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Otahuhu B Power Station Condenser In-Leakage Analysis and Condensate Monitoring System

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Heng Zhang

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ABSTRACT

Considerable ongoing risk of condenser in-leakage exists at Otahuhu B (OTB) Power Station. The condenser cooling water used at OTB station is corrosive brackish water with exceedingly high sodium and chloride concentrations. Significant signs of corrosion inside the condenser have been found recently. In the event of condenser in-leakage, the salt contaminants in the cooling water will directly enter the Heat Recovery Steam Generator (HRSG) with the potential for significant and costly damage resulting in a long plant outage.

A dynamic mathematical model was developed in the thesis to analyse the consequences of condenser in-leakage at OTB station. The analysis results show that the tolerance of the condenser to any leakage of cooling water is almost zero. Because the existing condensate monitoring system is not designed to detect contamination in this time frame, a new fast response system is required to detect condenser in-leakage immediately.

A new dedicated fast response condensate monitoring system has been engineered and installed at OTB station as a part of the project scope. The new system dramatically reduces the response time to condenser in-leakage events. Critical instruments utilise multiple redundancy schemes to enhance the availability and reliability of the system. In addition, action level voting, timing, and alarming has been automated to assist operators in making correct decisions.

The new condensate monitoring system is presently fully functional. The project has successfully achieved the objective of controlling the risk of condenser in-leakage events and minimising damage and negative effects on the plant.

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TABLE OF CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	ix
LIST OF TABLES.....	xiii
LIST OF ABBREVIATIONS	xv
CHAPTER 1 INTRODUCTION	1
1.1 Introduction to OTB Condenser System.....	1
1.2 Risk of Condenser Tube Failure	4
1.3 Effects and Cost of Condenser In-Leakage	6
1.3.1 Effect on Water and Steam Cycle Chemistry	6
1.3.2 Effect on Plant Performance.....	7
1.3.3 Effect on National Grid	8
1.3.4 Cost of Condenser In-Leakage	8
1.4 Current Issues of Managing Condenser In-Leakage	9
1.5 Study Purpose and Project Scope	11
1.6 Structure of the Thesis	12
CHAPTER 2 LITERATURE REVIEW	13
2.1 Overview of Condenser In-Leakage	13
2.2 Chemical Treatment.....	14
2.2.1 All Volatile Treatment.....	14
2.2.2 Caustic Treatment.....	15
2.3 Chemical Parameter Monitoring for Condenser In-Leakage.....	15

2.3.1 Specific Conductivity	16
2.3.2 Cation Conductivity.....	17
2.3.3 Power of Hydrogen.....	18
2.3.4 Sodium and Chloride	19
2.3.5 Parameter Selection and Monitoring Point.....	20
2.3.6 Target Value of Parameters	22
2.4 Chapter Summary.....	23
CHAPTER 3 NEW PLYMOUTH POWER STATION	
UNIT 3 CONDENSER TUBE LEAK EVENT STUDY	25
3.1 Introduction	25
3.2 Condensate Monitoring System.....	26
3.3 Condenser Tube Leak Event Study	27
3.4 Chapter Summary.....	32
CHAPTER 4 MATHEMATICAL MODELLING AND ANALYSIS ON	
CONDENSER IN-LEAKAGE.....	33
4.1 Introduction to Condenser In-Leakage.....	33
4.2 Orifice Leak.....	34
4.2.1 Experiment on Orifice Leak	34
4.2.2 Orifice Flow Calculations.....	36
4.3 Mathematical Model of Condenser In-Leakage.....	40
4.3.1 Condenser Hotwell Model.....	41
4.3.2 Case Study on Condenser Hotwell Model.....	46
4.3.2.1 Case Study 1: Full Load Analysis	46
4.3.2.2 Case Study 2: Minimum Combined Cycle Load Analysis	49
4.3.2.3 Case Study 3: Different Leakages Analysis.....	52
4.3.2.4 Case Study 4: Different Cooling Water Samples Analysis	55
4.3.3 Summary of Condenser Hotwell Model.....	57
4.3.4 HRSG Drum System Model.....	59
4.3.5 Case Study on HRSG Drum System Model	67
4.3.6 Summary of HRSG Drum System Model	73

