



## Development of the environmental-conscious mist cooling technology

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### ● Research Outline

In recent years, a machine part is efficiently processed by NC machine using CAD and CAM. However, it is rare to take into consideration the temperature of the tool and the work at the time of cutting with NC machine. Many cutting tools using a grain are developed. Tool flank wear is influenced by how to blow cutting oil. I developed the new method of spraying cutting oil in a mist with a fine particle diameter. The mist is carried out the phase change by cutting high temperature, and it evaporates. This new method has the characteristic using the evaporation latent heat of mist effectively. Hence, cutting temperature is greatly reduced by the evaporation latent heat of mist. Moreover, if a surfactant is added in the mist, the tool flank wear will be reduced greatly.

Many of materials of a machine structural parts are cast iron products and cast aluminum products. Casting defects sometimes arise for the casting products, such as blowhole. A casting part is determined by many factors, such as the casting rate and the amount of a sand mold moisture. In order to predict this casting defect, the numerical analysis which used the VOF method is suitable. In an experiment, the temperature change of the casting part is measured using the thermocouples. Furthermore, the temperature distribution in the solidification process of the casting is visualized using a thermography. Comparison with the experimental results and the numerical analysis results are performed from these. The new technology which cools the casting parts efficiently using the mist spraying is proposed from now on.

In recent years, the unusual weather, such as a rise of the maximum temperature, has occurred in the various places with the rise in heat of sea level. An air conditioner with a spraying mist reduces the room temperature in an office building. This will be solved by the numerical-analysis results and the experimental results. If this method is used, an ambient temperature will be sharply reduced using the evaporation latent heat of the mist. As a result, that leads to energy saving. Moreover, if the temperature of the suction air into the gas turbine is reduced by mist, the output of the gas turbine is increased.

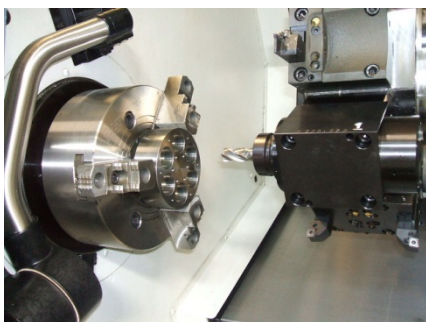


Figure 1. Mist cooling cutting.



Figure 2. Mist cooling cast.

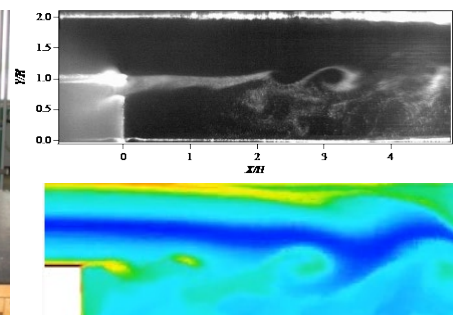


Figure 3. Visualization.