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Research on Structural Changes in Plastic Deformation during Rolling and Crimping of Tubes

Authors : Hein Win Zaw

Abstract : Today, the advanced strategies for aircraft production technology potentially need the higher performance, and on the other hand, those strategies and engineering technologies should meet considerable process and reduce of production costs. Thus, professionals who are working in these scopes are attempting to develop new materials to improve the manufacturability of designs, the creation of new technological processes, tools and equipment. This paper discusses about the research on structural changes in plastic deformation during rotary expansion and crimp of pipes. Pipelines are experiencing high pressure and pulsating load. That is why, it is high demands on the mechanical properties of the material, the quality of the external and internal surfaces, preserve cross-sectional shape and the minimum thickness of the pipe wall are taking into counts. In the manufacture of pipes, various operations: distribution, crimping, bending, etc. are used. The most widely used at various semi-products, connecting elements found the process of rotary expansion and crimp of pipes. In connection with the use of high strength materials and less-plastic, these conventional techniques do not allow obtaining high-quality parts, and also have a low economic efficiency. Therefore, research in this field is relevantly considerable to develop in advanced. Rotary expansion and crimp of pipes are accompanied by inhomogeneous plastic deformation, which leads to structural changes in the material, causes its deformation hardening, by this result changes the operational reliability of the product. Parts of the tube obtained by rotary expansion and crimp differ by multiplicity of form and characterized by various diameter in the various section, which formed in the result of inhomogeneous plastic deformation. The reliability of the coupling, obtained by rotary expansion and crimp, is determined by the structural arrangement of material formed by the formation process; there is maximum value of deformation, the excess of which is unacceptable. The structural state of material in this condition is determined by technological mode of formation in the rotary expansion and crimp. Considering the above, objective of the present study is to investigate the structural changes at different levels of plastic deformation, accompanying rotary expansion and crimp, and the analysis of stress concentrators of different scale levels, responsible for the formation of the primary zone of destruction.

Keywords : plastic deformation, rolling of tubes, crimping of tubes, structural changes
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