The present work investigates the corrosion resistance of Ni and Ni2Al3 coated austenitic stainless steel (TP347H) tubes, which were exposed in a biomass-fired boiler with an outlet steam temperature of 540 °C for 6757 h. The Ni2Al3 coating was produced by electroplating Ni followed by low temperature pack cementation. After exposure, microstructural investigations were performed by light optical and electron microscopy (SEM-EDS). Electroplated Ni coatings were not protective in straw firing power plants and exhibited similar corrosion morphology as uncoated tubes. For Ni2Al3 coatings, the nickel aluminide layer was no longer adherent to the tube and was only found within the deposit. However, Ni2Al3 coatings had provided some protection compared to uncoated and Ni coated tubes. The formation of nickel chloride binds aggressive chlorine and slows down the active oxidation mechanism. In local areas, sulphidation corrosion attack of Ni was detected.