



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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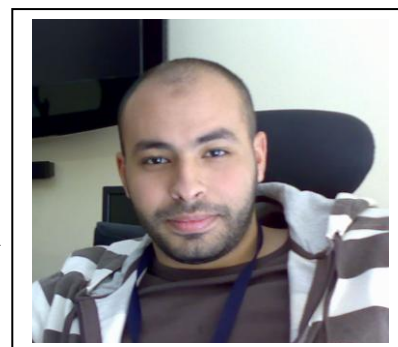
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Title of Thesis:

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

Acknowledgment	i
List of tables.....	iv
List of figures.....	v
Abstract.....	vi
Chapter (1): Introduction.....	1
1.1 Lafarge Cement Egypt (LCE) Plant Highlights:	1
1.1.1 Lafarge Cement Egypt Plant Equipment:	2
1.1.2 Plant Location:	2
1.2 El Sokhna Limestone Quarry Highlights.	3
1.2.1- Quarry sections.	4
1.2.2- Quarrying Activities.	4
1.2.3- Crushing Plant Highlights.	5
1.2.4- Preventive Maintenance schedules.	6
1.3- Crushing plant Key Performance Indicators (KPIs).	7
Chapter (2): Scope and goals of present work	9
2.1 Scope of the study:.....	9
2.2 Problem:	9
2.3 Objectives:.....	9
Chapter (3): Survey of quarry performance records	11
3.1- Quarry performance records (actual versus targets 2011-2015):.....	11
3.1.1- Percentages of achieved KPIs (actual versus targets 2011-2015)	12
3.2- Problem formulation:	15
3.3- Basic information:	15
3.3.1- Equation of reliability factor (RF):[5]	15
3.3.2- The relation between incident hours and reliability factor	15
3.3.3- Equation of total incident hours or total downtimes	15
Chapter (4): Current field Approach.....	17
4.1 current approach to follow up and improve performance:.....	17
4.2 Cons of the existing approach:	21
Chapter (5): Analytical basis of present work approaches	23
5.1 Attempts to decrease crushers' Incident hours	23
5.2- First Approach based on Pareto Principle.....	23
5.2.1 Survey of related aspects	23
5.2.1.1 Pareto Principle.....	23
5.2.1.2 Pareto chart	24

5.2.1.3 Purpose of Pareto chart	24
5.2.2 Analysis based on Pareto concept.....	24
5.2.2.1 Pareto analysis of mechanical breakdowns:	25
5.2.2.2 Pareto analysis of electrical breakdowns:	30
5.2.2.3 Pareto analysis of production breakdowns:	35
5.2.2.4 Pareto analysis of Instrumentation breakdowns:	40
5.2.3- Results	43
5. 3 Second Approach based on Benchmarking	47
5.3.1- Survey of related aspect.....	47
5.3.1.2 Benchmarking types:	47
5.3.1.3 Internal Benchmarking:	47
5.3.1.4 Methodology of the Present Approach:	47
5.3.2- Analysis based on benchmarking concept.....	48
5.3.2.1 Benchmarking steps:.....	48
5.3.2.2 Planning phase:	48
5.3.2.3 Gathering data phase:.....	48
5.3.2.4 Analyzing phase:.....	51
5.3.2.5 Controlling phase:.....	58
5.3.3- Results	62
Chapter (6): Conclusions.....	67
6.1 conclusions of the study:.....	67
6.2 Standard Operating Procedure (SOP):	67
6.2.1- SOP Definition:	67
6.2.2- SOP that constitutes the new approach to control and optimize crushing plant performance:	67
6.2.3- SOP to ensure a continuous improvement process in place	68
References.....	71

