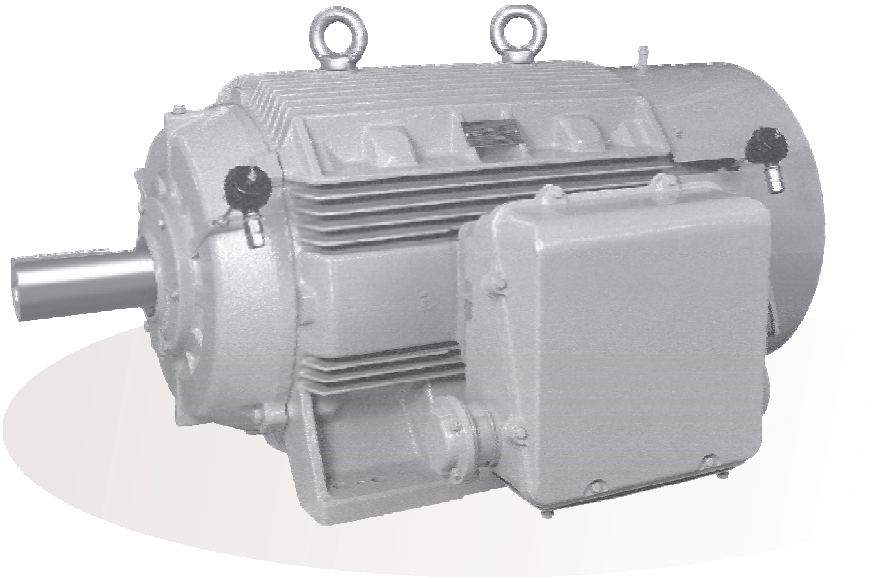
Energy Efficient Motors - Level I



0.37 kW to 225 kW
From 80 to 355 Frame

ENERGY EFFICIENT MOTORS LEVEL 1

Crompton Greaves has now developed a complete family of high efficiency motors confirming to Eff level 1 standards of IEEMA : 19-2000 and other applicable standards in Europe and rest of the world.

These motors are available in TEFC construction for use in safe areas and also in flameproof enclosure for use in Hazardous areas.

SPECIAL DESIGN FEATURES :

Higher efficiencies are achieved by following special features :

- Low loss special grade of thinner laminations. This reduces the Iron loss even at partial loads.
- Thicker conductors and more copper contents reduce copper loss due to lower resistance.
- Longer core length, reduced and uniform air gap between stator and rotor to reduce stray losses .
- Special design of fan and fan cover to reduce windage losses.

BENEFITS :

Improved efficiency is available from 60 % to 100 % load. The eff curve is almost flat resulting in higher energy savings as in most of the cases the motor is not always fully loaded .

The special design features also result in lower operating temperatures which enhance the life of motor and reduce the maintenance costs.

These motors have inherently low noise and vibration and help in conservation of environment .

Crompton Greaves energy efficient motors offer an additional feature which no other manufacturer offers.

These motors are with highest power factor in the industry due the special exclusive designs available with Crompton Greaves.

The higher power factor reduces the currents in the cables supplying power to motor and this reduces cable loss, improving the system efficiency sometimes by even 2 %.

Sometimes this allows even a lower cable size saving tremendously on capital costs. Saving is also made by reducing capacitors required to improve power factor.

MANUFACTURING RANGE :

Efficiency Level 1

- 0.37 kW to 160 kW
- Frame sizes : 71 to 315 for TEFC
  80 to 315 for Flame proof
- The entire range is available in IEC frames sizes (metric range) and also in NEMA frames

CONFORM TO FOLLOWING STANDARDS :

- IEEMA : 19-2000
- IS 12615
- IS 325-1996 & IEC 60034
- NEMA EPACT EFFICIENCY VALUES (for NEMA motors)

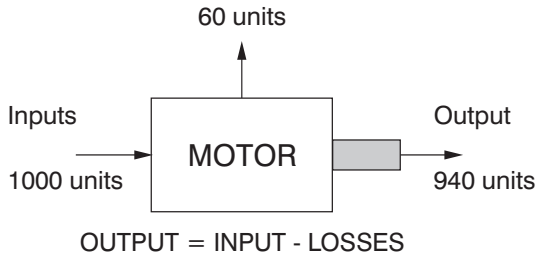
IEEMA 19-2000 standard covers kW ratings only up to 160kW. However we are offering energy efficient motors up to 450 kW.

