Welding is the most vital and fundamental manufacturing process in the construction of ships and metal hull boats. AWS’s fifth shipbuilding conference endeavors to provide up-to-date information on new and emerging technologies being developed for shipbuilding applications. The conference serves as a forum for communicating the focus and progress of these new innovative developments, as well as their potential value and impact to the shipbuilding community. Join an outstanding assemblage of experts from academia and industry to explore the state of the art in shipbuilding technology. This conference is a compelling opportunity for shipbuilders, designers, suppliers, researchers, educators, and administrators involved in ship procurement and construction.

AWS Conference
Charting the Course in Shipbuilding: U.S. Shipyards
October 18-19, 2007

This two-day conference will cover topics such as:
- Adaptive sensor and control systems
- Portable induction brazing
- Induction fairing
- Orbital pipe welding advances
- Tandem and double-electrode GMAW and SAW
- Tandem SAW for large tee joints
- Hybrid laser-arc welding
- Friction stir welding in naval applications
- Transient thermal tensioning to minimize buckling
- Cr-free consumables and strategies
- Portable x-ray fluorescence
- Modeling and simulation for multi-pass welding

American Welding Society
5th Charting the Course in Welding: U.S. Shipyards

THURSDAY, OCT. 18

CONTINENTAL BREAKFAST 7:30 am – 8:30 am
WELCOME REMARKS 8:30 am – 8:45 am
Lee Kvidahl, Conference Chair

SENSOR TORCH BASED ADAPTIVE INTELLIGENT SYSTEM FOR CIRCUMFERENTIAL WELDING OF PIPE
8:45 am – 9:30 am
YuMing Zhang, President, Adaptive Intelligent Systems LLC, Lexington, Ky.
An adaptive sensor and control system has been developed that can detect the depth of the weld pool surface. The system uses an innovative control approach to maintain the depth of the weld pool surface at a desired level to achieve the desired full penetration. As a result, it allows a worker without welding experience to hold and move the torch along the circumferential weld seam for full-position welding of pipes, despite variations in the torch-to-work distance and travel speed. This system may also be used in mechanized orbital systems to eliminate the need for experiments to find optimal parameters around the clock.

MORNING BREAK 10:15 am – 10:30 am

SINGLE-PASS GMAW OF PIPE SOCKET WELDS
10:30 am – 11:15 am
Michael Ludwig, Chief Welding Engineer, General Dynamics–Bath Iron Works, Bath, Me.
Bath Iron Works welds thousands of socket welds on current ships. Pipe fabrication standards have always required that pipe welds be composed of two layers. Advancements in GMAW power supplies have shown that very high-quality welds can now be made in difficult materials like copper-nickel. This presentation will cover efforts to develop GMAW-P procedures for the welding of stainless steel, copper-nickel, and steel pipe—and the rationale to go to a single pass for U.S. Navy applications.

INDUCTION BRAZING EQUIPMENT FOR SHIPBUILDING APPLICATIONS
9:30 am – 9:50 am
Compact, portable induction heating equipment using handheld transformers is an excellent alternative to traditional flame-brazing in shipbuilding applications.

INTRODUCTION OF TERAC – FAIRING WITH INDUCTION
9:50 am – 10:15 am
Mark Wells, Product & Application Manager, EFD Induction A.S., Skien, Norway
This presentation will cover the use of Induction to realize rapid, effective, and aesthetically improved straightening of decks, bulkheads, etc.

AFTERNOON BREAK 3:00 pm – 3:15 pm

HYBRID LASER-ARC WELDING OF PIPE & THIN STEEL PANEL STRUCTURES
3:15 pm – 4:00 pm
Dr. Shawn Kelly, Research Associate, Applied Research Laboratory, Penn State University, State College, Penn.
Recent advances in the development and implementation of hybrid laser arc welding processes for selected shipyard applications will be addressed. With the assistance of ARL Penn State and Wolf Robotics, NASSCO recently implemented a hybrid laser arc weld system in their pipe shop for productivity improvements. In addition, ARL Penn State is working with NGSST to transition hybrid weld technology for panel and stiffener welding of thin steel structures to reduce distortion. Details of the development, benefits, and implementation of these shipyard applications will be addressed.

HIGH SPEED TANDEM SAW
11:15 am – 12:30 pm
Nancy C. Porter, Project Manager, Edison Welding Institute, Columbus, Ohio
Northrop Grumman Ship Systems (NGSS) currently uses a modified two-electrode series arc submerged arc welding (SAW) process for single-sided butt welding, which was originally developed for thicker materials and, when applied to thin materials, results in inconsistent weld quality and excessive distortion. This project reduced welding distortion and improved weld consistency through the use of high-speed, tandem narrow groove SAW procedures, with improved flux copper backing using advanced power supplies and controlled weld root gap openings.

LUNCH (PROVIDED) 12:30 pm – 1:30 pm

DEVELOPMENT OF A CR-FREE CONSUMABLE FOR JOINING AUSTENITIC STAINLESS STEELS
1:30 pm – 2:15 pm
Dr. Brian Alexandrov, Professor, The Ohio State University, Edison Joining Technology Center, Columbus, Ohio
A new Cr-free electrode based on the Ni-Cu system has been developed for joining austenitic stainless steels. This consumable eliminated the generation of hexavalent Cr (CrVI) during welding of Type 304 stainless steel. By controlling the Cu content in the range from 5-10 wt% and with the addition of small amounts of Pd or Ru, the corrosion potential can be controlled such that this consumable is compatible with 18-8 type stainless steels. The mechanical properties of this new consumable meet or exceed the minimum requirements for the base metal. Weldability testing has been conducted to determine the susceptibility of the weld metal to solidification, liquation, and ductility dip cracking.

FRIDAY, OCT. 19

CONTINENTAL BREAKFAST 7:45 am – 8:45 am
TANDEM MAG
8:45 am – 9:30 am
 Lars-Erik Stridh, IWE, Process R&D, Application Manager, ESAB AB, Gothenburg, Sweden
This presentation will cover the process description, possibilities, limitations and important features of welding torch design. Results from trials with different wire types, wire diameters, and the process window will be presented.

INDEPENDENT CONTROL OF MELTING SPEED AND BASE METAL CURRENT USING DOUBLE-ELECTRODE GMAW
9:30 am – 10:15 am
YuMing Zhang, Professor, University of Kentucky, College of Engineering, Lexington, Ky.
In traditional GMAW, base metal current is the same as welding current, which melts the wire. Increasing welding current to increase melting speed causes the same increase in base metal current. The developed double-electrode GMAW adds a second (either GTAW or GMAW) torch to bypass part of the welding current back to the power supply without going through the base metal. A system has been developed to control base metal current at any desired low level, while the total welding current can increase freely. In addition, spray transfer can be achieved with a base metal current as low as 50A. Its implementation is realized by adding a control system, which includes a bypass torch to an existing GMAW process.

LUNCH (PROVIDED) 12:30 pm – 1:30 pm

THE USE OF PORTABLE XRF FOR RAPID ALLOY VERIFICATION AND ANALYSIS
2:15 pm – 3:00 pm
Bree Allen, Thermo Scientific NITON Analyzers LLC, Billerica, Mass.
The advent of x-ray fluorescence (XRF) technology into a portable handheld device has enabled significant changes in the way that alloy analysis can be performed in manufacturing and restoration industries. This talk will provide an overview of the XRF technique, a history of XRF analyzers, and a discussion about the specific uses of this technology in shipbuilding applications.

AFTERNOON BREAK 3:00 pm – 3:15 pm
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