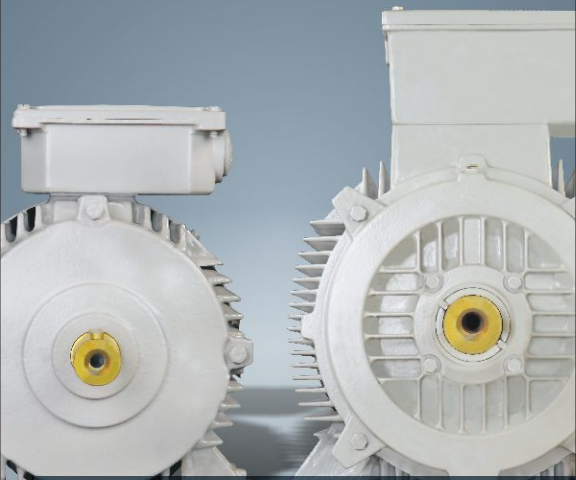


**SIEMENS**



The new “Champion” for energy efficiency & reliability - Conforming to IE2 & IE3 Efficiency Classes

First choice to reduce your energy bills.

Energy Saving Plan (ESP)

Answers for industry.

What will be the reduction in electricity bills for a period of 6 months, if for a 22kW, 4P, motor, running continuously at 85% Full Load for 8000 hours per annum, IE3 motor is used instead of IE1 motor? Consider a power tariff of ₹5 per kWh.

From the chart, it can be seen that running at Full Load, a 22kW, 4P motor requires 1.2 hours to save a kWh of energy.

Using this for 8000 hours p.a. at 85% FL, the energy saved will be:

$$\Delta_{\text{Energy\_consumption\_6m}} = \frac{1}{2} \times \frac{\text{Hrs}_{\text{operation\_pa}} \times \text{LoadFactor}}{Z_{\text{hrs\_of\_continuous\_operation\_to\_save\_1kWH}}}$$

$$= 8,000 \times 0.85 / (1.2 \times 2)$$

$$= 2,833 \text{ kWh}$$

$$\text{Savings in Electricity Bill} = 2833 \times \text{Tariff} = 2,833 \times 5$$

$$= ₹ 14,167$$

The factor of ½ is the resultant of 6m being considered for calculation.

The back cover shows the time required to reduced CO<sub>2</sub> emissions by 1kg. The calculation of total CO<sub>2</sub> emission reduction can be calculated by a similar procedure as shown above.

# Energy Saving Plan (ESP)

## Savings through IE2 / IE3 Motors over IE1 and IE3 motor over IE2 as per IS:12615 -2011

kW	No of Hours (Z) *								
	IE2 vs IE1			IE3 vs IE2			IE3 vs IE1		
	No. of Poles			No. of Poles			No. of Poles		
	2	4	6	2	4	6	2	4	6
0.75	14.0	10.2	12.0	25.2	30.2	26.6	9.0	7.6	8.3
1.1	11.8	8.7	10.0	19.3	23.0	19.8	6.6	6.3	6.6
1.5	10.2	7.6	8.7	15.7	18.8	16.3	5.7	5.4	5.7
2.2	8.6	6.6	7.0	12.0	13.8	12.5	4.5	4.5	4.5
3	7.4	5.8	6.1	9.8	11.4	10.3	3.9	3.8	3.9
3.7	6.8	5.4	5.4	8.8	9.8	9.0	3.4	3.5	3.4
4	6.6	5.1	5.4	8.2	9.6	8.3	3.3	3.3	3.3
5.5	5.8	4.5	4.5	6.4	7.5	6.9	2.7	2.8	2.7
7.5	4.8	3.8	3.9	5.3	6.3	5.5	2.3	2.4	2.3
9.3	4.2	3.5	3.4	4.8	5.1	5.0	2.0	2.1	2.0
11	4.0	3.3	3.0	4.1	4.7	4.6	1.8	1.9	1.8
15	3.3	2.8	2.6	3.5	3.7	3.6	1.5	1.6	1.5
18.5	2.7	2.3	2.4	3.0	3.3	3.4	1.4	1.4	1.4
22	2.7	2.2	2.2	2.7	2.8	2.9	1.2	1.2	1.2
30	2.1	1.7	1.8	2.2	2.2	2.4	1.0	1.0	1.0
37	1.8	1.5	1.6	2.0	2.0	2.1	0.9	0.9	0.9
45	1.6	1.4	1.4	1.8	1.8	1.9	0.8	0.8	0.8
55	1.4	1.1	1.3	1.5	1.5	1.6	0.7	0.6	0.7
75	1.1	0.9	1.1	1.3	1.2	1.3	0.6	0.5	0.6
90	0.9	0.8	0.9	1.1	1.0	1.1	0.5	0.4	0.5
110	0.8	0.7	0.8	0.9	0.9	1.0	0.4	0.4	0.4
125	0.7	0.6	0.7	0.9	0.8	0.9	0.4	0.3	0.4
132	0.6	0.6	0.6	0.9	0.8	0.9	0.4	0.3	0.4
160	0.6	0.5	0.6	0.7	0.6	0.7	0.3	0.3	0.3
200	0.4	0.4	0.4	0.6	0.5	0.6	0.3	0.2	0.3
250	0.4	0.3	0.4	0.5	0.4	0.5	0.2	0.2	0.2
315	0.3	0.3	0.3	0.4	0.3	0.4	0.2	0.1	0.2
375	0.2	0.2	0.2	0.3	0.3	0.3	0.1	0.1	0.1

