

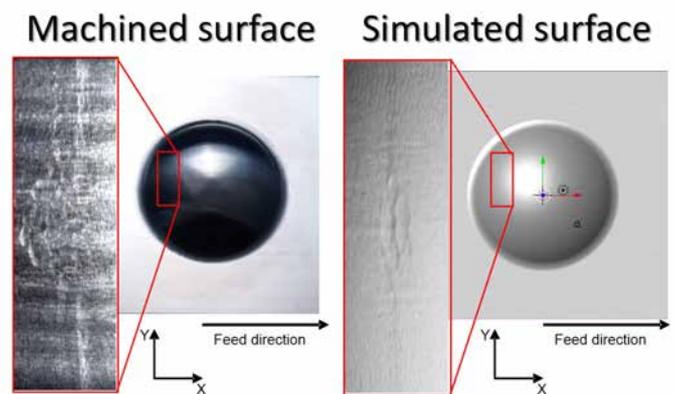
MTTRF has provided us the advanced 5-axis machining center for the past several years. This equipment is essential to show the practical effectiveness of our leading-edge researches. Our students are able to learn real-world machining operation by themselves with the equipment.

RESEARCH

Analysis of the influence of geometrical and dynamic errors of five-axis machine tools onto machined workpieces

One of the most essential disadvantages of the five-axis machining center is motion accuracy. This is because five-axis machining centers have many error sources than the conventional three-axis machining centers. Rotary axes of the five-axis machining centers have position and orientation errors of the rotational centers, called geometrical errors. Another error source in the machining is the dynamic synchronous errors between translational and rotary axes. It is also known that the unexpected problems may occur on the finished surface by the five-axis machining centers, because of the geometric and dynamic synchronous errors in the actual manufacturing field.

The objective of this study is to clarify the influence of the geometrical and dynamic errors of five-axis machine tools onto machined workpieces. In this study, actual milling tests of the shapes and its finished surface simulations considering the each geometric error and different position loop gain of feed drive systems which is a parameter affecting the dynamic synchronous accuracy were carried out, in order to clarify the influence of the each error factors onto machined surface.



- Glitches due to the velocity change of C-axis can be observed
- The glitches adequately simulated by the proposed method

EDUCATION

Applied Mechanical Engineering Project (Undergraduate course)

This is a special course for motivated students and they are assigned to different laboratories (1-2 student per laboratory). The purpose of the course is to learn how to think in a project oriented way. In order to achieve the purpose, complex shaped parts will be designed and produced.

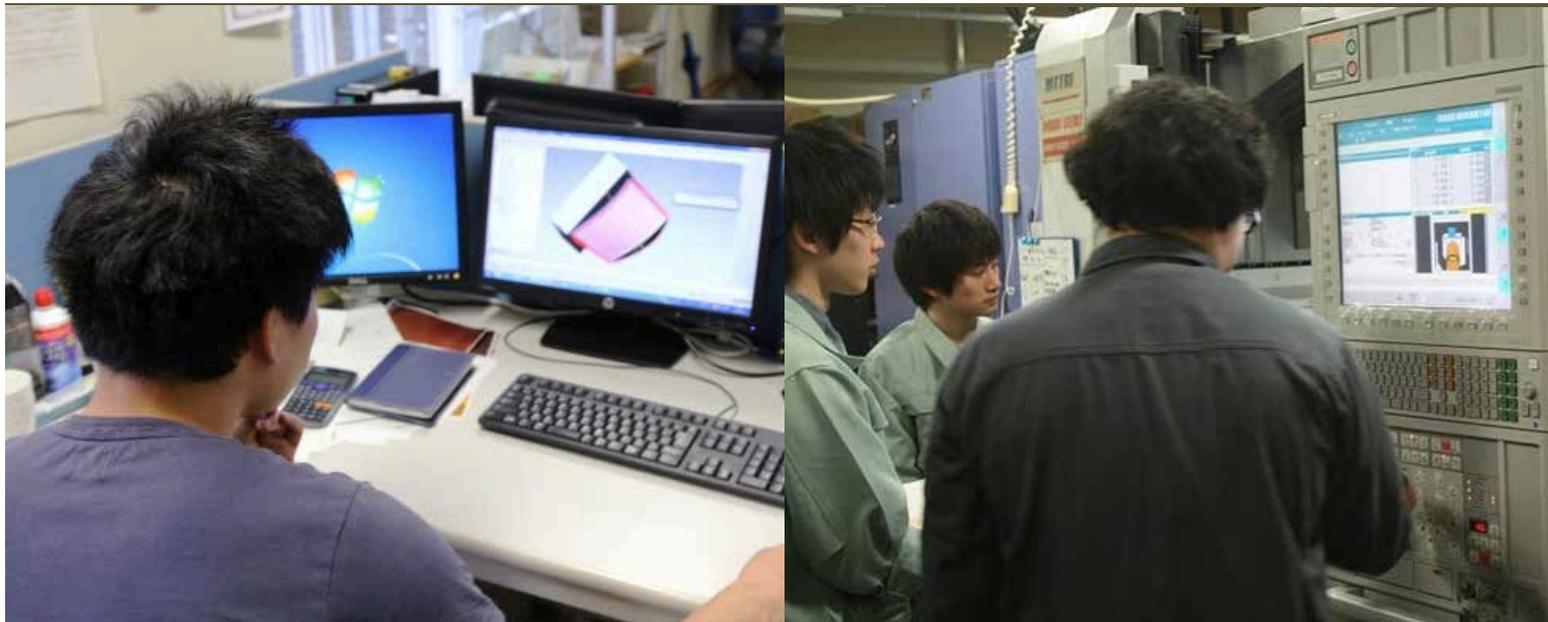
Students experience the latest manufacturing process with CAM and the MTTRF equipment. They are used for NC program generation and actual cutting tests. The MTTRF equipment is also used for lectures on structural configuration on NC machine tools.

Numerically Controlled Machine Tools (Graduate course)

This course focuses on the basis and advancement of the numerically controlled machine tools, including mechanical structure, mechanical components, motor and encoders, control systems, and the latest intelligent machine tools. Static and dynamic motion accuracies are also taught in lecture.

Accuracy evaluation using the ball-bar and grid encoder system, are demonstrated on the MTTRF equipment to realize the actual motion behaviors of the machine.

Characteristics of important components, such as bearings, ball-screws, linear guides, and coupling are also lectured by using the equipment.



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MTTRF Awardee since 2007