Case study

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Lean and sustainability assessment in the sawmill industry using Sus-VSM: A case study in the context of Fiji

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Abstract

Waste from the perspective of lean manufacturing and sustainability has a huge influence on economic, environmental, and societal aspects. The inefficiency of the current manufacturing systems poses a huge risk to small and medium size sawmills going out of business as current prices of fossil fuel and associated emissions continue to rise at an alarming rate. In this case study, a local sawmill has been investigated to improve process efficiency using sustainable value stream mapping in the context of Fiji. The produced timber with the highest demand is selected as the product and a complete assessment is done on the downstream operation to compile data and develop the current state map. The current state map incorporates sustainability pillars to address the lacking factors such as energy and water consumption, raw material usage, labor physical load, and workspace noise level along with standard lean manufacturing time-based metrics. Sustainable value stream mapping allowed the research team along with a panel of experts to identify processor 2 as the root cause of bottlenecking, unnecessary material movement/transportation, and high physical load index score. Implementing a multi-blade horizontal bandsaw in place of processor 2 reduces; energy consumption for transport, energy consumption for processing, VAT, NVAT, process water consumption, raw material usage, and carbon emission by; 34.9%, 8.72%, 6.37%, 20%, 24.71%, 3.05%, and 10.33% respectively without compromising productivity. The findings of this research suggest evaluating and assessing sustainability performance using Sus-VSM in the sawmill industry unveils potential economic, environmental, and societal benefits.

Keywords

Sawmill, sustainable value stream mapping, waste identification, process improvement

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Introduction

The sawmill industry has been in existence since the second half of the third century yet the industry's current business strategies are still based on traditional manufacturing processes.[1] This industry plays a strategic role in the upbringing of a developing country. In the recent decade, there has been a huge contribution towards Fiji's construction industry to accommodate infrastructure and housing deficit reduction. This development poses a serious threat to the materials industry, in particular, the sawmill industry as the current practices are low in efficiency, consume huge energy, emit high concentrations of carbon dioxide gases, and pose risk to workers.[2]

Most manufacturing approaches focus on producing products without considering the adverse effects on the environment and social responsibility.[3] Over the years, this has led to many challenges currently faced such as climate change, global warming, resource exploitation, scarcity, environmental degradation, depletion of non-renewable energy resources, and various dangerous diseases. To gain a competitive advantage several manufacturing companies have attempted to reduce costs by using low-quality and cheap materials, which resulted in them going out of business. Thus, companies should explore better and more innovative solutions to improve their production.[4] There exist several approaches, one of which is the lean manufacturing (LM) approach. LM is considered an internationally recognized manufacturing

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