A NEW APPROACH FOR CONTINUOUS IMPROVEMENT OF QUARRY SECTIONS FOR BETTER PERFORMANCE IN LAFARGE CEMENT EGYPT LIMESTONE QUARRY

By
Eng. Mohamed Ashraf Ghazy Hassan

A Thesis submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE

In
MINING ENGINEERING

FACULTY OF ENGINEERING - CAIRO UNIVERSITY
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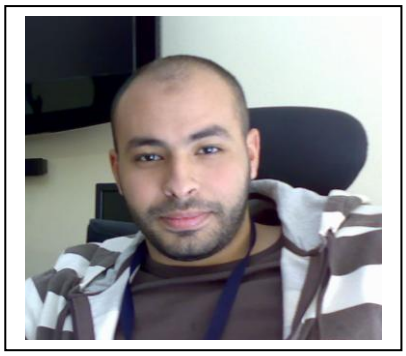
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Title of Thesis:

A new approach for Continuous Improvement of quarry sections for optimum performance and production cost in Lafarge Cement Egypt Limestone Quarry

Keywords:

Performance Optimization, Breakdown Management, Continuous Improvement, Quarry Management, Benchmarking.

Summary:

Crushing plant reliability factor (RF) used in Lafarge cement Egypt plant as a one of the main key performance indicators to measure and monitor quarry performance. Recently we noticed that we didn't achieve crushing plant Reliability factor target, so this study have been done to highlight the top reasons that mostly affect crushing plant (RF) by using pareto analysis, and to construct new control sheets to continually follow up, and optimize each section's performance by using internal benchmarking, and finally setting standard operating procedures in order to increase reliability factor, and thus quarry performance, and to ensure continuous, sustainable improvement process in place.

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Table of Contents

List of tables

List of figures

Abstract

The continuous pursuit of excellence is the underlying and ever present goal of the world’s best companies and As a result of the Intensive competitiveness between cement companies in the present time, it has become necessarily to support continuous improvement and gain competitive advantages.

To make this possible, companies make use of efficient methods of improving performance and focusing on the optimal use of resources in order to survive in the competition.

Since the quarries are the main element to produce the raw material for cement industry, it was necessary to focus on operating quarries optimally. And since crushers considered as the main element in the quarry where the impact of all inputs will affect the crushers' performance directly, from this point of view this study has been done to maximize quarry performance through managing crushing plant breakdowns and to ensure a continuous improvement process in place.

Chapter (1): Introduction

Since reliability reflect the ability of a machine, or system to consistently perform its intended or required function or mission, on demand and without degradation or failure [1], we use crushing plant reliability factor (RF) in Lafarge cement Egypt plant as a one of the main key performance indicators to measure and monitor quarry performance. Recently we noticed that we didn't achieve crushing plant Reliability factor target, so this study have been done to highlight the reasons that mostly affect crushing plant (RF), and to find out a certain approach that helps to increase reliability factor and thus quarry performance and to ensure continuous, sustainable improvement process in place.

1.1 Lafarge Cement Egypt (LCE) Plant Highlights:

Lafarge Cement Egypt plant - shown in figure (1) - arranged as the second plant all over the world in terms of cement production [2] with a total production capacity of about 10.6 million tons of cement per year.

Figure (1) Lafarge Cement Egypt Plant (LCE)

1.1.1 Lafarge Cement Egypt Plant Equipment:

The plant has two crushing lines, four raw mills, five kilns, Seven cement mills, one pet coke mill, and fourteen packing machine.

1.1.2 Plant Location:

Lafarge cement Egypt Plant located 100 km south-east from Cairo as shown in figure (2).

