# Utilization of M2M Technology in the Industrial Machinery/Machine Tool Industries

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## Abstract

Recently, an increasing number of enterprises in the industrial machinery/machine tool industries have been utilizing M2M technologies for monitoring machine working and location information. The aim has been to improve the efficiency of maintenance services at the global level, improving customer satisfaction through preventive maintenance and increasing sales. This paper introduces the current situation in the utilization of M2M technologies in the industrial machinery/machine tool industries.

## 1. Introduction

Recently, an increasing number of enterprises in the industrial machinery/machine tool industries have been utilizing M2M technologies for the remote monitoring of machine operations, fault occurrences and machine locations with the aim of improving the maintenance services and the implementation of preventive maintenance. This paper describes the background to M2M technology utilization in the industrial machinery/machine tool industries in section 2, specific utilization methods and systems in section 3, and issues and future orientation of M2M technology utilization in section 4.

## 2. Background to M2M Technology Utilization in the Industrial Machinery/Machine Tool Industries

### 2.1 Summary of the Industrial Machinery/Machine Tool Industries

The industrial machinery/machine tool industries are among the manufacturing industries fabricating machinery for use in various industrial fields such as the construction machine, processing machine and industrial machine fields.

Many enterprises in a large number of manufacturing industries are now advancing "globalization," and an increasing number of enterprises are promoting a shift towards services by focusing on the after-sales servicing of machinery in order to improve profitability through the enhancement of customer relationships. From the viewpoint of profits, measures focused on cost reductions are also as important as the "shift toward services industry." The industrial machinery/machine tool industries are not exempt from these trends of "globalization" and "shift toward services industry."

The industrial machinery/machine tool industries are a typical contract-oriented industry with a high-mix low-volume production base. The product compositions often vary between each customer and contract management and configurations are extremely difficult in this context. Furthermore, parts management and maintenance support aspects sometimes impose heavy burdens on these industries because the lifecycles of some products can be as long as more than twenty years. Under the prevailing conditions of the global oligopoly, the industries are endeavoring to survive by enhancing overseas operations and by providing support for both production and maintenance issues. As a result, production is being shifted from dedicated to universal machines and the scale of production is being expanded. Regarding the market, the economic stagnation in Europe and North America that had previously been the main market, is making it necessary to deal with the rise in plant investment demands for emerging countries such as Brazil, Russia, India and China (BRICS).

### 2.2 The Background to M2M Technology Utilization

While enterprises are oriented to "shift towards service industry," the rapid progress of "globalization" poses the problem of lead time in arranging satisfactory overseas maintenance service systems.

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Since overseas business often takes the form of joint ventures with local capital, sales and support provisions via local agents, information on the machines sold to customers, including that on the agreements, composition, working status and maintenance contracts, is sometimes not well defined. As a result, many industrial machinery/machine tool manufacturers have issues in identifying the users, locations and compositions of the machines sold in a foreign country.

In addition, overseas business is also affected by various other issues. In more extensive countries and regions than Japan where road conditions are very poor (often making aircraft use obligatory), these issues are particularly important. In consequence a lengthy lead time is required for the movement of service engineers and the distribution of maintenance parts and consumables. This results in the non-availability of high quality services such as the 24-hour support that is a matter of course in Japan.

The utilization of M2M technologies has become necessary in order to supplement current services situations as described above, as well as to differentiate business from that of competitors and improve the efficiency of in-house procedures.

## 3. Specific Methods and Systems for M2M Technology Utilization

### 3.1 Location Information Monitoring

Monitoring of machine location information is possible by combining M2M technology and other systems or services such as GPS ( **Fig. 1** ). Location identification can be utilized in supplementing contract information or providing information for collection of claims and in calling the service engineers quickly in case of a fault. In addition, as linkage with the contract information and composition information can clarify the compositions and numbers of machines at each location, M2M technology will also be helpful for the preparation of maintenance parts and consumables.

