

Emission reduction calculation

Year	Emission Reduction	
2001-02	8256	
2002-03	12706	
2003-04	14347	
2004-05	12562	
2005-06	12562	
2006-07	12562	
2007-08	12562	
2008-09	12562	
2009-10	12562	
2010-11	12562	
	123241	

Binani Cement Limited

Clinker cooler modification Project data for july 2000 to Jun 2001

			For July-2000					For Aug-2000				
	Parameter		03-Jul-00	11-Jul-00	18-Jul-00	26-Jul-00	Monthly Average	02-Aug-00	10-Aug-00	16-Aug-00	25-Aug-00	Monthly Average
1	Clinker production (Clk)	TPD	5250	5250	5250	5250		5250	5250	5300	5300	
	Inlet temperature of the clinker in cooler ($T_{\text{Clk in}}$)	C	1420	1420	1420	1420		1420	1420	1420	1420	
	Specific heat of clinker ($S_{\text{Clk in}}$)	kcal/kg/C	0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
	Heat from clinker	kCal/hr	81249285	81249285	81249285	81249285		81249285	81249285	82023087	82023087	
2	Clinker dust from kiln to cooler (M_{dust})	TPD	105	105	105	105		105	105	106	106	
	Temp. of Clinker dust from kiln to cooler (T_{dust})	C	1420	1420	1420	1420		1420	1420	1420	1420	
	Sp. Heat of Clinker dust from kiln to cooler (S_{dust})	kcal/kg/C	0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
	Heat from Clinker dust from kiln to cooler	kCal/hr	1624986	1624986	1624986	1624986		1624986	1624986	1640462	1640462	
3	Inlet temperature of the cooling air in cooler ($T_{\text{cooling air}}$)	C	28,8	31,5	28,0	30,8		28,5	29,8	25,5	31,5	
	Mass Flow rate of cooling air in cooler ($M_{\text{cooling air}}$)	kg/hr	579854	552325	583411	589725		586879	591187	600035	579911	
	Specific heat of cooling air ($S_{\text{cooling air}}$)	kcal/kg C	0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239	
	Heat from cooling air	kCal/hr	3988145	4162948	3907732	4338787		4001294	4207807	3659612	4370871	
4	Power consumed by cooler fans (P_{fan})	kWh/Day	32577	28896	32937	34980		33703	34893	34969	33495	
	Heat produced by cooler fans	kCal/hr	1167343	1035440	1180243	1253450		1207691	1250333	1253056	1200238	
1a	Exhaust air temperature from cooler ($T_{\text{Exhaust air cooler}}$)	C	290	300	285	305		290	295	305	295	
	Mass Flow rate of Cooler exhaust gas ($M_{\text{exhaust gas}}$)	Kg/hr	361949	354996	364329	339004		345673	343581	328130	346524	
	Sp. Heat of cooler Exhaust gas ($S_{\text{exhaust gas}}$)	cal/kg/deg.C	0,244	0,245	0,244	0,245		0,244	0,244	0,245	0,244	
	Heat from Cooler Exhaust gas	kcal/hr	25646433	26044728	25358532	25297439		24493205	24775880	24486038	24988093	
2a	Clinker from Cooler ($M_{\text{Clk out}}$)	TPD	5119	5119	5119	5124		5125	5124	5178	5173	
	Temp. of Clinker from Cooler ($T_{\text{Clk out}}$)	Deg.C	135,0	132,0	130,0	135,0		141,0	142,0	145,0	142,0	
	Sp heat of clinker from cooler ($S_{\text{Clk out}}$)	cal/kg/deg.C	0,191	0,191	0,191	0,191		0,192	0,192	0,192	0,192	
	Heat from Clinker Cooler	kcal/hr	5501737	5370443	5283029	5507155		5772549	5816374	6011413	5871904	
3a	Clinker Dust from Cooler ($M_{\text{dust cooler}}$)	tpd	131	131	131	126		125	126	122	127	
	Temp. of Clinker dust from cooler ($T_{\text{dust cooler}}$)	Deg.C	290,0	300,0	285,0	305,0		290,0	295,0	305,0	295,0	
	Sp heat of clinker dust from cooler ($S_{\text{dust cooler}}$)	cal/kg/deg.C	0,206	0,206	0,205	0,207		0,206	0,206	0,207	0,206	
	Heat from Clinker dust to ESP	kcal/hr	325914	337841	318914	331483		311259	318116	320851	320841	
4a	Radiation Losses (R_{loss})	kcal/hr	393456	381826	396626	384999		394513	389228	407189	381826	
	Heat Losses	kcal/hr	31867540	32134839	31357101	31521077		30971526	31299598	31225491	31562664	
	Cooler Efficiency	%	63,80	63,51	64,35	64,37	64,01	64,84	64,57	64,75	64,63	64,70
	Total heat input	kCal/hr	88029758	88072658	87962245	88466508	88132792,07	88083255	88332409	88576217	89234657	88556634,64
	Kiln running hours (K_{hrs})	hrs	24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00	

For Sept-2000					For Oct-2000					For Nov-2000				
02-Sep-00	16-Sep-00	22-Sep-00	28-Sep-00	Monthly Average	03-Okt-00	12-Okt-00	19-Okt-00	26-Okt-00	Monthly Average	06-Nov-00	15-Nov-00	22-Nov-00	28-Nov-00	Monthly Average
5300	5330	5330	5330		5330	5330	5330	5330		5350	5350	5350	5350	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
82023087	82487369	82487369	82487369		82487369	82487369	82487369	82487369		82796890	82796890	82796890	82796890	
106	107	107	107		107	107	107	107		107	107	107	107	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
1640462	1649747	1649747	1649747		1649747	1649747	1649747	1649747		1655938	1655938	1655938	1655938	
27,0	30,0	31,5	33,0		32,0	31,5	30,3	30,3		28,0	26,5	25,5	23,5	
585438	583299	592925	574883		589703	582182	580449	581152		582070	588084	584261	589703	
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239	
3781004	4186618	4468955	4539768		4515377	4387985	4200952	4206044		3898745	3727633	3563408	3314061	
32951	33585	35825	33112		35414	33894	33173	33295		32708	33236	32257	32507	
1180744	1203463	1283729	1186513		1269002	1214535	1188699	1193071		1172037	1190957	1155876	1164834	
320	330	335	338		325	315	310	308		305	305	290	295	
329788	305770	300658	297333		309891	330053	336048	332494		338712	338322	360908	355834	
0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,244	0,244	
25855416	24744323	24710685	24663037		24686501	25460267	25499594	25062548		25275648	25246534	25572640	25659454	
5174	5211	5212	5213		5211	5205	5204	5206		5224	5224	5219	5220	
142,0	144,0	146,0	145,0		148,0	145,0	142,0	140,0		135,0	134,0	130,0	129,0	
0,192	0,192	0,192	0,192		0,192	0,192	0,192	0,192		0,191	0,191	0,191	0,190	
5872826	6005101	6096503	6052212		6184972	6042946	5906620	5818825		5614752	5570118	5386299	5342470	
126	119	118	117		119	125	126	124		126	126	131	130	
320,0	330,0	335,0	338,0		325,0	315,0	310,0	308,0		305,0	305,0	290,0	295,0	
0,208	0,209	0,209	0,209		0,208	0,208	0,207	0,207		0,207	0,207	0,206	0,206	
349026	340557	343355	344645		336504	340333	337495	330389		331198	330816	324976	329461	
400852	388171	381826	375478		379711	381826	387114	387114		396626	402964	407189	415634	
32478120	31478152	31532370	31435372		31587688	32225372	32130824	31598876		31618224	31550433	31691104	31747019	
63,35	64,84	64,92	65,02	64,53	64,87	64,09	64,11	64,71	64,45	64,68	64,70	64,46	64,30	64,54
88625297	89527197	89889801	89863398	89476422,99	89921495	89739636	89526767	89536231	89681032,30	89523610	89371417	89172111	88931723	89249715,46
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00	

For Dec-2000					For Jan-2001					For Feb-2001			
05-Dez-00	15-Dez-00	23-Dez-00	28-Dez-00	Monthly Average	03-Jan-01	10-Jan-01	17-Jan-01	25-Jan-00	Monthly Average	09-Feb-01	15-Feb-01	21-Feb-01	Monthly Average
5400	5400	5450	5450		5450	5450	5450	5450		5500	5500	5600	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	
83570693	83570693	84344495	84344495		84344495	84344495	84344495	84344495		85118298	85118298	86665903	
108	108	109	109		109	109	109	109		110	110	112	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	
1671414	1671414	1686890	1686890		1686890	1686890	1686890	1686890		1702366	1702366	1733318	
23,5	24,0	22,5	22,5		16,8	17,0	21,0	18,0		23,5	23,5	27,0	
594182	592663	602981	596961		605498	600289	593046	601488		603872	596414	598070	
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	
3339234	3401680	3244268	3211874		2424321	2439380	2977791	2588205		3393688	3351775	3862585	
33261	33173	34422	33391		32844	32079	32231	32612		34932	33641	35153	
1191853	1188699	1233455	1196511		1176910	1149498	1154944	1168597		1251730	1205469	1259649	
295	298	297	300		305	309	311	308		315	321	320	
348305	343233	345552	353740		338175	341787	335497	336502		336551	328661	331253	
0,244	0,245	0,244	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245	
25116508	25009322	25091504	25952581		25235599	25849057	25542210	25364656		25961532	25850014	25970301	
5273	5274	5323	5320		5324	5322	5324	5324		5373	5374	5474	
138,0	136,0	140,0	132,0		135,0	132,0	135,0	138,0		138,0	139,0	142,0	
0,191	0,191	0,192	0,191		0,191	0,191	0,191	0,191		0,191	0,192	0,192	
5802934	5713604	5950236	5580750		5722447	5583297	5722125	5859612		5912952	5961088	6212702	
127	126	127	130		126	128	126	126		127	126	126	
295,0	298,0	297,0	300,0		305,0	309,0	311,0	308,0		315,0	321,0	320,0	
0,206	0,206	0,206	0,206		0,207	0,207	0,207	0,207		0,208	0,208	0,208	
322490	323092	323492	336646		330673	341439	338733	334371		347034	349635	350577	
415634	413523	419856	419856		444120	443065	426187	438846		415634	415634	400852	
31657565	31459541	31785087	32289833		31732839	32216859	32029255	31997486		32637152	32576372	32934432	
64,74	64,98	64,88	64,30	64,72	64,60	64,05	64,48	64,36	64,37	64,32	64,35	64,78	64,48
89773193	89832486	90509108	90439770	90138639,04	89632617	89620262	90164120	89788187	89801296,53	91466082	91377909	93521456	92121815,56
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	

