



## Application of INCONEL alloy 740H in High Pressure - High temperature Power Systems

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Nickel-base alloys are required for many of the components in advanced ultra-supercritical steam and CO<sub>2</sub> power systems operating at temperatures and pressures exceeding 1202°F (650°C) and 3.6 ksi (25 MPa). Age-hardened alloys offer a distinct advantage over traditional solid solution strengthened alloys by virtue of their significantly higher creep strength. This makes it possible to reduce wall thickness and thereby minimize total construction cost. INCONEL alloy 740H (UNS N07740) is an age-hardened alloy that was developed and extensively characterized for advanced ultra-supercritical steam boilers. The material has been extensively test at high temperatures leading to the establishment of ASME Code Case 2702 covering UNS N07740. Alloy 740H is the first age-hardened nickel-base alloy permitted for welded construction for use in the creep limited temperature regime. More recent development work on the alloy has focused on applications for supercritical CO<sub>2</sub> systems. Various laboratories have reported on oxidation and corrosion properties properties of the alloy under simulated operating conditions. This paper focuses on the manufacturing and properties of tubing and fittings that are being applied for the various advanced ultra-supercritical steam and supercritical CO<sub>2</sub> projects now planned or underway. As many of the structures are constructed by welding, a review of welding practices is presented, including dissimilar welds and their properties.

