APPENDIX B

Table B.1: Experimental Results upon EDM of die steel using positive polarity copper tool

Sr. No.	MRR 1 (mm^3/min)	TW1 (mm^3/min)	Roughness1 R*a* (μm)	Micro-hardness1 HV	Residual Stress1 (MPa)	BN1 (rms in a.u.)	BN1 (peak in a.u.)
1	2.5	1.21	1.21	934	127	45.1	74.3
2	3.49	1.71	1.53	930	135	38.88	66.66
3	3.41	1.61	1.83	951	218	38.88	66.66
4	3.57	1.89	2.22	978	223	41.1	67.7
5	4.16	1.99	2.31	961	349	39.83	68.14
6	4.18	1.98	2.36	996	353	39.45	66.95
7	4.19	1.98	2.45	970	387	43.92	71.83
8	4.15	1.97	2.56	965	397	43.92	71.83
9	4.19	2.01	2.78	969	426	37.37	62.75
10	4.85	2.26	2.99	1021	439	37.2	56.6
11	4.79	2.18	3.06	1010	447	35.1	56.9
12	5.02	2.54	3.09	1015	278	34.89	59.24
13	6.02	2.62	3.18	1020	281	34.87	54.91

Table B.2: Experimental Results upon EDM of die steel using negative polarity copper tool

Sr. No.	MRR2 (mm^3/min)	TW2 (mm^3/min)	Roughness2 R*a* (μm)	Microhardness2 HV0.05	Residual Stress2 (MPa)	BN2 (rms in a.u.)	BN2 (peak in a.u.)
1	6.21	2.11	3.25	1031	269	34.3	58.3
2	8.23	3.21	3.36	1023	273	31.8	50.9
3	7.64	2.78	3.43	1034	336	31.8	50.9
4	8.52	3.67	3.58	1038	467	32.71	48.04
5	9.19	3.97	3.67	1024	474	33.4	55.5
6	9.22	3.97	3.85	1036	318	32.9	54.5
7	9.22	3.91	4.04	1041	323	32.33	50.36
8	9.23	3.95	4.09	1047	289	32.58	52.9
9	9.19	3.95	4.17	1022	292	32.37	48.04
10	10.73	4.67	4.23	1081	363	31.50	48.50
11	10.15	4.31	4.36	1085	370	31.27	49.87
12	11.01	4.92	4.44	1088	242	31.20	49.10
13	11.99	5.11	4.56	1096	247	30.59	44.61

Table B.3. Experimental Results upon EDM of die steel using positive polarity copper tungsten tool

Sr. No.	MRR5 (mm^3/min)	TW5 (mm^3/min)	Roughness5 R*a* (μm)	Microhardness5 HV0.05	Residual Stress5 (MPa)	BN5 (rms in a.u.)	BN5 (peak in a.u.)
1	21.01	11.12	7.49	1206	429	19.13	30.1
2	23.34	12.19	7.62	1289	435	19.13	23.84
3	22.71	12.34	7.71	1351	612	19.41	27.79
4	23.01	12.46	7.89	1214	623	19.4	28.7
5	23.89	12.89	7.95	1297	256	19.28	26.78
6	23.87	12.9	8.11	1299	259	19.17	27.58
7	23.88	12.91	8.23	1310	265	20.1	27.2
8	23.87	12.91	8.31	1314	645	19.1	26.9
9	23.86	12.93	8.35	1319	659	18.6	25.1
10	24.45	13.54	8.43	1320	696	18.5	25.9
11	24.56	13.12	8.58	1367	712	18.2	24
12	24.88	13.32	8.69	1345	453	17.25	22.08
13	26.02	14.01	8.78	1326	459	16.77	21.78

Table B.4: Experimental Results upon EDM of die steel using negative polarity copper tungsten tool

Sr. No.	MRR6 (mm^3/min)	TW6 (mm^3/min)	Roughness6 R*a* (μm)	Microhardness6 HV0.05	Residual Stress6 (MPa)	BN6 (rms in a.u.)	BN6 (peak in a.u.)
1	27.72	13.1	8.92	1229	593	16.2	21.1
2	28.51	14.51	9.09	1186	526	16.16	20.56
3	28.21	14.11	9.24	1266	533	15.93	20.51
4	28.76	14.42	9.38	1272	378	15.7	19.6
5	29.41	15.04	9.47	1387	728	15.5	18.1
6	29.42	15.05	9.53	1393	737	15.2	19.2
7	29.43	15.07	9.68	1399	574	15.1	17.2
8	29.43	15.07	9.88	1410	579	14.9	18.1
9	29.43	15.07	9.96	1419	559	13.9	15.5
10	30.35	15.21	10.34	1406	567	12.89	13.78
11	30.01	15.41	10.78	1437	509	12.88	12.55
12	30.54	15.65	11.16	1449	489	12.69	13.12
13	31.91	16.11	11.87	1418	496	12.20	11.10

