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A new approach for online health assessment of abrasive waterjet cutting systems

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Abstract

In waterjet/abrasive waterjet (WJ/AWJ) cutting systems, the components of both the ultra high-pressure (UHP) intensifier and the cutting head are subject to faults and performance degradation. Abrasive particles are responsible for focusing tube wear and orifice breakage, whereas challenging pressure conditions are responsible for the wear and cracks of UHP pump components. The impact of these factors on quality and productivity leads to the need for reliable condition-monitoring systems in WJ/AWJ shop floors. This paper investigates a new approach for the online health condition assessment of both UHP pump and cutting head components by using a single type of information source, i.e., the plunger displacement signal. A multivariate analysis of variance (MANOVA) was performed to study the effects of actual faulty components on the acquired signals during AWJ cutting. The results demonstrate that plunger displacement signals are suitable for detecting and identifying critical faults in WJ/AWJ cutting systems.

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