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REDUCE PRODUCTION COST IN TEXTILE INDUSTRY BY PAYBACK ANALYSIS METHOD

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ABSTRACT-

The main conclusions of my paper are save the money by replacing by energy efficient motor to improve the losses, power factor, maintenance and life of the motor. The purpose of the paper is to perform an introductory investigation of replacing energy efficiency motor by standard induction motor with the help of a case study in textile industry. These are done by calculation comparison data between energy efficiency motor and standard induction motor.

1. INTRODUCTION

Three phase ac induction motor are used in Indian industry as application. It is simple in design; easy in operation has low internal cost, simple and low maintenance, reliable operation and high efficiency. Now a day's electric energy and electrical motor play a vital role in industry. The electric motor consumes bulk of electricity.

Energy Efficient Motor that gives you the same output strength by consuming lesser amount of power.

Energy efficient motors have some different form standard motor:

- Higher quality thin steel lamination in the stator.
- Reduced fan losses.
- More copper in the winding.
- Closer machinery tolerance.
- A greater length.
- High quality aluminum used in rotor frame.
- Optimized air gap between the rotor and the stator.
- Energy efficient motor has a greater efficiency than standard motor. The result less operating cost.
- Energy efficient motor has a lower slip therefore they have higher speed standard motor.
- Energy efficient motor can reduce maintenance cost and improve the operation in industry.
- So advantage of the energy efficient motor to increase the productivity.

According to cost and rise of productivity this motor are implemented in textile industry where more standard induction motor and used. We can reduce the annual cost of the industry by different parameter are improve tech used to save the cost and reduce the electricity bill of the industry. Energy efficient motor produces the same shaft output power (hp) uses less electrical input power (KW) than a standard efficient motor.

Energy efficient motor must have nominal full load efficiencies than exceed the minimum NEMA STANDARDS give in

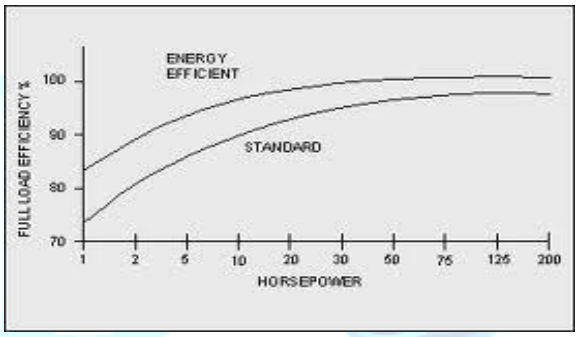


Figure 1.4 Comparisons between Standard Motor and Energy

A. Power Factor Improvement

Power factor is the ratio of the active to the tota l power in figure below

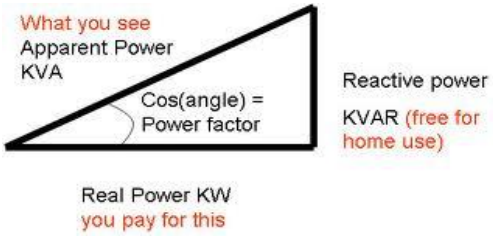


Figure 1.7

Power Factor

Induction motor requires both active and reactive power to operate. The active or true power measured in KW is consumed and produces work or heat the reactive power expressed in KVAR stored and discharge the inductive or capacitive elements of the circuit the magnetic field within the motor that causes it to rotate the total apparent power is the product of the total voltage and total

current in AC circuit in KVA. Induction motor the principal of cause low power factor because there are so many in use and they are not fully loaded.

- Power factor can also improve by replacement of standard with energy efficient motor.

B. These are some methods which are use to calculation and payback analysis

1. Direct Saving and Pay Back Analysis

The annual cost saving for the motor of different efficiencies operating at the same load can be calculated by

$$S = 0.746 \times hp \times p \times h \ (100/E_2 - 100/E_1)$$

Hp = horse power output

P = power cost / KWH

H = running time hr/yr

E_1E_2 = efficiencies of motor or system being compared.

2. Efficiency Factor or Efficiency Evaluation Factor

The efficiencies factor can express = EF_{kw} = PNH

P = power cost

N = number of year of operation

H = hours per year of running cost

$$EF_{hp} = 0.746 \ PNH$$

When the efficiency factor has been established the life cycle power cost saving (LCPS) than be calculated from the following equation

$$LCPS = EF_{hp} \times hp \ (100/E_1 - 100/E_2)$$

This value is the total projected power cost saving based on the life cycle and not the annual savings.

