Chapter 21
Comparing Experienced and Inexperienced Machine Workers:
Improving the Skills of Technicians

ABSTRACT

Toward the firm development of Advanced TPS based on the NMT (New Japan Model), this chapter aims to clarify the factors involved in improving the skills of technicians by conducting a comparison of experienced and inexperienced workers engaged in lathe work, using statistical science and electro-encephalography (EEG). First, a fact-finding survey concerning skill transfer in machining work was conducted to determine the kind of lathe work tasks undertaken by skilled workers. Second, a survey comparing worker's cognition was conducted using EEG analysis. Third, the decision-making criteria used by experienced workers were identified. Fourth, decisions related to the workpiece were visualized. The findings thus obtained were then used to clarify the necessary factors for efficiently and effectively improving the skills of inexperienced workers, and the required results have been achieved.

INTRODUCTION

The Japanese manufacturers today are operating for global production strategy. To overcome this, the authors believed it crucial to improve the intelligence skill level of the production operators who are the foundation of manufacturing. The author recognized the requirement for creating a new production system: Advanced TPS based on the NMT (New Japan Model) (Amasaka, 2002, 2007: Amasaka and Sakai, 2011) (Refer to Chapter 5, 6, 7 and 15).

As a solution, especially, the author suggested the improvement in value of the labor work of automobile manufactures (Sakai and Amasaka, 2006, 2007 and 2008; Tsunoi et al., 2010; Amasaka and Sakai, 2011: Uchida et al., 2012) (Refer to Chapter 6, 7, 15 and 21). Then, toward the firm development of "Advanced TPS", this research aims to clarify the factors involved in improving the skills of technicians

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by conducting a comparison of experienced and inexperienced workers engaged in lathe work (Yamazaki and Yoshioka, 2011; Yanagisawa, et al., 2013).

With the amount of production from the machining and assembly industries increasing year-on-year, machining technology is becoming increasingly important because machining is the fundamental process underpinning the industry. However, while the global level of technology is improving in line with machine-related companies' expansion of overseas production, the stagnant level of Japanese technology has become a matter for concern. Particularly evident is the sluggish pace at which the technical skills of inexperienced workers improve. This is thought to be due to the implicit style of training, which relies upon the intuition and know-how of experienced workers.

Thus, the author used electroencephalography (EEG) and statistical science to conduct a comparison of experienced and inexperienced workers engaged in lathe work, which is the foundation of machining work, and analyze the skills possessed by experienced workers. The findings were used to analyze the factors involved in improving the skills of inexperienced workers, and the required results have been achieved by using Science SQC (Yamazaki and Yoshioka, 2011; Yanagisawa et al., 2013; Amasaka, 2015) (Refer to Chapter 5).

SKILL TRANSFER PROBLEM IN THE MANUFACTURING INDUSTRY

In Japan, occupations in the service industry are by far the most popular, and the number of employees engaged in this kind of work is increasing year-on-year. Employment in the manufacturing industry continued to decline during the 10 year period between fiscal 1992, which was the peak, and fiscal 2002.

During this period, the figure fell 22% from 15.69 million people to 12.22 million people, resulting in fewer opportunities to transfer skills. For large companies, such a reduction in the number of employees places a greater burden on individual workers, which itself leads to an increase in the rate of people leaving. For businesses operating on a smaller scale such as small and medium sized companies and small factories, this leads to a lack of successors and ultimately to bankruptcy. Thus, Japan's manufacturing industry will begin to shrink.

In addition to the lack of successors, another problem faced by Japan's manufacturing industry is that of "skill transfer", or training. Although the manufacturing industry—which relies heavily on specialist technology—is becoming increasingly mechanized, there are still many products where a human touch is required in order to maintain quality.

As is the case with traditional crafts, workers need many years of experience to become able to produce quality products and the lack of established training methods makes it difficult to train new employees. Thus, the two major challenges for Japan's manufacturing industry are a lack of successors and problems with training new employees.

The World Skills Competition (formerly known as the "Skill Olympics") is run by World Skills International (WSI: World Skills International). The organization's committee is made up of official and technical delegates from member countries. The purpose of the competition is to promote occupational training in the participating countries and to encourage international exchange and goodwill among young technicians. Japan has been participating since the 11th competition in 1962.

Although Japan placed first or second from about the 11th competition to the 20th competition, Korea is recently going from strength to strength as shown in Table 1. In Korea, the large number of technical colleges means that training for machining skills is well organized and therefore technical skills