

LIST OF FIGURES

Figure 1.1	Physics of conductive induction	2
Figure 1.2	Physics of ion-bombardment	3
Figure 1.3a	Physics of particle-particle charging	4
Figure 1.3b	Physics of wall-particle charging	5
Figure 2.1.1	Experimental model for analysis	14
Figure 2.2.1	Effect of charge on the trajectory of a particle	25
Figure 2.2.2	Effect of particle size on the trajectory when different charges are applied to the particles of different sizes	27
Figure 2.2.3	Effect of particle size on the trajectory when same charge is applied to particles of different sizes	28
Figure 2.2.4	Effect of the feeder position on the trajectory of the particle	29
Figure 3.1	Schematic representation of the open-gradient triboelectrostatic separator used in the present work	41
Figure 3.2a	Schematic representation of the tribocharger and feed distribution system used in the preliminary work	42
Figure 3.2b	Schematic of the new turbo charger used in the TES bench-scale unit separation study	43
Figure 3.3	Flowsheet of the test work conducted during the course of experiments .	44
Figure 3.4	Comparison of separator efficiency in product ash content. The results were obtained on Pittsburgh No. 8 clean coal sample with different chargers installed	45

Figure 3.5	Comparison of separator efficiency in product sulfur content. The results were obtained on Pittsburgh No. 8 clean coal sample with different chargers installed	46
Figure 3.6	Product ash content as a function of combustible recovery. The results were obtained on Pittsburgh No. 8 clean coal sample in the TES bench-scale unit separation study	47
Figure 3.7	Product sulfur content as a function of combustible recovery. The results were obtained on Pittsburgh No. 8 clean coal sample in the TES bench-scale unit separation study	48
Figure 3.8	Effect of applied electrode potential on ash rejection. The results were obtained on Pittsburgh No. 8 clean coal sample in the TES bench-scale unit separation study	49
Figure 3.9	The effect of applied electrode potential on sulfur rejection. The results were obtained on Pittsburgh No. 8 clean coal sample in the TES bench-scale Unit separation study	50
Figure 3.10	The effect of feed rate on the separation efficiency of the bench-scale TES unit. The ash vs. recovery curves were obtained on a Pittsburgh No. 8 clean coal sample with a feed rate in the range of 3.6-40.0 kg/hr	51
Figure 3.11	The effect of feed rate on the separation efficiency of the bench-scale TES unit. The sulfur vs. recovery curves were obtained on a Pittsburgh No. 8 clean coal sample with a feed rate in the range of 3.6– 40.0 kg/hr	52
Figure 3.12	The effect of the feed rate on the TES unit separation efficiency. The grade vs. recovery curve (pyritic sulfur) were obtained on Pittsburgh No. 8 clean	

	coal sample with varies separator feed rates	53
Figure 3.13	The effect of feed rate on the separation efficiency of the bench-scale TES unit. The normalized ash vs. recovery curves were obtained on a Pittsburgh No. 8 clean coal sample with a feed rate in the range of 3.6 – 40.0 kg/hr ..	54
Figure 3.14	The effect of feed rate on the separation efficiency of the bench-scale TES unit. The normalized sulfur vs. recovery curves were obtained on a Pittsburgh No. 8 clean coal sample with a feed rate in the range of 3.6 – 40.0 kg/hr	55
Figure 3.15	Ash rejection as a function of combustible recovery. The results were obtained on a Pittsburgh No. 8 clean coal sample in the bench-scale TES unit study	56
Figure 3.16	Total sulfur rejection as a function of combustible recovery. The results were obtained on Pittsburgh No. 8 clean coal sample in the TES bench-scale unit separation study	57
Figure 3.17	Separation efficiency as a function of feed rate. The maximum throughput of the bench-scale TES unit was found approximately 30 kg/hr	58
Figure 3.18	Effect of the electrical field strength on the separation efficiency of the bench-scale TES unit. The grade vs. recovery curves (ash) were obtained on a Sewell seam clean coal sample with different voltage intensities	59
Figure 3.19	Effect of the electrical field strength on the separation efficiency of the bench-scale TES unit. The grade vs. recovery curves (sulfur) were obtained on a Sewell seam clean coal sample with different voltage	

	intensities	60
Figure 3.20	Combustible recovery as a function of ash rejection. The bench-scale TES unit test results were obtained on a Sewell seam clean coal sample in the present study	61
Figure 3.21	Combustible recovery as a function of total sulfur rejection. The bench-scale TES unit test results were obtained on a Sewell seam clean coal sample in the present study	62
Figure 3.22	The effect of feed size on the separation efficiency of the bench-scale TES unit. The ash content vs. recovery curves were obtained on a Sewell Seam sample	63
Figure 3.23	The effect of feed size on the separation efficiency of the bench-scale TES unit. The total sulfur content vs. recovery curves were obtained on a Sewell Seam sample	64
Figure 3.24	The effect of feed size on the separation efficiency of the bench-scale TES unit. The normalized ash vs. recovery curves were obtained on a Sewell Seam sample	65
Figure 3.25	The effect of feed size on the separation efficiency of the bench-scale TES unit. The normalized sulfur vs. recovery curves were obtained on a Sewell Seam sample	66
Figure 3.26	The effect of feed size on the separation efficiency of the bench-scale TES unit. The ash rejection vs. recovery curves were obtained on a Sewell Seam sample	67

Figure 3.27 The effect of feed size on the separation efficiency of the bench-scale TES unit. The sulfur rejection vs. recovery curves were obtained on a Sewell Seam sample68