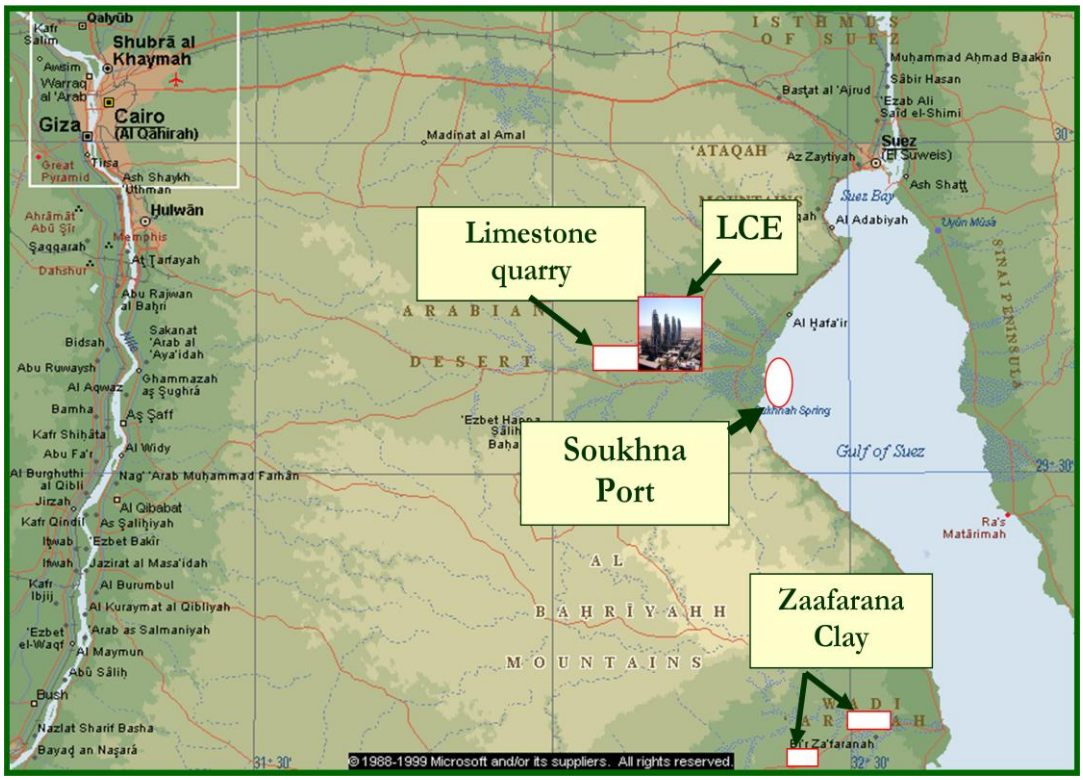

Figure (2) Lafarge Cement Egypt plant location

1.2 El Sokhna Limestone Quarry Highlights.

El Sokhna limestone quarry considered as a one of the biggest limestone quarries in Lafarge cement group, the quarry production capacity is 45,000 tons raw mix per day, with a crushing plant consists of two crushing lines 1400-ton/hour capacity each. The quarry has six working benches (each bench height is about 25 m), the average bench width is around 50 m, each level has two ways for maneuvering needs as shown in figure (3), the roads length exceeds 20 km, and the overburden thickness is about 0.5 m mainly consists of limestone fragments and it doesn't need special activities in most cases.