For Mar-2001					For Apr-2001					For May-2001				
07-Mrz-01	16-Mrz-01	20-Mrz-01	29-Mrz-01	Monthly Average	07-Apr-01	13-Apr-01	17-Apr-01	27-Apr-01	Monthly Average	03-Mai-01	10-Mai-01	17-Mai-01	25-Mai-01	Monthly Average
5600	5600	5600	5600		5600	5600	5600	5600		5600	5650	5650	5650	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
86665903	86665903	86665903	86665903		86665903	86665903	86665903	86665903		86665903	87439706	87439706	87439706	
112	112	112	112		112	112	112	112		112	113	113	113	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
1733318	1733318	1733318	1733318		1733318	1733318	1733318	1733318		1733318	1748794	1748794	1748794	
24,8	28,8	31,8	26,5		30,5	32,0	31,0	34,5		35,8	33,0	33,5	36,5	
593187	583398	581166	589628		585490	586387	578463	574717		580350	583944	588088	582604	
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239	
3511257	4012516	4415166	3737415		4272534	4489987	4290601	4745244		4965796	4611324	4714578	5089923	
33517	33184	33799	33501		34139	34814	33077	33577		35012	34719	35647	35687	
1201026	1189093	1211131	1200453		1223314	1247502	1185259	1203176		1254597	1244098	1277351	1278784	
322	325	330	331		325	326	328	331		331	328	330	331	
327226	321218	318020	327385		329256	339348	332652	324504		325269	324715	334015	333374	
0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245	
25819686	25588798	25735636	26576219		26229132	27118722	26751673	26342346		26404492	26113395	27030055	27062419	
5475	5476	5477	5473		5473	5469	5471	5474		5474	5524	5520	5520	
139,0	140,0	140,0	139,0		140,0	142,0	142,0	142,0		141,0	142,0	142,0	145,0	
0,192	0,192	0,192	0,192		0,192	0,192	0,192	0,192		0,192	0,192	0,192	0,192	
6072380	6121412	6121644	6070210		6117954	6207708	6210152	6213018		6165451	6270388	6265817	6409010	
125	124	123	127		127	131	129	126		126	126	130	130	
322,0	325,0	330,0	331,0		325,0	326,0	328,0	331,0		331,0	328,0	330,0	331,0	
0,208	0,208	0,209	0,209		0,208	0,208	0,209	0,209		0,209	0,209	0,209	0,209	
349907	348803	354201	366471		357532	370373	366772	363246		364103	358021	372016	373175	
410356	393456	380769	402964		386057	379711	383942	369127		363831	375478	373362	360652	
32652329	32452470	32592249	33415863		33090675	34076514	33712539	33287736		33297877	33117283	34041249	34205257	
64,93	65,33	65,34	64,20	64,95	64,76	63,80	64,09	64,72	64,34	64,81	65,16	64,24	64,20	64,60
93111505	93600831	94025518	93337089	93518735,64	93895069	94136711	93875082	94347642	94063625,87	94619614	95043922	95180429	95557208	95100293,20
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00	

5437

For Jun-2001		For 2000-01
06-Jun-01	Monthly Average	Annual Average
5650		
1420		
0,262		
87439706		
113		
1420		
0,262		
1748794		
32,5		
585649		
0,239		
4554562		
34854		
1248935		
335		
321070		
0,245		
26388304		
5524		
145,0		
0,192		
6413604		
126		
335,0		
0,209		
366665		
377595		
33546168		
64,69	64,69	64,53
94991997	94991997,00	91236083
24,00		

Heat Cap - Coefficients						
Gas/Mat	*T^0	*T^1	*T^2	*T^3	*T^4	
O2	0,2130	7,796E-05	-7,563E-08	4,074E-11	-8,183E-15	
CO2	0,1906	1,771E-04	-1,733E-07	9,315E-11	-1,894E-14	
N2+Ar	0,2465	-3,284E-06	4,366E-08	-2,750E-11	5,504E-15	
H2O,steam	0,4445	2,910E-05	6,887E-08	-3,726E-11	6,472E-15	
H2O, liq.	1,0000					
Rawmeal	0,2060	1,014E-04	-3,673E-08			
Clinker	0,1742	1,414E-04	-1,283E-07	5,074E-11		

O2	mass %	23,0
CO2	mass %	0,0
N2	mass %	77,0
H2O	mass %	0,0

CV Fan Flow	m3/min	9500
Fan Power Drawn		180

Clinker cooler modification Project data for Aug 2001- March 2002

			For Aug-2001			For Sept-2001					For Oct-2001				
	Parameter		14-Aug-01	18-Aug-01	Monthly Average	03-Sep-01	12-Sep-01	19-Sep-01	28-Sep-01	Monthly Average	04-Oct-01	11-Oct-01	19-Oct-01	23-Oct-01	Monthly Average
1	Clinker production (Clk)	TPD	5820	5820		5820	5850	5850	5850		5850	5850	5850	5850	
	Inlet temperature of the clinker in cooler ($T_{Clk\ in}$)	C	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
	Specific heat of clinker ($S_{Clk\ in}$)	kcal/kg/C	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
	Heat from clinker	kCal/hr	90070635	90070635		90070635	90534917	90534917	90534917		90534917	90534917	90534917	90534917	
2	Clinker dust from kiln to cooler (M_{dust})	TPD	116	116		116	117	117	117		117	117	117	117	
	Temp. of Clinker dust from kiln to cooler (T_{dust})	C	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
	Sp. Heat of Clinker dust from kiln to cooler (S_{dust})	kcal/kg/C	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
	Heat from Clinker dust from kiln to cooler	kCal/hr	1801413	1801413		1801413	1810698	1810698	1810698		1810698	1810698	1810698	1810698	
3	Inlet temperature of the cooling air in cooler ($T_{cooling\ air}$)	C	28,8	27,5		28,5	28,5	32,0	33,8		32,0	30,8	29,5	29,5	
	Flow rate of cooling air in cooler	m3/min	9146	9226		9383	9348	9193	9379		9347	9150	9161	9330	
	Mass Flow rate of cooling air in cooler ($M_{cooling\ air}$)	kg/hr	610361	618263		626694	624357	606925	615667		617092	606605	609802	621068	
	Specific heat of cooling air ($S_{cooling\ air}$)	kcal/kg C	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239	
	Heat from cooling air	kCal/hr	4197963	4067082		4272749	4256812	4647249	4972586		4725094	4462974	4303749	4383264	
4	Power consumed by cooler fans (P_{fan})	kWh/Day	38053	39071		41120	40657	38642	41059		40637	38103	38234	40415	
	Heat produced by cooler fans	kCal/hr	1363566	1400044		1473467	1456876	1384672	1471281		1456159	1365358	1370052	1448204	
1a	Exhaust air temperature from cooler ($T_{Exhaust\ air\ cooled}$)	C	296	295		298	300	308	298		295	293	290	288	
	Flow rate of Cooler exhaust fan	m3/hr	577930	586478		574404	593184	563298	591807		597915	598792	616720	622629	
	Mass Flow rate of Cooler exhaust gas ($M_{exhaust\ gas}$)	Kg/hr	340873	346524		337606	347428	325381	347835		353281	355050	367628	372474	
	Sp. Heat of cooler Exhaust gas ($S_{exhaust\ gas}$)	kcal/kg/deg.C	0,244	0,244		0,245	0,245	0,245	0,245		0,244	0,244	0,244	0,244	
	Heat from Cooler Exhaust gas	kcal/hr	24666144	24988093		24599308	25489455	24526377	25344611		25475372	25424711	26048858	26205468	
2a	Clinker from Cooler ($M_{clk\ out}$)	TPD	5695	5693		5696	5722	5728	5722		5721	5721	5717	5716	
	Temp. of Clinker from Cooler ($T_{clk\ out}$)	Deg.C	136,0	138,0		138,0	134,0	139,0	139,0		135,0	136,0	133,0	130,0	
	Sp heat of clinker from cooler ($S_{clk\ out}$)	kcal/kg/deg.C	0,191	0,191		0,191	0,191	0,192	0,192		0,191	0,191	0,191	0,191	
	Heat from Clinker Cooler	kcal/hr	6170040	6265889		6268759	6100812	6353710	6346879		6148771	6197659	6046423	5898474	
3a	Clinker Dust from Cooler ($M_{dust\ cooler}$)	tpd	125	127		124	128	122	128		129	129	133	134	
	Temp. of Clinker dust from cooler ($T_{dust\ cooler}$)	Deg.C	296,0	295,0		298,0	300,0	308,0	298,0		295,0	293,0	290,0	288,0	
	Sp heat of clinker dust from cooler ($S_{dust\ cooler}$)	kcal/kg/deg.C	0,206	0,206		0,206	0,206	0,207	0,206		0,206	0,206	0,206	0,205	
	Heat from Clinker dust	kcal/hr	317357	320841		317795	330638	323321	327423		327097	325106	331028	331637	
4a	Radiation Losses (R_{loss})	kcal/hr	393456	398739		394513	394513	379711	372303		379711	384999	390285	390285	
	Heat Losses	kcal/hr	31546997	31973562		31580374	32315418	31583118	32391217		32330950	32332476	32816594	32825864	
	Cooler Efficiency	%	67,62	67,15	67,39	67,65	67,05	67,90	67,21	67,45	67,19	67,07	66,52	66,56	66,83
	Total heat input	kCal/hr	97433577	97339174	97386375,65	97618264	98059303	98377536	98789483	98211146,51	98526869	98173947	98019416	98177083	98224328,75
	Kiln running hours (K_{hrs})	hrs	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00	
5	Baseline Efficiency	%			64,53					64,53					64,53
6	Increase in Cooler Efficiency	%			2,86					2,92					2,30
7	Saving in heat output due to increase in cooler efficiency	Kcal/hr			2782557,08					2868262,26					2263269,10
8	Saving in heat input due to increase in cooler efficiency	Kcal/hr			4129205,04					4252395,47					3386394,47
9	Total energy saved	Million Kcal			2384,82					3041,10					2441,76
10	Average calorific value of petcoke	Kcal/ kg			0					0					0
11	Average calorific value of Coal	Kcal/ kg			6484					6517					6947
12	Average calorific value of Lignite	Kcal/ kg			4639					5128					4961
13	Average calorific value of agri fuel	Kcal/ kg			0					0					0
14	tCO ₂ emission per ton of Petcoke	t CO2/TJ			100,8					100,8					100,8
15	tCO ₂ emission per ton of Coal	t CO2/TJ			96,1					96,1					96,1
16	tCO ₂ emission per ton of Lignite	t CO2/TJ			101,2					101,2					101,2
17	tCO ₂ emission per ton of agri fuel	t CO2/TJ			0					0					0
18	Quantity of petcoke consumed	tons/month			0					0					0
19	Quantity of fine coal consumed	tons/month			15711					20586,38					20412
20	Quantity of lignite consumed	tons/month			273					167,62					0
21	Quantity of agri fuel consumed	tons/month			0					0					0
22	Total heat supplied by fuels	Kcal/month			103136,57					135020,99					141802,16
2	Average emission factor of fuel used	t CO2/TJ			96,16					96,13					96,10
23	Average emission factor of fuel used	CO2/Million Kcal			401,96					401,83					401,70
24	Emission Reduction	tons/month			958,60					1222,02					980,85