IMPORTANCE OF ENERGY EFFICIENCY :

Growing cost of energy calls for power saving at each possible step of manufacturing. Electric motor driven systems used in industrial processes consume more than 70 percent of electricity used in industry, hence best possible technology is being applied for achieving highest possible efficiency values.

EFFICIENCY MEASUREMENT OF AN ELECTRIC MOTOR

The efficiency of an electric motor is determined by the amount of useful power it produces compared to the amount of energy required to operate it. The figure below illustrates how a Crompton Greaves Energy efficient motor effectively turns 1000 units of electrical power into mechanical power.



Since motor efficiency is commonly expressed as a percentage. Efficiency in this case would be 94%.

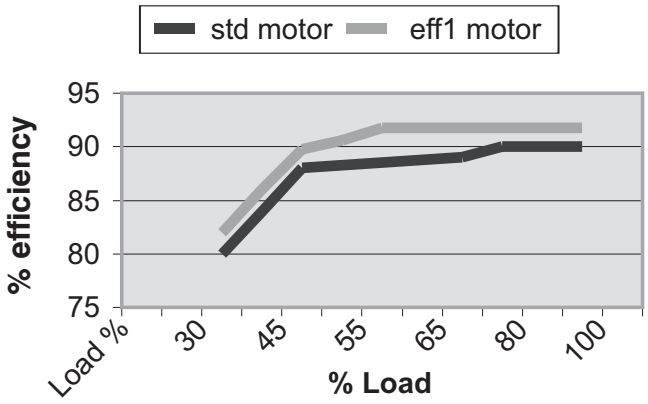
APPLICATIONS :

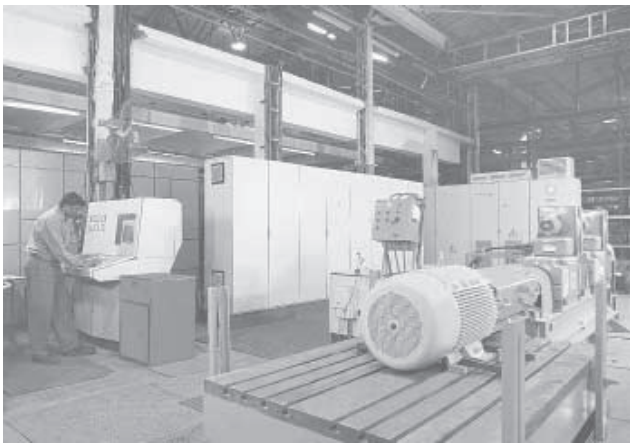
The benefits of using these motors are maximum in continuous duty applications like Blowers, Compressors, Fans, Exhausters Pumps etc.

BEST PERFORMANCE EVEN AT PARTIAL LOADS :

In many applications the load factor of the motor will range between 60% to 80%. The efficiency curve of standard motor is drooping in nature i.e there is a sharp fall in efficiency at partial loads. But the energy efficient motors have a flat efficiency curve and hence the fall in efficiency is marginal. Thus energy saving is significant even in part loads.

15 kW 4 pole efficency pattern





INTERNATIONAL APPROVALS & CERTIFICATES

CSA INTERNATIONAL · C SA US · UKAS QUALITY MANAGEMENT 008 · CSA E · ELECTRICAL EQUIPMENT EECS CERTIFICATION SERVICE · CE · Ex BASEEFA

ASSESSING COST EFFECTIVENESS OF ENERGY EFFICIENT MOTORS :

Savings :

Savings are calculated as follows :-

kW - out put of motor in kW

E1 - efficiency of standard motor

E2 - efficiency of energy efficient motor

$$X = \left(\frac{kW}{E1} - \frac{kW}{E2} \right)$$

$$\text{Savings} = X * \left(\begin{matrix} \text{working} \\ \text{Hour's} \end{matrix} \right) * \left(\begin{matrix} \text{working} \\ \text{days} \end{matrix} \right) * \left(\text{tariff} \right)$$