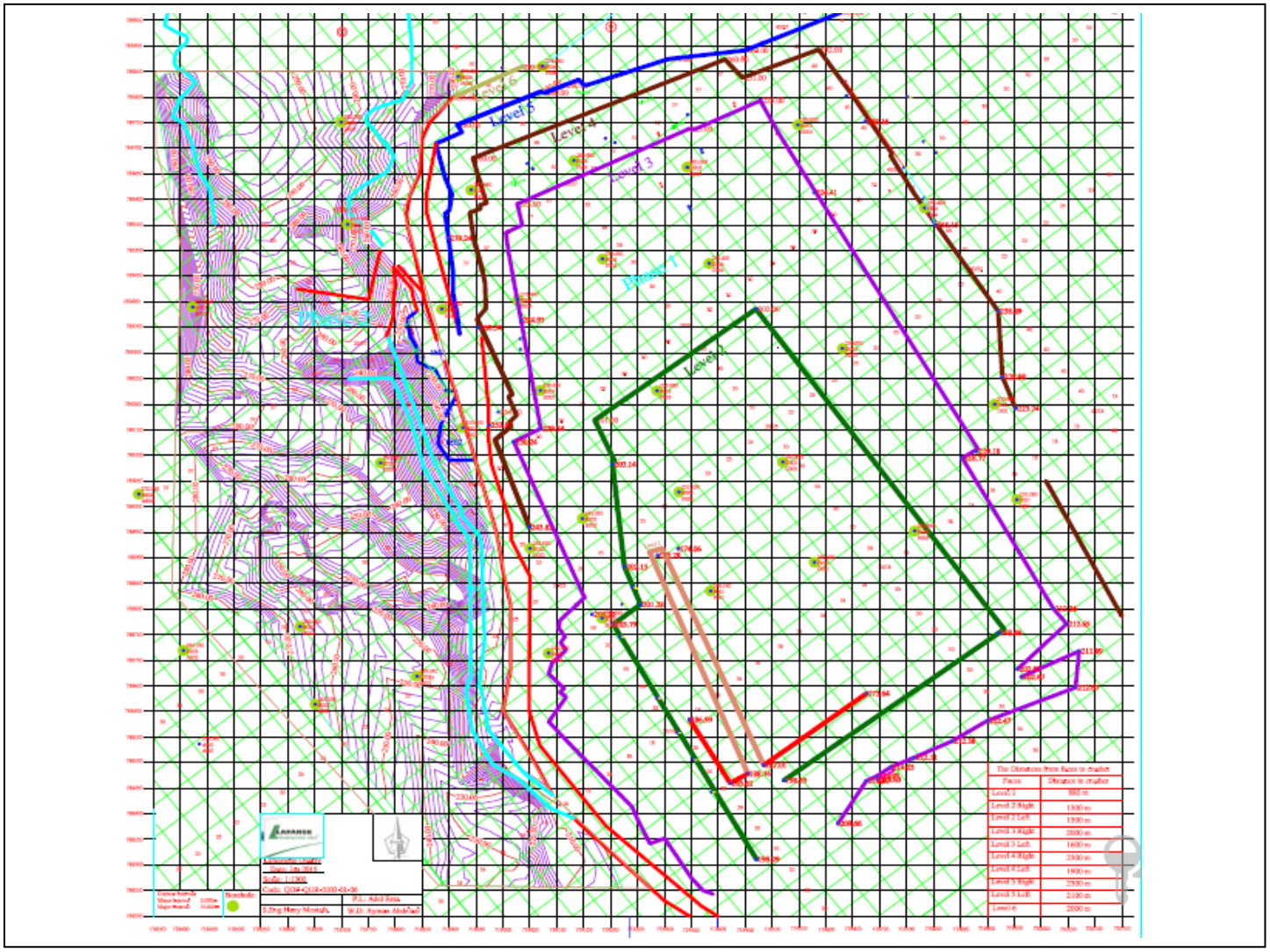

Figure (3) El Sokhna Limestone Quarry

1.2.1- Quarry sections.

The quarries department consists of planning and Exploration team, drilling and blasting team, quarry operation team, crushers' operation team, clays and additives team, and fleet maintenance team. As shown in figure (4).

