

VARIATION OF PRODUCTION WITH TIME, CUTTING TOOL AND FUEL CONSUMPTION OF SURFACE MINER 2200 SM 3.8

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Abstract – The paper aims at the variation of production with time, cutting tool and fuel consumption of surface miner 2200 SM. Surface miner was first introduced in South Africa in the year 1983. Present work is done by observing the detail report of two conjunctive months and on each month surface miner works for 30 days and on each day it works for three shifts (i.e. eight hour per shift). The first surface miner was brought to India by Gujarat Ambuja Cement Limited in the year 1999. In India Surface miner was initially used for lime stone mining and in the year 1999 it was first used for coal cutting. Number of modification in the model of Surface miner 2200 SM like extension in the length of milling drum from 2200mm to 3800mm has increased the maximum production from 10,000 tons per day to 22,000 tons. SM 2200 has brought revolution in Indian mine and now a day every mine has at least two surface miners.

Keywords: Milling machine, Production VS Time, Production VS Cutting Tool, Picks, Fuel VS Time, Depth of cut, Face length.

I. INTRODUCTION

Surface miner 2200 SM 3.8 is an up milling machine and is basically used for road cutting, coal mining and other mineral. Earlier extraction of coal consists of four different process i.e. Drilling, blasting, loading and crushing but a single operation is required instead of four with the surface miner 2200 SM 3.8 from Wirtgen group. In the year 2000 surface miner 2200 was having the milling drum of width of 2200mm and conveyor load. In order to increase the production SM 2200 was redesigned and width of milling drum increased to 3800mm and removed the conveyor loading system to minimize the ideal cutting time of machine. Milling drum of surface miner has 96 welded holders and each holder carries a cutting tool (picks). The milling drum is mechanically driven by 12 cylinder V shape either E or C series diesel engine manufactured by caterpillar.

II. 2. METHODOLOGY

Present work is carried out to show the factors that affect the production and compare the theoretical value that has taken from company officials and the actual value calculated by following ways.

