

CONTENTS

CHAPTER 1 INTRODUCTION AND OBJECTIVES OF THE STUDY	1
1.1 Introduction	1
1.1.1 Energy scenario and importance of surface coal mining in India	1
1.1.2 Overburden removal in surface coal mining	2
1.1.3 A comparison of overburden removal with various HEMM.....	3
1.1.4 Global dragline production.....	5
1.1.5 History and assessment of dragline mining methods in India	5
1.1.6 Tandem dragline operation	10
1.1.7 Planning of tandem dragline operation.....	11
1.1.8 Planning of dragline operations using computer	12
1.2 Objectives of the study	13
1.3 Outline of the thesis.....	15
CHAPTER 2 LITERATURE REVIEW	17
2.1 History of the dragline.....	17
2.2 An introduction to dragline	17
2.3 Classifications of dragline.....	19
2.4 Dragline applicability conditions in mining operations	19
2.5 Dragline applications.....	20
2.6 Dragline advantages, disadvantages, and limitations	20
2.6.1 Advantages	20
2.6.2 Disadvantages.....	21
2.6.3 Limitations.....	22
2.7 Dragline modes of operation	22
2.7.1 Normal underhand digging.....	23

2.7.2 Overhand digging or chop-down operation.....	23
2.7.3 Pull-back operation from spoil side.....	24
2.8 Dragline stripping methods.....	25
2.8.1 Single seam methods	25
2.8.2 Tandem dragline method.....	28
2.8.3 Multi-seam methods	38
CHAPTER 3 - PLANNING OF DRAGLINE OPERATION AND DEVELOPMENT OF THREE-DIMENSIONAL BALANCING DIAGRAM.....	40
3.1 Introduction.....	40
3.2 Planning for dragline operation.....	40
3.2.1 Dragline method selection.....	40
3.2.2 Dragline machine size selection	41
3.2.3 Macro-level operational planning	41
3.2.4 Micro-level operational planning	45
3.2.5 Balancing diagram.....	48
CHAPTER 4 VALIDATION AND APPLICATION OF THE DEVELOPED COMPUTER PROGRAM.....	65
4.1 Validation of the computer program with actual field conditions	65
4.2 Applications of the developed model.....	69
CHAPTER 5 FIELD STUDIES	70
5.1 General	70
5.2 Brief information about NCL.....	71
5.3 Nighai project.....	75
5.3.1 General information about Nighai project.....	75
5.3.2 Mineable reserves(MR),overburden(OBR), and stripping ratio(SR).....	75
5.3.3 Quarry parameters	76
5.3.4 Details of major HEMM equipment deployed in the project	76
5.3.5 Method of working.....	77

5.4 Dhudhichua project	79
5.4.1 General information about Dhudhichua project	79
5.4.2 Mineable reserves(MR),overburden(OBR), and stripping ratio(SR)	80
5.4.3 Description of coal seams.....	80
5.4.4 Details of major HEMM equipment deployed in the project	82
5.4.5 Method of working and its status	83
5.5 Bina project	84
5.5.1 General information about Bina project	84
5.5.2 Geology and coal reserves.....	85
5.5.3 Details of major HEMM equipment deployed in the project	85
5.5.4 Method of working	86
5.6 Jayant project.....	88
5.6.1 General information about Jayant project	88
5.6.2 Summary of coal reserve, OB estimate, and other vital parameters.....	88
5.6.3 Description of coal seams.....	89
5.6.4 Mineable reserves(MR),overburden(OBR), and stripping ratio(SR)	90
5.6.5 Details of major HEMM equipment deployed in the project	91
5.6.6 Method of working	92
5.7 Data collection from field study.....	94
5.8 Dragline monitoring system.....	94
5.9 Determination of annual production capacity of different draglines	97
5.9.1 Average cycle time	98
5.9.2 Average annual production of different capacity draglines for various swing angles	99
CHAPTER 6 RESULTS AND DISCUSSION THROUGH PARAMETRIC ANALYSIS IN THE CASE STUDIES	101
6.1 Annual production of leading dragline is less than the annual production of lagging dragline	102

6.2 Annual production capacity of leading and lagging dragline are same	110
6.3 Annual production capacity of leading dragline is greater than the annual production capacity of lagging dragline.....	117
6.4 Relationship equations	124
6.5 Influence of cut width	141
6.6 Influence of stripping bench height	149
6.7 Influence of coal seam thickness	156
6.8 Influence of seam gradient.....	163
6.9 To find the best combination of cut width and bench height within the possible working range of draglines	169
CHAPTER 7 DRAGLINE COST ANALYSIS.....	175
7.1 Cost analysis	175
7.1.1 Calculation of cost of dragline operation in mines under case study	175
CHAPTER 8 CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH	180
8.1 Conclusions.....	180
8.2 Recommendations for future research	181
REFERENCES	183
APPENDIX-1 - THREE-DIMENSIONAL BALANCING DIAGRAMS	193
APPENDIX-2 Computer program codes of three-dimensional balancing diagram for horizontal tandem operation	230
APPENDIX-3 Computer program codes of three-dimensional balancing diagram for vertical tandem operation (mode-1 and mode-2).....	269
APPENDIX 4: LIST OF PUBLICATIONS	312