PROJECT facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Vision 21

08/2000

DEVELOPMENT OF OXIDE DISPERSION STRENGTHENED (ODS) HEAT EXCHANGER TUBING

PRIMARY PARTNER

Huntington Alloys,
Huntington, West Virginia

PROJECT PARTNERS

Foster Wheeler Development Corporation, Livingston, New Jersey

Michigan Technological University, Houghton, Michigan

University of California, San Diego, La Jolla, California

Edison Welding Institute, Columbus, Ohio

Oak Ridge National Laboratory, Oak Ridge, Tennessee

Description

Huntington Alloys and partners will develop Oxide Dispersion Strengthened (ODS) tubing for high-temperature heat exchangers that will be used in Vision 21 power plants. The main limitations of current ODS tubing are their poor weldability and relatively poor circumferential creep strength at elevated temperatures. Thus far, these two characteristics have restricted ODS materials to mostly non-pressure containing applications.

Current conventional heat exchanger alloys have a maximum operating temperature of approximately 732°C/1350°F. Also, the maximum practical limit for current wrought Ni-base superalloys would be 860°C/1580°F. This Vision 21 project will use novel tube processing modifications to develop ODS Fe-Cr-Al alloy (e.g. MA956) tubes with sufficient strength for long-term use at much higher temperatures (T>1093°C/2000°F). In addition, advanced welding techniques will be used to develop a joining method which will produce adequate joints on ODS materials.

Goals

The primary technical challenges in this project will be to develop a welding process which will produce adequate joints on ODS tubes and to develop an ODS tube with the appropriate microstructure such that the tube has adequate high temperature strength and ductility. Other aspects of developing ODS heat exchanger tubing that will be studied are the establishment of bending strain limits (below which recrystallization will not occur during normal operation), the establishment of high-temperature corrosion limits for the ODS tube, and the generation of data for use by heat exchanger designers and the ASME Boiler and Pressure Vessel Code.

Benefits

As a supporting technology, the development of ODS heat exchanger tubing and the associated welding technology will result in heat exchangers that can operate at very high-temperatures (T>1093°C/2000°F), and thereby serve to increase the efficiency and reduce the emissions of Vision 21 power plants. In addition, this technology will allow ODS materials to be used in a variety of industries where high temperature processes are required, thus aiding in energy savings and emission reductions in other industrial sectors.

Development of Oxide Dispersion Strengthened (ODS) Heat Exchanger Tubing

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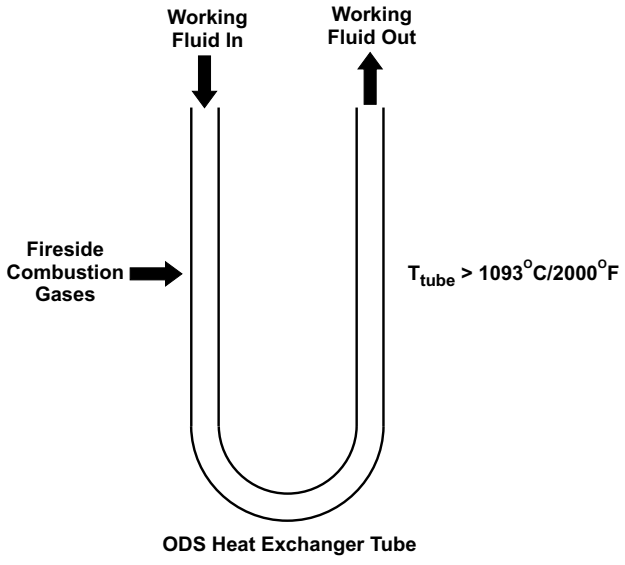
Milestones

October 2000	Initiate Project
September 2001	Complete Laboratory Corrosion Testing
November 2001	Determine Strain Limits of Tubing
June 2002	Complete Development of Joining Technique(s)
March 2003	Complete Development of ODS Heat Exchanger Tube
June 2003	Complete Testing of Welded Joints
June 2003	Commercial Production of ODS Heat Exchanger Tube
June 2003	Complete In-the-Field Corrosion Testing
August 2003	Supply Appropriate Data to ASME Code
September 2003	Supply Appropriate Data to Heat Exchanger Designers



ODS Tubing for use in High Temperature Heat Exchangers