



Control and Management of Reinforcement Steel Leftovers
(Case Study In Kingdom Of Bahrain Industry)

By

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COMMITTEE DECISION

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Dedication

*The total thanks to my **god** who gives me all things, stand with me when no one was, and home "Bahrain"*

This total effort was not done without you,

*My **father**, who **stand by** me at every step in my life, and taught me that the best kind of knowledge to have is that which is help other,*

*My **mother**, my only **truly** friend, who taught me that even the largest task can be accomplished if it is done step by step at a time.*

Mchamed Salem Mchamed Mutlag Abuwajeh

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List of Abbreviations

Abbreviation	Meaning
1D	One-Dimensional
1DCSP	One Dimension Cutting Stock Problem
1DCSPUL	One Dimension Cutting Stock Problem With Usable Leftover
2D	Two-Dimensional
ALBA	Aluminum Of Bahrain
BAPCO	Bahrain Petroleum Company
BBS	Bending Schedules
BD	Bahrain Dinar,
BIM	Building Information Modelling
BRC	British Reinforcement Concrete Company
C&D	Construction And Demolition
C&DWM	Construction And Demolition Waste Management
C-CUT	Cutting Computer Program
CG	Column Generation
CMS	Control And Management System
COLA	Computerized Laying Out
CSP	Cutting Stock Problem
CSPUL	Cutting Stock Optimization Problem With Usable Leftovers
CUT	Cutting Computer Program
EAF	Arc Furnaces
ESI	Emirates Steel Industries
EU	European Union
FFD	First-Fit Decreasing
GA	Genetic Algorithm
GCC	Gulf Cooperation Council
GPIC	Gulf Petrochemical Industries
Hadeed	Saudi Iron And Steel Company
IP	Integer Programming
IPTS	Institute For Prospective Technological Studies
K.S.A.	Kingdome Of Saudi Arabia
LP	Linear Programming
MBS	Minimal Bin Slack
NEP	Number Of Efficient Cutting Patterns
OECD	Organization For Economic Cooperation And Development
Qasco	Qatar Steel Company
RFID	Radio Frequency Identification
SDM	System Dynamic Modeling
SHP	Sequential Heuristic Procedure
Tw	Trim Loss
UAE	Union Arab Emirates
UNEP	United Nations Environment Program
USD	United State Dollar
WRAP	Waste And Resource Action Program

ABSTRACT**Control and Management of Reinforcement Steel Leftovers****(Case Study In Kingdom Of Bahrain Industry)**

By

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A cutting stock problem is one of the main and classical problems in different industries as well as in many aspects of our lives. The problem "Controlling and Managing of Reinforcement Steel Leftovers," is one of the important factors in construction industry. The aim of this study is to develop and test a system to minimize the waste, maximize the revenue and succeed in the optimal use of scarce resources.

Data will be collected from real projects from Kingdom of Bahrain biggest factories; meanwhile, the developed software will be used to reach the desired results. The first step is to analyze the validity of the developed software according to various aspects. Then several case studies were taken from national Companies. Furthermore, interview questions are set up for managers and employees in these companies to design a control and management system. During the interviews, the companies' team were shown the results of the developed software before they answer the questions. Finally, it is to develop a proper management system that saves the raw material.

It is found that the application of pre-determination of Reinforcement Steel Leftovers lengths will achieve significantly better results and thus reduce the amount of losses and achieve optimal use of resources. The most important result of this thesis is founding that not only achieving an optimum solution that leads to minimize losses, but to have an effective and flexible control and management system and an effective updated inventory system.