

***Adding Value Through Experience***

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## ALLOYS FOR HIGH TEMPERATURE APPLICATIONS

All materials have their limitations and in the case of metals at high temperature, this may be strength at the service temperature or resistance to corrosion / attack in the environment, and, at the service temperature. It may of course be the combination of strength and corrosion resistance.

In many industrial applications a pragmatic approach to the problems is taken and this may be dictated by what is available and at what cost. If need be process parameters may have to be adapted. This is not ideal and will result in equipment performance that is less than optimum and premature failures may still occur.

In this series of TekniTalk we will review some of the variables affecting metal performance at high temperature and also the alloys commonly used under these conditions.

An increase in temperature has the effect of accelerating corrosion processes and for aqueous corrosion conditions a rule of thumb is corrosion rate will double for every 10 deg C rise in temperature. In a similar way, high temperature corrosion phenomena will also be accelerated by a temperature increase.

The second very significant effect of temperature is on mechanical properties. In general terms, strength ( proof / yield and ultimate tensile ) can be expected to decrease with increase in temperature. However, although not obvious at ambient temperature for steels, nickel alloys etc strength and strain characteristics are time dependent. However, once temperatures exceed about 400 deg C the influence of time at temperature starts to become significant and needs to be taken into consideration. This phenomenon is known as "creep" and is quantified by the creep strength or creep rate of the metal.

(To be continued...)

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