DESIGN OF INTEGRATED QUALITY ASSURANCE PROGRAM FOR MAINTENANCE OF DESALINATION PLANTS USING SIX SIGMA

Submitted By

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B.Sc. of Nuclear Engineering, Faculty of Engineering, Alexandria University, 2005

Master in Nuclear & Radiation Engineering, Faculty of Engineering,

Alexandria University, 2009

A Thesis Submitted in Partial Fulfillment

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APPROVAL SHEET

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ABSTRACT

To increase the profitability and decreasing the operation failure of the Multi-Effects Desalination/Thermo vapor compression MED/TVC type the Six-Sigma method will be used as the main method to achieve that.

The objectives of this research are proposed to develop Integrated Quality Assurance Program for maitainence of desalination plants and using the Reliability Centered Maintenance (RCM) for the (MED/TVC) desalination unit type, to improve the performance of desalination unit and increase the life time of its components. By applying the Six-Sigma method, to enhance the Desalination unit performance and increase the operation lifetime, the critical systems in the unit is specified based on the operation experience. The critical systems to safety and to the operation are: Chemical Dosing System (CDS), Sea Water System (SWS), and Evaporators System (ES). Designing an Integrated Quality Assurance Program (IQAP) for maintenance of MED/TVC unit, by using the application of the Six Sigma, defines, measure, analyze, improve, and control (DMAIC) problem-solving methodology in MED/TVC Unit, aimed to increase the Reliability, availability and increase the unit lifetime. From the operation logbook, the low performance of the MED/TVC unit was discovered, also from the maintenance logbook, the lifetime of the evaporator components decreased and not matched with replaced components schedule.

The results of the MED/TVC illustrate a successful practical application of a Six Sigma project in maintenance program for Desalination Unit.

Sea Water System - for sea water system by applying the scientific method (four step method) plus the PDCA cycle, it means we apply the Six Sigma philosophy. To improve the performance of the multi effects Desalination unit and increase the operational lifetime, one of the critical systems in the Multi-effects desalination/thermo vapor compression MED/TVC unit is Sea Water System (SWS). By using the Six Sigma philosophy, define measure, analyze, improve, and control (DMAIC) method for problem-solving methodology in

MED/TVC Unit, to improve the Reliability and Availability of the MED/TVC Unit.

The operation and maintenance staff discovered that the low performance of the MED/TVC unit, the availability and reliability not matches with the operation objectives, also the lifetime of the components for the evaporator decreased and not matched with replaced components as schedule. So, the Reliability Centered Maintenance will apply.

The results of the SWS illustrate a successful practical application of a Six Sigma project in maintenance program for MED/TVC Desalination Unit.

The Integrated Quality Assurance for the MED-TVC desalination unit shall contain the following aspects:

- Organization,
- Quality Management System,
- Quality Assurance in Procurement of Items and Services,
- Management Procedures and Work Instructions,
- Documentation Management system,
- Identification and Control of Items,
- Control of Special Processes,
- Control of Measuring and Test Equipment,
- Handling, Storage, Shipping, and Housekeeping,
- Inspection, Test and Operating Status,
- Control of Nonconformances,
- Corrective Action Program,
- Quality Assurance Records,
- Quality Assurance Assessments,
- Indoctrination, Training and Qualification of Personnel, and
- Statistical Techniques.

By applying all the requirements under each section of the quality assurance program, the performance, reliability, and availability are improved.