3. Present Value or Present worth Method with Constant Power Cost

The cost of money over the payback period money invested today at a specific rate of interest will increase in value at same future clad

Present worth = $1/ (1+i)^n$ x annual saving

i = annual rate of interest

n = year of saving

4. Present Value or Present worth Method with Increasing Power Cost

The method is based on constant cost for electric power.

$$S (I+I_P) + S (I+I_P) + \_ \_ + S (I+I_P)^n$$

Where

S = initial annual power cost saving

N = year

I_P = annual percent increase in power cost

Assume the i_p increase first year

The present worth of series of saving

$$Pw = S \left[\frac{1+I_P}{I+I_R} + \frac{(I+I_P)^2}{(I+I_R)^2} + \_ \_ + \frac{(I+I_P)^n}{(I+I_R)^n}\right]$$

I_R= is the annual interest rate for money or required rate of return.

Effective interest rate is a function of the percent increase in power cost and the rate of return.

$$I_g = \frac{I+I_R}{I+I_P} - I$$

Where

I_E = effective interest rate

I_R = annual interest rate or rate of return

I_P = annual percent increase in power cost.

The present worth can be calculated.

$$Pw = S \left[\frac{(I+I_E)^n - 1}{I_E (I+I_E)^n}\right]$$

5. Net Present worth Method

Previous method not consider the impact e.g. tax or depreciation on the present worth in order the net present worth of the power cost saving.

The net present worth method for the energy saving consist of two components.

$$NPW = NPW_E + NPW_D$$

NPW_E = Net present worth of energy saving

NPW_D = Net present worth of the depreciation on the premium investment.

$$NPW_E = PW \ [1-T]$$

PW = Present worth, T= tax rate

$$PW = S \left[\frac{(I+I_E)^n - 1}{I_E (I+I_E)^n}\right]$$

$$I_E = \frac{I+I_R}{I+I_\infty} - 1$$

Where S is the annual saving based on the initial power rate.

The net present worth of the depreciation $(NPW)_D$

Calculated

$$NPW_D = [NPWE] \ \left[\frac{I+I_R)^n - 1}{N \quad I_R [I+I_R]^n}\right] \times T$$

II. LITERATURE REVIEW

A. General Survey of Various Reports

The benefits and advantage of using Energy Efficient Motor instead of Standard Induction Motors for energy conversation and money saving method are discussed in many technical papers published in International and conference brief of the papers is given below.

Singh et al (2010) presented paper the core study the forging industry motor the replacement of low efficiency motors with high efficiency motors with payback time and operating cost benefits and comparison of standard motor and energy efficient induction motor on the basis of different performed about parameter.

Secenard et al (2007) presented to improve efficiency up to 5% amount of energy saved. In this disused about motor efficiency increased by reducing losses large air gap tends to maximize efficiency high efficiency motor is to save the environment this reduction of energy consumption full load efficiency of the EEM motors is about 2-5% than that of SIM

B. Problem Formulation:

The Main Objective Of These paper Work to improve the efficiency with the implementation of energy efficient motor in place of standard induction motor are used in textile industry There is a large gap between the demand & supply of electrical energy. This gap is widening at the rate of 3% to reduce this gap either we are to increase the generation of electrical energy or we are to conserve it. It is very difficult to increase the generation of electrical energy as per the increasing demand. Therefore, it is suggested to employ energy efficient motors. For conservation of electrical energy into mechanical energy. The basic need of industry is electric motors consume around 70% of the total electricity used in the industrial sector. As motor are the largest users of electrical energy, even small efficiency improvement can produce very large saving across the country? Energy conservation measure taken by individual consumers in this direction can improve the national economy & benefit the environment on global scale.

For example if Proposal for the Replacement of Existing Standard Efficiency Motor with Energy Efficient Induction Motor

The specification and parameters of energy efficient motor required for the replacement of present standard efficiency induction motor are as under

There are some fixed parameters and specifications for all hp rating motor are:-

1. Life Of Motor – 15 Years
2. Energy Rate Per KWH – Rs5.60
3. Working Hours – 22
4. Working Days In A Year - 245
5. Applied Voltage – 410Voltage

- All readings are based on john c Andrea's & NEMA table.
- Method used for calculation and payback period for all hp motor are direct saving and payback analysis methods.
- Motor cost are increased accordingly to hp in both standard and energy efficient motors.

Rating of the Motor 20hp, 4pole, and 1500rpm?