For Nov-2001					For Dec-2001					For Jan-2002					For Feb-2002				
08-Nov-01	14-Nov-01	19-Nov-01	26-Nov-01	Monthly Average	04-Dec-01	11-Dec-01	18-Dec-01	27-Dec-01	Monthly Average	05-Jan-02	10-Jan-02	18-Jan-02	25-Jan-01	Monthly Average	04-Feb-02	12-Feb-02	21-Feb-02	28-Feb-02	Monthly Average
5850	5850	5850	5850		5850	5850	5850	5850		5900	5900	5900	5900		5900	5900	5900	5900	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
90534917	90534917	90534917	90534917		90534917	90534917	90534917	90534917		91308720	91308720	91308720	91308720		91308720	91308720	91308720	91308720	
117	117	117	117		117	117	117	117		118	118	118	118		118	118	118	118	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
1810698	1810698	1810698	1810698		1810698	1810698	1810698	1810698		1826174	1826174	1826174	1826174		1826174	1826174	1826174	1826174	
26,0	24,5	26,5	25,0		23,5	26,0	25,0	20,5		16,8	17,0	21,0	18,0		23,5	24,5	20,5	20,0	
9315	9239	9167	9028		9156	9208	9244	9254		9298	9275	9244	9195		9224	9235	9301	9266	
627310	625324	616351	610064		621835	620134	624601	634874		646203	644039	633152	636233		626445	625072	638115	636792	
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239	
3901115	3664040	3906803	3647698		3494643	3856486	3734615	3111811		2587299	2617164	3179167	2737713		3520547	3662560	3127697	3044983	
40215	39228	38317	36584		38177	38837	39290	39421		40002	39701	39300	38662		39041	39180	40034	39578	
1441038	1405670	1373026	1310927		1368009	1391659	1407892	1412586		1433405	1422619	1408250	1385388		1398969	1403950	1434552	1418212	
305	302	291	290		288	285	282	286		294	301	293	298		288	285	287	295	
583349	582677	605445	602235		611001	630517	629258	620375		583013	564006	574490	613930		598806	613218	598223	580462	
338712	340087	360268	358994		365518	379221	380510	372454		345084	329762	340640	360838		358222	368816	358513	342969	
0,245	0,245	0,244	0,244		0,244	0,244	0,244	0,244		0,244	0,245	0,244	0,245		0,244	0,244	0,244	0,244	
25275648	25121778	25617638	25437065		25716045	26395085	26198916	26017364		24797675	24276263	24392857	26292077		25202780	25670880	25133368	24731747	
5724	5724	5719	5720		5718	5714	5714	5716		5774	5778	5776	5767		5771	5768	5771	5775	
135,0	134,0	130,0	129,0		131,0	129,0	132,0	130,0		131,0	138,0	134,0	132,0		132,0	130,0	131,0	136,0	
0,191	0,191	0,191	0,190		0,191	0,190	0,191	0,191		0,191	0,191	0,191	0,191		0,191	0,191	0,191	0,191	
6152152	6103231	5902305	5854209		5949908	5847956	5994659	5898977		6008226	6359277	6158428	6050587		6054015	5952173	6004808	6256118	
126	126	131	130		132	136	136	134		126	122	124	133		129	132	129	125	
305,0	302,0	291,0	290,0		288,0	285,0	282,0	286,0		294,0	301,0	293,0	298,0		288,0	285,0	287,0	295,0	
0,207	0,207	0,206	0,206		0,205	0,205	0,205	0,205		0,206	0,207	0,206	0,206		0,205	0,205	0,205	0,206	
331198	327194	326223	323253		325443	331950	327412	327885		317742	315542	311912	339663		318947	322842	317407	317549	
405077	411412	402964	409300		415634	405077	409300	428297		444120	443065	426187	438846		415634	411412	428297	430407	
32164074	31963615	32249130	32023827		32407031	32980068	32930288	32672523		31567763	31394146	31289384	33121173		31991376	32357307	31883879	31735821	
67,07	67,19	66,97	67,09	67,08	66,66	66,21	66,22	66,27	66,34	67,51	67,69	67,98	65,95	67,28	67,37	67,05	67,36	67,48	67,32
97687768	97415325	97625444	97304240	97508194,24	97208267	97593760	97488122	96870012	97290040,44	97155598	97174678	97722312	97257995	97327645,75	98054410	98201404	97697142	97598089	97887761,30
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00	
				64,53					64,53					64,53					64,53
				2,55					1,81					2,75					2,79
				2486060,30					1761454,17					2678330,74					2729021,69
				3706135,14					2655170,94					3980761,42					4053931,16
				2304,66					1964,03					2671,69					2717,96
				0					0					0					0
				6832					6556					6556					6554
				5051					4899					4643					4604
				0					0					0					0
				100,8					100,8					100,8					100,8
				96,1					96,1					96,1					96,1
				101,2					101,2					101,2					101,2
				0					0					0					0
				0					0					0					0
				17529					20695					18788					18484
				0					0					0					0
				0					0					0					0
				119758,13					135676,42					123174,13					121144,14
				96,10					96,10					96,10					96,10
				401,70					401,70					401,70					401,70
				925,78					788,95					1073,21					1091,80

For Mar-2002					Aug01-Mar02
05-Mrz-02	11-Mrz-02	19-Mrz-02	27-Mrz-02	Monthly Average	Yearly Average
5900	5900	5900	5900		
1420	1420	1420	1420		
0,262	0,262	0,262	0,262		
91308720	91308720	91308720	91308720		
118	118	118	118		
1420	1420	1420	1420		
0,262	0,262	0,262	0,262		
1826174	1826174	1826174	1826174		
20,0	21,0	16,0	18,5		
9259	9233	9276	9245		
636309	632385	646300	638630		
0,239	0,239	0,239	0,239		
3042671	3175319	2471695	2824455		
39487	39156	39707	39309		
1414951	1403090	1422834	1408573		
285	295	288	299		
601838	585622	592394	560653		
361972	346018	354387	328949		
0,244	0,244	0,244	0,245		
25194478	24951615	24932926	24051084		
5770	5774	5772	5779		
137,0	134,0	135,0	140,0		
0,191	0,191	0,191	0,192		
6300677	6155864	6203792	6459575		
130	126	128	121		
285,0	295,0	288,0	299,0		
0,205	0,206	0,205	0,206		
316851	320372	315532	311346		
430407	426187	447284	436737		
32242413	31854039	31899535	31258743		
66,96	67,40	67,12	67,90	67,35	
97592516	97713303	97029424	97367921	97425790,84	
24,00	24,00	24,00	24,00		
				64,53	
				2,82	
				2743225,98	
				4073349,37	
				3017,13	20543,15
				0	0
				6541	6623
				4839	4846
				0	0
				100,8	
				96,1	
				101,2	
				0	
				0	0
				20175	152380,38
				1079	1519,62
				0	0
				137185,96	
				96,29	
				402,51	
				1214,42	8255,63

5867
430
0,079169

Thermal energy	45	GWh
	45000000000	Wh
	1,62E+14	J
	3,8756E+13	
	38756	Million Kcal

Parameter	Unit	Value
Total Energy Saved	Million kcal	20543,15
Calorific value of pet coke	kcal/kg	0
Calorific value of coal	kcal/kg	6623
Calorific value of Lignite	kcal/kg	4846
Calorific value of Agri fuel	kcal/kg	0
% Petcoke Used	%	0,00
% Coal Used	%	0,99
% Lignite used	%	0,01
% Agri fuel used	%	0,00
Savings in Petcoke	Tonnes	#DIV/0!
Savings in Coal	Tonnes	3079,1
Savings in Lignite	Tonnes	30,7
Savings in Agri fuel	Tonnes	#DIV/0!

Heat Cap - Coefficients						
Gas/Mat	*T^0	*T^1	*T^2	*T^3	*T^4	
O2	0,2130	7,796E-05	-7,563E-08	4,074E-11	-8,183E-15	
CO2	0,1906	1,771E-04	-1,733E-07	9,315E-11	-1,894E-14	
N2+Ar	0,2465	-3,284E-06	4,366E-08	-2,750E-11	5,504E-15	
H2O, stear	0,4445	2,910E-05	6,887E-08	-3,726E-11	6,472E-15	
H2O, liq.	1,0000					
Rawmeal	0,2060	1,014E-04	-3,673E-08			
Clinker	0,1742	1,414E-04	-1,283E-07	5,074E-11		

