

The Hastelloys and Nickel 200 – Candidate Materials in the Fabrication of Process Equipment.

Stainless steels are used extensively in the fabrication of the equipment used in the processing industries. For many processes the stainless steels provide satisfactory performance over extended periods of time. However, in the chemical, bioresearch and pharmaceutical industries in particular, the selection of the materials of construction for the process equipment is often complicated by the aggressive environments and conditions that may be encountered. In these circumstances the rates of corrosion of the steels become an issue.

A cost effective solution to this problem appears to have been the introduction of glass coatings, typically sprayed onto the piece of equipment, which may have been fabricated from stainless steel. The coating is then fused to the metal substrate in a post heat treatment. This glass coating provides a highly polished surface and imparts corrosion resistance to the metal substrate. However, there are limitations to the use of glass coatings. It has been found that fairly rapid failure occurs in certain environments, e.g., in strongly alkaline solutions, in the presence of fluorine or fluoride ions, in concentrated phosphoric acids at elevated temperatures. Thermal shock, or the frequent cycling of the temperature of the process equipment, leads to failure due to cracking and exfoliation of the coating. Impact and frequent vibration will similarly damage the glass coated process equipment.

Should other materials of construction be considered? What metals or alloys offer similar or better performance to the glass lined steels? A series of nickel based alloys, the Hastelloys®, have been shown to exhibit excellent long term performance in a variety of processes, e.g., the production or use of acetic acid, sulfuric acid, phosphoric acid and hydrochloric acid, chemical environments in which the stainless steels corrode. The Hastelloys® incorporate varying amounts of chromium, molybdenum and tungsten into the base metal to provide improved corrosion characteristics. Of particular interest is their corrosion resistance in strongly alkaline solutions. It is also important to note that the alloys offer resistance to both localized corrosion (weld zones for example) and stress corrosion cracking, as well as to general chemical corrosion processes. Another alternative is Nickel 200, a commercially pure wrought nickel with good mechanical, thermal and electrical properties, which is presently being used to fabricate processing equipment for the chemical, pharmaceutical and food industries. Both Nickel 200 and the Hastelloys® can be used over a wide range of temperature, from ambient to 1500° F, depending upon the chemical environment. The alloys can be fusion welded using gas shielded processes such as TIG or MIG and may be machined, cut or formed by conventional practice.

It may be argued that both the Hastelloys® and Nickel 200 are expensive materials, significantly more expensive than stainless steel or glass coated stainless steel. While this is true, the longer operating life and the reliability of equipment fabricated from these materials can offset the higher initial capital costs. Premature and unexpected failure, as may occur with glass coatings,

results in loss of production, the possible contamination of the entire process system and the need to replace the failed equipment. Why not then request a quotation for the fabrication of the required equipment from a Hastelloy® and/or Nickel 200?

A&B Process Systems is renowned from coast to coast for the fabrication of stainless steel tanks, stainless steel reactors and stainless steel process piping. Although the stainless steels represent a highly versatile and cost effective choice, the company recognized the usefulness of other alloys and metals in the fabrication of processing equipment. A&B therefore developed the capability to fabricate such equipment from both the Hastelloys® and Nickel 200 to provide the same high quality product. Irrespective of the material of construction, fabrication is completed at A&B's facilities in accordance with any one of several guidelines, for example FDA, USDA, cGMP, ASME or BPE. Based upon project certification and compliance requirements, the finished product is inspected and tested to ensure that the customer's quality requirements are met.