

IMPLEMENTATION OF STATISTICAL
PROCESS CONTROL IN A
MANUFACTURING ORGANIZATION

KOKKINOS ANDREAS

H.T.I. DIPLOMA

M/1001

JUNE 2005

IMPLEMENTATION OF STATISTICAL PROCESS CONTROL IN A MANUFACTURING ORGANIZATION

By

Andreas Kokkinos

Project report submitted to the
Department of Mechanical Engineering

of the Higher Technical Institute

Nicosia Cyprus

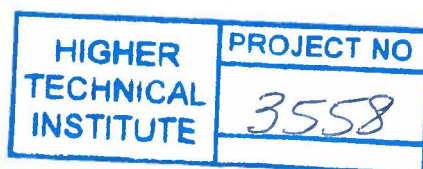
in partial fulfillment of the requirements for the diploma of

TECHNICIAN ENGINEER

In

MECHANICAL ENGINEERING

June 2005



ABSTRACT

The project was done to study through literature the meaning of Quality in manufacturing organization. Also, to study the existing status of the company as well to what they have accomplished in the field of Quality and performance indicators.

However, the company concerned was Elysee Irrigation Ltd, which manufactures and supplies piping and irrigations systems for agricultural, domestic and public use. The company is based at the countryside of Nicosia, Cyprus.

The main goal of the project is to improve the Quality Status of the company, by using Quality Control techniques. These achieved by the investigation of some products, so that the company has better quality output products.

The results of the product investigated are obtained in specific Statistical Process Control (SPC) software, and have been explained.

In conclusion, at the end there are the benefits of the author through this project, the benefits of the Elysee Irrigation Ltd. Finally, the recommendations are made for the improvement of the products.

ACKNOWLEDGEMENTS

First of all, I would like to express my sincere appreciation to Dr. Ioannis Angeli, Lecturer in the Mechanical Engineering Department, for his importance contribution and guidance of this project.

However, many thanks I wish to give to the Management necessary information relevant to the subject of the diploma project, special thanks to Mrs. Theopisti Christoforou which is the Quality Supervisor of the company for her advises.

Finally, my thanks to my beloved family who supported me, these four years until the end, and especially my sister who help me in the typing of my diploma project and my brother who help me to scanner some photos.

List of Contents

	Page
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
LIST OF CONTENTS	iii
ABBREVIATIONS	vi
LIST OF FIGURES/TABLES	vii
LIST OF APPENDICES	viii
<u>CHAPTER 1 – INTRODUCTION TO PROJECT</u>	1
1.1 INTRODUCTION	2
1.2 METHODOLOGY CARRIED OUT	2
1.3 PROJECT STRUCTURE	2
<u>CHAPTER 2 – QUALITY IMPORTANCE AND MANAGING QUALITY</u>	4
2.1 TOTAL QUALITY MANAGEMENT (TQM)	5
2.1.1 TQM Defined	5
2.1.2 Principles of TQM	6
2.1.3 Managing Transition Steps for TQM	9
2.1.4 Conclusion of TQM	10
2.2 INTERNATIONAL QUALITY STANDARDS	12
2.2.1 What is the history and origins of the ISO9000 series of Standards?	12
2.2.2 ISO9000	13
2.2.3 International Standards of Environmental Management (ISO14000)	14
2.2.4 Why are the Standards so Important?	16
2.3 INTRODUCTION OF STATISTICAL PROCESS CONTROL	16
2.3.1 Quality tools	18
2.3.1.1 Histogram	18
2.3.1.1.1 A Histogram is used for:	18
2.3.1.2 Cause and Effect Diagram	20
2.3.1.2.1 A Cause and Effect Diagram is used for:	20
2.3.1.2.2 Steps in Construction a Cause and Effect Diagram	21
2.3.1.3 Pareto	22
2.3.1.3.1 A Pareto is used for:	22
2.3.1.4 Scatter Diagram	23
2.3.1.4.1 A Scatter Diagram is used for:	23

2.3.2 Control Charts	24
2.3.2.1 X-BAR and R Charts	24
2.3.2.1.1 Theoretical Control limits for X-BAR Charts	24
2.3.2.2 X-BAR and S Charts	26
2.3.2.2.1 Theoretical Control limits for X-BAR Charts	26
2.3.2.3 Attribute Charts in General, p Charts in Particular	27
2.3.2.4 Attribute Charts in General, np Charts in Particular	27
2.3.2.5 Attribute Charts in General, c Charts in Particular	28
2.3.2.6 Attribute Charts in General, u Charts in Particular	29
2.3.2.7 How to select the correct chart?	31
2.3.3 Taquchi Methods	32
2.3.4 Benefits and Capabilities of SPC	33
2.3.5 Other ISO14000 Series Standards	35

CHAPTER 3 – COMPANY’S PROFILE AND EXISTING QUALITY MANAGEMENT SYSTEM **36**

3.1 COMPANY’S BACKGROUND	37
3.2 COMPANY’S PROFILE	38
3.3 THE QUALITY POLICY IN THE COMPANY	41
3.4 CUSTOMER SERVICE	41

CHAPTER 4 – METHODOLOGY ADOPTED **45**

4.1 METHODOLOGY ADOPTED	46
--------------------------------	-----------

CHAPTER 5 – IMPEMENTATION OF SPC TECHNIQUES IN THE ELYSEE IRRIGATION **48**

5.1 INTRODUCTION	49
5.2 INSPECTION	49
5.2.1 Role of Inspection	49
5.3 “DEFECT” AND “DEFECTIVE”	50
5.4 COLLECTING DATA	50
5.5 WHAT IS THE GAIN FROM THE CONSTRUCTION OF CONTROL CHARTS	51
5.6 PRODUCTION PROCESS OF THE FITTING DIVISION	51
5.7 INJECTION MOLDING MACHINES	53
5.7.1 Reciprocating (Single – Stage).Screw Machines	53
5.7.2 Molding Basics	54
5.7.3 How is the product approach for to be done:	54
5.7.4 Plasticating	54
5.7.5 Screw Design	55
5.7.6 Molds	56
5.8 IMPLEMENTATION OF CONTROL CHARTS WITH ANALYSES	

DURING MANUFACTURING PROCESS	57
5.8.1 Chart Reference 1 (Female Adaptor ½" x ½" F)	57
5.8.2 Chart Reference 2 (Male Elbow 25 x ¾")	60
5.8.3 Chart Reference 3 (Female Tee 20 x ½" x 20)	63
5.8.4 Chart Reference to PVC Pipes Machine [B2]	66

CHAPTER 6 – OVERALL CONCLUSIONS AND RECOMMENDATIONS **69**

6.1 CONCLUSIONS	70
6.2 BENEFITS OF COMPANY	71
6.3 BENEFITS OF THE AUTHOR	71

REFERENCES **85**