### 3.2 Operation Condition Information Monitoring

In addition to the location information, M2M technology can also monitor operation status information such as the power ON-OFF status and normal or abnormal status and usage of the machines ( **Fig. 2** ). Operation condition information monitoring will also lead to improving the service level of service engineers and the efficiency of fault recovery work.
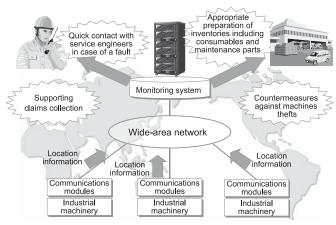


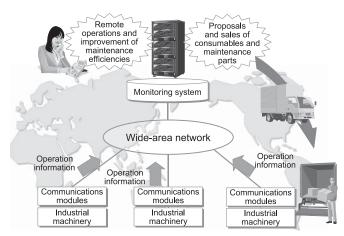Fig. 1   Location information monitoring.



Fig. 2   Operation condition information monitoring.

Identification of machine usage will also enable provision of information regarding consumables including molds and spare parts for the sales departments, thereby contributing to expansion of sales and profits.

### 3.3 Predictive Information Monitoring

If fault prediction information can be monitored by advancing the service one step further from operation condition information monitoring, it will be possible to change the details of repair services from after the fault to preceding preventive maintenance ( **Fig. 3** ). Since most industrial machinery and machine tools are expected to operate continually, the evolution to preventive maintenance is expected to reduce machine down time and contribute to the expansion of customer profit.
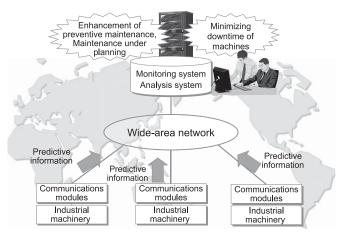
Fig. 3   Predictive information monitoring.

## 4.  Issues and Future Orientation of M2M Technology Utilization

One of the problems of M2M technology utilization in the industrial machinery/machine tool industries is the lead time involved in the introduction of the service. The usual cause of this issue is the difficulty of obtaining capital investment decisions regarding the burdens of construction services and operational costs payments, or the impossibility of providing the service as a charged service because its contents do not appear to offer clear advantages to the customer. The second reason is that the wide variety of product shipment destinations requires expert knowledge of the laws that apply in each country/region and the selection/contracting of carrier circuits for constructing global service and network systems. The third reason is that security policies are becoming barriers against the introduction of the service when connecting each customer operating industrial machinery/machine tools to the service providing network.

For the future, the strategy of applying countermeasures to such issues will not be adequately solved by improving in-house efficiency, considering the difficulty of charging for the service. It will also be required to implement a service model that can lead to the expansion of sales.

The point regarding operation will be to outsource the carrier selection/contracting function of the worldwide network circuit service. In parallel with this matter, the vendor will be required to provide global one-stop service throughout the network.

Considering that some enterprises will not want to use their in-house LAN in order to avoid degrading security, but will request to connect a communication device and circuit to every machine, suitable measures for dealing with such a contingency will also be necessary.

## 5. Conclusion

Under the trend of "globalization," the industrial machinery/machine tool industry is encountering the need to win the cost competition with the emerging countries such as China. This trend is additional to the ongoing performance competition with the European manufacturers. In this severely competitive environment, many Japanese enterprises are now considering differentiating themselves from competitors by utilizing the M2M technology in a "shift toward services industry."

We believe that the key elements in disseminating services utilizing the M2M technology will include: provision of service platforms and applications enabling "Small start + Scale out," selection of optimum carriers in each of the global regions, provision of an outsourcing service for unifying contracting and billing operations in Japan, and reduction of the costs of communication modules and gateway devices. In this context NEC is offering solutions (CONNEXIVE M2M service platform) for effectively implementing such functions.

In addition to the implementation of these functions, we will give additional support for the creation of new business models among industrial machinery/machine tool manufacturers based on our expertise and knowledge of the industry. This support will include, for example, consideration of the job requirements of the order-based production enterprises and provision of consultations related to projects, which supports enterprises to implement the M2M services.

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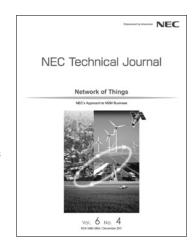Device Products Supporting M2M Services - Their Actual Applications
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