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Supercomputer simulation of responsible automobile welded structures behavior

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A new approach for welded structures design based on computer, supercomputer and grid technologies is proposed- Predictive Welding Engineering (PWE), providing: computer design of welded structures (WS) on a basis of 3D parametrized models of functional elements. Computer simulation of welding in a free state on the assumption that all welds are applied simultaneously. Simulation of the interaction of a pre-stressed WS with external static and dynamic loads. Assessment of the availability and visibility of welds, taking into account the results of designing assembly-welding fixtures. Computer synthesis of fixtures by means of functional elements libraries. Assessment of changes in the residual stress-strain state of WS in the fixture as compared to free welding. Simulation of the interaction of external loads with stress-strain state after assembly-welding in the fixture. Supercomputer stress-tests under conditions of an ideal state of welded joints, taking into account the level of allowable and unacceptable weld defects (corresponding cracks, undercuts, lack of penetration, etc.). Off-line description of working tool tracks of welding robot and checking the correctness of the control program in the appropriate tool environment. PWE can provide the engineering prediction of welded structure behavior in dynamic extreme operating conditions. Supercomputer simulation could be illustrated in real time by means of internet and supercomputer resources of Supercomputer Remote Access Center in Minsk (Belarus).

References

1. Medvedev S V (2002) Computer modeling of residual welding strains in technological design of welded structures. *Welding International*. 16(1):59-65.

Biography

Sergey Medvedev has completed his PhD at Institute of Engineering Cybernetics of Academy of Sciences of Belorussian Soviet Social Republic and Dsc from United Institute of Informatics Problems (UIIP), National Academy of Sciences of Belarus. He is the Head of the Laboratory of Technical System Synthesis of UIIP. He has published more than 150 papers in reputed journals and materials of scientific conferences.

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