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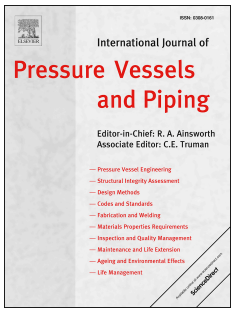

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Shakedown analysis of pressure pipeline with an oblique nozzle at elevated temperatures using the Linear Matching Method

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Abstract: There are many power plant components operating at elevated temperatures, subjected to the combined mechanical and thermal loading conditions. The shakedown problem is an important topic for the safe operation of these high temperature components. This work mainly addresses the shakedown analysis of the pressure pipeline with an oblique nozzle at elevated temperatures using the Linear Matching Method (LMM). Parametric studies on main factors affecting the shakedown boundary are conducted. The results indicate that the LMM analysis tool is adequate to identify the shakedown boundary of the component, verified by the ABAQUS step-by-step analysis. Regarding to the angle of the oblique nozzle, the ratchet limit is enhanced with the increasing angle, while the reverse plasticity limit increases until a maximum value is reached, and then presents a certain decrease. This implies that designers should make some compromises on the limit load and reverse plasticity limit when determining an economic angel of the oblique nozzle. In addition, parametric studies demonstrate that the diameter-to-thickness ratios of the oblique nozzle and the main pipe have a remarkable effect on the reverse plasticity and ratchet limit of the component.