\* The motor is expected to save 1 unit energy (1kWh) when it continuously runs at rated load for the number of hours as given in the table.

E.g. -160kW/4Pole IE3 motor will save 1 unit in 0.3 hours i.e. 18 minutes over IE1 motor of same rating.

Unit saved in one year (Y)= Annual running hoursx Load Factor / Z

Money Saved in one Year = Y x Electricity tariff

Parameters are subject to tolerance as per IS 325

# CO<sub>2</sub> Mitigation Plan (CMP)

CO<sub>2</sub> mitigation through IE2/IE3 Motor over IE1 motor and IE3 motor over IE2 motor as per IS:12615-2011

Output kW	No. of hours (Z)								
	IE2 vs IE1			IE3 vs IE2			IE3 vs IE1		
	2	4	6	2	4	6	2	4	6
0.75	17.3	12.6	14.8	31.2	37.3	32.9	11.1	9.4	10.2
1.1	14.6	10.7	12.3	23.8	28.5	24.5	8.2	7.8	8.2
1.5	12.6	9.4	10.7	19.4	23.3	20.1	7.0	6.7	7.0
2.2	10.6	8.2	8.7	14.9	17.1	15.5	5.6	5.5	5.6
3	9.2	7.2	7.6	12.1	14.0	12.8	4.8	4.7	4.8
3.7	8.4	6.6	6.7	10.9	12.1	11.1	4.2	4.3	4.2
4	8.2	6.3	6.6	10.1	11.8	10.3	4.0	4.1	4.0
5.5	7.2	5.6	5.5	7.9	9.3	8.5	3.3	3.5	3.3
7.5	5.9	4.7	4.9	6.5	7.8	6.7	2.8	2.9	2.8
9.3	5.1	4.3	4.2	5.9	6.3	6.2	2.5	2.6	2.5
11	4.9	4.0	3.7	5.1	5.8	5.6	2.2	2.4	2.2
15	4.1	3.5	3.2	4.3	4.6	4.5	1.9	2.0	1.9
18.5	3.4	2.9	3.0	3.7	4.0	4.3	1.7	1.7	1.7
22	3.3	2.7	2.7	3.4	3.4	3.6	1.5	1.5	1.5
30	2.6	2.2	2.3	2.7	2.7	2.9	1.3	1.2	1.3
37	2.2	1.9	2.0	2.4	2.4	2.6	1.1	1.1	1.1
45	1.9	1.7	1.8	2.2	2.2	2.4	1.0	0.9	1.0
55	1.8	1.4	1.6	1.8	1.8	2.0	0.9	0.8	0.9
75	1.3	1.1	1.3	1.6	1.5	1.6	0.7	0.6	0.7
90	1.1	1.0	1.1	1.4	1.2	1.4	0.6	0.6	0.6
110	1.0	0.8	1.0	1.1	1.1	1.3	0.6	0.5	0.6
125	0.9	0.7	0.9	1.1	1.0	1.1	0.5	0.4	0.5
132	0.8	0.7	0.8	1.1	0.9	1.1	0.4	0.4	0.4
160	0.7	0.6	0.7	0.9	0.8	0.9	0.4	0.3	0.4
200	0.6	0.5	0.6	0.7	0.6	0.7	0.3	0.3	0.3
250	0.4	0.4	0.4	0.6	0.5	0.6	0.2	0.2	0.2
315	0.3	0.3	0.3	0.4	0.4	0.4	0.2	0.2	0.2
375	0.3	0.3	0.3	0.4	0.3	0.4	0.2	0.1	0.2

(Grid emission factor - 0.81)

- \* The Motor is expected to mitigate 1kg of CO<sub>2</sub> when it runs continuously at rated load for the number of hours as given in the table.  
 E.g. 160kW/4Pole IE3 motor will mitigate 1kg of CO<sub>2</sub> in 0.3 hours when compared with IE1 motor (i.e. 18 minutes)

$$\text{CO}_2 \text{ Mitigation in one year (Y)} = \frac{\text{Hours of operation per year} \times \text{load factor}}{\text{No. of Hours (Z)}}$$