EXAMPLE

3.7 kW 4 pole motor in frame ND112M

Std motor eff 2: 85 % eff1 88.3 %

Price eff2 : Rs 7215/- eff1: Rs 9380/-

Working hours 16 per day, working days 300 in a year, power rate Rs 4.50 per kWH

X = 0.1626

RS Savings = 0.1626X16X300X4.5

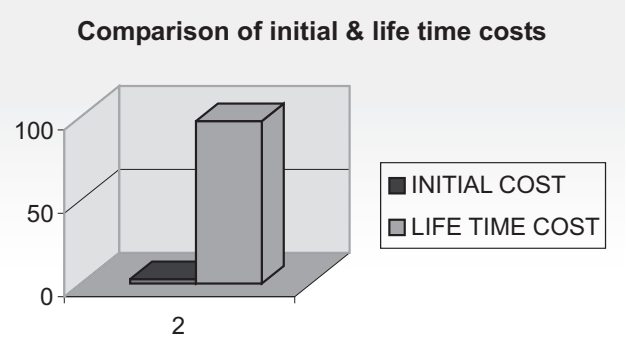
= 3514 /- RS per year

Extra investment RS 2615/-

Payback period = 9 months

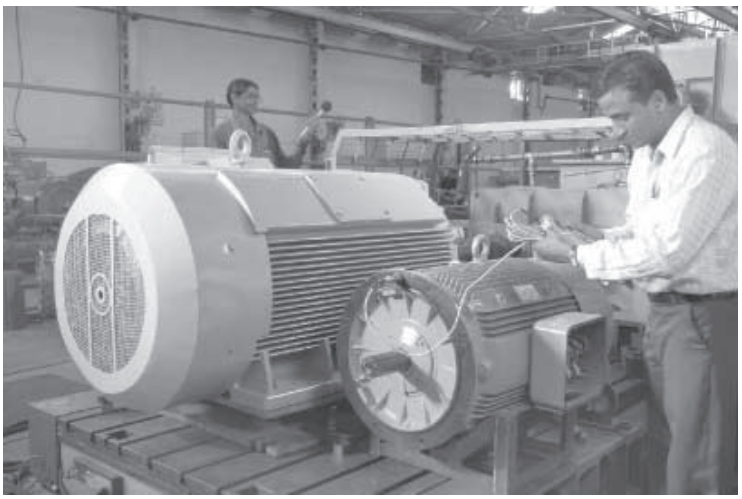
Energy cost for a 15 years usage at Rs 4.50 / kWH is staggering 14.10 lacs as compared to buying cost of Rs 7215/-. Also the energy kWH rate is likely to only go up in future.

If we compare initial purchase price of the motor with the cost of energy it uses over it working lifetime, the initial cost represents less than two percent of its lifetime cost in most of the cases .



So it makes a great deal of sense to choose an eff1 level motor whenever a motor is needed to drive any applications.

Combining this with usual Crompton greaves motors reliability, wide service network (over 180 service points all over India), the wise choice is Crompton greaves EFF1 motor.