Standard motor efficiency = 88.9

Power factor= 0.85 lagging

Energy efficient motor efficiency = 92.0

Power factor= 0.87 lagging

Operating time = 5390 hours

For standard motor

Power I/P = 20 x 0.745 / 0.889

= 16.78kw

For energy efficient motor

Power I/P = 20 x 0.746 / 0.92

= 16.21kw

Annual energy saving = (16.78 – 16.21) x 5390hr

= 3072.3

Annual power cost saving = 3072.3 x 5.6

= Rs17205

Standard motor 20 hp = 60500

Energy efficiency motor120 hp price = 65500

Time to recover initial cost = 65500 – 60500 / 17205

= 0.294years=3.5 month

Saving for 15 year= 15*17204.88=Rs258075

Table 4.5 Comparison Table for 20hp 4pole 1500 Rpm Motor

S. No.	Parameter	Standard Motor	Energy Efficient Motor	Difference
1	Efficiency	88.9%	92.0%	3.1
2	Power Factor	0.85 Lagging	0.87 Lagging	0.02
3	Current	27.80A	26.23A	1.57

4	KW	16.78Kw	16.21 Kw	0.57
5	Price	60,500	65,500	5000

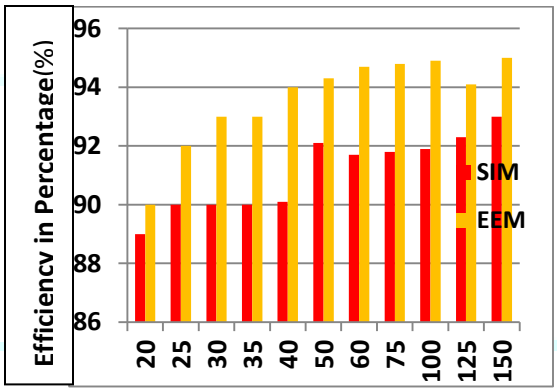
Payback period = 3.5 month

Annual saving = Rs. 17205

Total saving in 15 years = Rs. 2, 58,075

III. RESULT AND DISCUSSION

In previous topics we discuss the various parameters for the standard induction motor and energy efficient motor.. Now these parameters are being presented graphically and in a tabulation form systematically. The energy efficient motor has improved efficiency, power factor, KW, Losses, current prices difference.



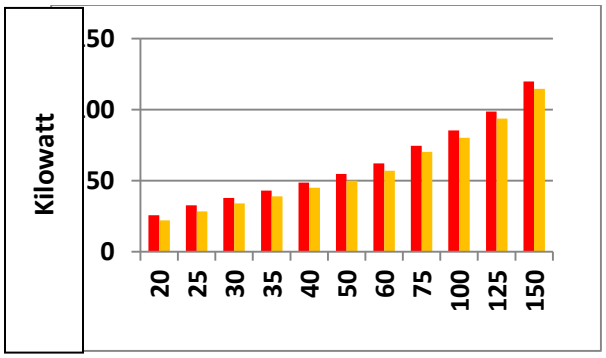
Horse Power

Figure 5.1

Efficiency Comparisons between SIM &EEM

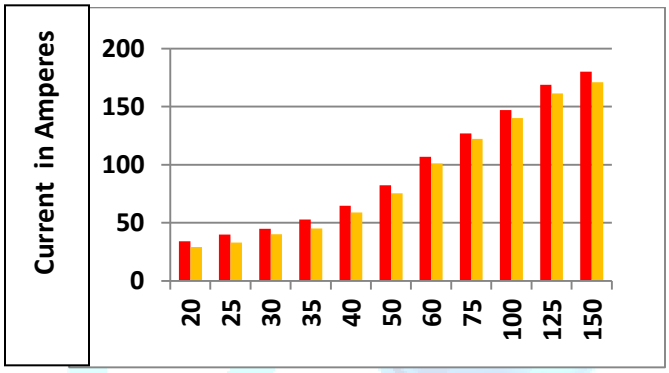
The efficiency requirement for the SIM and EEM for different power rating as shown in figure 5.1.The efficiency of the motor is major part of energy saving parameters. More efficiency, more saving. The efficiency is improved by to reducing losses, improving power factor and reducing KW load and reducing current.

For the same output power the energy efficient motor draw losses active power (KW) the losses in EEM are small.