TABLE OF CONTENTS

ABSTRACT i

TABLE OF CONTENTS iii

1. LIST OF FIGURES viii

2. LIST OF TABLES x

4. LIST OF EQUATIONS xii

8. LIST OF ABBREVIATIONS xiii

10. CHAPTER ONE 2

INTRODUCTION 2

1.1 Background 2

1.1.1 QUALITY ASSURANCE EVOLUTION 2

1.1.1.1 QUALITY INSPECTION STAGE 2

1.1.1.2 QUALITY CONTROL STAGE 2

1.1.1.3 QUALITY ASSURANCE STAGE 3

1.1.1.4 TOTAL QUALITY MANAGEMENT 3

1.1.1.5 SIX-SIGMA STAGE 3

1.2 Problem Statement 4

1.3 Study Objectives 4

1.4 Work Plan 5

1.6 Thesis Structure 6

CHAPTER TWO 9

11. LITERATURE REVIEW 9

2.1 Literature Review 9

2.2 Water Crisis 10

2.2.1 Need For Seawater Desalination 10

2.2.2 Desalination Technologies 11

2.2.3.1 Multi-Effect Distillation 14

2.2.3.2 Multi-Stage Flash Distillation 17

2.2.3.2 Reverse Osmosis 21

CHAPTER THREE 27

MED-TVC DESCRIPTION AND DATA ANALYSIS 27
3.1 General Information About Med/Tvc Units 27
3.2 Process Characteristics 27
3.2.1 Distillation Process 27
3.2.1.1 Supply of Heating Medium 29
3.2.1.2 Raw water supply 30
3.2.1.3 Distillate production 30
3.2.1.4 Auxiliary Power Consumption 30
3.2.2 Evaporator 31
3.2.2.1 General design 31
3.2.2.1 Sea Water Spraying Systems 32
3.2.2.2 Demisters 32
3.2.2.3 Heat Transfer Surfaces and Tube plates 32
3.2.2.4 Final Condenser And Feed Heaters 32
3.2.3 Thermal Vapour Compressors 32
3.2.4 Steam Transformer. 33
3.2.5 Vaccum System 34
3.2.6 Hydro Ejector System 34
3.2.7 Steam Ejectors System 34
3.2.8 Chemical Dosing Of Sea Water Feed & Steam Transformer Feed Water 34
3.2.8.1 Process Pumps 35
3.2.8.1 Piping And Valves 36
3.2.8.1.1 Piping Systems 36
3.2.8.1.1.1 Steam System 36
3.2.8.1.1.2 Distillate System 36
3.2.8.1.1.3 Brine Blowdown System 36
3.2.8.1.1.4 Sea Water Supply System 36
3.2.8.1.1.5 Seawater/Brine Discharge 37
3.2.8.1.1.6 Instrument Air 37

3.2.8.1.2 Valves Types.....37
3.2.8.1.2.1 Isolating Valves.....37
3.2.8.1.2.2 Control Valves 37
3.2.8.2 Acid Cleaning.....38
3.2.9 Instrumentation 38
3.2.9.1 Flow Measurement 38
3.2.9.2 Temperature Measurement.....39
3.2.9.3 Pressure Measurement.....39
3.2.9.4 Level Measurement 39
3.2.9.5 Conductivity Measurement 39
3.2.10 Desalination Plant Control 40
3.2.10.1 Control Panel 40
3.2.10.2 Protection Of Equipment.....40
3.3 Main Parameters And Data For MED-TVC Systems......41
3.3.1 Chemical Dosing Skid Package 41
CHAPTER FOUR 53
4.1. Scope of the Work 53
4.2. Methodology.....53
4.2.1 Define The Organization.....53
4.2.2 Measure The Organization.....56
4.2.3 Analyze The Organization 57
4.2.4 Improve The Organization 59
4.2.5 Control Phase.....59
1. CHAPTER FIVE 61
2. RESULTS AND DISCUSSION.....61
5.1 Chemical Dosing System Calculation 61
5.1.1 Status And Behavior Of Cds Before Applying The Six-Sigma.62
5.1.2 Developing Integrated Quality Assurance Program For Maintenance Of Cds......66
5.1.2.1 Project Planning 66

5.1.2.1.1 Define Phase 66
5.1.2.1.2 Measure Phase 67
5.1.2.1.3 Analyze Phase 71
5.1.2.1.4 Improve & Control Phase. 81
5.1.2.1.5 Six- Sigma Calculation 83
5.2 Sea Water System Calculations 86
5.2.1 Methodology 86
5.2.2 Status And Behavior Of Sws Before Applying Six- Sigma. 87
5.2.3 Integrated Quality Assurance Program For SWS Maintenance 95
5.2.3.1 Project Planning 95
5.2.3.2 Definition Phase 95
5.2.3.3 Measurements Phase 97
5.2.3.4 Analysis Phase 98
5.2.3.5 Improve & Control Phase. 108
CHAPTER SIX 113
INTEGRATED QUALITY ASSURANCE PROGRAM 113
6.1 Integrated Quality Assurance Program Structure 113
6.1.1 Organization 113
6.1.2 Quality Management System 114
6.1.2 Quality Assurance in Procurement of Items and Services 115
6.1.2.1 Procurement Document Control 115
6.1.2.2Evaluation and Selection of Internal and External Providers 117
6.1.2.3 Internal and External Providers Interface Control 117
6.1.2.4 Verification of Internal and External Providers Performance 118
6.1.2.4.1 Acceptance of Items and Services 118
6.1.2.5 Management Procedures and Work Instructions 118
6.1.3 Documentation Management system 119
6.1.4 Identification and Control of Items 120

6.1.5 Control of Special Processes 121
6.1.6 Control of Measuring and Test Equipment 122
6.1.7 Handling, Storage, Shipping, and Housekeeping 122
6.1.8 Inspection, Test and Operating Status 123
6.1.9 Control of Nonconformances 124
6.1.10 Corrective Action Program 125
6.1.11 Quality Assurance Records 127
6.1.12 Quality Assurance Assessments 130
6.1.12.1 Internal Assessments 130
6.1.13 Statistical Techniques 135
CHAPTER SEVEN 138
CONCLUSIONS AND RECOMENDATIONS 138
REFERENCES 148
المستخلص 1
الملخص 2