PERFORMANCE FIGURES OF TEFC SCR MOTORS FOR 50°/70°- EFF LEVEL 1

OUTPUT		POLE	FRAME SIZE	FL RPM	FLC AMPS.	FLT Kg-m	EFFICIENCY (%)			POWER FACTOR			DOL STG.		POT % FLT	GD.^{2} KGM.^{2}	NET WT. kG
kW	HP						FL	3/4 LOAD	1/2 LOAD	FL	3/4 LOAD	1/2 LOAD	STG.T % FLT	STG.C % FLC			
0.37	0.50	6	ND80	910	1.14	0.40	69.4	67.0	64.0	0.65	0.60	0.50	200	500	250	0.011	17
0.55	0.75	4	ND80	1410	1.38	0.38	78.0	76.0	73.0	0.71	0.65	0.54	200	600	275	0.007	17
		6	ND80	910	1.56	0.59	72.0	70.0	65.0	0.68	0.63	0.50	200	500	250	0.011	17
0.75	1.00	2	ND80	2820	1.67	0.26	77.0	75.0	70.0	0.81	0.73	0.60	250	650	300	0.003	17
		4	ND80	1410	1.69	0.52	82.5	81.0	75.0	0.75	0.70	0.64	200	550	275	0.007	17
		6	ND90S	935	2.19	0.78	74.6	73.0	70.0	0.64	0.54	0.42	180	500	250	0.018	22
1.10	1.50	2	ND80	2820	2.28	0.38	82.8	81.5	78.0	0.81	0.75	0.67	225	650	275	0.004	17
		4	ND90S	1425	2.40	0.75	83.8	83.0	80.0	0.76	0.69	0.59	200	600	275	0.018	22
		6	ND90L	935	3.19	1.15	77.3	76.5	74.0	0.62	0.52	0.40	180	500	250	0.023	25
1.50	2.00	2	ND90S	2830	3.10	0.52	84.1	83.5	82.0	0.80	0.74	0.64	250	650	300	0.006	22
		4	ND90L	1425	3.23	1.03	85.0	84.0	82.0	0.76	0.70	0.60	200	600	275	0.023	25
		6	ND100L	935	3.75	1.56	79.6	78.0	76.0	0.70	0.62	0.50	200	550	250	0.037	35
2.20	3.00	2	ND90L	2860	4.36	0.75	85.6	85.0	83.0	0.82	0.74	0.66	250	700	300	0.008	25
		4	ND100L	1440	4.92	1.49	86.4	85.0	82.0	0.72	0.65	0.52	200	650	275	0.037	35
		6	ND112M	935	5.48	2.29	82.2	81.0	79.0	0.68	0.60	0.50	180	550	250	0.048	45
3.70	5.00	2	ND100L	2850	7.10	1.26	87.5	86.0	83.0	0.83	0.77	0.68	250	650	300	0.022	36
		4	ND112M	1440	7.30	2.50	88.3	87.0	86.0	0.80	0.74	0.62	200	650	275	0.052	45
		6	ND132S	940	7.90	3.83	85.1	84.5	83.0	0.77	0.73	0.62	200	600	250	0.185	68
5.50	7.50	2	ND132S	2865	10.20	1.87	88.6	88.0	86.0	0.85	0.81	0.76	225	700	300	0.062	42
		4	ND132S	1445	10.70	3.71	89.2	88.0	86.0	0.80	0.75	0.68	225	650	275	0.141	68
		6#	ND132M	940	11.30	5.70	86.8	85.5	84.0	0.78	0.74	0.62	200	600	250	0.227	79
7.50	10.00	2	ND132S	2865	13.60	2.55	89.5	88.0	86.0	0.86	0.82	0.75	250	700	300	0.062	68
		4	ND132M	1445	14.10	5.06	90.1	89.0	87.0	0.82	0.75	0.65	200	650	275	0.171	79
