Analysis of Safety Compliance and Accident Impacts on Lost time Performance of Small Scale Automotive Maintenance Workshops in Calabar, Nigeria

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Abstract

The objective of the present research is twofold; first to assess the level of safety compliance practices among artisans and secondly, to measure the impacts of unplanned lost time emanating from accident on time performance of small-scale auto maintenance firms. Ninety different auto-maintenance jobs executed by automobile, heavy duty, generator and panel beater auto firms between, Januarys to December, 2016 were analyzed using direct observation. Furthermore, primary data collected were analyzed using MS Excel 2013 and Minitab 17 software. Results revealed the mean performance rating of workshops on the availability and usage of personal protective equipment as 143.9 and 154.7. While 224.2 and 302.7 constitutes respective poor usage rate and nonavailability of personal protective equipment in the respective workshops.

Keywords:

Automotive maintenance; Safety measures; Accident index; Severity index; lost time index; Productivity

Introduction

Dhillon described maintenance as an appropriate action made for retaining an item/part/equipment, or restoring it to a given condition. Concisely, maintenance is undertaken to restore broken equipment's, preserve equipment conditions and prevent their failure, which ultimately reduces production loss and downtime as well as the associated safety hazards. In Nigeria, large proportions of auto maintenance firms are classified as "small scale". This classification emanates from the low capital output ratio of the sector, which is the ratio of capital level relative to output. SMS automotive maintenance firms are vital to human resources in the automobile industry in virtually every nation's economy due to its significant contribution in terms of job creation. Preventive

maintenance (PM) plays vital roles to mitigate if possible avoid potential stoppages and disruptions of equipment or machinery from occurring in daily operations. While corrective or breakdown maintenance, is performed when a system or machine fails. It includes repair and replacement of failed parts to create an optimal performance again. Corrective maintenance activities are, in contrast to preventive maintenance, not schedulable.

Methodology

Primary data used in the current study were basically obtained through survey design approach with direct observation of two automotive maintenance workshops each sampled across forty- five different small scale auto firms, amounting to ninety observations. This comprises of heavy duty, automobile, generator and panel body auto firms caught across the seven layouts (Eight-Mile, Diamond Hill, Anantigha, Essien Town, Ikot Enobong, Big-Qua Town and Etta-Agbor) in Calabar metropolis where SMS auto firms are found in their large numbers. Each auto firms had a work force of at least four to six artisans performing different repairs at a duration of 8hours daily (i.e. the peak hours of industrial activities), for 6days per week, excluding Sundays, for a period of twelve months between January to December 2016. The data collected was tabulated and classified according to maintenance characteristic (i.e. initial and actual final time, actual performance, number of incident/injuries that resulted to lost days overrun cost and time, and the severity rate of incident). This was done to ensure that all variables considered were clearly defined. Furthermore, Microsoft Excel 2013 and Minitab 17 statistical tools were used for analyses of the data. Additionally, the analysis on proper usage and safe handling of tools were ranked by the measurement of the relative index ranging from (1= Excellent, 2= Very Good, 3= Poor, 4= none). Where 1 to 3 implies the level of usage or availability of tools impact (Ibrahim, 2012), to ascertain the mean rating of each response on safety compliance in SMS auto maintenance firms.

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Extended Abstract

Analyses

Table 1 presents the summary of comparative analyses of time performance and lost time rate inherent in each auto firms.

In order to determine the overall productivity lost factor (OPLF) of each auto firms, the index of accident, lost time index and severity index values were computed as depicted in Table 2. Within these auto maintenance sectors, the accident index range between 0.133, 0.111, 0.155, and 0.277 for automobile, generator, heavy duty and panel beater auto firm. This implies that panel beater autos firms recorded the highest number of injuries with an accident index of 0.277. Thus, recording lost time index of 62 and 2.48 as severity index and 42.69% as overall productivity lost factor. This is repeated for automobile, generator, and heavy duty auto firms respectively as presented in Table 2.

An explanation to these findings is that artisans in panel beater auto maintenance firms constantly get in contact with hot surfaces, exhaust pipes, radiator and cooling system pipes, soldering and welding operations due to the nature of maintenance practices.

Conclusion

The impacts of unplanned lost time emanating from accident/ injuries on time performance of small-scale automotive maintenance firms has been evaluated using descriptive analysis and multivariate linear regression technique. Descriptive analysis of ninety auto maintenance jobs executed across Automobile, Heavy duty, generator and panel beater auto firms between January to December, 2016 revealed the mean performance rating of workshops on the availability and usage of appropriate protective equipment were determined as 143.9 and 154.7 respectively while 224.2 and 302.7 constitutes respective poor usage rate and non-availability of appropriate safety equipment in the workshops. Results further revealed an average productive lost time of 58.2% resulting from accident/injuries. Conversely, regression model formulated revealed that a unit increase of 659.2, 63.5 and 82.8 in accident, severity and lost time index, caused a decreased of -150.8 in overall productivity lost factor. With a coefficient of determination (\mathbb{R}^2) of 72.01% at probability value less than 0.005.

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