List of tables

Table (1) Actual versus target key performance indicators (KPIs) Records (2011-2015..	11
Continued- Table (1) Actual versus target key performance indicators (KPIs) Records from (2011-2015).....	11
Table (2) Calculation of production loss due to not achieving (RF) target (2013-2015) ..	14
Table (3) El-Sokhna limestone quarry budget – 2013	17
Table (4) Daily key performance indicator follow up report (24/12/2014).....	17
Continued - Table (4) Daily key performance indicator follow up report (24/12/2014)...	18
Continued - Table (4) Daily key performance indicator follow up report (24/12/2014)...	18
Table (5) Crushing plant daily downtime report (24-12-2014)	19
Continued – table (5) Crushing plant daily downtime report (24-12-2014).....	20
Table (6) Top (20 %) of Mechanical breakdowns.	29
Table (7) Top (20 %) of electrical breakdowns.	34
Table (8) Top (20 %) of production breakdowns.	39
Table (9) Top (20 %) of instrumentation breakdowns.....	42
Table (10) The top 20% of crushing plant breakdowns.....	43
Table (11) Template of the proposed Action Plan to improve Quarries Department Performance.	44
Table (12) Downtime house and frequencies due to metal alarm (2014-2015)	46
Table (13) Action plan to reduce or eliminate metal alarm downtimes	46
Table (14) Records and classification of all quarries department downtimes from 2011 to 2015.....	49
Table (15) Annual production downtimes (hours) from 2011 to 2015.....	50
Table (16) % of annual breakdowns to the total Incident hours (2011-2015)	51
Table (17) Minimum (%) of breakdowns from 2011 to 2015	52
Table (18) Averages of annual Breakdowns % to the total Incident hours (2011-2015) ..	52
Table (19) % of annual production downtimes to the total Incident hours (2011- 2015) .	53
Table (20) Minimum (%) of production downtimes (2011-2015).....	54
Table (21) Averages of annual production downtimes % to the total Incident hours (2011-2015)	54
Table (22) Structure of quarry optimization control sheets	60
Table (23) Evaluating crushing plant performance (19/7/2016).....	62
Table (24) a proposed action plan to improve the out of target breakdowns	65

List of figures

Figure (1) Lafarge Cement Egypt Plant (LCE).....	1
Figure (2) Lafarge Cement Egypt plant location	2
Figure (3) El Sokhna Limestone Quarry.....	3
Figure (4) Quarry Sections.....	4
Figure (5) Quarrying activities in El Sokhna Limestone quarry.....	4
Figure (6) Crushing plant lines	5
Figure (7) Crushing line components in El-Sokhna limestone quarry	6
Figure (8) Percentage of achieved production to the target from 2011 to 2015.....	12
Figure (9) Percentage of achieved operating hours to the target from 2011 to 2015	12
Figure (10) Percentage of achieved output to the target (2011 – 2015)	13
Figure (11) Percentage of achieved utilization factor to the target (2011 – 2015).....	13
Figure (12) Percentage of achieved power consumption to the target (2011-2015).....	13
Figure (13) Percentage of achieved breakdowns to the target from 2011 to 2015.....	14
Figure (14) Percentage of achieved reliability factor to the target from 2011 to 2015	14
Figure (15) Attempts to decrease crushers' Incident hours	23
Figure (16) Pareto analysis for Mechanical breakdowns' hours in 2014.	25
Figure (17) Pareto analysis for Mechanical breakdowns' frequency in 2014.....	26
Figure (18) Pareto analysis for Mechanical breakdowns' hours in 2015.	27
Figure (19) Pareto analysis for Mechanical breakdowns' frequency in 2015.	28
Figure (20) Pareto analysis for Electrical breakdowns' hours in 2014.	30
Figure (21) Pareto analysis for Electrical breakdowns' frequency in 2014.	31
Figure (22) Pareto analysis for Electrical breakdowns' hours in 2015.	32
Figure (23) Pareto analysis for Electrical breakdowns' frequency in 2015.	33
Figure (24) Pareto analysis for Production breakdowns' hours in 2014.	35
Figure (25) Pareto analysis for Production breakdowns' frequency in 2014.....	36
Figure (26) Pareto analysis for Production breakdowns' hours in 2015.	37
Figure (27) Pareto analysis for Production breakdowns' frequency in 2015.....	38
Figure (28) Pareto analysis for Instrumentation breakdowns' hours in 2015.	40
Figure (29) Pareto analysis for Instrumentation breakdowns' frequency in 2015.	41
Figure (30) Position of metal detector in the process	46
Figure (31) Position of metal separator in the process	46
Figure (32) Benchmarking steps (Ingram, 2009).....	48
Figure (33) Breakdowns related to drilling and blasting section.....	55
Figure (34) Breakdowns related to quarry operation section.....	55
Figure (35) Breakdowns related to crushers' operation section.....	56
Figure (36) Breakdowns related to fleet maintenance section.....	56
Figure (37) Breakdowns related to clays and additives section.....	57
Figure (38) Proposed cycle to ensure a continuous improvement process in place.	69