LIST OF FIGURES

Figure 1 1 Steps for developing IQAP for MED-TVC desalination unit 6

Figure 2-1 Areas Projected to Experience Economical and Physical Water Scarcity by 2025 10

Figure 2-2 Accumulated Contracted and Operating Desalination Capacities since 1965 11

Figure2-3 DesaltingDevice Theory 12

Fig 2-4 Schematic Diagram of MED Desalination Plant 15

Fig 2-5 Schematic Diagram of MED-TVC Desalination Plant 17

Fig 2-6 Schematic Diagram of MSF Desalination Plant. 18

Fig 2-7 Principle of Reverse Osmosis 22

Fig 2-8 Basic Components of the Reverse Osmosis Seawater Desalination Plant 25

Fig 4-1 Six Sigma project selection process 55

Fig.5-1 Anti-Scaling Flowrate 62

Fig.5-2 Anti-scaling Tank Level 63

Fig.5-3 Anti-Scaling Pump Pressure 63

Fig.5-4 De-chlorination Tank level 63

Fig.5-5 De-Chlorination Flowrate 64

Fig.5-6 Dosing De-Chlorination pump pressure 64

Fig.5-7 Anti-Foaming Tank Level 65

Fig.5-8 Anti-Foaming Pump Flowrate 65

Fig.5-9 Anti-Foaming pump Pressure 66

Fig. 5-10 Pareto Chart for the Anti-Foaming system deviations 70

Fig. 5-11 Pareto chart for the Anti-Scaling system deviations 70

Fig.5-12 Pareto Chart for the DE chlorination system deviations 71

Fig.5-13 Chain of causes- and- occurrences of chemical dosing failures 74

Fig.5-14 Proportions Follow Normal Distribution 75

Fig.5-15 Tank Levels after adjustment. 82

Fig.5-16 Flowrate after adjustment 82

Fig.5-17 Pump Pressure after adjustment 83

Fig.5-18 MED/TVC Desalination Plant Components 88

Fig.5-19 Sea Water Flowrate 89

Fig.5-20 Sea Water Temperature 89

Fig.5-21 PHE Inlet Pressure 90

Fig.5-22 PHE Outlet Pressure 90

Fig.5-23 Sea Water Conductivity 90

Fig.5-24 Condenser Inlet Temperature 91

Fig.5-25 Sea Water Pre-heater Inlet Temperature (Stage 1) 91

Fig.5-26 Sea Water Pre-heater Inlet Temperature (Stage 2) 92

Fig.5-27 Sea Water Pre-heater Inlet Temperature (Stage 3) 92

Fig.5-28 Cell 6 to condenser Vapor Temperature 93

Fig.5-29 Pareto Chart for the Brine PHE system deviations 93

Fig.5-30 Pareto Chart for the Distillate PHE system deviations 94

Fig.5-31 Pareto chart for the Condensation PHE system deviations 94

Fig.5-32. Chain of Causes- and- Occurrences of SWS failures 102

Fig.5-33. Proportions follow normal distribution 105

Fig.5-34 Condenser inlet temperature after adjustment 109

Fig.5-35 Water Flowrate after adjustment 110

Fig.5-36 PHE outlet pressure after adjustment.. 110

LIST OF TABLES

Table 2-1 Process limits and capability (Okhovat, 2012). 9

Table 3-1 Sea Water Treatment 43

Table 3-2 De-Chlorination Dilution Table 44

Table 3-3 Calculated Setpoint Table 44

Table 3-4 System Monitoring And Recommended Plant Log Format 45

Table 3-5Desalination plant process flow diagram (heat and mass balance).. 49

Table 5-1 (SIPOC) Diagram For The Dosing System Operation 68

Table 5-2 Input Controllable Factors And Their Low And High Levels 73

Table 5-3 Experimental Design Strategy Of The DOE Screening 75

Table 5.4 Measurement Results In Terms Of Proportion Of Deviations For The Four CTQs 76

Table 5-5 ANOVA of The Screening DOE And Determination Of The Significant Factors 78

Table 5-6 Metrics Measured Based On Monitored Data 80

Table 5-7 Improvement Actions Shall Be Take Into Account…81 81

Table 5-8 (SIPOC) Diagram For The Dosing System Operation 96

Table 5-9 Input Controllable Factors And Their Low And High Levels 101

Table 5.10. Experimental Design Strategy Of The Screening DOE 103

Table 5.11. The Measurement Results In Terms Of 104