

## Stainless Steel Sheet as used in Turbine Housing [CK-SMiTH]

**Name of member:** NIPPON STEEL Stainless Steel Corporation  
**Manufacturer:** Calsonic Kansei Corp.  
**Field:** automotive  
**Environment:** urban, rural, industrial  
**Grade and surface:** high heat resistant ferritic stainless steel  
**Competing material:** cast iron of carbon steel or austenitic stainless steel

**Advantage point of using stainless steel:**  
**Using thinner sheet material instead of Cast Iron, result in:**

1. Reduced heat capacity
2. Improved heat retention
3. A reduction in total weight, which leads to reduced fuel consumption and an improved performance in exhaust efficiency.

**Reasons to adopt high-heat-resistant ferritic grade;**

1. Higher durability for more than 850 degrees Celsius
2. Less de-formability at high-temperatures

A conventional turbine housing has a comparatively high heat capacity, because it is made of a solid layer of high heat resistant cast iron. Therefore, when the system starts at a cold temperature, it takes a long time until the temperature of the exhaust gas rises to the activation temperature of the purification catalyst system.

Calsonic Kansei Corporation has focused on this issue and has developed a new turbine housing system for diesel engines - "CK-SMiTH", which has replaced conventional cast iron with stainless steel sheet material. The CK-SMiTH has a dual layer structure of thinner press-formed stainless steel sheet materials, to reduce its weight and heat capacity. The reduced heat capacity leads to shorter activation time for the exhaust purification catalyst system from a cold start. In addition, an air layer within this dual structure improves its heat retention, and this high heat retention can extend idling stop time, because heat loss is reduced during engine stoppage. Furthermore, thanks to the reduction in heat loss to external systems, there is an efficiency of the turbine, even after warm up.

Thus, thanks to these advanced characteristics, the CK-SMiTH results in reduced fuel consumption and a higher performance in exhaust efficiency. Given the stringent requirement against environment pollution, turbocharger systems have been, and will continue to be used, to ensure the high performance of diesel engines while reducing their environmental impacts. In addition, the requirement to have high durability at higher exhaust gas temperatures is expected to increase in the future, particularly in the field of gasoline engine systems, and the technology of the CK-SMiTH also can be adopted in high-performance system for gasoline engines.



*Picture courtesy of Calsonic Kansei Corporation*

Finally, using thinner press-formed sheet materials in turbocharger systems contribute to the expansion of the stainless steel market, and is also expected to encourage improvements in fabrication technology.