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).

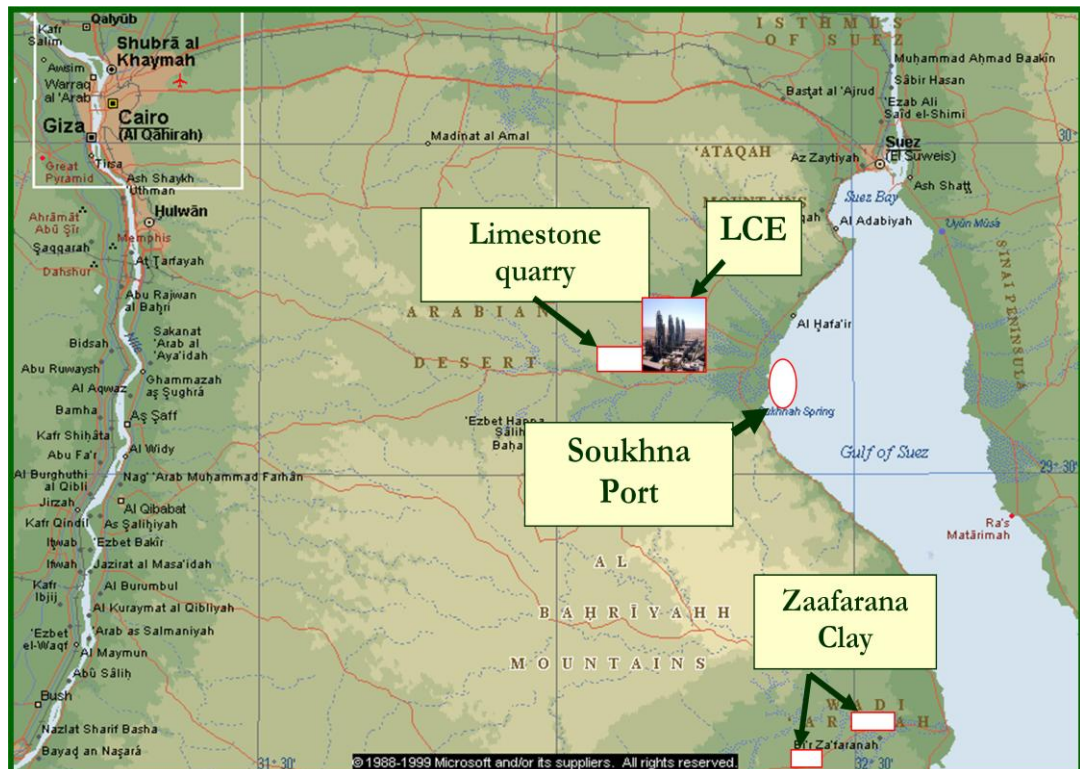


Figure (2) Lafarge Cement Egypt plant location

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.