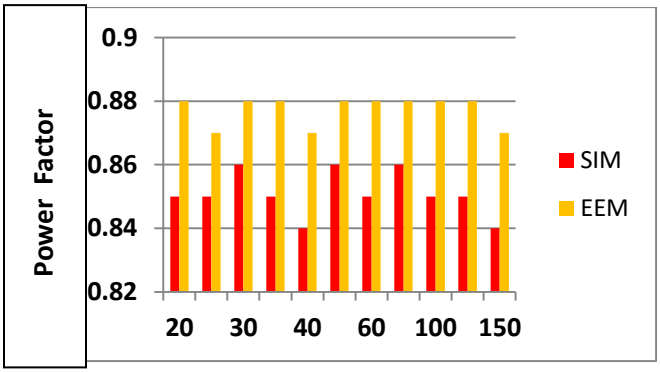
Horse Power

Figure 5.2 KW Comparison Between SIM&EEM



Horse Power

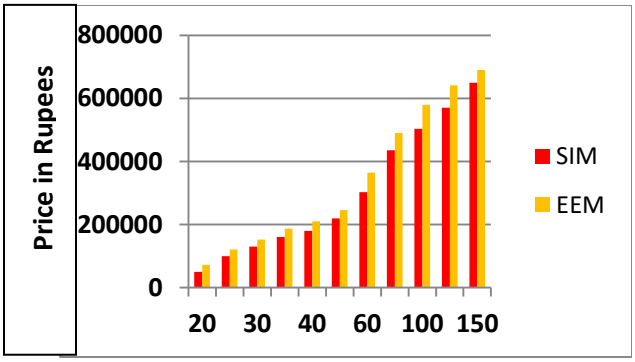
Figure 5.3 Current Comparisons SIM&EEM



Horse Power

Figure 5.4 Power Factor Comparisons SIM &EEM

The price of energy efficient motor is 15% - 30% more than that of standard efficient motor and the additional price can be recovered by the saving in the energy consumption bill, when we replace standard efficient motor with the energy efficient motor.



Horse Power

Figure 5.5 Price Comparisons in SIM&EEM

The above figures show the annual energy bill saving by the replacement of standard induction motor with energy efficient motor. The annual saving depends upon the efficiency and rating of the SIM and EEM motors. The annual saving and the payback period with respect to increase in HP rating is not uniform. The reason is that the difference of SIM and EEM.

IV. CONCLUSION AND FUTURE SCOPE

A. Conclusion

Out of the total electrical energy consumed by the industries and agriculture field, Three phase induction motor used consumed 70% electrical energy. In future, the increasing demand of electrical power and increase in the power tariffs, energy conversation will become a global issue. Improvement of efficiency of electrical drives can play a very important role in energy conservation. By replacing the energy efficient motor with standard induction motor in textile industries may result in huge savings in electrical energy consumption bills as well as in KW, current, and improvement in efficiencies and improve in power factor .Efficiency results in more annual saving. This improves the voltage profile of the electrical power transmission system.

B. Future Scope

The additional cost related with selecting energy efficient motors may be easily returned in the form of lowered energy cost and high performance. Mostly inefficient motor are selected on the basis of purchase price without concern for the lifecycle cost. As energy prices, increases and environmental laws continue to strengthen, it is necessary to look closely at equipment efficiency. This report reflects upon the preliminary study done on the electrical energy savings by using energy efficient motors. There is future scope of study of energy saving by the use of individual drive system instead of group drive system. Work should be done to optimize the motor design for more and more reduction of losses and the motor cost.

REFERENCES

1. Andreas John C.," Energy efficient motors selection and application" Second edition, Marcel Dekker, Inc, New York, Basel, Hong Kong, 1992.
2. Austin H.Bonnet, Fellow, IEEE," Reliability comparison between Standard and Energy Feecient motors.", IEEE Transactions on industry applications, Vol.33, No.1, pp.135-142,January/February 1997.
3. Colby S Roy and Flora L Denise "Measured efficiency of high efficiency and standard induction motors", IEEE Transactions in 1990.
4. Corino S, Romero E and Mantilla L.F "Energy savings by means of energy efficient electric motors" department of electrical engineering and energy E.T.S.I.I. y T. Ubiersidad de Cantabria Avda De Los Castros,39005 Santander(Spain).
5. Hassan Yusri Mohammad, Majid Shah Md and Rahman Ab Hasimah" Application of Energy Efficient Motor in Malaysian Industries", IEEE Transactions in 2000.
6. JenLee Wei and Kenarangui Rasool," Energy Management for Motors, system and electrical equipments", IEEE Transaction on industry application, Vol.38,No.2,pp.602-607,March/Aprail 2001.
7. Khushdip Singh Salana," Saving energy using energy efficient Motors: A case study" IEEE 2010.