Sirindhorn International institute of Technology Thammasat University

Thesis ME-Ph.D.-2004-03

A STUDY OF STEAM EJECTOR REFRIGERATION CYCLE, PARAMETERS AFFECTING PERFORMANCE OF THE EJECTOR

Table of Contents

Chapter	Title	Page
	Signature Page	i
	Acknowledgement	ii
	Abstract	iii
	Table of Contents	v
	List of Figures	vii
	List of Tables	X
	Nomenclature	xi
1.	Introduction	1
2.	Background of Ejector and Ejector Refrigeration System	5
	2.1 Background of Ejector	5
	2.2 Background of Ejector Refrigeration Cycle	13
	2.2.1 Performance Characteristics	15
	2.3 Conclusion	19
3.	Experimental Apparatus	21
	3.1 Design and Construction	21
	3.2 Materials of Construction	21
	3.3 The Ejector	24
	3.3.1 The Primary Nozzle	25
	3.3.2 The Mixing Chamber	25
	3.3.3 The Throat	26
	3.3.4 The Subsonic Diffuser	27
	3.4 The Steam Boiler	28
	3.5 The Superheater	28
	3.6 The Evaporator	28
	3.7 The Condenser	29
	3.8 The Pumping System	29
	3.9 Instrumentation and Control	30
	3.10 Conclusion	32
4.	Computational Fluid Dynamics (CFD) Simulation on a	
	Supersonic Flow within a Steam Ejector	33
	4.1 Purpose of the Investigation	33
	4.2 Model Descriptions	34
	4.2.1 Geometries	34
	4.2.2 Grid	34

Chapter	Title	Page
	4.3 Case Setup	36
	4.3.1 Working fluid properties	36
	4.3.2 Boundary conditions	37
	4.4 Results	38
	4.5 Conclusion	39
5.	Flow and Mixing Process within a Steam Ejector	40
	5.1 Flow and Mixing Process of the Steam Ejector	41
	5.2 Conclusion	48
6.	Parameters Affecting Performance of the Ejector 6.1 Performance of the Steam Ejector, Effect of the	50
	Operating Conditions	51
	6.1.1 Effect of Ejector Downstream Condition	52
	6.1.2 Effect of Primary Fluid Upstream Condition	57
	6.1.3 Effect of Secondary Fluid Upstream Condition6.2 Performance of the Steam Ejector, Effect of the	61
	Ejector Geometries	- 66
	6.2.1 Effect of Primary Nozzle Geometries	66
	6.2.2 Effect of Primary Nozzle Exit Position (NXP)	71
	6.2.3 Effect of Mixing Chamber Geometries	76
	6.2.4 Effect of Ejector Throat Length	81
	6.3 Conclusion	86
7.	Ejector Performance Prediction Using Computational	
	Fluid Dynamics Method	92
	7.1 Ejector Performance Prediction using CFD Method	92
	7.2 Recommendations for Model Improvement	96
8.	Conclusions	99
	References	104
	External Examiner's Comments and Answer to the Comments	109