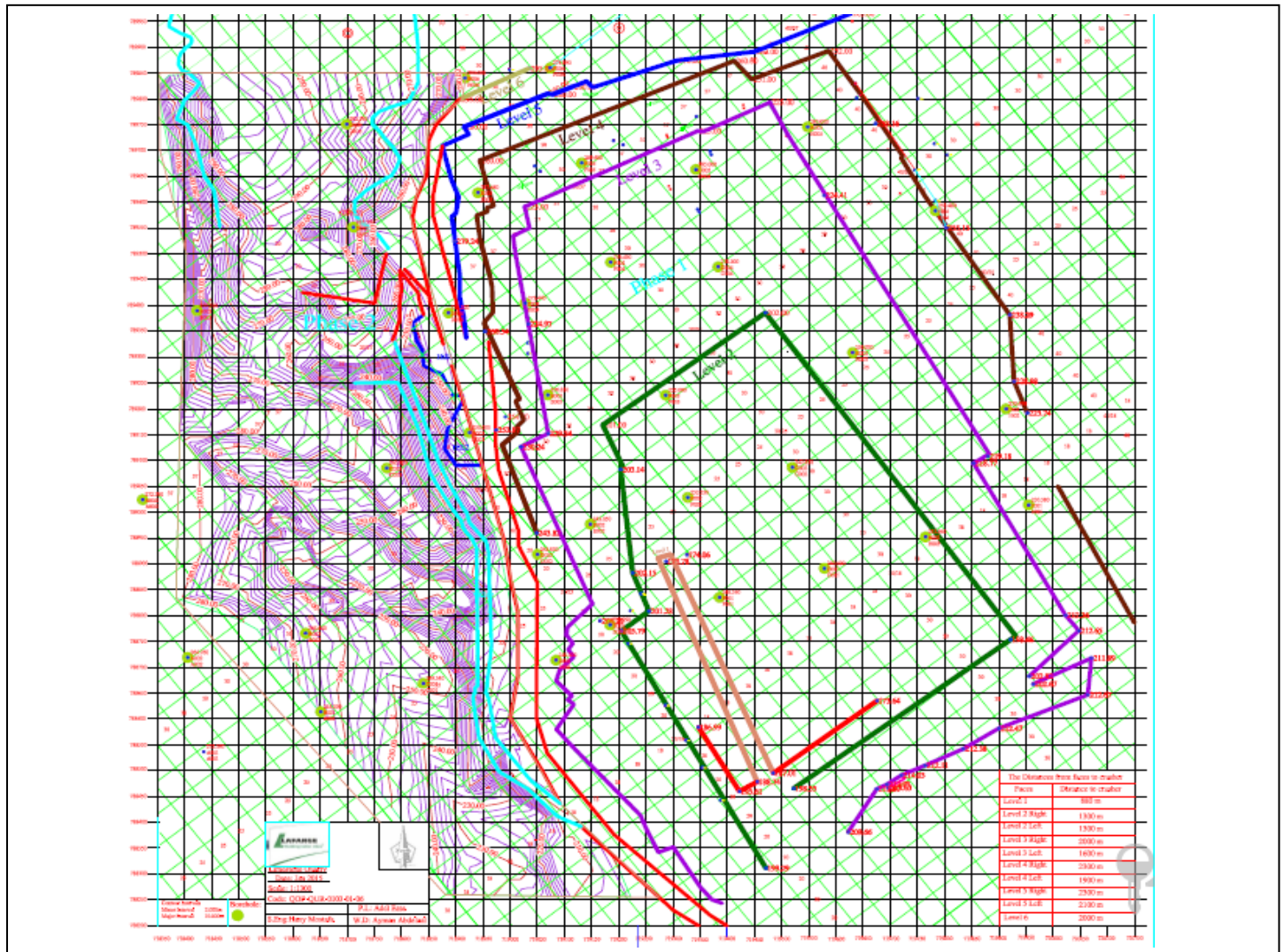


Figure (3) El Sokhna Limestone Quarry

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).