4.3.7 General Water Cycle Model	74
4.3.7.1 <i>Water Travel Time through Pipelines</i>	75
4.3.7.2 <i>Water Travel Time through Preheater</i>	76
4.3.7.3 <i>Water Travel Time through Economisers</i>	79
4.3.8 Case Study on General Water Cycle Model	82
4.3.8.1 <i>Water Travel Time through Major Pipelines</i>	83
4.3.8.2 <i>Water Travel Time through Preheater and Economisers</i>	85
4.3.8.3 <i>General Analysis of Water Cycle System</i>	86
4.4 Chapter Summary	93
CHAPTER 5 CONDENSATE MONITORING SYSTEM.....	97
5.1 Experiment on Different Chemical Parameters.....	97
5.1.1 Sodium.....	98
5.1.2 Cation Conductivity.....	100
5.1.3 Specific Conductivity and pH.....	101
5.1.4 Chemical Parameters Comparison.....	102
5.2 Instrumentation Selection	103
5.3 Minimisation of Sample Lag Time	107
5.4 New Wet Analysis Rack	110
5.4.1 Wet Analysis Rack Arrangement	110
5.4.2 Function Description of Major Items	114
5.5 Instrumentation and Control.....	121
5.5.1 Instrumentation Power Distribution	121
5.5.2 Instrumentation Wiring.....	124
5.6 Chapter Summary.....	129
CHAPTER 6 TELEPERM XP AND LOGIC PROGRAMMING	130
6.1 Introduction to Teleperm XP	130
6.1.1 Teleperm XP Structure.....	130
6.1.2 Automation System.....	133
6.1.3 Automation System 620B.....	137

6.2 Teleperm XP SIM Module Configuration.....	140
6.3 Condensate Monitoring System Logic Program	143
6.3.1 Engineering System ES680	143
6.3.2 Individual Signal Function Configuration.....	145
6.3.2.1 <i>Teleperm XP Linear Signal Configuration.....</i>	<i>145</i>
6.3.2.2 <i>Logarithmic Algorithm Deduction.....</i>	<i>148</i>
6.3.2.3 <i>Teleperm XP Logarithmic Signal Configuration</i>	<i>154</i>
6.3.3 Redundant Signal Processing	157
6.3.3.1 <i>Cation Conductivity 2V3 Selection</i>	<i>157</i>
6.3.3.2 <i>Sodium 1V2 Selection.....</i>	<i>159</i>
6.3.4 System Alarms.....	161
6.3.4.1 <i>Hard Wired Alarm</i>	<i>161</i>
6.3.4.2 <i>Teleperm XP Logic Alarm</i>	<i>163</i>
6.3.5 Action Level Determination	165
6.3.5.1 <i>Sodium Action Level Determination</i>	<i>166</i>
6.3.5.2 <i>Cation Conductivity Action Level Determination.....</i>	<i>168</i>
6.3.5.3 <i>Final Action Level Determination.....</i>	<i>168</i>
6.3.5.4 <i>Action Level Activation</i>	<i>171</i>
6.3.5.5 <i>Action Level Matrix Table Animation</i>	<i>172</i>
6.3.6 Action Level Timing.....	174
6.3.6.1 <i>Calculation of Remaining Time.....</i>	<i>174</i>
6.3.6.2 <i>Action Level Timing Function</i>	<i>176</i>
6.3.7 Human Machine Interface	178
6.4 System Commissioning	180
6.5 Chapter Summary.....	181
CHAPTER 7 CONCLUSION	183
7.1 Conclusion.....	183
7.2 Future Work	186
REFERENCES.....	187
APPENDIX A Mathematical Modelling Data Tables.....	189

APPENDIX B	Condensate Monitoring System Diagrams.....	201
APPENDIX C	Teleperm XP Logic Function Diagrams	210
APPENDIX D	OTB Station Level One HRSG Assessment Report	211