Average production per hour = PT/WT

Fuel per hour = FT/WT

Production per picks = PT/TC

PT = total production in one month

WT= total machine working hour in that particular month

FT= total fuel burnt in one month

TC= Number of cutting tool used in one month

3. GRAPS AND DATA

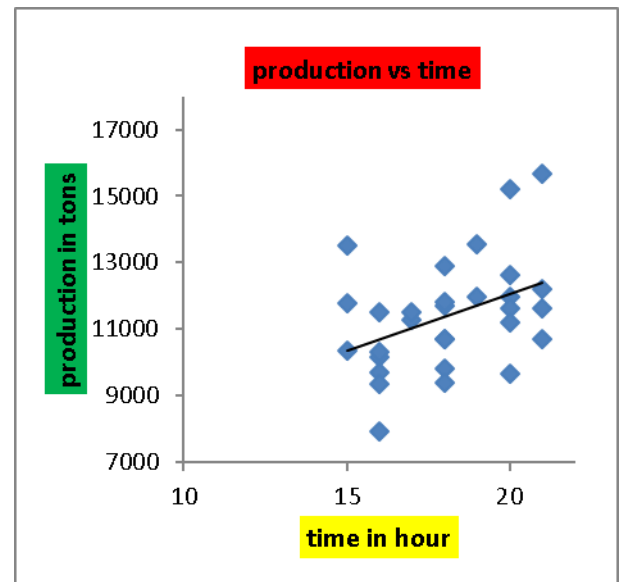


Fig 1. Production and time graph for month 1

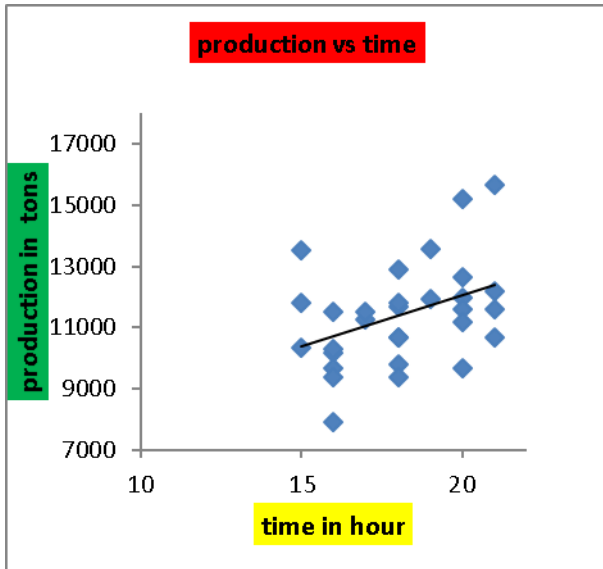


Fig 2. Production and time graph for month2

From the above graph we conclude that production increases with the increase in the working hour of surface miner. Present work is done by plotting the production of each day and the time of working of SM2200 on that day.

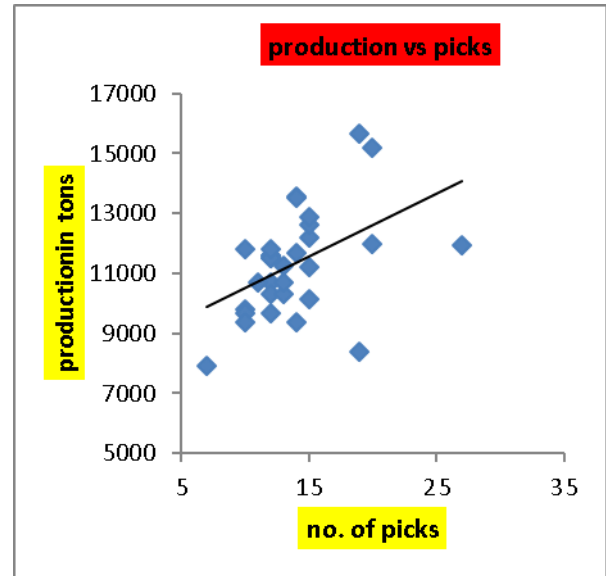


Fig 4. Production and picks graph of month2

From the above graph we conclude that the number of picks required increases with the increase in the production. The present work is done by plotting the production of each day and the picks changed on that particular day.

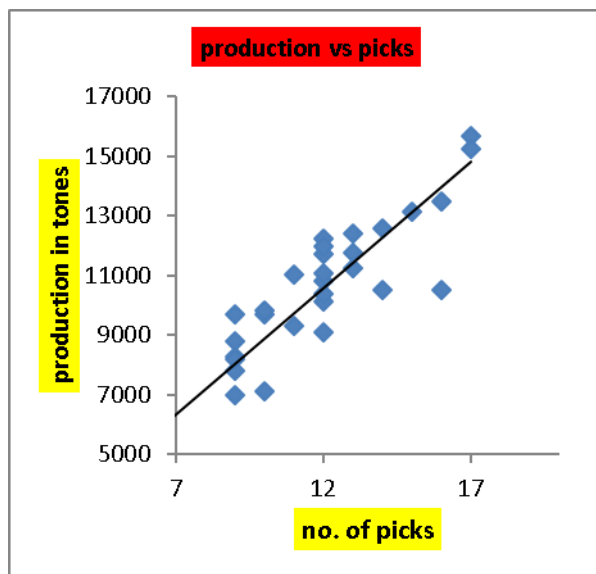


Fig 3. Production and picks graph for month1

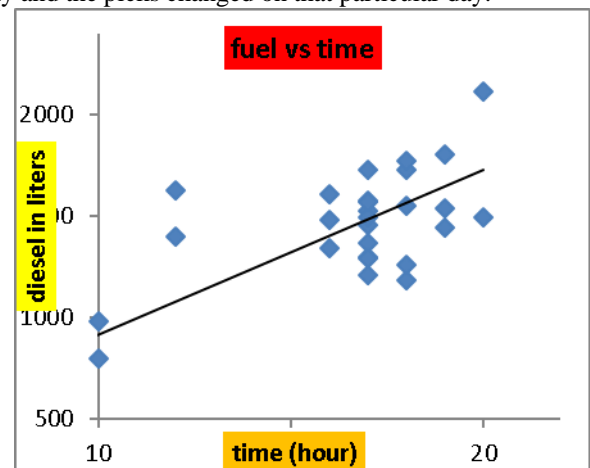


Fig 5. Fuel burnt and working hour for month1.

