a line-up of inverter-driven multi-indoor unit climate control systems newly developed by MHI, has an energy efficiency (COP: Coefficient of Performance) 24% higher than MHI's conventional system, and a footprint 52% smaller. End users all over the world are pleased with the performance of the KX4 series.

The local sales and service stores abroad now require more technical assistance for the installation, commissioning, and servicing of multi air-conditioners. Many of the stores in charge of local sales are handling these multi air-conditioners for the first time. And the advanced control technologies incorporated in the new systems – most notably the n-to-n connections for multiple outdoor units and indoor units and the operation system for multiple inverter-driven-type compressors and electronic expansion valves – are adding to their challenges.

To address the needs of local sales and service stores, we have established a new service network (Mitsubishi Air-conditioner Service Assistant network: hereinafter abbreviated as MASA) using the in-house service management technology and the Internet. The new network is now being run as part of a company-wide quality-improvement activity (QI-I activity: Quality Improvement Initiative) to solve the challenges for local sales and service stores.

2. The needs of the sales and service stores supporting sales, and MHI's responses

2.1 The needs of the sales and service stores

Our research on the market in China, a growing economy

with rapidly rising sales of multi air-conditioners, identified the following needs.

The stores strongly requested the following for the KX4 series, the latest multi-climate-control system developed in Japan. (1) First, they wanted to quickly acquire technical information and service techniques for the latest models as their own technologies. (2) Second, they wanted to respond immediately to service calls from end users, and to receive the necessary parts to enable them to do so. (3) Third, they needed manufacturer support to handle requirements they were unable to deal with themselves.

Though clarified in a hearing held in China, these needs seem to be common among sales and service stores all over the world. Sales and service stores apparently wish to learn the necessary design techniques and service techniques as soon as possible in order to expand their sales of multi air-conditioners in their own countries.

To meet these needs in China, MHI and its service center in China have reinforced the parts supply system in the Chinese market and provided guidance on service techniques for the sales and service stores. We have also further strengthened and rationalized the service system by developing and introducing the MASA system. This system enables us to respond immediately to service calls and technical inquiries from a wide range of sales and services stores throughout the country. (The MASA system is outlined in Section 3.)

2.2 Introduction of the new service system and area control service stores

With the sharp increase in sales in the Chinese market, we have newly set up an "area control service store" that controls sales and service stores in each area by making good use of the MASA system in order to support the vast Chinese market.

When an end user or another party places a service call, the sales and service store enters it in the MASA system and

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provides primary service. When a sales and service store is faced with a technical problem, the area control service store provides technical consultation and service assistance.

The Mitsubishi Heavy Industries (Shanghai) Co., Ltd. (MHISH) service center and the Air-Conditioning & Refrigeration Systems Headquarters of Mitsubishi Heavy Industries, Ltd. (MHI) have control over the overall management of service processing.

2.3 Guidance on the latest techniques and service techniques

We have provided guidance by holding seminars on business transaction techniques and service techniques for sales and service stores. Courses on practical skills are now being held at a training center set up as an annex to the MHISH service center. Course participants learn to capture service information with personal computers and use the tools for directly operating the new-type multi air-conditioners installed indoors and outdoors. The introduction of this course has improved service techniques. The sales and service stores are now able to use their personal computers to capture service information on the latest multi air-conditioners equipped with an inverter-driven-type compressor, electronic expansion valves, a refrigerant control function, a function to store the most recent operational data, and so on.

After a course is completed, we test individual students

on their understanding of the service techniques and use the test results to improve the course and plan our future guidance measures.

In the future we will be disseminating the technical guidance and its benefits to a wider range of sales and service stores (workers) through e-learning and other channels that make effective use of the MASA system bulletin board function. This, in turn, will expand the scope of technical guidance beyond the participants in the courses.

3. MASA system utilizing IT

3.1 Concept of MASA system

Fig. 1 shows the basic concept of the MASA system.

The principal aim of the system is to establish an Internet-based network for the stores selling and servicing the air conditioning equipment manufactured by MHI. Through this network, the stores will be able to improve the customer satisfaction of end users by exchanging information on sales and service with MHI and with each other.

MHI and sales and service stores exchange information on the market and technical points and cooperate with each other in quality-improvement activities. The market data, service case histories, and other useful information resources stored in the MASA system on a daily basis have become valuable assets in development.

