Modelling failure pressure of pipeline composite repair design using finite element analysis incorporating putty's contribution

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Abstract:
A composite repair system which consists of Fibre Reinforced Polymer (FRP) and putty as infill material has been proven effective in repairing pipeline system as it can structurally reinforce the damaged steel pipes and potentially prevent external corrosion. However, previous studies including the design codes are neglecting the contribution of putty as they assume putty is only functioned to fill the corroded section. A recent study has pointed out that putty is not only limited to transfer the load, but it can serve as a load bearing component. Thus, the purpose of this research is to model the contribution of putty in terms of load bearing capacity through finite element analysis (FEA) and mathematical modelling. Two finite elements models were utilized to study the performance of two different material properties of putties used to repair externally corroded pipeline followed by regression analysis. It was found that by incorporating the strength contribution of putty, there are potential to increase the burst pressure by about 5%. The finding of this research is significant as it can serve as a stepping stone towards design optimization of pipeline rehabilitation.

Keywords: Fibre Reinforced Polymer (FRP); finite element analysis (FEA); Mathematical Modelling;

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