

Study and characterization of stainless steel brazed and welded plates for heat exchanger applications

Loïc Mouelle^a, Jérôme Serri^a, Eric Fleury^a, Thierry Mazet^b

^aUniversité de Lorraine, CNRS, Arts et Métiers ParisTech, LEM3, F-57000 Metz, France

^bFives Cryo, 88190 Golbey, France

Abstract—

The aim of the study relies on an industrial context, in which, high pressure Plate Fin Heat Exchangers (PFHE) made of stainless steel 316L, are brazed with Ni-Cr-Fe-Si alloy and followed by dissimilar Multipass TIG welding process with Inconel 625 as filler metal. Due to the heterogeneous chemical composition of brazed joints and residual stresses introduced by brazing process, hot cracks may appear after the welding of brazed assembly. In order to understand the cracking phenomena, microstructural and chemical characterizations are made at the bonding interface between base metal, brazed joints and weld beads. In the other hand, numerical simulation of welding based on thermo-elasto-plastic phenomenological constitutive model handling annealing effect, is introduced through Finite Element Method (FEM) to evaluate the residual stress field as well as, the deformation field after dissimilar Multipass TIG welding process.

Keywords— brazing, dissimilar welding, hot cracking, finite element modelling, residual stresses