

Fitness-for-Service Assessment and Life Extensions of Meltshop Cranes



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High-capacity meltshop cranes exposed to harsh service environments can exhibit damages, such as cracking, during regular day-to-day operation and mostly toward end of design life. These damages can lead to equipment failure that will result in longer downtime, lost production and potential safety risks. In-depth thermal-structural assessments are a valuable tool for operators to characterize current condition and remaining life of equipment to develop a fundamental understanding of crane condition, informing future operations. This article presents the modern approaches and benefits from several structural Fitness-for-Service assessments of high-capacity meltshop cranes. The benefits from this approach are discussed considering established design-by-rule specifications where calculated stresses are based on elastic analysis (i.e., *AIST Technical Report No. 6*) with resulting insights, life extension recommendations, and benefits to operators presented.

Introduction

Within the steelmaking industry, producers will commonly operate equipment, such as high capacity overhead traveling cranes, in support of production processes. These operations lead to spending significant amounts of capital in sourcing the equipment, as well as extensive planning for operations, maintenance and repair, and the associated effort and cost. The critical question for production assets is equipment reliability, downtime, safe operation and remaining life. Typical contributing factors that can affect equipment lifespan and operations include equipment overload, misuse of the equipment, poor design, material selection, and material fatigue. Fatigue is often the dominant factor in

determining the remaining life of a meltshop crane, as well as several contributing factors such as the degree of mechanical wear and structural deformation/damage. The benefit of quantifying fatigue allows for informed commercial and operational decision-making as to the ongoing use of specialized lifting equipment.

A structural Fitness-for-Service (FFS) assessment is a comprehensive exercise used to evaluate the overall fitness of an asset to continue operation (i.e., the life described in the original design standard of the equipment). Outcomes of such an assessment identify potential life limiting regions (i.e., regions that will drive remaining fatigue life), and in doing so, determine the equipment's remaining theoretical operational life.