

# INCREASING COAL PRODUCTION THROUGH DRAGLINES

## Executive Summary

While I was doing training in a workshop of maintenance and repairing of Heavy Earth Moving Machinery (HEMM) there I saw nowadays machinery comes with a data logger in which the machine records every second its speed, fuel, brake, acceleration, trip time, loading weight, GPS location coordinates and many other components readings and usage records.

Then I thought to work on machines data, for that I went to the VPR company which is open cast mining, there I saw many types of machinery like draglines, shovels, dumpers, surface miners, Drillers and many others, major portion of production comes with draglines they are huge. I know one uncle there, asked him about draglines he told me that you can go to dragline office for its better understanding. I met with the supervisor, maintenance engineer and asked him about its uses, working, maintenance schedule, staff members and many other questions which are listed below.

### My Question

Is there any problem did you face while improving your production with draglines?

They Answered –

Yes, they wants to improve but there are many problems as it is a huge machines and aged also, so many time breakdown occurs and so many collective problems affects its production like idling of machine due to improper dozing, shifting, no operator etc.

### My Question

Is there any data being recorded for all its working conditions every day?

They Answered -

they said yes, we get some data from machines and some we record manually like system failure reasons and its maintenance hours recorded manually and cycle time, working hours, fuel consumption they get through machines and collectively they are stored in office.

## My Question

Since I am working on a college project so can I work with you to understand and deep analysis for improving draglines effectiveness?

They Answered -

Yes sure, any improvement will help us and whatever is your need this analysis we can arrange it for you.

Number of times I met with them is 1 till now.

## Organization Background

Main objective of company “VPR mining” is to produce coal in compliance with social upliftment, sustainable development along with safe environment upgradation. It is an ISO 9001:2015, ISO 14001:2015 certified company. This company has surface (open-cast pit) type mine, mainly its products are sub-bituminous coal also known as non-cooking coal whose 86% coal is dispatched to power sectors for electric generation and remaining transported for other purposes. VPR mining uses state of art mining technology for coal and overburden removal. It is located in Madhya Pradesh which constitutes 8% of the total coal resources in India, and 13% of coal production comes from Madhya Pradesh itself. Main HEMM equipments for production in this company are draglines, shovels, dumpers, surface miners, Drillers and many other Auxiliary Equipment

Under the growing coal demand, Company is currently adapting advanced mining technologies along with its continuous research and development.

## Problem Statement

As we know major production of coal and overburden removal in any open cast mine can be achieved by draglines so the problem statements are as follows: -

1. Many times, machines are unavailable so tracking which factor is mostly affecting its unavailability.

2. For growth in production improving machine utilization as well as capacity utilization of draglines.
3. Analysing which system and assemblies of draglines cause breakdown at regular intervals so that corrective actions can be taken on a time scale which can help in spare parts ordering.

## **Problem Solving Approach**

### **1. Details about the methods used with Justification**

In view of problem statements (1) there are 4 draglines in the mine every dragline machine working hours (a), idle hours (b), breakdown hours (c), maintenance hours (d) and total shift hours (e) should be recorded for a period of time then analysing a, b, c and d

If any machine has more idle hours (b) than standard idle hour in that case finding reasons behind idling of machine it can be no power, improper blasting time/area, improper dozing (clearing dragline working pathway), shifting, no operator case.

Similarly tracking breakdown (c) and maintenance hours (d) for every draglines its reason can be either mechanical or electrical failure.

After all these finding machine wise availability percentage using formula

$$\% \text{ availability} = \frac{\text{Total shift hours(e)} - \text{Breakdown hours (c)} - \text{Maintenance hours (d)}}{\text{Total shift hours(e)}} \times 100 \%$$

This can be used to keep track which dragline is lagging behind standard availability percentage.

Now in view of problem statement (2) finding percentage utilization with working hours and total shift hours for all 4 draglines as shown below this can be used to compare utilization of draglines.

$$\% \text{ utilization} = \frac{\text{Working hours (a)}}{\text{Total shift hours(e)}} \times 100 \%$$

If we talk about capacity utilization then it is related to production through draglines so it can be analysed using its carrying load per bucket to the original carrying capacity per bucket

At last, for problem statement (3) analysing breakdown reasons for all draglines over a period and comparing with condition monitoring checks which constitute machine system and assemblies condition checks at regular interval if any major system cause breakdown of draglines regularly then it can help them for fixing.

## **2. Details about the intended data collection with Justification**

As these draglines have a data logger device which makes it easier to fetch data through the draglines and the dragline office also keeps records about its maintenance hours and idle hours which can help in depicting its availability and utilization. Cycle time records can help in improving cycle time efficiency, feedback opinion surveys can be done with various staff members who are related to draglines this rating can help to know the reasons behind the lower capacity utilization of draglines in mine.

## **3. Details about the analysis tools with Justification**

As per talk with them, data of these machines are mainly recorded on paper first then after they processed every dragline have record-keeping book in which its data is written. So table extraction tool can be used to export data in excel format then after excel data analysis and visualization techniques can be used for understanding machine working time and performance over a period of time.

## **Expected Timeline**

Expected time for data collection	– 1 week approx.
Expected time for reviewing and cleaning data	– 1.5 weeks approx.
Expected time for making conclusion after analysis + Mid-Term and Final-Term Submission	– 2.5 weeks approx.

## **Expected Outcome**

Excel visualization tool will be enough for this project then expected out will be mainly pictorial graphs which would help in comparisons and depicting inferences for problem statements.