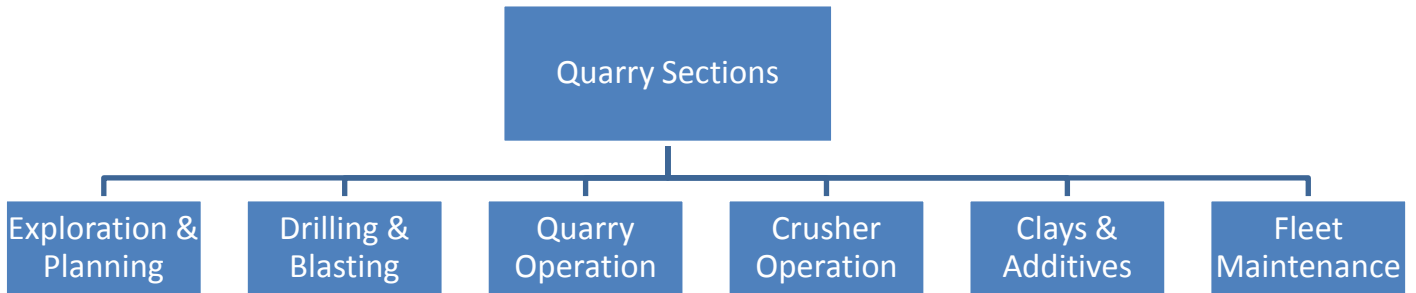


Figure (4) Quarry Sections

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.