O2	mass %	23,0
CO2	mass %	0,0
N2	mass %	77,0
H2O	mass %	0,0

CV Fan Flow	m3/min	9500
Fan Power Drawn		180

Clinker cooler modification Project data for April 2002-March 2003

		April'02				Monthly Average	May'02			Monthly Average	June'02				Monthly Average
	Parameter	05-Apr-02	11-Apr-02	15-Apr-02	27-Apr-02		03-Mai-02	22-Mai-02	29-Mai-02		05-Jun-02	13-Jun-02	21-Jun-02	27-Jun-02	
1	Clinker production (C _{lk})	TPD	5900	5900	5900		5900	5900	5900		5900	5900	5950	5950	
	Inlet temperature of the clinker in cooler (T _{clk in})	C	1420	1420	1420		1420	1420	1420		1420	1420	1420	1420	
	Specific heat of clinker (S _{clk in})	kcal/kg/C	0,262	0,262	0,262		0,262	0,262	0,262		0,262	0,262	0,262	0,262	
	Heat from clinker	kCal/hr	91308720	91308720	91308720		91308720	91308720	91308720		91308720	91308720	92082522	92082522	
2	Clinker dust from kiln to cooler (M _{dust})	TPD	118	118	118		118	118	118		118	118	119	119	
	Temp. of Clinker dust from kiln to cooler (T _{dust})	C	1420	1420	1420		1420	1420	1420		1420	1420	1420	1420	
	Sp. Heat of Clinker dust from kiln to cooler (S _{dust})	kcal/kg/C	0,262	0,262	0,262		0,262	0,262	0,262		0,262	0,262	0,262	0,262	
	Heat from Clinker dust from kiln to cooler	kCal/hr	1826174	1826174	1826174		1826174	1826174	1826174		1826174	1826174	1841650	1841650	
3	Inlet temperature of the cooling air in cooler (T _{cooling air})	C	33,5	30,0	31,5		34,5	33,0	31,5		33,5	35,5	33,0	32,0	
	Flow rate of cooling air in cooler	m3/min	9178	9196	9179		9099	9199	9095		9162	9089	9071	9062	
	Mass Flow rate of cooling air in cooler (M _{cooling air})	kg/hr	602979	611140	606986		595835	605355	601467		601947	593234	596936	598301	
	Specific heat of cooling air (S _{cooling air})	kcal/kg C	0,239	0,239	0,239		0,239	0,239	0,239		0,239	0,239	0,239	0,239	
4	Heat from cooling air	kCal/hr	4833951	4386451	4574936		4919610	4780404	4533339		4825681	5040449	4713919	4581215	
	Power consumed by cooler fans (P _{fan})	kWh/Day	38453	38682	38462		37457	38722	37412		38254	37329	37113	37002	
	Heat produced by cooler fans	kCal/hr	1377899	1386105	1378222		1342209	1387538	1340597		1370768	1337623	1329883	1325905	
1a	Exhaust air temperature from cooler (T _{Exhaust air cooler})	C	321	315	320		330	295	291		305	320	315	301	
	Flow rate of Cooler exhaust fan	m3/hr	531768	561214	562074		537265	604921	605609		580143	563502	567493	581552	
	Mass Flow rate of Cooler exhaust gas (M _{exhaust gas})	Kg/hr	300445	320318	318104		299021	357421	360365		336850	318911	323902	340021	
	Sp. Heat of cooler Exhaust gas (S _{exhaust gas})	kcal/kg/deg.C	0,245	0,245	0,245		0,245	0,244	0,244		0,245	0,245	0,245	0,245	
2a	Heat from Cooler Exhaust gas	kcal/hr	23630764	24709261	24939399		24198116	25773890	25624587		25136755	25002724	24985736	25031510	
	Clinker from Cooler (M _{clk out})	TPD	5785	5779	5779		5784	5769	5769		5775	5778	5827	5824	
	Temp. of Clinker from Cooler (T _{clk out})	Deg.C	145,0	143,0	141,0		148,0	131,0	132,0		138,0	140,0	142,0	139,0	
	Sp heat of clinker from cooler (S _{clk out})	kcal/kg/deg.C	0,192	0,192	0,192		0,192	0,191	0,191		0,191	0,192	0,192	0,192	
3a	Heat from Clinker Cooler	kcal/hr	6716359	6609027	6509048		6865368	6003302	6052473		6355440	6458888	6614332	6460254	
	Clinker Dust from Cooler (M _{dust cooler})	tpd	115	121	121		116	131	131		125	122	123	126	
	Temp. of Clinker dust from cooler (T _{dust cooler})	Deg.C	321,0	315,0	320,0		330,0	295,0	291,0		305,0	320,0	315,0	301,0	
	Sp heat of clinker dust from cooler (S _{dust cooler})	kcal/kg/deg.C	0,208	0,208	0,208		0,209	0,206	0,206		0,207	0,208	0,208	0,207	
4a	Heat from Clinker dust to ESP	kcal/hr	319619	330294	336661		333040	330930	326311		329378	337516	333990	325358	
	Radiation Losses (R _{loss})	kcal/hr	373362	388171	381826		369127	375478	381826		373362	364890	375478	379711	
	Heat Losses	kcal/hr	31040103	32036754	32166935		31765651	32483602	32385198		32194935	32164018	32309537	32196833	
	Cooler Efficiency	%	68,76	67,61	67,54		68,01	68,04	67,29		67,54	67,59	67,68	67,68	
Total heat input		kCal/hr	99346744	98907450	99088052		99187469,56	99396713	99302836		99236126,11	99331343	99512965	99967974	
Kiln running hours (K _{hrs})		hrs	24,00	24,00	24,00		24,00	24,00	24,00		24,00	24,00	24,00	24,00	
4	Baseline Efficiency	%					64,53				64,53				
5	Increase in Cooler Efficiency	%					3,48				3,01				
6	Saving in heat output due to increase in cooler efficiency	Kcal/hr					3455622,26				2987169,06				
7	Saving in heat input due to increase in cooler	Kcal/hr					5080756,62				4422804,06				
8	Total energy saved	Million Kcal					3356,35				1630,02				
9	Average calorific value of petcoke	Kcal/ kg					0				0				
10	Average calorific value of Coal	Kcal/ kg					6554				6551				
11	Average calorific value of Lignite	Kcal/ kg					4422				4336				
12	Average calorific value of agri fuel	Kcal/ kg					0				0				
13	tCO ₂ emission per ton of Petcoke	t CO2/TJ					100,8				100,8				
14	tCO ₂ emission per ton of Coal	t CO2/TJ					96,1				96,1				
15	tCO ₂ emission per ton of Lignite	t CO2/TJ					101,2				101,2				
16	tCO ₂ emission per ton of agri fuel	t CO2/TJ					0				0				
17	Quantity of petcoke consumed	tons/annum					0				0				
18	Quantity of fine coal consumed	tons/annum					17889,14				10180				
19	Quantity of lignite consumed	tons/annum					153,86				0				
20	Quantity of agri fuel consumed	tons/annum					0				0				
21	Total heat supplied by fuels	Million Kcal/annum					117925,79				66689,18				
22	Average emission factor of fuel used	t CO2/TJ					96,13				96,10				
23	Average emission factor of fuel used	kgCO2/Million Kcal					401,82				401,70				
24	Emission Reduction	tons/month					1348,65				654,78				

July'02					Aug'02					Sept'02					Oct'02				Nov'02	
04-Jul-02	12-Jul-02	18-Jul-02	22-Jul-02	Monthly Average	03-Aug-02	07-Aug-02	14-Aug-02	24-Aug-02	Monthly Average	03-Sep-02	11-Sep-02	17-Sep-02	24-Sep-02	Monthly Average	03-Oct-02	11-Oct-02	17-Oct-02	Monthly Average	27-Nov-02	Monthly Average
5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950		5950	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420		1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262		0,262	
92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522		92082522	
119	119	119	119		119	119	119	119		119	119	119	119		119	119	119		119	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420		1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262		0,262	
1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650		1841650	
29,0	29,5	31,0	28,0		30,5	26,5	26,5	31,0		28,5	29,0	28,0	30,5		28,5	29,0	28,0		24,5	
9113	8998	9078	9043		8977	9115	9098	9114		9111	9104	9106	9031		9097	9066	9188		9281	
607631	598954	601296	604979		595601	612822	611713	603703		608489	607045	609195	599208		607538	604509	614655		628194	
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239		0,239	
4215603	4227192	4459956	4052194		4346316	3884432	3877407	4477809		4148630	4211533	4080435	4372640		4142140	4193939	4117003		3680853	
37634	36210	37194	36767		35957	37656	37450	37647		37606	37524	37549	36621		37428	37051	38578		39776	
1348552	1297525	1332785	1317484		1288459	1349340	1341958	1349018		1347548	1344610	1345506	1312253		1341170	1327661	1382378		1425307	
310	309	311	315		311	315	309	305		305	315	311	314		315	320	311		310	
574144	562320	572873	571969		559345	559194	562769	591128		592089	572089	577868	571151		569604	573498	562769		576945	
330508	324257	329211	326456		321437	319165	324516	343228		343751	326525	332082	326545		325106	324569	323405		332120	
0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245		0,245	
25079192	24523293	25063689	25182786		24471826	24620340	24542874	25612683		25651689	25188071	25282254	25107351		25078674	25446263	24621626		25201547	
5826	5829	5826	5826		5829	5829	5828	5822		5822	5826	5825	5827		5827	5826	5828		5825	
141,0	145,0	140,0	138,0		148,0	146,0	148,0	139,0		138,0	142,0	139,0	139,0		138,0	141,0	142,0		138,0	
0,192	0,192	0,192	0,191		0,192	0,192	0,192	0,192		0,191	0,192	0,192	0,192		0,191	0,192	0,192		0,191	
6562432	6766746	6512514	6412412		6919056	6818007	6918178	6457960		6407644	6613205	6461136	6462746		6412974	6562589	6615491		6411229	
124	121	124	124		121	121	122	128		128	124	125	123		123	124	122		125	
310,0	309,0	311,0	315,0		311,0	315,0	309,0	305,0		305,0	315,0	311,0	314,0		315,0	320,0	311,0		310,0	
0,207	0,207	0,207	0,208		0,207	0,208	0,207	0,207		0,207	0,208	0,207	0,208		0,208	0,208	0,207		0,207	
331931	323927	332387	336624		324538	329106	324185	335614		336125	336695	335286	334953		335232	343503	326525		333551	
392399	390285	383942	396626		386057	402964	402964	383942		394513	392399	396626	386057		394513	392399	396626		411412	
32365955	32004251	32292532	32328448		32101476	32170417	32188202	32790199		32789971	32530370	32475302	32291106		32221394	32744755	31960267		32357738	
67,47	67,82	67,62	67,44	67,59	67,76	67,56	67,53	67,13	67,49	67,02	67,30	67,31	67,58	67,30	67,59	67,07	67,85	67,50	67,33	67,33
99488327	99448890	99716914	99293851	99486995,58	99558948	99157945	99143538	99750999	99402857,57	99420351	99480315	99350114	99609065	99464961,43	99407482	99445773	99423554	99425603,06	99030332	99030332
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00		24,00	
				64,53					64,53					64,53				64,53		64,53
				3,06					2,96					2,77				2,97		2,80
				3040176,48					2945900,36					2758404,86				2957492,42		2772849,30
				4498243,85					4364710,84					4098472,44				4381173,09		4118296,89
				3344,89					2772,46					2930,20				2932,54		2017,55
				0					0					0				0		0
				6380					6547					6547				6497		6515
				4455					4523					4623				4772		4635
				0					0					0				0		0
				100,8					100,8					100,8				100,8		100,8
				96,1					96,1					96,1				96,1		96,1
				101,2					101,2					101,2				101,2		101,2
				0					0					0				0		0
				0					0					0				0		0
				20356					16865					19957				18590		13782,02
				1575					1336					5,62				0		0
				0					0					0				0		0
				136887,91					116457,88					130684,46				120779,23		89789,86
				96,36					96,36					96,10				96,10		96,10
				402,79					402,80					401,70				401,70		401,70
				1347,29					1116,76					1177,07				1177,99		810,45

Dec'02				Jan'03					Feb'03					March'03					2002-03
04-Dec-02	21-Dec-02	26-Dec-02	Monthly Average	06-Jan-03	13-Jan-03	21-Jan-03	31-Jan-03	Monthly Average	04-Feb-03	11-Feb-03	18-Feb-03	26-Feb-03	Monthly Average	07-Mrz-03	14-Mrz-03	21-Mrz-03	28-Mrz-03	Monthly Average	Yearly Average
5950	5950	5950		5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950	5950		
1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		
0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		
92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		
119	119	119		119	119	119	119		119	119	119	119		119	119	119	119		
1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		
0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		
1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		
22,0	23,5	18,5		22,0	21,0	23,5	16,0		19,0	20,0	19,0	28,0		23,0	27,5	30,0	30,0		
9311	9319	9390		9317	9106	9217	9331		9207	9262	9099	9133		9140	8963	9063	8911		
635534	632911	648630		635967	623711	625984	650122		634892	636532	627447	610999		621802	600624	602310	592204		
0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		
3343315	3556886	2868681		3345593	3131763	3517956	2486315		2883909	3043738	2850091	4092520		3419988	3951048	4323070	4250536		
40161	40275	41204		40244	37551	38954	40423		38817	39529	37454	37887		37976	35790	37013	35163		
1439103	1443188	1476477		1442077	1345578	1395852	1448491		1390943	1416456	1342102	1357618		1360807	1282475	1326299	1260008		
300	302	291		291	302	301	295		298	296	300	310		310	311	305	311		
584438	578186	588257		599666	578826	581666	595429		587307	577759	592100	573810		582719	576516	583097	578783		
342305	337465	350040		356829	337839	340088	351813		345190	340772	346793	330316		335444	331305	338566	332608		
0,245	0,245	0,244		0,244	0,245	0,245	0,244		0,245	0,244	0,245	0,245		0,245	0,245	0,245	0,245		
25113614	24928142	24890386		25373128	24955727	25036428	25369464		25151909	24658846	25442861	25064601		25453771	25223077	25264738	25322275		
5824	5825	5823		5820	5825	5824	5821		5823	5825	5822	5826		5824	5825	5824	5825		
141,0	141,0	135,0		135,0	132,0	135,0	130,0		135,0	138,0	131,0	136,0		135,0	136,0	135,0	135,0		
0,192	0,192	0,191		0,191	0,191	0,191	0,191		0,191	0,191	0,191	0,191		0,191	0,191	0,191	0,191		
6559927	6561449	6258493		6255844	6110997	6260023	6007739		6258713	6411036	6058212	6311843		6259778	6311210	6259691	6260692		
126	125	127		130	125	126	129		127	125	128	124		126	125	126	125		
300,0	302,0	291,0		291,0	302,0	301,0	295,0		298,0	296,0	300,0	310,0		310,0	311,0	305,0	311,0		
0,206	0,207	0,206		0,206	0,207	0,207	0,206		0,206	0,206	0,206	0,207		0,207	0,207	0,207	0,207		
325763	324672	316962		323109	325031	325422	325738		324934	317263	330034	331738		336889	334501	331055	335816		
421966	415634	436737		421966	426187	415634	447284		434627	430407	434627	396626		417745	398739	388171	388171		
32421271	32229897	31902577		32374047	31817942	32037507	32150225		32170183	31817552	32265733	32104809		32468183	32267527	32243655	32306954		
67,15	67,42	67,54	67,37	67,20	67,67	67,59	67,15	67,40	67,24	67,66	67,11	67,69	67,43	67,11	67,46	67,62	67,51	67,42	
98706590	98924246	98269331	98633388,93	98711843	98401514	98837980	97858979	98452578,98	98199025	98384367	98116366	99374310	98518517,10	98704967	99157696	99573542	99434717	99217730,46	
24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		
			64,53					64,53					64,53					64,53	
			2,84					2,87					2,90					2,89	
			2800886,86					2825805,18					2853994,29					2870327,26	
			4157487,85					4192575,63					4232722,85					4257195,69	
			3049,73					3117,60					2841,85					3119,67	31599,97
			0					0					0					0	0
			6543					6540					6488					6466	6512,25
			4701					4694					4410					4151	4500,75
			0					0					0					0	0
			100,8					100,8					100,8					100,8	
			96,1					96,1					96,1					96,1	
			101,2					101,2					101,2					101,2	
			0					0					0					0	
			0					0					0					0	0
			19090					20931,53					18952,52					20882	217096,21
			1148					273,47					333,85					0	5755,8
			0					0					0					0	0
			130302,62					138175,87					124436,23					135023,01	
			96,31					96,15					96,16					96,10	
			402,58					401,90					401,95					401,70	
			1227,76					1252,95					1142,28					1253,17	12706,25