LIST OF FIGURES

Figure 1.1 Simplified layout of OTB station [1].....	1
Figure 1.2 Schematic diagram of OTB condenser system.....	2
Figure 1.3 Internal structure of a condenser	2
Figure 1.4 Clean tube sheet and corroded tube sheet.....	5
Figure 2.1 Measurement of specific conductivity [7].....	16
Figure 2.2 Principle of cation exchanger	17
Figure 3.1 Inspection on LP steam turbine rotor.....	25
Figure 3.2 Condensate sample point.....	26
Figure 3.3 KH+ analyser and Ko analyser.....	27
Figure 3.4 Condensate specific conductivity (CEP Ko) trend	27
Figure 3.5 Condensate sodium (CEP SODIUM) trend.....	28
Figure 3.6 Time delay for sodium concentration in the boiler drum	29
Figure 3.7 Sodium concentration in the boiler drum	30
Figure 3.8 Cation conductivity (CEP KH+) in the condensate.....	31
Figure 4.1 Simplified inner structure of the condenser.....	33
Figure 4.2 A leak point in a condenser tube.....	34
Figure 4.3 Experiment simulating a condenser tube leak.....	35
Figure 4.4 Leakage rate through a 2 mm diameter orifice.....	35
Figure 4.5 Leakage rate comparison between calculated and experimental results	38
Figure 4.6 Leakage rate through different orifices with differential pressures.....	40
Figure 4.7 Condenser model.....	41
Figure 4.8 Na and Cl concentrations in condenser hotwell (1).....	48
Figure 4.9 Na and Cl concentrations in the condenser hotwell (2).....	49
Figure 4.10 Na concentration comparison at 380MW and 240MW (1).....	51
Figure 4.11 Na concentration comparison at 380MW and 240MW (2).....	52

Figure 4.12 Cl concentration variation with different radius orifices.....	54
Figure 4.13 Cl and Na concentrations in the condenser with different samples.....	57
Figure 4.14 Simplified water cycle system.....	59
Figure 4.15 Drum model diagram.....	61
Figure 4.16 Cl and Na concentrations in HP drum system	72
Figure 4.17 Cl concentrations in the three drum systems	73
Figure 4.18 Simplified water cycle flow diagram.....	74
Figure 4.19 Diagram of water flowing through the preheater	77
Figure 4.20 Simplified water cycle flow diagram.....	83
Figure 4.21 Simplified water cycle system diagram.....	86
Figure 4.22 Cl concentrations at different locations in the HRSG water cycle	91
Figure 4.23 Comparison between actual contamination and the modelled result.....	94
Figure 5.1 Comparison between the calculated and measured sodium (Na) results.....	99
Figure 5.2 Comparison between the calculated and measured KH+ results.....	101
Figure 5.3 Specific conductivity measured results	102
Figure 5.4 Condensate sampling point.....	108
Figure 5.5 Condensate sampling pipe schematic diagram.....	109
Figure 5.6 Sampling pipe layout	109
Figure 5.7 Location of the wet analysis rack	111
Figure 5.8 (a) Wet analysis rack front side.....	111
Figure 5.9 Condensate monitoring system P&ID diagram	113
Figure 5.10 Closed cooling water loop P&ID.....	115
Figure 5.11 Condensate sample loop P&ID.....	115
Figure 5.12 Condensate sample loop	116
Figure 5.13 Flow meter and low flow sensor.....	118
Figure 5.14 Existing single cation resin column.....	119
Figure 5.15 Dual cation exchange resin column diagram.....	120
Figure 5.16 Power distribution schematic wiring diagram	123
Figure 5.17 Internal structure of the electrical distribution box.....	124
Figure 5.18 Wiring terminal and DCS I/O modules	125

Figure 5.19 Analogue signal wiring diagram.....	126
Figure 5.20 Digital signal wiring diagram.....	128
Figure 6.1 Teleperm XP distributed control system.....	131
Figure 6.2 Hierarchical structure of Teleperm XP [15].....	133
Figure 6.3 FUM and SIM configuration	134
Figure 6.4 Teleperm XP Automation Systems	136
Figure 6.5 AS620B system topology	137
Figure 6.6 Automation system 620B structure.....	138
Figure 6.7 SIM module cabinet.....	139
Figure 6.8 SIM-B module arrangement	141
Figure 6.9 Configuration of SIM module	143
Figure 6.10 Engineering System Arrangement [15]	144
Figure 6.11 Function block diagram	145
Figure 6.12 Function block diagram layout.....	146
Figure 6.13 Logarithmic current output - four decade [16]	149
Figure 6.14 Na logarithmic curve in linear scale	150
Figure 6.15 Na value with logarithmic scale	151
Figure 6.16 Comparison between logarithmic and proportional mode	153
Figure 6.17 TXP Sodium signal function diagram	156
Figure 6.18 Cation conductivity 2-out-of-3 voting function.....	158
Figure 6.19 1V2 function schematic diagram.....	161
Figure 6.20 System alarms logic schematic diagram.....	164
Figure 6.21 Alarms displayed on HMI.....	165
Figure 6.22 Sodium action level voting logic diagram.....	167
Figure 6.23 Cation conductivity action level voting logic diagram.....	168
Figure 6.24 Final action level voting logic	170
Figure 6.25 Action level activation logic diagram.....	171
Figure 6.26 Action level active indication on HMI	172
Figure 6.27 Contamination level matrix table	172
Figure 6.28 Matrix table animation logic diagram	173