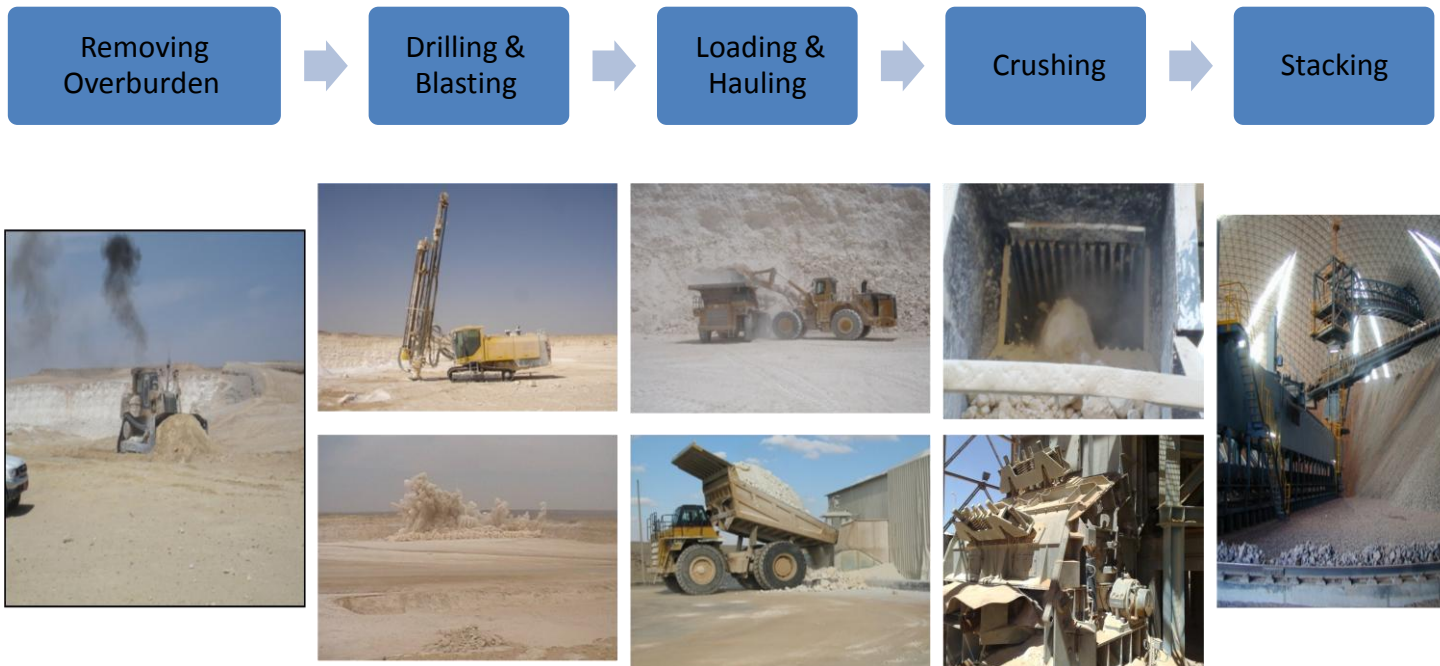


Figure (5) Quarrying activities in El Sokhna Limestone quarry

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).

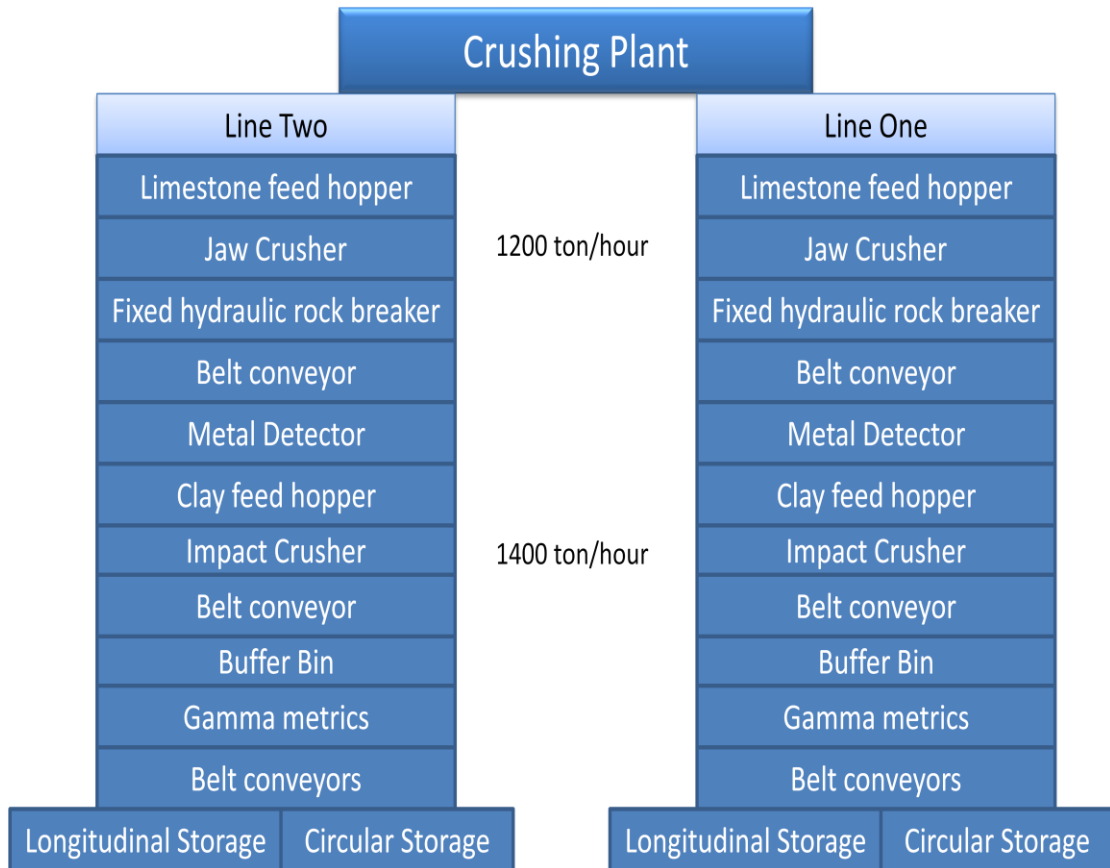


Figure (6) Crushing plant lines