

Table of Contents

Chapter Title	Page
Signature Page	i
Acknowledgements	ii
Abstract	iii
List of Figures	vii
List of Tables	viii
1. Introduction	1
1.1 Occupational Industrial Hazards	1
1.2 Job Rotations and Workforce Scheduling	1
1.3 Problem Statements	3
1.4 Objectives of the Study	3
1.5 Organization of the Dissertation	3
2. Reviews on Industrial Noise and Energy Expenditure	5
2.1 Industrial Noise	5
2.1.1 Measures of Noise Levels	5
2.1.2 Permissible Noise Exposure Limits	5
2.1.3 Industrial Noise Control	7
2.2 Energy Expenditure	8
2.2.1 Assessment of Energy Expenditure	9
2.2.2 Assessment of Energy Requirement	10
2.2.3 Recommended Limits	11
3. Reviews on Combinatorial Optimization Problems	12
3.1 The Minimum-Makespan Multiprocessor Scheduling Problem	12
3.2 The One-Dimensional Bin Packing Problem	13
3.2.1 Approximation Algorithms	14
3.2.2 Exact Algorithms	15
3.2.3 Meta-heuristic Algorithms	16
3.2.4 Variants of 1BPP	16
3.3 The Variable-Sized Bin Packing Problem	17
3.4 The Two-Dimensional Vector Packing Problem	17
3.5 The Minimax Work Assignment Problem	19
3.6 The Dual Problem of Minimax WAP	22
4. The Workforce Scheduling Problem with Noise Criterion	23
4.1 Problem Descriptions and Mathematical Model	23
4.2 Lower Bound	25
4.3 The Modified FFD Heuristic (MFFD-N)	25
4.4 The DFDS- x Heuristic for WSP-N	26
4.4.1 Dual Fit Decreasing (DFD)	26

4.4.2	Dual Fit Decreasing with Swaps (DFDS)	27
4.4.3	DFDS with Random Search (DFDS- x)	28
4.5	The Branch-and-Bound Heuristic (BnB-H)	28
4.6	The Branch-and-Bound Method (BB-N)	29
4.7	Hybrid Procedure	30
4.8	Numerical Example	30
4.8.1	Computation of Lower bound	31
4.8.2	Solution of MFFD-N Heuristic	31
4.8.3	Solution of DFDS Heuristic	31
4.8.4	Solution of BnB-H	34
4.8.5	Solution of BB-N	37
4.9	Computational Experiments	39
4.9.1	Test Problems	39
4.9.2	Experiment	39
4.9.3	Results	39
5.	The Workforce Scheduling Problem with Energy Criterion	44
5.1	Problem Descriptions and Mathematical Model	44
5.2	Lower Bound	45
5.3	The Modified FFD Heuristic (MFFD-E)	45
5.4	The DFDS- x Heuristic for WSP-E	46
5.4.1	Dual Fit Decreasing (DFD)	46
5.4.2	Dual Fit Decreasing with Swaps (DFDS)	46
5.4.3	DFDS with Random Search (DFDS- x)	47
5.5	The Branch-and-Bound Method (BB-E)	48
5.6	Hybrid Procedure	48
5.7	Numerical Example	49
5.7.1	Computation of Lower bound	49
5.7.2	Solution of MFFD-E Heuristic	49
5.7.3	Solution of DFDS Heuristic	49
5.7.4	Solution of BB-E	50
5.8	Computational Experiments	53
5.8.1	Test Problems	53
5.8.2	Experiment	53
5.8.3	Results	53
6.	The Two-Criterion Workforce Scheduling Problem	57
6.1	Problem Descriptions and Mathematical Model	57
6.2	Lower Bounds	58
6.3	Heuristics	59
6.3.1	2MFFD, 2MBFD, 2MFFDc, and 2MBFDc	59
6.3.2	Two-Vector Dual Fit Decreasing (2DFD)	59
6.3.3	Two-Vector Dual Fit Decreasing with Swaps (2DFDS)	60
6.3.4	2DFDS with Random Search (2DFDS- x)	62
6.4	Exact Algorithms	62
6.4.1	The BB_1 algorithm	62
6.4.2	The BB_2 algorithm	64

6.4.3 The BB_3 algorithm	65
6.5 Hybrid Procedure	65
6.6 Numerical Example	65
6.7 Computational Experiments	66
6.7.1 Test Problems	66
6.7.2 Experiment	67
6.7.3 Results	67
7. Conclusions and Recommendations	71
7.1 Algorithms for WSP-N	72
7.2 Algorithms for WSP-E	72
7.3 Algorithms for 2WSP	72
7.4 Recommended Future Works	73
References	74

สำนักหอสมุด