Figure 6.29 Remaining time calculation example	176
Figure 6.30 Action level timing function logic diagram	177
Figure 6.31 Action level timing indication on HMI.....	178
Figure 6.32 Condensate monitoring system HMI graphic	179
Figure 6.33 Data trending graphic	180
Figure A. 1 Water steam cycle overview diagram.....	199
Figure A. 2 HRSG overview diagram.....	200
Figure B. 1 Front side of the analysis rack.....	202
Figure B. 2 Back side of the analysis rack.....	203
Figure B. 3 Condensate monitoring system P&ID diagram	204
Figure B. 4 Power distribution schematic wiring diagram	205
Figure B. 5 Analogue signal wiring diagram	206
Figure B. 6 Digital signal wiring diagram.....	207

LIST OF TABLES

Table 2.1 HRSG cycle chemistry monitoring parameters [4].....	21
Table 2.2 Action level conditions for condensate contamination [4].....	22
Table 4.1 Feedwater flow rate to each drum system.....	68
Table 4.2 Technical data for condensate preheater	76
Table 4.3 Technical data for HP economiser #1.....	79
Table 4.4 Technical data for HP economiser #2.....	80
Table 4.5 Technical data for IP economiser	81
Table 4.6 Condensate and feedwater flow rates through the different systems	82
Table 4.7 Technical data for major pipelines [1].....	83
Table 4.8 Water travel time through pipeline	84
Table 4.9 Water travel time in the water cycle system.....	86
Table 4.10 Water travel time from condenser to major parts in water cycle.....	88
Table 4.11 Cl contamination time at different locations of the water cycle.....	91
Table 5.1 Solutions with different dilution rates	98
Table 5.2 Sodium measured and calculated results.....	98
Table 5.3 Cation Conductivity (KH+) measured and calculated results.....	100
Table 5.4 Specific conductivity (Ko) measured results	101
Table 5.5 Contamination level comparison.....	102
Table 5.6 Analyser price list.....	103
Table 6.1 Module and signal allocation	142
Table 6.2 Condensate monitoring system signals	147
Table 6.3 Sodium action level.....	148
Table 6.4 Na logarithmic expression format	150
Table 6.5 Analyser output current in logarithmic mode and Proportional mode	152
Table 6.6 Sodium value accuracy test results	157

Table 6.7 Combined action level voting table.....	169
Table 6.8 Permissible running time per event.....	174
Table A. 1 Leak rate comparison between experiment and calculation results.....	190
Table A. 2 Flow through different radius orifices with different DP	190
Table A. 3 Na and Cl concentration in condenser hotwell.....	191
Table A. 4 Na Concentration in condensate at 380MW and 240MW	192
Table A. 5 Cl Concentration in condensate with different radius orifices	192
Table A. 6 Na and Cl concentration in condensate with different samples.....	193
Table A. 7 Cl and Na concentration in HP drum.....	194
Table A. 8 Cl concentration in three drum systems	194
Table A. 9 Cl concentrations at different locations of water cycle system	195
Table B. 1 Condensate Monitoring System Component KKS Codes.....	208

LIST OF ABBREVIATIONS

AI	Analogue Input
AO	Analogue Output
AP	Automation Processor
APF	Automation Processor Fail-Safe
APT	Automation Processor Turbine
AS	Automation System
AVT	All Volatile Treatment
barA	bar Absolute
CB	Circuit Breaker
CSMA/CD	Carrier Sense Multiple Access with Collision Detection
DCS	Distributed Control System
DI	Digital Input
DN	Diameter Nominal
DO	Digital Output
DP	Differential Pressure
DS	Diagnostic System
DT	Diagnostic Terminal
EOH	Equivalent Operation Hour
EPRI	Electric Power Research Institute
EPROM	Erasable Programmable Read-Only Memory
ES	Engineering System
ET	Engineering Terminal
FAC	Flow Accelerated Corrosion
HMI	Human Machine Interface
HP	High Pressure
HRSG	Heat Recovery Steam Generator
ID	Inside Diameter
IP	Intermediate Pressure
LP	Low Pressure
MCB	Miniature Circuit Breaker
MCC	Motor Control Centre
OD	Outside Diameter
OM	Operation and Monitoring System
OT	Operation Terminal
OTB	Otahuhu B Power station

PI	Plant Information
ppb	parts per billion
ppm	parts per million
TSV	Thermal Shutoff Valve