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Estimation of Residual Stresses in Thick Walled Cylinder by Radial Basis Artificial Neural

Authors : Mohammad Heidari

Abstract : In this paper a method for high strength steel is proposed of residual stresses in autofrettaged tubes by combination of artificial neural networks is presented. Many different thick walled cylinders that were subjected to different conditions were studied. At first, the residual stress is calculated by analytical solution. Then by changing of the parameters that influenced in residual stresses such as percentage of autofrettage, internal pressure, wall ratio of cylinder, material property of cylinder, bauschinger and hardening effect factor, a neural network is created. These parameters are the input of network. The output of network is residual stress. Numerical data, employed for training the network and capabilities of the model in predicting the residual stress has been verified. The output obtained from neural network model is compared with numerical results, and the amount of relative error has been calculated. Based on this verification error, it is shown that the radial basis function of neural network has the average error of 2.75% in predicting residual stress of thick wall cylinder. Further analysis of residual stress of thick wall cylinder under different input conditions has been investigated and comparison results of modeling with numerical considerations shows a good agreement, which also proves the feasibility and effectiveness of the adopted approach.

Keywords : thick walled cylinder, residual stress, radial basis, artificial neural network
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