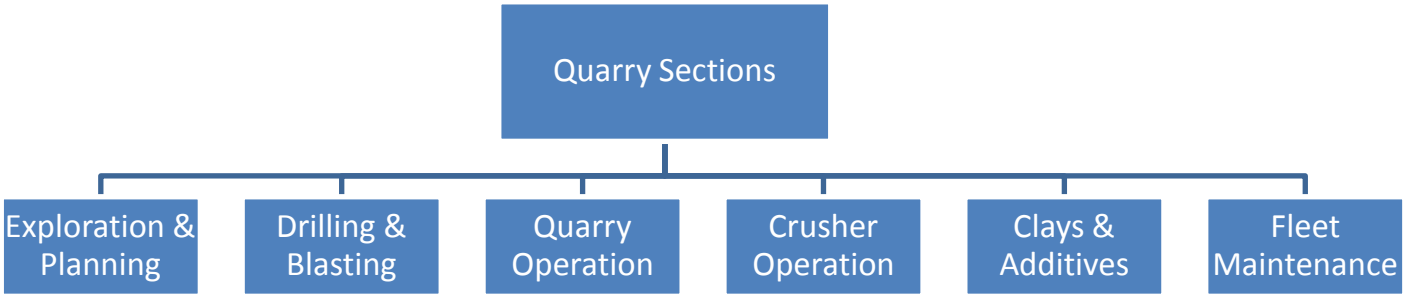

Figure (4) Quarry Sections

1.2.2- Quarrying Activities.

Quarrying activities in el Sokhna limestone quarry – as shown in figure (5) - starts with removing overburden (mainly a , then drilling and blasting, loading and hauling, crushing, and finally stacking the raw material into storages.

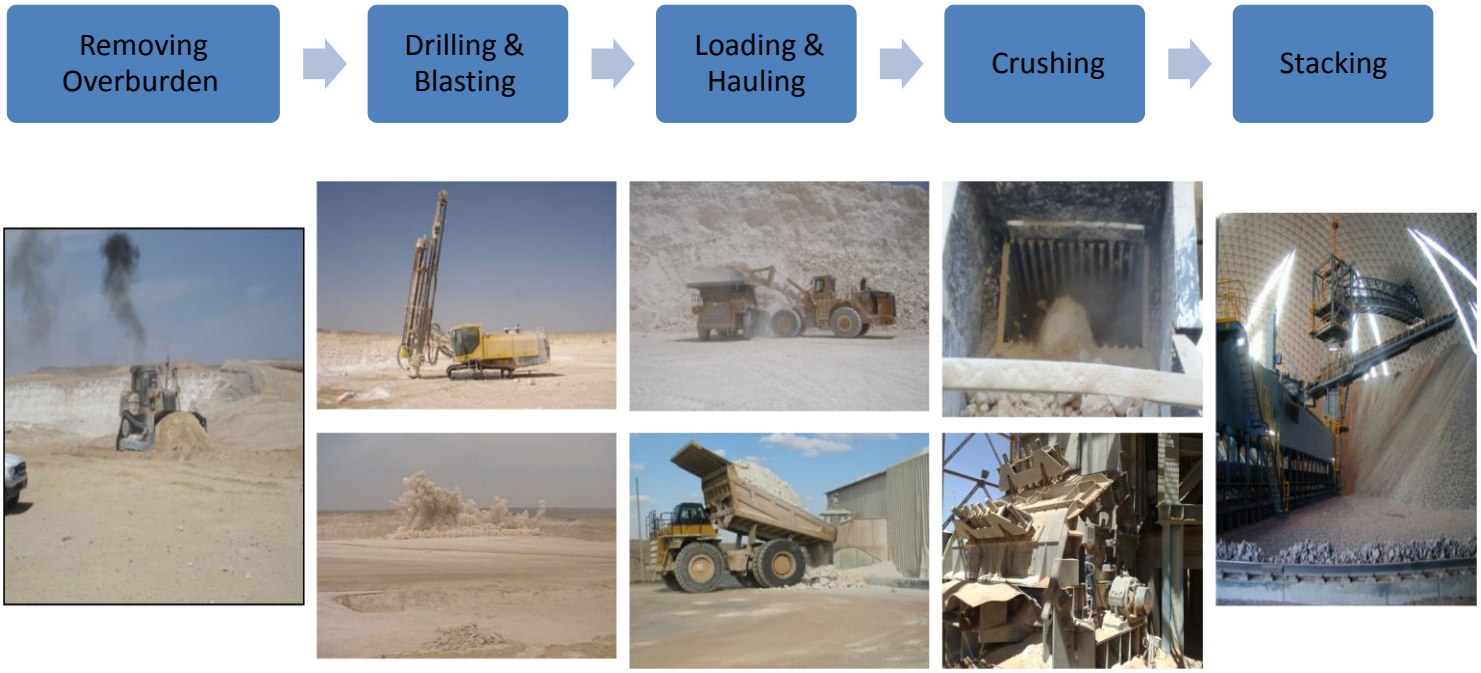

Figure (5) Quarrying activities in El Sokhna Limestone quarry

1.2.3- Crushing Plant Highlights.

