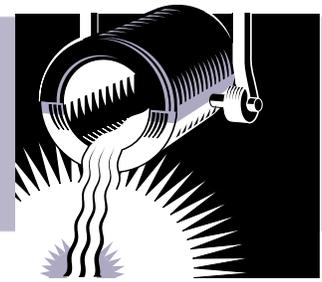


METAL CASTING

Project Fact Sheet



SERVICE PERFORMANCE OF WELDED DUPLEX STAINLESS STEEL CASTINGS

BENEFITS

This project will develop a suitable database to provide detailed fabrication and service performance guidelines including welding and heat treatment procedures for duplex stainless steel and wrought materials.

The database will enable the industry to reduce wastes resulting from improper fabrication and heat treatment methods, to reduce fabrication time due to undocumented fabrication procedures, and to improve service performance of components fabricated from duplex stainless steels, compared to conventional materials.

Energy savings will result from the reduced need to produce replacement castings. In addition, foundry customers will realize substantial energy and cost savings due to reduced shutdowns for maintenance.

APPLICATIONS

These results can be applied throughout the steel foundry industry. Moreover, a variety of types of industrial facilities can benefit from enhanced duplex stainless steel castings and wrought materials. Examples include: oil refineries, ethylene furnaces, and reformer furnaces. There are about 187 oil refineries in the U.S. and an estimated 450 ethylene furnaces and 700 reformer furnaces in the U.S.

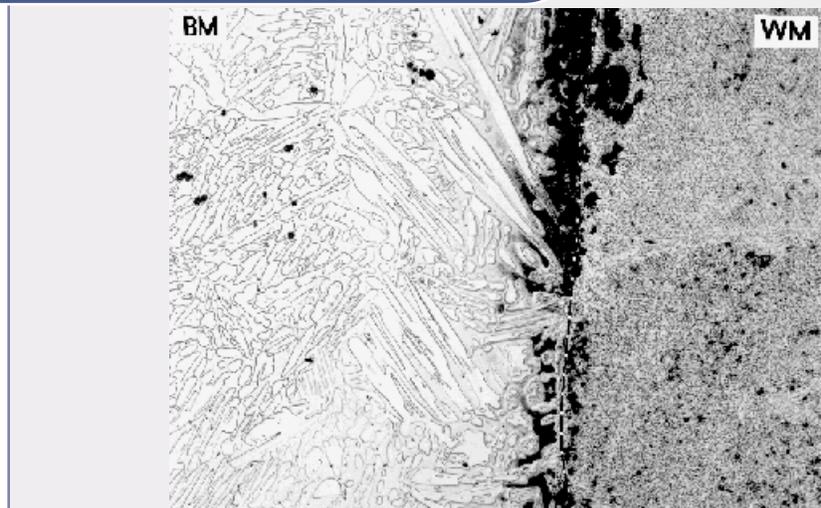
DETERMINING THE EFFECTS OF WELDING ON CORROSION PERFORMANCE OF CAST AND WROUGHT DUPLEX STAINLESS STEEL

Welding can impair the corrosion performance of both wrought and cast materials. It requires that both the fabrication aspects of the materials and the published values for the base materials be taken into account.

The corrosion performance is most egregiously degraded by welding processes which leave behind a fusion zone containing melted base material. This melted base metal zone, which is termed the "unmixed zone" in the filler metal added processes, is the region responsible for the degraded corrosion pitting resistance. Further, the phase balance in this zone is influenced by solidification and this phase balance must be restored either by heat treatment or by the selection of filler metals richer in austenite formers such as nickel and nitrogen.

A paucity of data exists upon which the specifier/engineer can base service performance. Hence, the industry needs a more comprehensive study of the behavior of welded components. This project, lead by the University of Tennessee and sponsored by the Steel Founders' Society of America will document the effects of welding on duplex stainless steel castings and provide guidelines to casting and design engineers to aid in the selection of materials.

CORROSION PERFORMANCE MAY BE DEGRADED UPON WELDING



Weld fusion boundary pitting corrosion sensitive material ASTM A890-4A (2205 type).



Showcase Description

Goal: The goal of this project is to examine and determine the effects of welding on the corrosion performance of cast and wrought duplex stainless steel materials. The results will be presented in the form of guidelines to engineers in the selection of materials.

Progress and Milestones

This three year project was awarded in August 2000. Planned activities include:

- Determine the proper filler metals to be utilized for the upgrading of casting which will be solution heat treated prior to fabrication and service.
- Determine the optimum filler metals for use when the structure is to be utilized in the as-welded condition.
- Define the phase balance for all conditions utilizing appropriate "ferrite" measuring techniques.



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