A methodology for integrated critical spare parts and insurance management

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Abstract

Critical spare■parts stock optimization has become a relevant topic for academy and industry. In most articles, the problem has been stated as a trade■off between economic risks of shortages and financial costs. Risk optimization in this context has been mainly studied from a logistics point of view. The most common decision variables have been stock levels, stock location, and reorder points. In this context, buying insurance to cover shortage cost can be a complementary (or exclusive) measure for risk mitigation. Insurance optimization traditionally has been studied from a microeconomic and financial perspective. The main decision variable has been the indemnity function, and occasionally, the insurance premium. Its use in the context of physical asset management has not been observed to the best of our knowledge. This creates an opportunity to link inventory optimization techniques with insurance optimization for shortage losses. In this work, we present a novel approach to jointly manage the shortage risk of a critical non■repairable component in a unique critical system. We develop an original model to integrate critical spare■parts stock optimization with insurance optimization techniques. The result is a decision model to select the optimal stock and insurance policy that maximizes the decision maker's expected utility. This allows for a business■centered integrated perspective in critical parts decisions. We present a case study representative of the mining industry, illustrating the complementary nature of selecting optimal stock levels and contracting an optimal insurance. Our results show that contracting an insurance can lead to policies preferred by a risk■averse decision maker. The case study shows that this may even occur lowering stock levels and increasing profits..