AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

Optimum Site selection of

Concrete Batch Plants in Egypt

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B.Sc. 1999
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A Dissertation
Submitted In Partial Fulfilment Of The Requirement
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Under Supervision of

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Statement

This dissertation is submitted as partial fulfillment of Ph.D. degree in Civil Engineering (Structural), Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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I would like to dedicate this dissertation to my father, mother's soul, my wife and my daughter.

ABSTRACT

Ready mix concrete (RMC) has a potential role for generating income in the field of construction industry in Egypt. The standard of production and awareness of ready mix should be raised so that there are measures to be used in evaluating ready mix operations other than the result of the crushed cubes of the hardened concrete and the slump of the fresh concrete. Protection of the surrounding environment is one of the vital factors which should be considered. One of the methods is to improve the quality of fresh concrete and durability of hardened concrete and to enhance construction productivity. The global trend is pushing to use RMC produced in patch plants. The main aim in this study is to develop pilot framework criteria, which is useful for spreading Concrete Batch Plants (CBPs) as network all-over Egypt. This shall serve new and old urban communities and other habitations.

The pilot framework criteria needs an optimum location selection technique was devised in this study. To define the variables or factors that determine site suitability, a bibliographic database was created and aspects of interest were chosen. Then, the most comprehensive aspects were singled out, by eliminating redundant ones. Variables were grouped in a criteria based on the way they influence the project. Variables were classified as intrinsic environment, extrinsic environment, logistic, and socioeconomic criteria. Extensive interviews and questionnaires with experts working in RMC industry and municipalities, with more than 15 years of experience in site work dealing with RMC, were done. These structured interviews aim to evaluate the significance and rank of factors according to their suitability weight. Logistic criterion received the highest values, followed by environmental extrinsic issues.

A Geographic Information System (GIS) using a base map compiled from different types of maps was also developed. Thematic map was accomplished, for the administered the certain study area graphically for each alternative. Resultant compiled data in thematic maps were obtained, and the multi-criteria evaluation was used to combine the variables.

Finally, minimum variance based on operational research or Expert Choice based on Analytic Hierarchy Process (AHP) was used to obtain the optimum sites for CBP, through added values of polygons in the maps, for the criteria. The developed framework was verified and found yield results in good agreement with experts' opinions. This framework also establishes considerations adequate CBP

site selection process thru pilot framework criteria. This could be easily tolerated to be applied in different situations.

Keywords; Ready Mix Concrete, Optimization, Site Selection, Concrete Batch Plant, Geographic Information System

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Abbreviations

RMC	Ready Mixed Concrete
CBP	Concrete Batch Plant
SSCBP	Site Selection for CBP
GIS	Geographical Information System
DM	Drum Mixer
QC	Quality Control
AHP	Analytic Hierarchy Process
DSS	Decision support systems
OR	Operational Research
SD	Sustainable Development
BLOB	Binary Large Object
MCA	Multi-Criteria Analysis
SMCE	Spatial Multiple Criteria Evaluation
GPS	Global Position System
GI	Geographical Information

Chapter 1

Introduction

1.1 Overview

There is a rapid growth in the use of ready mixed concrete (RMC) for construction in developing countries. In Egypt, the production and use of RMC is currently widespread, which improves the performance of concrete because efficient systematic external monitoring and self-inspection could be easily applicable.

Concrete Batch Plant (CBP) is an important element in any concrete construction process, whether it is working as a central mixing plant on project site or as offsite one producing RMC which are to be transported by transit mixers[1]to projects.

Site selection of CBP should be in a suitable location, as CBP costs a lot of funds, and it is not allowable to be located in an erroneous site. Erroneous location may result in spending a lot of money, which may prove later unsuitable to fulfil its function, or totally abandon feasibility of CBP or impact negatively on the surrounding environment. So, it is very important to study all relevant site elective criteria and develop advanced techniques that can support the optimum site selection process.

This research work consists of the compilation of the appropriate data followed by extensive literature review, experts' interviews, and questionnaires with expert opinions. It can be concluded that a mandatory quality study can be introduced successfully into the existing RMC industry in Egypt, with immediate benefits to the industry and its customers.

1.2 Problem statement

Most of middle and small contractors use the drum mixer (DM), which usually results in poor quality concrete. This could be attributed to a general disregard of the basics of good quality intentionally or un-intentionally by ordinary DM besides the waste of material during pouring. The employment of unskilled labours has also contributed to the same result of producing poor quality concrete. In addition to the huge storage areas on site, that is used. Engineers tend to specify unwarranted concrete strength in order to compensate for expected poor quality, quick deterioration, and high cost of maintenance due to performance defects.