



Can stainless steel use at low temperatures?

Austenitic stainless steels are extensively used for service down to as low as liquid helium temperature (-269 deg C). This is largely due to the lack of a clearly defined transition from ductile to brittle fracture in impact toughness testing. Toughness is measured by impacting a small sample with a swinging hammer. The distance which the hammer swings after impact is a measure of the toughness. The shorter the distance, the tougher the steel as the energy of the hammer is absorbed by the sample. Toughness is measured in Joules (J). Minimum values of toughness are specified for different applications. A value of 40 J is regarded as reasonable for most service conditions.

Steels with ferritic or martensitic structures show a sudden change from ductile (safe) to brittle (unsafe) fracture over a small temperature difference. Even the best of these steels show this behaviour at temperatures higher than -100 deg C and in many cases only just below zero.

In contrast austenitic steels only show a gradual fall in the impact toughness value and are still well above 100 J at -196 deg C. Another factor in affecting the choice of steel at low temperature is the ability to resist transformation from austenite to martensite.

Can I use stainless steel at high temperatures?



Various types of stainless steel are used across the whole temperature range from ambient to 1100 deg C. The choice of grade depends on several factors:

- A. Maximum temperature of operation
- B. Time at temperature, cyclic nature of process
- C. Type of atmosphere, oxidising, reducing, sulphidising, carburising.
- D. Strength requirement

A distinction is made between stainless steels and heat-resisting steels. However, this distinction is often blurred and it is useful to consider them as one range of steels.

Increasing amounts of Chromium and silicon impart greater oxidation resistance. Increasing amounts of Nickel impart greater carburisation resistance.