The crushing plant consists of two similar crushing lines as shown in figure (6), each line consists of two crushing stages, Jaw crusher for the primary stage with 1200 ton/hour capacity, and Impact crusher for the secondary stage with 1400 ton/hour capacity. As shown in figure (7).

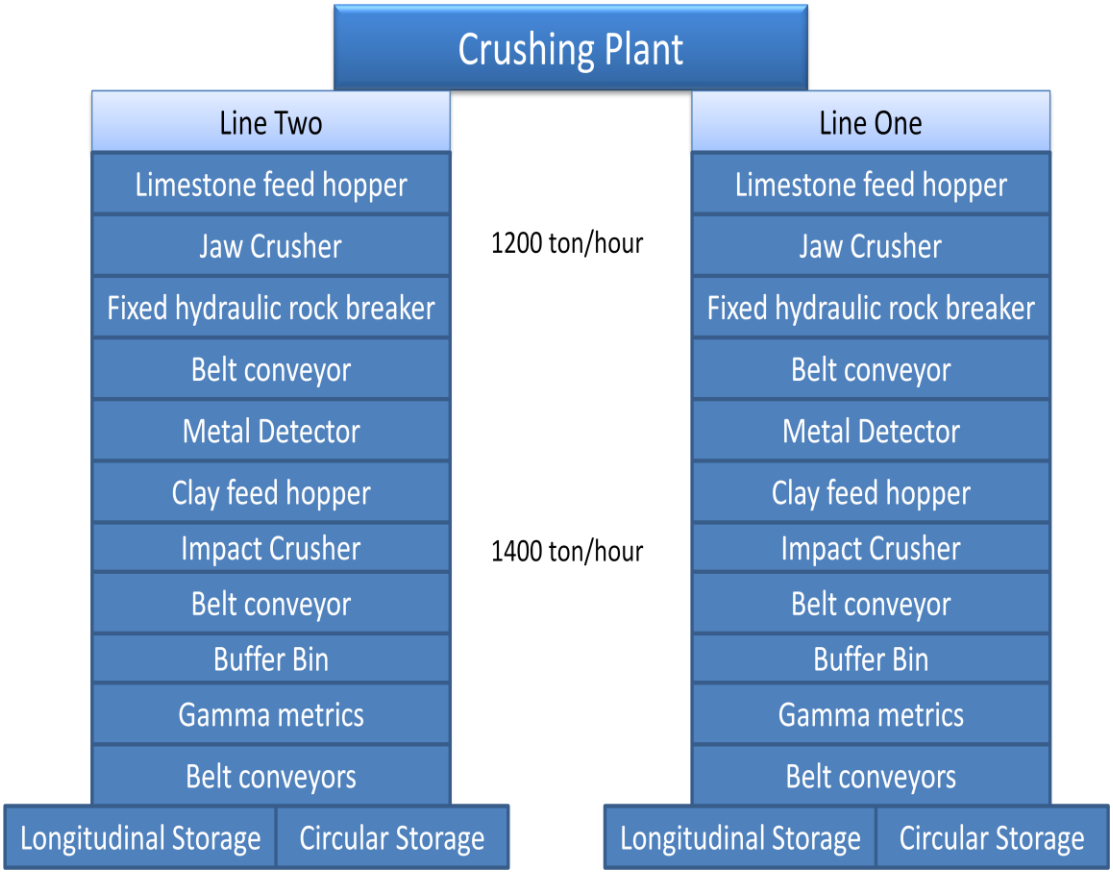

Figure (6) Crushing plant lines