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Maintenance Performance Measurement Derived Optimization: A Case Study

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Abstract : Maintenance performance measurement (MPM) represents an integrated aspect that considers both operational and maintenance related aspects while evaluating the effectiveness and efficiency of maintenance to ensure assets are working as they should. Three salient issues require to be addressed for an asset-intensive organization to employ an MPM-based framework to optimize maintenance. Firstly, the organization should establish important perfomance metric(s), in this case the maintenance objective(s), which they will be focuss on. The second issue entails aligning the maintenance objective(s) with maintenance optimization. This is achieved by deriving maintenance performance indicators that subsequently form an objective function for the optimization program. Lastly, the objective function is employed in an optimization program to derive maintenance decision support. In this study, we develop a framework that initially identifies the crucial maintenance performance measures, and employs them to derive maintenance decision support. The proposed framework is demonstrated in a case study of a geothermal drilling rig, where the objective function is evaluated utilizing a simulation-based model whose parameters are derived from empirical maintenance data. Availability, reliability and maintenance inventory are depicted as essential objectives requiring further attention. A simulation model is developed mimicking a drilling rig operations and maintenance where the sub-systems are modelled undergoing imperfect maintenance, corrective (CM) and preventive (PM), with the total cost as the primary performance measurement. Moreover, three maintenance spare inventory policies are considered; classical (retaining stocks for a contractual period), vendor-managed inventory with consignment stock and periodic monitoring order-to-stock (s, S) policy. Optimization results infer that the adoption of (s, S) inventory policy, increased PM interval and reduced reliance of CM actions offers improved availability and total costs reduction.

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