

A Criterion for Evaluating Plastic Loads: Plastic Work-Tangent Criterion

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Abstract : In ASME Boiler and Pressure Vessel Code, the plastic load is defined by applying the twice elastic slope (TES) criterion of plastic collapse to a characteristic load-deformation curve for the vessel. Several other plastic criterion such as tangent intersection (TI) criterion, plastic work (PW) criterion have been proposed in the literature, but all exhibit a practical limitation: difficult to define the load parameter for vessels subject to several combined loads. An alternative criterion: plastic work-tangent (PWT) criterion for evaluating plastic load in pressure vessel design by analysis is presented in this paper. According to the plastic work-load curve, when the tangent variation is less than a given value in the plastic phase, the corresponding load is the plastic load. Application of the proposed criterion is illustrated by considering the elastic-plastic response of the lower head of reactor pressure vessel (RPV) and nozzle intersection of (RPV). It is proposed that this is because the PWT criterion more fully represents the constraining effect of material strain hardening on the spread of plastic deformation and more efficiently ton evaluating the plastic load.

Keywords : plastic load, plastic work, strain hardening, plastic work-tangent criterion

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