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**R&D development status of steam turbine
for Advanced-USC power plant**

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Abstract

The Fukushima nuclear power plant became a miserable situation due to the earthquake and tsunami. This accident influences the crafting of the national energy plan. Instead of nuclear power, renewable energy and thermal power energy are expected to increase in Japan. In order to hold down the unit cost of a power generation, it is expected that use of coal fire power plants are extended. However, we must get over the problem of carbon dioxide reduction. The development of 700°C class advanced ultra super critical plant is one of urgent issues for the reduction of carbon dioxide emissions.

The development of 700°C class rotor material is very difficult because it will be very different from the work to develop ferritic steel; it is expected to involve a Ni base super alloy. Conventional Ni base super alloy can be exposed to high temperatures of 700°C or more in comparatively small parts such as blade profiles of the gas turbine without problems. But segregation is a problem and so is the feasibility of manufacturing a large-scale ingot for the steam turbine rotor material from Ni base super alloy. Manufacturing a large-scale ingot is expensive compared with an ingot of ferrite materials. Therefore, development of a welded rotor has been considered by using Ni base super alloy and conventional steel.

In this presentation, I mention the development issues and progress of the turbine material and the structures for 700°C class USC. It especially introduces the development situation of three kinds of unique Ni base alloy. And some example of fabrication which have been developed until now are introduced.