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Life extension, upgrade and repair of welded structures: Towards the use of high strength steels

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Many steel structures and installations, regardless of industry, around the world are reaching their original design life. Most of the operators chose to extend the service life of their assets rather than scrape them and/or build new. As a result of this trend, the application of fatigue life improvement techniques and specifically High frequency mechanical impact (HFMI) treatment has become very popular. However, the successful application of fatigue life improvement techniques must be based on the knowledge of the three main factors and their interaction affecting the endurance of welds of structural integrity concern: weld imperfections, geometrical stress concentrations and residual stresses. These three factors and their reciprocal influence are the target of any fatigue life improvement technique. Consequentially, it is only HFMI techniques which are able to tackle and/or improve these three weld features during one single working operation. The use of HFMI techniques have also lately gained attention within lightweight design, where high strength steels are used in welded structures with application of HFMI technique with promising fatigue life improvement. The current study will cover the latest development, treatment procedures specification, quality assessment and control of welds improved by HFMI techniques. Fatigue design recommendations for welded structures from plate thickness 5 to 50 mm and for yield strengths ranging from 235 MPa to 960 MPa. Finally, progress in the development of international design and operations guidelines, under the framework of the International Institute of Welding (IIW) for these collection of techniques will be discussed.

Biography

Zuheir Barsoum is an Associate Professor at KTH Royal Institute of Technology where he is directing a research group on steel structures. He is a chairman within the International Institute of Welding (IIW). He has published more than 90 papers in reputed journals and international conferences and received awards for his research. He has been involved in, beside university curriculum development and teaching, in developing international vocational training program in welding and design. He is a frequently engaged consultant within the industry as an expert in structural integrity. He is currently a Visiting Associate Professor at Khalifa University in Abu Dhabi.

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