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BRIEF DESCRIPTION OF THE UNIT / RESEARCH GROUP

The research focus of the underwater technology center Hannover (UWTH) at the Institute of Materials Science (IW) is in the field of special cutting and welding technology. Many of these techniques are explored for applications under water but also under atmospheric conditions.

A part of these methods was originally developed for the decommissioning of nuclear installations, but today the research is focused also on the development of underwater welding and cutting processes for maintenance of off-shore structures. The additional materials for underwater welding are developed and tested at the UWTH.

Another area of research is located in the electron beam cutting and welding in atmosphere (NVEB C/W, Non Vacuum Electron Beam Cutting/Welding). The advantages of this method are:

- the high cutting/welding speeds (> 10 m / min)
- the high overall efficiency (about 50%)

- good gap bridging ability and the great tolerance towards positioning inaccuracies
- the high process reliability.

Particularly, the use of aluminum alloys, copper alloys and high-strength steel sheets and the demand for economic and fast manufacturing processes are now resulting in an increased demand of European automotive industry after NVEBW.
The demonstration welding system at the Institute of Materials Science, funded by the Deutsche Forschungsgemeinschaft, is unique in the German research landscape. The complex is large designed, so that welding tests on original components, for example from the automotive industry, can be performed at a scale 1 to 1. At NVEBW, in contrast to the more common vacuum electron beam welding, the highly accelerated electron beam is coupled to the atmosphere after passing the anode and an electromagnetic coil system via a pressure step system. The high vacuum range is therefore limited on the beam generator itself. At the exit of the beam into the atmosphere, it comes to scattering of the electrons, resulting in a widening of the electron beam. This ensures high tolerance of the method compared to positioning errors and weld preparation inaccuracies. The main application of the technique is NVEBW today mainly in thin sheet range (aluminum, steel) with sheet thicknesses between 0.5 and 5 mm, but it can also sheet thicknesses up to 20 mm can be welded in one layer.

WHAT WE OFFER / PROJECT DESCRIPTION

Teaching and academic mobility:

- Lectures at SPbPU and at LUH twice a year.

International scientific exchange:

- Workshops at SPbPU and at LUH twice a year.

International student exchange:

- Experimantal investigation of different welding processes at LUH and at SPbPU.

Proposal of a Joint research project on „Entwicklung eines Simulationstools zur Berechnung der Schmelzbaddynamik und des Humping-Phänomens beim NVEB-Schweißen durch eine analytische Modellbeschreibung des Prozesses und deren Verifikation im Experiment“

KEYWORDS

Materials, Non vacuum electron beam cutting/welding, laser welding

COLLABORATIONS SOUGHT

- Research in different joint research projects
- Establishment of a sustainable doctoral and student exchange program