Table B.5: Experimental Results upon EDM of die steel using positive polarity graphite tool

Sr. No.	MRR3 (mm^3/min)	TW3 (mm^3/min)	Roughness3 R*a* (μm)	Microhardness 3 HV0.05	Residual Stress3 (MPa)	BN3 (rms in a.u.)	BN3 (peak in a.u.)
1	11.01	6.18	4.69	1128	299	30.59	44.61
2	13.44	7.32	4.76	1115	309	30.1	47.4
3	12.78	6.98	4.91	1137	311	29.8	44.7
4	13.63	7.61	5.11	1153	518	29.54	44.29
5	14.32	7.99	5.27	1161	183	29.3	47.97
6	14.34	7.98	5.34	1164	191	28.96	45.92
7	14.34	7.99	5.46	1169	198	28.1	42.1
8	14.31	7.98	5.49	1171	674	27.4	44.1
9	14.32	7.95	5.56	1172	636	26.79	38.08
10	14.91	8.32	5.67	1176	586	26.71	37.74
11	14.73	8.09	5.71	1182	548	26.29	40.45
12	15.45	8.68	5.89	1181	406	26.1	37.5
13	16.22	9.01	5.95	1198	419	25.8	40.2

Table B.6: Experimental Results upon EDM of die steel using negative polarity graphite tool

Sr. No.	MRR4 (mm^3/min)	TW4 (mm^3/min)	Roughness4 R*a* (μm)	Microhardness4 HV0.05	Residual Stress4 (MPa)	BN4 (rms in a.u.)	BN4 (peak in a.u.)
1	17.3	8.54	6.12	1191	156	25.52	40.46
2	18.64	9.45	6.24	1220	167	24.8	37.9
3	18.51	9.27	6.35	1253	174	24.49	37.42
4	19.09	9.51	6.44	1224	236	23.99	33.99
5	19.62	10.02	6.56	1242	284	23.9	36.5
6	19.63	10.06	6.71	1245	342	23.7	33.4
7	19.64	10.06	6.84	1251	568	23.14	31.06
8	19.64	10.02	6.89	1276	327	22.9	34.8
9	19.62	10.03	6.93	1258	209	21.9	31.8
10	20.25	10.52	7.07	1251	214	21.57	28.96
11	19.99	10.31	7.16	1274	136	21.3	31.4
12	20.41	10.69	7.23	1261	143	21.2	28.2
13	21.76	11.31	7.38	1253	151	20.9	28.6

Table B.7. Experimental results Machinability Indices of workpiece using three electrode obtained by standard ZNC-EDM

Machinability Indices/Surface Characteristics	Tool (+)			Tool (-)		
	Cu	Cu-W	Graphite	Cu	Cu-W	Graphite
MRR (mm^3/min)	17	6.8	7	31	22	26.5
TW (mm^3/min)	9.7	3	9.9	16.5	11.5	14.5
Microhardness (HV)	1290	1500	1375	1030	1210	1090
Surface Roughness (mm)	6.3	4.2	4.9	11.9	7.7	9.1
Residual Stress (MPa)	490	550	380	630	260	690
BN (rms value)	29	41	32.5	15	24	20
BN (peak value)	43	67	53	37	29	18

Table B.8: Experimental Results upon EDM of die steel using positive and negative polarity copper tool using L9 orthogonal array.

Sr. No.	MRR(mm^3/min) of Cu positive polarity	MRR(mm^3/min) of Cu negative polarity
1	0.15385	0.01283
2	0.34615	0.01923
3	1.69871	0.05128
4	0.48077	0.03846
5	0.16026	0.08974
6	0.36538	0.03205
7	0.03205	0.05689
8	0.01923	0.08754
9	0.04487	0.09765

Table B.9: Experimental Results upon EDM of die steel using positive and negative polarity graphite tool using L9 orthogonal array.

Sr. No.	MRR(mm^3/min) of graphite positive polarity	MRR(mm^3/min) of graphite negative polarity
1	2.10872	20.326
2	4.24417	27.626
3	10.13576	34.369
4	8.31256	43.901
5	1.17845	16.096
6	2.87942	39.923
7	1.60428	16.989
8	4.18090	27.932
9	0.83477	3.180