5938
502
0,092250687

Parameter	Unit	Value
Total Energy Saved	Million kcal	31599,97
Calorific value of pet coke	kcal/kg	0
Calorific value of coal	kcal/kg	6512,25
Calorific value of Lignite	kcal/kg	4500,75
Calorific value of Agri fuel	kcal/kg	0
% Petcoke Used	%	0,00
% Coal Used	%	0,98
% Lignite used	%	0,02
% Agri fuel used	%	0,00
Savings in Petcoke	Tonnes	#DIV/0!
Savings in Coal	Tonnes	4765,1
Savings in Lignite	Tonnes	126,3
Savings in Agri fuel	Tonnes	#DIV/0!

Heat Cap - Coefficients					
Gas/Mat	*T^0	*T^1	*T^2	*T^3	*T^4
O2	0,2130	7,796E-05	-7,563E-08	4,074E-11	-8,183E-15
CO2	0,1906	1,771E-04	-1,733E-07	9,315E-11	-1,894E-14
N2+Ar	0,2465	-3,284E-06	4,366E-08	-2,750E-11	5,504E-15
H2O,steam	0,4445	2,910E-05	6,887E-08	-3,726E-11	6,472E-15
H2O, liq.	1,0000				
Rawmeal	0,2060	1,014E-04	-3,673E-08		
Clinker	0,1742	1,414E-04	-1,283E-07	5,074E-11	

O2	mass %	23,0
CO2	mass %	0,0
N2	mass %	77,0
H2O	mass %	0,0

CV Fan Flow	m3/min	9500
Fan Power Drawn		180

Binani Cement Limited

Clinker cooler modification Project data for April 2003-March 2004

	Parameter		April'03				Monthly Average	May'03			Monthly Average
			02-Apr-03	08-Apr-03	19-Apr-03	25-Apr-03		05-Mai-03	12-Mai-03	17-Mai-03	
1	Clinker production (Clk)	TPD	5950	5950	5950	5950		5950	5950	5950	
	Inlet temperature of the clinker in cooler ($T_{\text{Clk in}}$)	C	1420	1420	1420	1420		1420	1420	1420	
	Specific heat of clinker ($S_{\text{Clk in}}$)	kcal/kg/C	0,262	0,262	0,262	0,262		0,262	0,262	0,262	
	Heat from clinker	kCal/hr	92082522	92082522	92082522	92082522		92082522	92082522	92082522	
2	Clinker dust from kiln to cooler (M_{dust})	TPD	119	119	119	119		119	119	119	
	Temp. of Clinker dust from kiln to cooler (T_{dust})	C	1420	1420	1420	1420		1420	1420	1420	
	Sp. Heat of Clinker dust from kiln to cooler (S_{dust})	kcal/kg/C	0,262	0,262	0,262	0,262		0,262	0,262	0,262	
	Heat from Clinker dust from kiln to cooler	kCal/hr	1841650	1841650	1841650	1841650		1841650	1841650	1841650	
3	Inlet temperature of the cooling air in cooler ($T_{\text{cooling air}}$)	C	32,0	32,5	27,0	34,0		32,5	35,5	34,0	
	Flow rate of cooling air in cooler	m3/min	8931	8980	8582	8481		8724	8720	8806	
	Mass Flow rate of cooling air in cooler ($M_{\text{cooling air}}$)	kg/hr	589626	591913	576001	556258		574995	569175	577586	
	Specific heat of cooling air ($S_{\text{cooling air}}$)	kcal/kg C	0,239	0,239	0,239	0,239		0,239	0,239	0,239	
4	Heat from cooling air	kCal/hr	4514788	4603277	3720059	4526112		4471700	4836032	4699654	
	Power consumed by cooler fans (P_{fan})	kWh/Day	35400	35996	27614	24889		29642	29606	30498	
	Heat produced by cooler fans	kCal/hr	1268500	1289857	989502	891856		1062172	1060882	1092845	
	Exhaust air temperature from cooler ($T_{\text{Exhaust air cooler}}$)	C	315	305	307	315		325	325	329	
1a	Flow rate of Cooler exhaust fan	m3/hr	4497	4745	4447	4514		3420	3355	3656	
	Mass Flow rate of Cooler exhaust gas ($M_{\text{exhaust gas}}$)	Kg/hr	187,4	197,7	185,3	188,1		142,5	139,8	152,3	
	Sp. Heat of cooler Exhaust gas ($S_{\text{exhaust gas}}$)	kcal/kg/deg.C	577673	588092	575526	578399		553705	550179	566147	
	Heat from Cooler Exhaust gas	kcal/hr	329712	341466	333017	330126		310747	308768	315618	
2a	Clinker from Cooler ($M_{\text{Clk out}}$)	TPD	0,245	0,245	0,245	0,245		0,245	0,245	0,245	
	Temp. of Clinker from Cooler ($T_{\text{Clk out}}$)	Deg.C	25433927	25481163	25018221	25465904		24754676	24597001	25461539	
	Sp heat of clinker from cooler ($S_{\text{Clk out}}$)	kcal/kg/deg.C	5825	5823	5826	5825		5830	5831	5828	
	Heat from Clinker Cooler	kcal/hr	140,0	138,0	135,0	134,0		141,0	145,0	134,0	
3a	Clinker Dust from Cooler ($M_{\text{dust cooler}}$)	tpd	0,192	0,191	0,191	0,191		0,192	0,192	0,191	
	Temp. of Clinker dust from cooler ($T_{\text{dust cooler}}$)	Deg.C	6511355	6408579	6261448	6210839		6567405	6769790	6213661	
	Sp heat of clinker dust from cooler ($S_{\text{dust cooler}}$)	kcal/kg/deg.C	125	127	124	125		120	119	122	
	Heat from Clinker dust	kcal/hr	315,0	305,0	307,0	315,0		325,0	325,0	329,0	
4a	Radiation Losses (R_{loss})	kcal/hr	0,208	0,207	0,207	0,208		0,208	0,208	0,209	
	Heat Losses	kcal/hr	339981	333891	329144	340409		337433	335284	349756	
4a	Cooler Efficiency	%	379711	377595	400852	371244		377595	364890	371244	
	Total heat input	kCal/hr	32664974	32601228	32009665	32388396		32037109	32066966	32396200	
	Kiln running hours (K_{hrs})	hrs	67,24	67,34	67,55	67,40	67,38	67,79	67,88	67,51	67,73
	Total heat input	kCal/hr	99707461	99817307	98633733	99342141	99375160,50	99458045	99821087	99716672	99665267,72
	Kiln running hours	hrs	24,00	24,00	24,00	24,00		24,00	24,00	24,00	
4	Baseline Efficiency	%					64,53				64,53
5	Increase in Cooler Efficiency	%					2,85				3,20
6	Saving in heat output due to increase in cooler efficiency	Kcal/hr					2832776,50				3184514,12
7	Saving in heat input due to increase in cooler efficiency	Kcal/hr					4204143,33				4702110,40
8	Total energy saved	Million Kcal					3025,93				2068,22
9	Average calorific value of petcoke	Kcal/ kg									
10	Average calorific value of Coal	Kcal/ kg					6458				6492
11	Average calorific value of Lignite	Kcal/ kg									
12	Average calorific value of agri fuel	Kcal/ kg									
13	tCO ₂ emission per ton of Petcoke	t CO2/TJ					100,8				100,8
14	tCO ₂ emission per ton of Coal	t CO2/TJ					96,1				96,1
15	tCO ₂ emission per ton of Lignite	t CO2/TJ					101,2				101,2
16	tCO ₂ emission per ton of agri fuel	t CO2/TJ					0				0
17	Quantity of petcoke consumed	tons/month					0				0
18	Quantity of fine coal consumed	tons/month					20712				12275
19	Quantity of lignite consumed	tons/month					0				0
20	Quantity of agri fuel consumed	tons/month					0				0
21	Total heat supplied by fuels	Million Kcal/month					133758,10				79689,30
22	Average emission factor of fuel used	t CO2/TJ					96,10				96,10
23	Average emission factor of fuel used	gCO2/Million Kcal					401,70				401,70
24	Emission Reduction	tons/month					1215,51				830,80

