Fatigue and Fracture life-cycle Cost Assessment of A Miter Gate with Multiple Cracks

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Abstract

Fatigue cracks in Miter gates are considered a nuisance as they require periodic inspection and repair. If left unattended, the cracks could grow to reach a critical length and threaten the integrity of the structure. Although the cracks are typically characterized by a stable propagation rate, the scatter in fatigue performance is difficult to quantify and could be on the order of thousands or even millions of cycles. The development of maintenance and management programs for Steel Hydraulic Structures (SHSs) should therefore account for the inherent scatter in performance through probabilistic fatigue assessment. The assessment can be performed through conducting large number of numerical (e.g. finite element analysis) or analytical (e.g. mathematical formulation) simulations that account for the inherent statistical scatter in both load and resistance. In this study, a framework for probabilistic assessment of the propagation rate of cracks in Miter gates using finite element Monte Carlo simulations was developed. The parameters influencing the propagation rate were treated as random variables

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