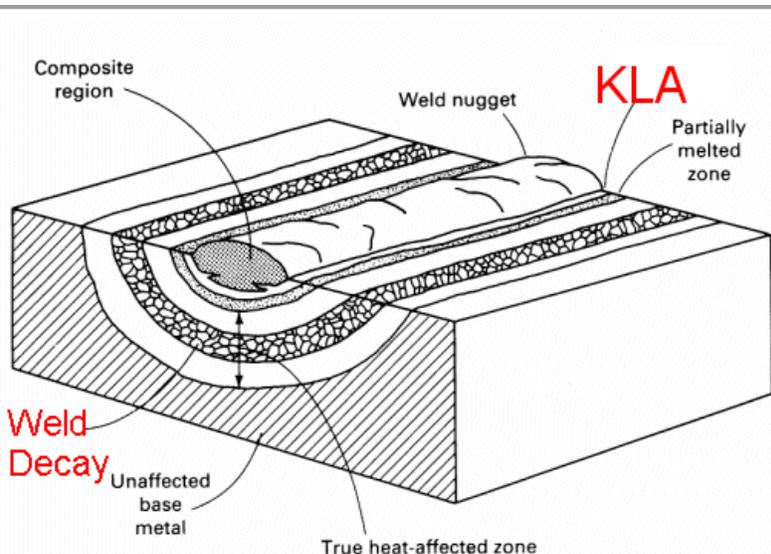


Different Types of Corrosion

- Recognition, Mechanisms & Prevention

Intergranular Corrosion: Weld Decay

Recognition



What is weld decay? Weld decay is a form of intergranular corrosion, usually of stainless steels or certain nickel-base alloys, that occurs as the result of sensitization in the heat-affected zone during the welding operation.

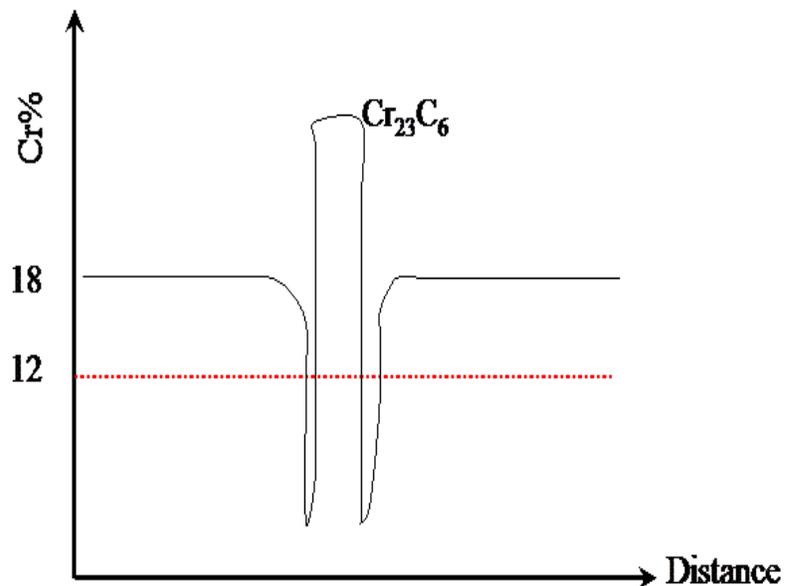
The corrosive attack is restricted to the heat affected zone (HAZ). Positive

identification of this type of corrosion usually requires microstructure examination under a microscopy although sometimes it is possible to visually recognize weld decay if parallel lines are already formed in the heat affected zone along the weld (see photo below).



Mechanisms

What causes weld decay? As in the case of intergranular corrosion, grain boundary precipitation, notably chromium carbides in stainless steels, is a well recognized and accepted mechanism of weld decay. In this case, the precipitation of chromium carbides is induced by the welding operation when the heat affected zone (HAZ) experiences a particular temperature range



(550°C~850°C). The precipitation of chromium carbides consumed the alloying element - chromium from a narrow band along the grain boundary and this makes the zone anodic to the unaffected grains. The chromium depleted zone becomes the preferential path for corrosion attack or crack propagation if under tensile stress.

Prevention

How to prevent weld decay? Weld decay can be prevented through:

- Use low carbon (e.g. 304L, 316L) grade of stainless steels
- Use stabilized grades alloyed with titanium (for example type 321) or niobium (for example type 347). Titanium and niobium are strong carbide-formers. They react with the carbon to form the corresponding carbides thereby preventing chromium depletion.
- Use post-weld heat treatment (PWHT).

For more details

More details on weld decay and weldment corrosion are included in the following corrosion courses which you can take as in-house training courses, course-on-demand, online courses or distance learning courses:

Corrosion and Its Prevention (5-day module)

Corrosion and Its Prevention (2-day module)

Corrosion Testing and Monitoring Made Easy: -Techniques and Applications (3)

Corrosion, Metallurgy, Failure Analysis and Prevention (3 days)

Marine Corrosion, Causes and Prevention (2 days)

Materials Selection and Corrosion (2 days)

Stainless Steels and Alloys: Why They Resist Corrosion and How They Fail (2 days)

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