June'03					July'03					Aug'03					Sept'03				
03-Jun-03	11-Jun-03	18-Jun-03	26-Jun-03	Monthly Average	01-Jul-03	08-Jul-03	19-Jul-03	25-Jul-03	Monthly Average	04-Aug-03	13-Aug-03	19-Aug-03	26-Aug-03	Monthly Average	02-Sep-03	08-Sep-03	17-Sep-03	23-Sep-03	Monthly Average
5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950	5950	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522	
119	119	119	119		119	119	119	119		119	119	119	119		119	119	119	119	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650	
34,0	33,0	26,5	31,5		33,0	28,5	31,0	28,0		25,5	28,5	28,0	26,0		27,5	27,5	29,5	27,5	
8387	8553	8553	8564		8586	8628	8469	8399		8368	8402	8590	8577		8515	8535	8507	8575	
550095	562819	575059	566348		565000	576268	561001	561856		564519	561164	574651	577656		570600	571918	566253	574627	
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239	
4475967	4444505	3645068	4268643		4461725	3928944	4161080	3763357		3442998	3825969	3849054	3592324		3753544	3762216	3996399	3780037	
29260	31051	31055	31177		31417	31890	30143	29386		29066	29424	31461	31323		30639	30854	30545	31299	
1048483	1112661	1112804	1117176		1125776	1142725	1080124	1052998		1041532	1054360	1127353	1122408		1097898	1105602	1094529	1121548	
318	319	311	321		320	311	308	321		318	316	318	311		310	309	311	314	
3673	3500	3835	3499		3431	3907	4133	3302		3372	3480	3380	3787		3771	3710	3748	3783	
153,0	145,8	159,8	145,8		143,0	162,8	172,2	137,6		140,5	145,0	140,8	157,8		157,1	154,6	156,2	157,6	
567022	557985	575231	557932		554298	578805	578512	547269		551105	556921	551540	572823		572016	568918	570852	572621	
321990	316323	330566	315228		313703	332620	334169	309203		312951	317328	313198	329183		329283	328062	328050	327385	
0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245	
25081704	24720022	25166848	24793440		24594354	25323213	25188799	24319588		24377638	24558598	24396882	25061514		24986242	24811051	24975272	25171987	
5828	5829	5826	5829		5830	5825	5825	5832		5831	5830	5831	5826		5826	5827	5827	5826	
139,0	145,0	138,0	141,0		142,0	135,0	139,0	141,0		142,0	145,0	144,0	141,0		140,0	142,0	140,0	138,0	
0,192	0,192	0,191	0,192		0,192	0,191	0,192	0,192		0,192	0,192	0,192	0,192		0,192	0,192	0,192	0,191	
6463735	6767833	6411637	6566376		6617567	6260687	6460982	6568971		6618350	6768099	6719002	6562753		6512721	6613983	6513002	6412257	
122	121	124	121		120	125	125	118		119	120	119	124		124	123	123	124	
318,0	319,0	311,0	321,0		320,0	311,0	308,0	321,0		318,0	316,0	318,0	311,0		310,0	309,0	311,0	314,0	
0,208	0,208	0,207	0,208		0,208	0,207	0,207	0,208		0,208	0,208	0,208	0,207		0,207	0,207	0,207	0,208	
337258	333047	333755	335345		332003	335829	332053	328936		327791	328928	328050	332358		330701	327728	331215	335816	
371244	375478	402964	381826		375478	394513	383942	396626		407189	394513	396626	405077		398739	398739	390285	398739	
32253942	32196381	32315204	32076988		31919403	32314242	32365775	31614121		31730968	32050139	31840561	32361702		32228404	32151501	32209774	32318799	
67,57	67,64	67,25	67,70	67,54	67,92	67,36	67,36	67,98	67,66	67,76	67,56	67,81	67,19	67,58	67,37	67,46	67,47	67,30	67,40
99448623	99481339	98682045	99309992	99230500,05	99511674	98995842	99165377	98740528	99103355,31	98408702	98804502	98900579	98638905	98688171,98	98775615	98791991	99015101	98825757	98852115,76
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00	
				64,53					64,53					64,53					64,53
				3,01					3,13					3,05					2,87
				2985929,84					3098563,02					3008812,73					2835693,70
				4421039,83					4579838,67					4452302,17					4207346,69
				3183,15					3406,71					3287,58					2942,41
				6508					6593					6449					8429
														4026					6362
																			3852
				100,8					100,8					100,8					100,8
				96,1					96,1					96,1					96,1
				101,2					101,2					101,2					101,2
				0					0					0					0
				0					0					0					40
				20117					21257					21299					18477
				0					0					366					833,58
				0					0					0					0
				130921,44					140147,40					138830,77					121098,78
				96,10					96,10					96,15					96,25
				401,70					401,70					401,92					402,32
				1278,66					1368,47					1321,36					1183,78

Oct'03					Nov'03					Dec'03					Jan'04			
06-Okt-03	14-Okt-03	22-Okt-03	28-Okt-03	Monthly Average	04-Nov-03	14-Nov-03	19-Nov-03	24-Nov-03	Monthly Average	04-Dec-03	10-Dec-03	15-Dec-03	23-Dec-03	Monthly Average	08-Jan-04	14-Jan-04	21-Jan-04	30-Jan-04
5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950	5950
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262
92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522
119	119	119	119		119	119	119	119		119	119	119	119		119	119	119	119
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262
1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650
26,5	24,0	25,0	25,5		27,0	24,5	21,0	21,0		22,0	21,0	19,0	19,0		18,5	21,0	18,5	20,5
8542	8601	8618	8570		8526	8539	8483	8540		8462	8500	8533	8488		8558	8582	8462	8562
574300	583141	582311	578123		572295	577945	581021	584937		577578	582189	588434	585363		591148	587796	584532	587388
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239
3640259	3347023	3481757	3525972		3696119	3386423	2917409	2937075		3038425	2923277	2672881	2658932		2614458	2951426	2585196	2879058
30931	31584	31770	31241		30760	30896	30291	30914		30058	30476	30833	30348		31104	31374	30061	31147
1108361	1131760	1138425	1119469		1102233	1107107	1085428	1107752		1077078	1092057	1104849	1087470		1114560	1124235	1077186	1116101
309	305	301	305		305	302	300	301		298	302	301	300		301	303	304	303
3888	4112	4123	3913		3808	4010	4061	4151		4201	4304	4533	4083		4359	4346	4480	4341
162,0	171,3	171,8	163,0		158,7	167,1	169,2	173,0		175,0	179,3	188,9	170,1		181,6	181,1	186,7	180,9
577866	588746	589270	579100		568413	578281	580720	584975		587312	580682	579209	570578		571708	571140	576945	570921
333222	341845	344534	336245		330040	337521	340128	342023		345193	338922	338651	334187		334266	332774	335574	332647
0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245
25201274	25509478	25363699	25091560		24628503	24932258	24953873	25178824		25152105	25035763	24930655	24518062		24607816	24665254	24957117	24655801
5825	5823	5823	5825		5827	5825	5825	5824		5823	5825	5825	5827		5827	5827	5825	5827
138,0	134,0	135,0	139,0		139,0	134,0	132,0	132,0		131,0	133,0	135,0	134,0		135,0	132,0	135,0	133,0
0,191	0,191	0,191	0,192		0,192	0,191	0,191	0,191		0,191	0,191	0,191	0,191		0,191	0,191	0,191	0,191
6411010	6208456	6258258	6460841		6463401	6210866	6110568	6109604		6059288	6160422	6260593	6212640		6262335	6112739	6261119	6162652
125	127	127	125		123	125	125	126		127	125	125	123		123	123	125	123
309,0	305,0	301,0	305,0		305,0	302,0	300,0	301,0		298,0	302,0	301,0	300,0		301,0	303,0	304,0	303,0
0,207	0,207	0,207	0,207		0,207	0,207	0,206	0,207		0,206	0,207	0,207	0,206		0,207	0,207	0,207	0,207
332882	334262	329676	328786		322718	324726	323691	327273		324936	326074	324047	318038		319851	321899	326366	321775
402964	413523	409300	407189		400852	411412	426187	426187		421966	426187	434627	434627		436737	426187	436737	428297
32348131	32465719	32360932	32288376		31815474	31879262	31814319	32041888		31958295	31948445	31949922	31483367		31626738	31526079	31981338	31568525
67,22	67,01	67,16	67,24	67,16	67,77	67,61	67,51	67,29	67,55	67,40	67,38	67,30	67,77	67,46	67,61	67,83	67,23	67,76
98672793	98402955	98544355	98569614	98547429,28	98722525	98417703	97927010	97969000	98259059,38	98039677	97939507	97701903	97670575	97837915,37	97653191	97999834	97586554	97919332
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00
				64,53					64,53					64,53				
				2,63					3,02					2,93				
				2588906,05					2964254,22					2868223,42				
				3855001,72					4388446,74					4251638,13				
				2860,41					3108,78					2724,02				
				8413					8450					8478				
				6374					6463					6555				
				100,8					100,8					100,8				
				96,1					96,1					96,1				
				101,2					101,2					101,2				
				0					0					0				
				1926					3030					3479				
				18809					16254					12958				
				0					0					0				
				0					0					0				
				136092,00					130653,10					114434,65				
				96,66					97,02					97,31				
				404,04					405,55					406,76				
				1155,71					1260,76					1108,03				

	Feb'04					March'04					2003-04
Monthly Average	03-Feb-04	11-Feb-04	17-Feb-04	23-Feb-04	Monthly Average	02-Mrz-04	08-Mrz-04	16-Mrz-04	24-Mrz-04	Monthly Average	Yearly Average
	5950	5950	5950	5950		5950	5950	5950	5950		
	1420	1420	1420	1420		1420	1420	1420	1420		
	0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		
	92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		
	119	119	119	119		119	119	119	119		
	1420	1420	1420	1420		1420	1420	1420	1420		
	0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		
	1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		
	17,5	19,5	24,0	24,0		23,5	27,5	30,5	28,0		
	8518	8366	8425	8555		8589	8548	8476	8573		
	590407	575928	571234	579992		583336	572816	562386	573509		
	0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		
	2469870	2685009	3278682	3328949		3278278	3768122	4103934	3841408		
	30665	29040	29670	31070		31455	31001	30218	31272		
	1098829	1040600	1063175	1113342		1127138	1110869	1082812	1120580		
	304	301	310	312		313	317	318	320		
	4273	4506	4371	4272		4128	4037	3688	3814		
	178,0	187,8	182,1	178,0		172,0	168,2	153,7	158,9		
	567927	578058	572010	568093		561436	568429	562385	557775		
	330329	337978	329280	325906		321538	323336	319356	315670		
	0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		
	24567043	24881108	24986005	24894124		24641406	25105065	24876569	24748619		
	5827	5825	5826	5827		5829	5827	5829	5830		
	131,0	130,0	132,0	135,0		135,0	138,0	141,0	139,0		
	0,191	0,191	0,191	0,191		0,191	0,191	0,192	0,192		
	6063645	6011611	6112542	6263174		6264719	6413253	6565293	6465950		
	123	125	124	123		121	123	121	120		
	304,0	301,0	310,0	312,0		313,0	317,0	318,0	320,0		
	0,207	0,207	0,207	0,207		0,207	0,208	0,208	0,208		
	321265	323403	330698	330795		328087	336910	334500	334085		
	440956	432517	413523	413523		415634	398739	386057	396626		
	31392909	31648639	31842768	31901616		31649847	32253967	32162419	31945281		
	67,61	67,80	67,59	67,60	67,57	67,64	67,81	67,36	67,55	67,69	67,60
	97789727,65	97492872	97649782	98266030	98366463	97943786,88	98329588	98803164	99110919	98886161	98782457,96
		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00	
	64,53					64,53					64,53
	3,08					3,11					3,07
	3009988,59					3044432,86					3035529,82
	4452117,57					4501045,62					4490233,17
	2583,12					2995,90					3325,24
	8428					8366					8378
	6530					6569					6611
											3939
											0
	100,8					100,8					100,8
	96,1					96,1					96,1
	101,2					101,2					101,2
	0					0					0
	2827					3985					4908
	12097					13216					14723
	0					0					0
	0					0					0
	102819,37					120154,41					138452,98
	97,19					97,40					97,50
	406,25					407,15					407,53
	1049,39					1219,78					1355,14
											14347,40

Parameter	Unit	Value
Total Energy Saved	Million kcal	35511,47
Calorific value of pet coke	kcal/kg	8420,3
Calorific value of coal	kcal/kg	6497
Calorific value of Lignite	kcal/kg	3939
Calorific value of Agri fuel	kcal/kg	0
% Petcoke Used	%	0,11
% Coal Used	%	0,88
% Lignite used	%	0,00
% Agri fuel used	%	0,00
Savings in Petcoke	Tonnes	481,8
Savings in Coal	Tonnes	4824,0
Savings in Lignite	Tonnes	28,6
Savings in Agri fuel	Tonnes	#DIV/0!

