PRODUCTIVITY IMPROVEMENTS OF QUARRY PROCESS BY IDENTIFYING LEAN WASTES

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IN

CONSTRUCTION PROJECT MANAGEMENT

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DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university to the best of my knowledge and believe it does not contain any material previously published, written or orally communicated by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for inter library loans, and for the title and summary to be available to outside organizations.

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ABSTRACT

The Sri Lankan Central Bank Annual Report 2013 revealed that, the construction industry contribution to GDP has reached 8.7% in year 2012 with continual growth from 2003. It further says that, more public investments in the highway sector contributed to sustaining the growth momentum in the construction industry. Hence construction has automatically become one of the major energy consuming industries in the country. In that regard, the Asphalt concrete production process is at the top level of energy consumption due to the higher amount of energy used to raise the temperature of raw materials to a high mixing temperature of around 150 C.

Key findings of a research done on the Asphalt Coating Plant in Scotland, reveals that it is economical to have daily production throughout of at least 100 tones and 1% moisture increment of aggregate, increases the fuel consumption by 0.7 liter/tone (Gillespie, 2012). The above research doesn't cover the stone quarrying process which provides the aggregates for asphalt production. The research done by Rylander (2013) on the quarrying process has contributed to find lean wastes happening in the raw material supplying process from quarry to crusher.

Controlling aggregate production costs are a significant problem in the quarrying process due to high competition in the industry. The production cost of aggregates is severely affected by the selected crushing circuit. In this thesis, the study was carried out based on two different crushing circuits to find a more productive crushing circuit in the quarrying process. The lean principles were applied to identify the lean wastes over production, waiting, transportation, non-value-added processing, excess inventory, defects, excess motion and underutilized people in two crushing processes. The identified wastes of each circuit were analyzed compared to the other circuit. This study was limited to horizontal flow crushing.

The analyzed results show that cellular manufacturing with intermediate stockpile increases the availability of the system by minimizing the waiting. At two-stage crushing circuit uses less manpower, machinery and electricity power than a three-stage crushing circuit since two-stage crushing minimizes the waste over conveyance, over motion and over utilization of people. Finally, the study recommends that by selecting the circuit, two-stage crushing with cellular manufacturing can increase the productivity of the system.

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ABBREVIATIONS

JIT - Just In Time

JIC - Just In Case

VSM - Value Stream Mapping

WIP - Work in Process

CSS - Closed Side Setting

PO - Purchase Order

MRF - Material Requisition Form

GRN - Goods Received Note