All of the information entered into the MASA system by

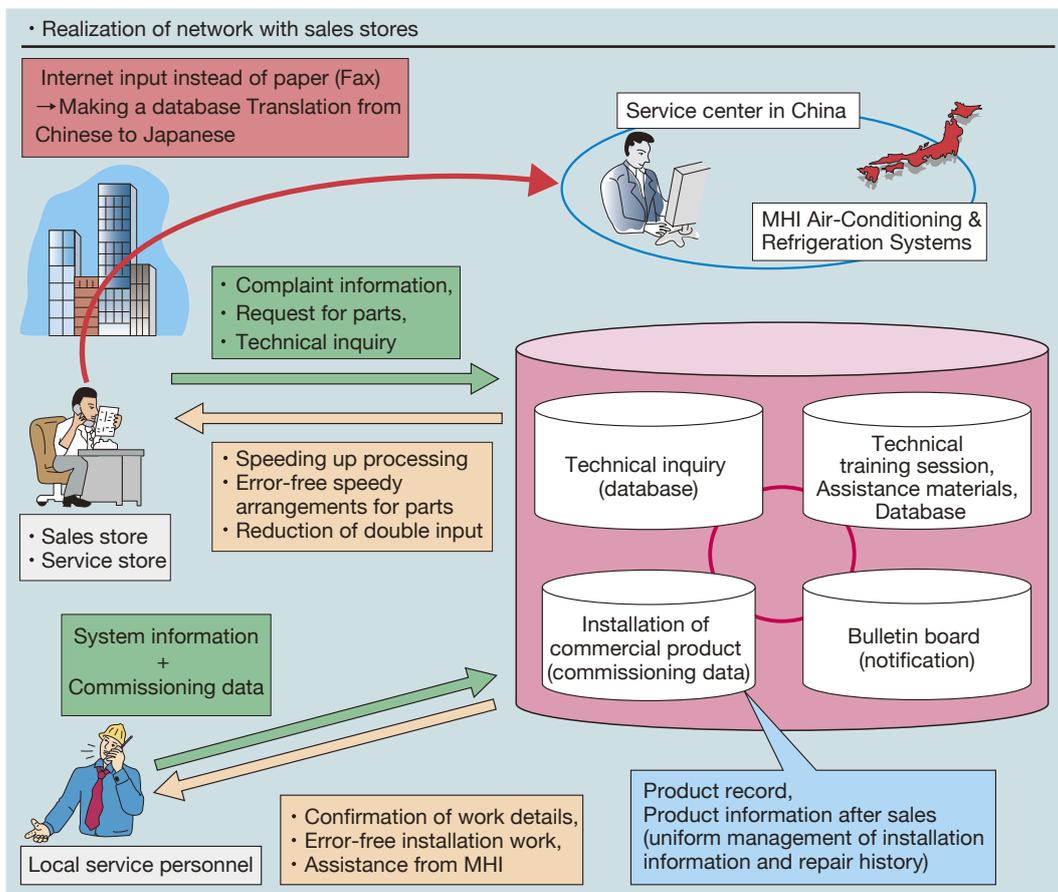


Fig. 1 Concept of MASA system
Method for exchanging service information with local sales and service stores over the Internet

the stores is registered in the MASA database. Information entered in Chinese is translated into Japanese. Through this system, the voices of local sales and service stores reach development personnel in Japan online and can be left in the database until their problems are solved.

Fig. 2 shows the log-in screen for the MASA system. Users can specify Japanese or Chinese at log-in.

3.2 IT incorporated into the MASA system

The MASA system has been developed based on MHI's Internet technology⁽¹⁾ and database construction technology.⁽²⁾ These technologies make it possible to support an exceptionally wide range of sales and service stores in China while offering the following functions.

The details and status of service information and technical inquiries (Are the issues new or old? Have the issues been solved?) can be easily confirmed on the screen of any personal computer.

Fig. 3 shows the control for the MASA system. The screen shows the number of service issues, the number of technical inquiries, and whether the issues and inquiries are solved. If there are any problems, corrective measures can be taken at once.

Technical materials, operational data, and image data can be uploaded and downloaded. Operation data and image data are important complements to the service information in the market. The MASA system stores these data in a database on a 1-to-n relation – not the 1-to-1 relation applied in the e-mail between the MHI person in charge and the sales and service stores. This makes it possible to transmit the information more widely to the persons concerned.

Chinese and Japanese can be entered and displayed at the same time. **Fig. 4** shows an example of service information



Fig. 2 Log-in screen of MASA system
Users can log-in in either Chinese or Japanese.

entered by a sales and service store. Sales and service stores enter the model name, serial number, error code, and necessary part number as service information. They can also enter local operation information in Chinese. And with the Japanese translations of the service information displayed in real time at MHISH, development members in Japan can confirm the contents of the information on the same screen. Great benefits in design are also gained, as designers can obtain market information directly online.

The MASA system lets sales and service stores register equipment at the installation stage, upload data on the commissioning of equipment to the system, and use the data for equipment records. A list of all of multi air-conditioner systems and their service histories is included in the equipment information.

When stores provide subsequent after-sales service, these features allow them to check past service history in advance, download operation data, and process complaints smoothly by consulting the operation data.