Heat Cap - Coefficients						
Gas/Mat	*T^0	*T^1	*T^2	*T^3	*T^4	
O2	0,2130	7,796E-05	-7,563E-08	4,074E-11	#####	
CO2	0,1906	1,771E-04	-1,733E-07	9,315E-11	#####	
N2+Ar	0,2465	-3,284E-06	4,366E-08	#####	5,504E-15	
H2O,sted	0,4445	2,910E-05	6,887E-08	#####	6,472E-15	
H2O, liq.	1,0000					
Rawmeal	0,2060	1,014E-04	-3,673E-08			
Clinker	0,1742	1,414E-04	-1,283E-07	5,074E-11		

O2	mass %	23,0
CO2	mass %	0,0
N2	mass %	77,0
H2O	mass %	0,0

CV Fan Flow	m3/min	9500
Fan Power Drawn		180

Clinker cooler modification Project data for April 2004-March 2005

			April'04			May'04			June'04				
	Parameter		05-Apr-04	13-Apr-04	Monthly Average	17-Mai-04	24-Mai-04	Monthly Average	04-Jun-04	10-Jun-04	21-Jun-04	23-Jun-04	Monthly Average
1	Clinker production (Clk)	TPD	5950	5950		5950	5950		5950	5950	5950	5950	
	Inlet temperature of the clinker in cooler ($T_{clk\ in}$)	C	1420	1420		1420	1420		1420	1420	1420	1420	
	Specific heat of clinker ($S_{clk\ in}$)	kcal/kg/C	0,262	0,262		0,262	0,262		0,262	0,262	0,262	0,262	
	Heat from clinker	kCal/hr	92082522	92082522		92082522	92082522		92082522	92082522	92082522	92082522	
2	Clinker dust from kiln to cooler (M_{dust})	TPD	119	119		119	119		119	119	119	119	
	Temp. of Clinker dust from kiln to cooler (T_{dust})	C	1420	1420		1420	1420		1420	1420	1420	1420	
	Sp. Heat of Clinker dust from kiln to cooler (S_{dust})	kcal/kg/C	0,262	0,262		0,262	0,262		0,262	0,262	0,262	0,262	
	Heat from Clinker dust from kiln to cooler	kCal/hr	1841650	1841650		1841650	1841650		1841650	1841650	1841650	1841650	
3	Inlet temperature of the cooling air in cooler ($T_{cooling\ air}$)	C	33,0	33,0		34,0	32,0		32,5	33,5	31,5	30,0	
	Flow rate of cooling air in cooler	m3/min	8620	8585		8559	8514		8568	8510	8502	8526	
	Mass Flow rate of cooling air in cooler ($M_{cooling\ air}$)	kg/hr	567223	564911		561367	562115		564763	559074	562248	566616	
	Specific heat of cooling air ($S_{cooling\ air}$)	kcal/kg C	0,239	0,239		0,239	0,239		0,239	0,239	0,239	0,239	
4	Heat from cooling air	kCal/hr	4479277	4461022		4567688	4304131		4392131	4481977	4237738	4066882	
	Power consumed by cooler fans (P_{fan})	kWh/Day	31793	31402		31115	30628		31222	30580	30498	30758	
	Heat produced by cooler fans	kCal/hr	1139249	1125238		1114954	1097503		1118788	1095783	1092845	1102162	
1a	Exhaust air temperature from cooler ($T_{Exhaust\ air\ cooler}$)	C	325	329		325	323		321	320	318	320	
	Flow rate of Cooler exhaust fan	m3/hr	561307	557381		566122	563784		568556	565261	569646	564107	
	Mass Flow rate of Cooler exhaust gas ($M_{exhaust\ gas}$)	Kg/hr	315013	310731		317716	317465		321230	319907	323480	319254	
	Sp. Heat of cooler Exhaust gas ($S_{exhaust\ gas}$)	kcal/kg/deg.C	0,245	0,245		0,245	0,245		0,245	0,245	0,245	0,245	
2a	Heat from Cooler Exhaust gas	kcal/hr	25094530	25067287		25309810	25129578		25265527	25080772	25197748	25029604	
	Clinker from Cooler ($M_{clk\ out}$)	TPD	5829	5830		5828	5828		5827	5828	5827	5828	
	Temp. of Clinker from Cooler ($T_{clk\ out}$)	Deg.C	139,0	140,0		141,0	145,0		138,0	140,0	140,0	139,0	
	Sp heat of clinker from cooler ($S_{clk\ out}$)	kcal/kg/deg.C	0,192	0,192		0,192	0,192		0,191	0,192	0,192	0,192	
3a	Heat from Clinker Cooler	kcal/hr	6465104	6516255		6564384	6766379		6413223	6514352	6513294	6464433	
	Clinker Dust from Cooler ($M_{dust\ cooler}$)	tpd	121	120		122	122		123	122	123	122	
	Temp. of Clinker dust from cooler ($T_{dust\ cooler}$)	Deg.C	325,0	329,0		325,0	323,0		321,0	320,0	318,0	320,0	
	Sp heat of clinker dust from cooler ($S_{dust\ cooler}$)	kcal/kg/deg.C	0,208	0,209		0,208	0,208		0,208	0,208	0,208	0,208	
4a	Heat from Clinker dust	kcal/hr	342066	344341		345000	341217		341730	338569	338819	337879	
	Radiation Losses (R_{loss})	kcal/hr	375478	375478		371244	379711		377595	373362	381826	388171	
	Heat Losses	kcal/hr	32277178	32303361		32590439	32616885		32398076	32307055	32431687	32220087	
	Cooler Efficiency	%	67,57	67,54	67,56	67,28	67,16	67,22	67,42	67,53	67,32	67,49	67,44
	Total heat input	kCal/hr	99542699	99510434	99526566,19	99606815	99325807	99466310,96	99435092	99501933	99254756	99093216	99321249,24
	Kiln running hours (K_{hrs})	hrs	24,00	24,00		24,00	24,00		24,00	24,00	24,00	24,00	
4	Baseline Efficiency	%			64,53			64,53					64,53
5	Increase in Cooler Efficiency	%			3,03			2,69					2,91
6	Saving in heat output due to increase in cooler efficiency	Kcal/hr			3011800,23			2676955,08					2889992,61
7	Saving in heat input due to increase in cooler efficiency	Kcal/hr			4458219,21			3982300,77					4285296,03
8	Total energy saved	Million Kcal			1932,64			1871,28					3085,41
9	Average calorific value of petcoke	Kcal/ kg			8295			8308					8318
10	Average calorific value of Coal	Kcal/ kg			6520			6601					6678
11	Average calorific value of Lignite	Kcal/ kg											
12	Average calorific value of agri fuel	Kcal/ kg											
13	tCO ₂ emission per ton of Petcoke	t CO2/TJ			100,8			100,8					100,8
14	tCO ₂ emission per ton of Coal	t CO2/TJ			96,1			96,1					96,1
15	tCO ₂ emission per ton of Lignite	t CO2/TJ			101,2			101,2					101,2
16	tCO ₂ emission per ton of agri fuel	t CO2/TJ			0			0					0
17	Quantity of petcoke consumed	tons/month			1866			2207					2075
18	Quantity of fine coal consumed	tons/month			9565			10369					17646
19	Quantity of lignite consumed	tons/month			0			0					0
20	Quantity of agri fuel consumed	tons/month			0			0					0
21	Total heat supplied by fuels	n Kcal/month			77842,27			86781,53					135099,84
22	Average emission factor of fuel used	t CO2/TJ			97,03			97,09					96,70
23	Average emission factor of fuel used	2/Million Kcal			405,60			405,85					404,21
24	Emission Reduction	tons/month			783,89			759,46					1247,15

July'04					Aug'04					Sept'04				Oct'04			
06-Jul-04	14-Jul-04	20-Jul-04	26-Jul-04	Monthly Average	06-Aug-04	13-Aug-04	20-Aug-04	25-Aug-04	Monthly Average	03-Sep-04	10-Sep-04	15-Sep-04	Monthly Average	12-Okt-04	18-Okt-04	26-Okt-04	Monthly Average
5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950		5950	5950	5950	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420		1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262		0,262	0,262	0,262	
92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522		92082522	92082522	92082522	
119	119	119	119		119	119	119	119		119	119	119		119	119	119	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420		1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262		0,262	0,262	0,262	
1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650		1841650	1841650	1841650	
27,0	29,5	31,0	29,0		30,0	27,0	26,5	26,5		29,0	29,5	28,5		23,0	25,5	22,0	
8450	8453	8581	8582		8433	8524	8548	8560		8469	8560	8544		8549	8611	8544	
567191	562708	568418	572249		560408	572166	574741	575498		564667	569829	570655		581600	580891	583187	
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239		0,239	0,239	0,239	
3663155	3971377	4216097	3970128		4022318	3695286	3643053	3647855		3917524	4021637	3890678		3198871	3542853	3067934	
29047	29079	31367	31378		29748	30739	31003	31127		30135	29320	29155		30092	30755	30032	
1040851	1041998	1123984	1124378		1065970	1101481	1110941	1115384		1079838	1050633	1044721		1078297	1102054	1076147	
318	315	316	319		315	311	316	312		317	315	308		305	303	304	
568874	565258	565947	566287		559425	568093	566813	567772		557652	565204	569048		574404	581320	563298	
323041	322626	322471	321029		319297	326464	322964	325723		317206	322595	328702		333518	338706	327636	
0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245		0,245	0,245	0,245	
25163617	24887336	24956614	25087788		24630518	24854555	24994768	24880084		24629082	24884933	24776736		24888053	25104900	24366794	
5827	5828	5828	5828		5829	5827	5828	5827		5830	5828	5827		5826	5824	5828	
138,0	140,0	139,0	139,0		141,0	138,0	137,0	138,0		141,0	137,0	140,0		137,0	135,0	140,0	
0,191	0,192	0,192	0,192		0,192	0,191	0,191	0,191		0,192	0,191	0,192		0,191	0,191	0,192	
6413148	6514353	6463992	6463911		6566013	6413334	6363536	6413410		6566444	6363916	6513438		6361746	6260103	6514826	
123	122	122	122		121	123	122	123		120	122	123		124	126	122	
318,0	315,0	316,0	319,0		315,0	311,0	316,0	312,0		317,0	315,0	308,0		305,0	303,0	304,0	
0,208	0,208	0,208	0,208		0,208	0,207	0,208	0,207		0,208	0,208	0,207		0,207	0,207	0,207	
338360	332675	334259	338002		329242	329614	334770	330609		330522	332643	326621		326119	327636	318646	
400852	390285	383942	392399		388171	400852	402964	402964		392399	390285	394513		417745	407189	421966	
32315977	32124649	32138808	32282100		31913944	31998355	32096039	32027067		31918448	31971777	32011308		31993663	32099828	31622232	
67,23	67,53	67,62	67,40	67,45	67,77	67,59	67,47	67,55	67,59	67,73	67,70	67,62	67,69	67,42	67,43	67,75	67,54
98628179	98937548	99264254	99018679	98962164,90	99012461	98720940	98678167	98687412	98774745,01	98921534	98996443	98859572	98925849,67	98201340	98569080	98068253	98279557,99
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00		24,00	24,00	24,00	
				64,53					64,53				64,53				64,53
				2,92					3,06				3,16				3,01
				2886198,13					3026407,56				3121803,05				2954740,39
				4279242,91					4477335,05				4612204,72				4375029,69
				2949,68					3330,24				1772,24				2648,86
									8296								8357
				6561					5917				6139				6327
									3568								
									4525				4539				4697
				100,8					100,8				100,8				100,8
				96,1					96,1				96,1				96,1
				101,2					101,2				101,2				101,2
				0					0				0				0
				0					2406				133				2753
				19197					19454				12022				13760
				490,88					0				0				0
				0					99,98				0				198,46
				125951,52					135521,90				73803,06				110998,51
				96,10					96,47				96,10				96,27
				401,70					403,25				401,70				402,40
				1184,88					1342,92				711,91				1065,89

