



Quality and Reliability Data Fusion for Improving Decision Making by Means of Influence Diagram: Case Study

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Abstract. The article focuses on the decision making in fault diagnosis of lubrication systems. In these systems, the diagnosis covers, in the majority of cases, the mechanical reliability or analysis of lubricating oils, but in a separate manner. In this section, the mechanical reliability is considered in combination with the lubricant quality, but the diagnosis process is always infected by uncertainties. Bayesian network (BN) model is developed and used as a decision-making tool. From this one, it is possible to quantify the probability of failure of this system. The diagnosis of failures is based on using Fault-Tree (FT) and Bayesian Network (BN). Firstly, a conversion from FT to BN is presented to establish a quick and accurate diagnosis. Secondly, the diagnosis is optimized by means of Influence Diagram (ID) which measures the preference.

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Keywords: Influence diagram · Fault tree · Bayesian network · Lubrication system · Decision making

1 Introduction

Fault diagnosis, safety, maintenance, and dependability are the main areas of research where BNs have made a strong contribution [1]. Diagnosis always ends with decision making, which is not easy. In the situations where information is incomplete and uncertainty exists, it is possible to call on BNs to facilitating diagnosis and decision-making. Other techniques may be also used in fault diagnosis alongside BNs such as fault tree, fuzzy logic, and decision tree [2]. Hybridization between these techniques gives promising results and facilitates the decision-making.

Bayesian modeling for reliability studies has also been widely exposed in recent years [3]. Whatever the system, static or dynamic, BN can model their reliability using dynamic Bayesian network. Several studies have been carried out whose objective and field are varied. The rehabilitation of water networks, the evaluation of the availability of electrical power, and the optimization of emergency plan in gas network operation