3.70	5.00	8	ND160M	710	8	5	83.0	83.0	81.0	0.74	0.70	0.62	150	700	225	0.46	120
5.50	7.5	8	ND160M	710	12	8	85.1	85.1	83.1	0.74	0.70	0.62	150	700	225	0.46	120
7.50	10.00	6	ND160M	970	15	8	88.1	88.1	86.1	0.80	0.75	0.65	175	500	225	0.46	120
		8	ND160L	710	16	10	86.4	86.4	84.4	0.76	0.72	0.64	150	600	225	0.64	146
9.3	12.5	2	ND160M	2930	16	3	90.0	90.0	88.0	0.88	0.85	0.78	250	700	300	0.13	125
		4	ND160M	1470	17	6	90.5	90.5	88.5	0.85	0.81	0.70	225	600	275	0.31	125
		6	ND160L	970	18	9	89.3	89.3	87.3	0.80	0.75	0.65	175	500	225	0.59	148
		8	ND180M	720	20	13	87.3	87.3	85.0	0.74	0.70	0.60	150	500	225	0.99	174
11	15	2	ND160M	2925	19	4	90.5	90.5	88.0	0.90	0.86	0.78	200	650	250	0.13	120
		4	ND160M	1470	20	7	91.0	91.0	89.0	0.85	0.81	0.70	225	600	275	0.36	120
		6	ND160L	975	21	11	89.7	89.7	86.0	0.80	0.75	0.65	200	600	250	0.64	146
		8	ND180L	720	24	15	88.1	88.1	86.1	0.74	0.70	0.60	150	500	225	1.16	205
15	20	2	ND160M	2920	26	5	91.3	91.3	89.0	0.88	0.85	0.78	250	700	300	0.17	120
		4*	ND160L	1470	26	10	91.8	91.8	89.8	0.88	0.85	0.77	200	600	250	0.47	146
		6	ND180L	975	29	15	90.5	90.5	88.5	0.79	0.76	0.66	225	700	275	1.16	205
		8	ND200L	725	33	20	89.0	89.0	87.0	0.71	0.65	0.55	225	600	275	2.14	270
18.5	25.0	2	ND160L	2920	32	6	91.8	91.8	89.0	0.88	0.85	0.78	250	700	300	0.21	146
		4	ND180M	1475	33	12	92.2	92.2	90.2	0.85	0.80	0.72	175	600	225	0.81	170
		6	ND200L	975	34	18	91.3	91.3	89.3	0.84	0.80	0.72	200	600	250	1.69	270
		8	ND225S	730	38	25	89.8	89.8	87.8	0.75	0.71	0.63	175	500	225	3.24	345
22	30	2	ND180M	2940	40	7	92.2	92.2	90.2	0.84	0.80	0.74	175	700	225	0.44	164
		4	ND180L	1475	39	15	92.6	92.6	90.6	0.85	0.80	0.72	175	600	225	0.95	205
		6	ND200L	975	40	22	91.8	91.8	89.8	0.84	0.80	0.72	200	600	250	2.04	270
		8	ND225M	730	45	29	90.2	90.2	88.0	0.75	0.71	0.63	175	500	225	3.61	375
30	40	2	ND200L	2950	52	10	92.9	92.9	90.9	0.87	0.84	0.80	150	700	225	0.80	270
		4	ND200L	1470	51	20	93.2	93.2	91.2	0.88	0.82	0.76	225	600	275	1.62	270
		6	ND225M	980	53	30	92.6	92.6	90.6	0.85	0.81	0.72	200	600	250	3.61	375
		8	ND250M	735	61	40	91.5	91.5	89.5	0.75	0.71	0.63	175	700	225	4.82	465