Nov'04					Dec'04					Jan'05				
05-Nov-04	10-Nov-04	17-Nov-04	23-Nov-04	Monthly Average	04-Dez-04	08-Dez-04	15-Dez-04	23-Dez-04	Monthly Average	05-Jan-05	11-Jan-05	17-Jan-05	27-Jan-05	Monthly Average
5950	5950	5950	5950		5950	5950	5950	5950		5950	5950	5950	5950	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522		92082522	92082522	92082522	92082522	
119	119	119	119		119	119	119	119		119	119	119	119	
1420	1420	1420	1420		1420	1420	1420	1420		1420	1420	1420	1420	
0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262		0,262	0,262	0,262	0,262	
1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650		1841650	1841650	1841650	1841650	
22,0	25,5	27,5	25,5		21,0	22,5	22,5	18,0		17,5	17,5	15,0	16,0	
8499	8516	8572	8589		8565	8582	8541	8538		8562	8493	8535	8551	
580103	574457	574395	579434		586603	584812	582007	590807		593468	588675	596748	595795	
0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239		0,239	0,239	0,239	0,239	
3051708	3503614	3778510	3533965		2945440	3146510	3131415	2542242		2482673	2462624	2139412	2278546	
28684	28019	29440	29624		28510	28686	28271	28242		29335	28623	29058	27553	
1027843	1004014	1054933	1061527		1021608	1027915	1013044	1012005		1051171	1025658	1041245	987316	
301	302	304	298		301	305	304	302		305	309	311	308	
576824	570801	565476	571460		564938	570857	567218	559541		565649	565812	562345	565353	
337257	333155	328903	335876		330308	331459	329916	326583		328435	326271	323162	326567	
0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245		0,245	0,245	0,245	0,245	
24828023	24609748	24460991	24473236		24316408	24734393	24536347	24124261		24508748	24675617	24603110	24615827	
5825	5827	5828	5827		5828	5827	5827	5829		5828	5828	5829	5828	
135,0	138,0	141,0	143,0		141,0	136,0	140,0	141,0		138,0	136,0	135,0	135,0	
0,191	0,191	0,192	0,192		0,192	0,191	0,192	0,192		0,191	0,191	0,191	0,191	
6261147	6412690	6564541	6663679		6564672	6312534	6513880	6565985		6413914	6313715	6264508	6263810	
125	123	122	123		122	123	123	121		122	122	121	122	
301,0	302,0	304,0	298,0		301,0	305,0	304,0	302,0		305,0	309,0	311,0	308,0	
0,207	0,207	0,207	0,206		0,207	0,207	0,207	0,207		0,207	0,207	0,207	0,207	
322713	320525	319878	316166		316063	324106	320863	314202		321149	325939	326279	324500	
421966	407189	398739	407189		426187	419856	419856	438846		440956	440956	451503	447284	
31833850	31750151	31744149	31860270		31623331	31790889	31790946	31443294		31684767	31756227	31645400	31651422	
67,52	67,74	67,86	67,66	67,69	67,70	67,59	67,58	67,74	67,65	67,49	67,40	67,41	67,43	67,43
98003725	98431801	98757616	98519664	98428201,51	97891221	98098598	98068632	97478419	97884217,46	97458017	97412455	97104830	97190035	97291334,10
24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00		24,00	24,00	24,00	24,00	
				64,53					64,53					64,53
				3,16					3,12					2,90
				3115064,29					3057572,39					2824758,91
				4601629,50					4519448,45					4188960,98
				3313,17					3357,95					2985,68
				6530					6182					5862
				4573					4579					4262
				100,8					100,8					100,8
				96,1					96,1					96,1
				101,2					101,2					101,2
				0					0					0
				1337,29					0					0
				18715					20010					18968
				0					0					0
				1692					2981					5821
				129944,91					137351,82					135999,52
				90,38					86,55					78,57
				377,78					361,78					328,42
				1251,66					1214,83					980,56

Feb'05					March'05				2004-05
05-Feb-05	11-Feb-05	17-Feb-05	23-Feb-05	Monthly Average	02-Mrz-05	10-Mrz-05	16-Mrz-05	Monthly Average	Yearly Average
5950	5950	5950	5950		5950	5950	5950		
1420	1420	1420	1420		1420	1420	1420		
0,262	0,262	0,262	0,262		0,262	0,262	0,262		
92082522	92082522	92082522	92082522		92082522	92082522	92082522		
119	119	119	119		119	119	119		
1420	1420	1420	1420		1420	1420	1420		
0,262	0,262	0,262	0,262		0,262	0,262	0,262		
1841650	1841650	1841650	1841650		1841650	1841650	1841650		
22,5	23,5	18,0	20,0		27,0	22,0	29,5		
8547	8481	8533	8466		8524	8550	8558		
582389	575992	590436	581851		572127	583630	569679		
0,239	0,239	0,239	0,239		0,239	0,239	0,239		
3133473	3237008	2540646	2782268		3695038	3070267	4020580		
27510	26110	26980	26350		26130	26759	26833		
985775	935608	966783	944208		936325	958864	961516		
304	306	305	301		308	315	320		
564292	569805	573872	577016		565766	557134	557364		
328214	330276	333209	337369		326806	317989	315438		
0,245	0,245	0,245	0,245		0,245	0,245	0,245		
24409785	24729221	24865031	24836259		24633847	24529638	24730381		
5828	5827	5826	5825		5828	5830	5830		
138,0	139,0	136,0	135,0		139,0	140,0	139,0		
0,191	0,192	0,191	0,191		0,192	0,192	0,192		
6414237	6463068	6311829	6261102		6464036	6516314	6466049		
122	123	124	125		122	120	120		
304,0	306,0	305,0	301,0		308,0	315,0	320,0		
0,207	0,207	0,207	0,207		0,207	0,208	0,208		
319208	324690	325817	322820		324737	327893	333839		
419856	415634	438846	430407		400852	421966	390285		
31563086	31932613	31941523	31850589		31823472	31795813	31920555		
67,81	67,45	67,22	67,38	67,46	67,71	67,54	67,73	67,66	
98043421	98096789	97431603	97650649	97805615,58	98555536	97953304	98906269	98471702,90	
24,00	24,00	24,00	24,00		24,00	24,00	24,00		
				64,53				64,53	
				2,93				3,13	
				2869244,10				3080981,87	
				4253024,29				4553704,63	
				2690,89				3284,81	33222,87
									8314,8
				6151				6156	6302
									3568
				4372				4313	4482,5
				100,8				100,8	
				96,1				96,1	
				101,2				101,2	
				0				0	
				426				0	13203,29
				16320				20772	196798
				0				0	490,88
				5764				4239	20795
				125584,53				146155,24	
				76,82				84,08	
				321,09				351,45	
				864,02				1154,44	12561,61

Parameter	Unit	Value
Total Energy Saved	Million kcal	33222,87
Calorific value of pet coke	kcal/kg	8314,8
Calorific value of coal	kcal/kg	6302
Calorific value of Lignite	kcal/kg	3568
Calorific value of Agri fuel	kcal/kg	4482,5
% Petcoke Used	%	0,08
% Coal Used	%	0,86
% Lignite used	%	0,00
% Agri fuel used	%	0,06
Savings in Petcoke	Tonnes	303,6
Savings in Coal	Tonnes	4524,8
Savings in Lignite	Tonnes	11,3
Savings in Agri fuel	Tonnes	478,1

Heat Cap - Coefficients						
Gas/Mat	*T^0	*T^1	*T^2	*T^3	*T^4	
O2	0,2130	7,796E-05	-7,563E-08	4,074E-11	-8,183E-15	
CO2	0,1906	1,771E-04	-1,733E-07	9,315E-11	-1,894E-14	
N2+Ar	0,2465	-3,284E-06	4,366E-08	-2,750E-11	5,504E-15	
H2O,sted	0,4445	2,910E-05	6,887E-08	-3,726E-11	6,472E-15	
H2O, liq.	1,0000					
Rawmea	0,2060	1,014E-04	-3,673E-08			
Clinker	0,1742	1,414E-04	-1,283E-07	5,074E-11		

O2	mass %	23,0
CO2	mass %	0,0
N2	mass %	77,0
H2O	mass %	0,0

CV Fan Fl	m3/min	9500
Fan Power Drawn		180

IRR calculations for Cooler Upgradation in Binani Cement Limited	
Project parameters	
Initial Investment of the proposed project (Rs in millions)	40.47
Annual administrative cost (Rs in millions)	1.00
Expected CER pricing (Rs/ ton of CO ₂)	280.00

Escalation of Fuel cost					
Year	Coal Cost (Rs/MT)	Coal CV (Kcal/kg)	Cost (Rs/million)	Escalation (%)	
1997-99	2279	6403	355.93	-8.56	
1999-2000	2149	6603	325.46	21.20	
2000-01	2614	6627	394.45		6.3%

[illegible]

PARTICULARS	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
OPENING VALUE	404,70	303,53	227,64	170,73	128,05	96,04	72,03	54,02	40,52	30,39	22,79	17,09	12,82	9,61	7,21
DEPRE. AS PER IT ACT @ 25	101,18	75,88	56,91	42,68	32,01	24,01	18,01	13,51	10,13	7,60	5,70	4,27	3,20	2,40	1,80
CLOSING WDV	303,53	227,64	170,73	128,05	96,04	72,03	54,02	40,52	30,39	22,79	17,09	12,82	9,61	7,21	5,41
I.TAX @ 35% ON DEPRECIATION	35,41	26,56	19,92	14,94	11,20	8,40	6,30	4,73	3,55	2,66	1,99	1,50	1,12	0,84	0,63

DEPRECIATION CALCULATED ON WDV METHOD