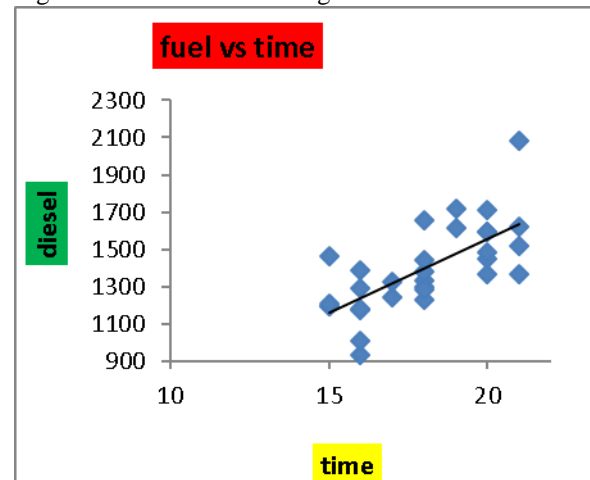


Fig 6. Fuel burnt and working hour for month2

Fuel burnt is plotted along y –axis and working hour is along x axis. Fuel per liter is calculated from the above graph.

III. ANALYSIS AND RESULT

Production report of two months namely month1 and month2 are taken and graph is drawn between different parameters. The average production per hour for month1 and month2 are 632.25 tones/hour and 628.54 tones/hour respectively. The theoretical production rate varies from 900-950 tones/hour.

The average fuel consumption per hour for month1 and month2 are 88.56 liters/hour and 77.69 liters/hour respectively. The theoretical rate of fuel consumption varies from 90-100 liters/hour.

The average production per picks for month1 and month2 are 883.36 tones/picks and 817.5 tones/picks respectively. The theoretical production per picks is 1000 tones/picks.

From the present work production rate, fuel consumption rate and production per picks of month1 is greater than that of month2. Considering the face length equal for both the months the production depends on the nature of cutting coal. If the cutting coal is soft (i.e. pure coal) then production is more and if the cutting coal is harder then production is less.

Production per picks depends up on the nature of cutting material (i.e. coal, limestone and other minerals) and also on the quality of the picks.

Fuel burnt per hour depends up on the nature of cutting material (i.e. If the cutting material is harder, then milling drum requires more power hence more fuel is burnt) and also depends up on the depth of cut. SM2200 can cut up to the depth of 300 mm.

The actual production rate is less than that of the theoretical value because the face length for both the months is less than 300m. Fuel per hour is also less that means machine is working under less pressure i.e. depth of cut is less than 300mm. production per picks is less than theoretical value because of cutting material is harder and low quality of cutting tool.

IV. CONCLUSION

This paper explains how the production varies with time, cutting tool and fuel consumption. Face length, availability of trucks and loader for transportation plays an important role in production. Production increases with the increase in face length by decreasing the setting time for cutting. Face length of minimum 300 meter is required for optimum production. Larger face length also enhances the machine life. The number

of trucks and loader also effects the production by limiting deposits of cut coal on the face. If machine cut for longer time and trucks and loader are not available then face will cover with the cut coal and there will no more space for the machine to cut.

Keeping the working hour constant production is directly proportional to the fuel consumption. Higher the fuel consumption higher is the production. This paper work explains production increases with the increase in working hour of machine and fuel consumption also increases with the increase in working hour of surface miner

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