PERFORMANCE FIGURES OF TEFC SCR MOTORS FOR 50°/70°- EFF LEVEL 1

OUTPUT		POLE	FRAME SIZE	FL RPM	FLC AMPS.	FLT Kg-m	EFFICIENCY (%)			POWER FACTOR			DOL STG.		POT % FLT	GD.^{2} KGM.^{2}	NET WT. kG
kW	HP						FL	3/4 LOAD	1/2 LOAD	FL	3/4 LOAD	1/2 LOAD	STG.T % FLT	STG.C % FLC			
37	50	2	ND200L	2955	63	12	93.3	93.3	91.0	0.87	0.84	0.80	150	700	225	0.89	270
		4	ND225S	1475	68	24	93.6	93.6	91.0	0.81	0.76	0.70	250	600	300	2.64	345
		6	ND250MX	980	66	37	93.0	93.0	91.5	0.84	0.80	0.72	225	600	275	4.82	465
		8	ND280S	735	75	49	91.9	91.9	89.9	0.75	0.71	0.63	200	700	250	8.01	600
45	60	2	ND225M	2960	73	15	93.7	93.7	91.7	0.92	0.88	0.82	250	700	300	1.87	375
		4	ND225M	1475	81	30	93.9	93.9	92.0	0.82	0.78	0.70	250	600	300	3.13	375
		6	ND280S	980	79	45	93.4	93.4	91.4	0.85	0.81	0.73	225	700	275	8.01	600
		8	ND280M	725	90	60	92.4	92.4	90.4	0.75	0.71	0.63	175	700	225	9.89	630
55	75	2	ND250MX	2960	87	18	94.0	94.0	92.0	0.94	0.92	0.88	200	700	250	2.79	465
		4	ND250MX	1485	92	36	94.2	94.2	92.2	0.88	0.84	0.76	175	600	225	3.45	465
		6	ND280M	980	101	55	93.8	93.8	91.8	0.81	0.78	0.74	200	700	250	9.89	630
		8	ND315S	742	116	72	92.8	92.8	90.0	0.71	0.67	0.58	175	500	225	14.12	900
75	100	2	ND280S	2960	119	25	94.6	94.6	92.6	0.93	0.9	0.86	200	700	250	7.14	600
		4	ND280S	1480	122	49	94.7	94.7	92.7	0.90	0.88	0.84	200	700	250	7.21	600
		6	ND315S	987	134	74	94.2	94.2	92.2	0.83	0.76	0.64	200	600	250	14.12	900
		8	ND315M	742	153	98	93.5	93.5	91.5	0.73	0.66	0.56	200	500	250	18.98	950
90	120	2	ND280M	2975	146	29	95.0	95.0	93.0	0.90	0.86	0.78	225	700	275	8.18	630
		4	ND280M	1480	146	59	95.0	95.0	93.0	0.90	0.88	0.84	225	700	275	8.26	630
		6	ND315M	987	156	89	94.5	94.5	92.5	0.85	0.80	0.70	200	600	250	17.00	950
		8	ND315L	742	175	118	94.0	94.0	92.0	0.76	0.72	0.62	150	500	225	29.85	1160
110	150	2	ND315S	2965	171	36	95.0	95.0	93.0	0.94	0.92	0.84	200	700	250	6.63	900
		4	ND315S	1485	175	72	95.2	95.2	93.5	0.92	0.88	0.86	200	650	250	11.62	900
		6	ND315M	987	188	109	94.6	94.6	92.6	0.86	0.82	0.74	200	600	250	18.98	950
		8	ND315LX	742	214	144	94.3	94.3	92.3	0.76	0.72	0.62	150	500	225	29.85	1160
132	180	2	ND315M	2970	205	43	95.3	95.3	93.3	0.94	0.92	0.84	175	700	225	7.97	950
		4	ND315M	1490	214	86	95.5	95.5	93.5	0.90	0.86	0.78	225	700	275	13.98	950
		6	ND315L	990	225	130	94.9	94.9	92.8	0.86	0.82	0.74	200	600	250	29.85	1160
		8	ND315LX	742	255	173	94.7	94.7	92.7	0.76	0.72	0.62	150	500	225	29.85	1160
160	215	2	ND315LX	2980	248	52	95.5	95.5	93.5	0.94	0.92	0.90	175	700	225	16.37	1130
		4	ND315LX	1488	255	105	95.8	95.8	93.8	0.91	0.88	0.78	200	650	250	24.97	1160
		6	ND315LX	990	272	157	95.1	95.1	93.0	0.86	0.82	0.74	200	600	250	29.85	1160
		8	ND355LX	743	304	210	95.0	95.0	93.0	0.77	0.73	0.63	140	500	225	45.43	2100
180	240	2	ND315LX	2975	279	59	95.5	95.5	93.5	0.94	0.92	0.90	225	650	275	13.9	1160
		4	ND315LX	1488	287	118	95.8	95.8	93.8	0.91	0.88	0.84	200	650	250	21.1	1160
		6	ND355L	990	306	177	95.1	95.1	93.5	0.86	0.82	0.76	200	600	250	33.50	2150
		8	ND355LX	743	338	236	95.0	95.0	93.5	0.78	0.74	0.62	120	400	225	51.1	2100
200	270	2	ND315LX	2975	309	65	95.8	95.5	94.0	0.94	0.92	0.88	225	700	270	16.4	1160
		4	ND315LX	1488	319	131	95.8	95.6	94.7	0.91	0.88	0.84	200	650	250	25	1160
		6	ND355LX	991	347	197	95.6	95.3	94.2	0.84	0.80	0.72	130	500	225	29.7	2150
		8	ND355LX	743	366	262	95.0	95.0	94.0	0.80	0.76	0.70	120	400	175	58.1	2150
225	300	2**	ND355LX	2975	355	74	95.8	95.0	93.5	0.92	0.90	0.84	150	650	225	18.4	2150
		4	ND355LX	1488	355	147	95.8	95.8	93.8	0.92	0.88	0.80	150	600	225	28	2150
		6	ND355LX	991	390	221	95.6	95.3	94.2	0.84	0.80	0.70	125	500	250	31.7	2150
		8**	ND355LX	743	422	295	95.0	95.0	93.5	0.78	0.74	0.62	120	400	225	58.1	2150

ALL PERFORMANCE FIGURES ARE SUBJECT TO TOLERANCES AS PER IS 325-1996
EFFICIENCY FIGURES ARE AS PER EFF1 CLASS OF IS12615-2004.

** 40/80

* 45/75

class F rise 50/95^{0}C