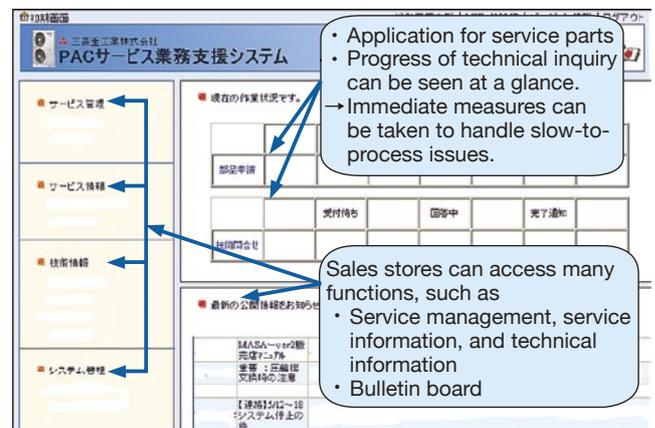


Fig. 3 Service management screen of MASA system
The service status can be seen at a glance. Technical information can be exchanged through technical inquiries and the bulletin board function.

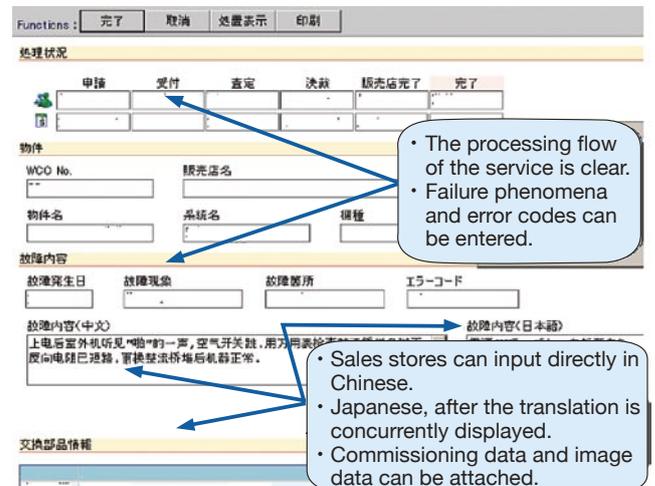


Fig. 4 Service screen of MASA system
Screen used by the sales and service stores to applying for service. Information entered in Chinese is translated and displayed in Japanese.



Fig. 5 MHI service center in China: exterior view
The figure shows the appearance of the service center and the status of access to the MASA system terminal.

These improvements have made it possible to provide prompt and accurate service. The sales and service stores are very pleased.

3.3 Present operation status

Fig. 5 shows the outer appearance of MHI's service center and the access status at the terminal of the MASA system. At present, the MASA system processes 90% or more of service information from the sales and service stores authorized by MHI.

The information from the sales and service stores in China used to be entirely in the Chinese language. This limited the number of personnel capable of handling it. In the MASA system, the actual opinions from the market, translated from Chinese to Japanese, reach development sites in Japan directly. This brings many merits, including the ability to reflect the intentions of the sales and service stores in system development.

Further, with the introduction of the MASA system, the sales and service stores can now directly input details of the services they accept. This has made it possible for the person in charge of MHISH to rapidly verify the technical details of the service information entered and the arrangements for parts and processing. This, in turn, leads to improvements in the customer satisfaction of end users and other benefits.

Challenges grow, however, for the sales and service stores in inland areas where Internet infrastructure is lacking and conventional fax reception is the only viable method

for system linkage. In some cases, the MHI service center prepares proxy applications for the faxing of information. As the establishment of the Internet environment progresses, this proxy application will be phased out.

4. Conclusion

- (1) Overseas sales of multi air-conditioners for commercial use are increasing exponentially. As a result, the local stores which sell and service the air conditioning equipment made by MHI have a pressing need for technical and service guidance on the latest products. To respond, we have developed a service operation assistance system (MASA system) based on IT as a company-wide quality improvement activity (QI-I activity).
- (2) To increase its service-processing capacity in the Chinese market, MHI has established a service network made up a control service store for each region, a set of sales and service stores working under each control store, and the MHI service center working as the key component at the core of the servicing network. The MASA system supports the operation of this service network.
- (3) The MASA system has adopted functions to (1) process service operations such as requests for parts and approvals for parts shipments; (2) upload and download files; and (3) display and enter Chinese and Japanese at the same time.
- (4) MHI has set up the MASA system in China and processed services in the Chinese market since the beginning of 2004. This has expedited service processing and pleased end users and personnel from sales and service stores as a result. The system has become effective in other areas as well. Development personnel, for example, can confirm market information directly.
- (5) MHI is planning to make the MASA system multilingual, with the capability to translate Chinese into languages such as English and Hangul, and to apply the system in other overseas areas in order to meet the requests from stores selling and servicing MHI products in other parts of the world.

References

- (1) Morimura et. al., "Providing Comfort through Air- Conditioning and Assuring the Quality of Frozen Food" -Service Technology for Air- Conditioning and Refrigeration-, Mitsubishi Heavy Industries Technical Review Vol. 40 No. 2 (2003)
- (2) Morimura et. al., Establishment of CS center and Efforts for CS improvement, Mitsubishi Juko Giho Vol. 40 No. 2 (2003)



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