

5 Motors

5.1 Introduction

There are millions of motors in use in industry worldwide. The Motor Challenge Programme claims that motor driven systems account for approximately 65% of the energy consumed by European Union (EU) industry. The Motor Challenge Programme is a voluntary programme promoted by the European Commission to help companies improve the energy efficiency of their electric motor driven systems.

Energy efficiency should be a major consideration when purchasing or rewinding a motor. The annual energy cost of running a motor is usually many times greater than its initial purchase price. For example, even at the relatively low energy rate of \$0.04/kWh, a typical 20 horsepower (hp) continuously running motor uses almost \$6,000 worth of electricity annually, about six times its initial purchase price.

The main barriers to achieving energy efficiency with motors are:

- A large number of motors are sold to original equipment manufacturers, whose main concerns are price and delivery time rather than efficiency
- Those departments of a company responsible for buying motors are often under pressure to recover their investments as quickly as possible. They are not responsible for buying energy. Maintenance managers make purchase decisions on replacement and not on energy efficiency
- The majority of motors when they fail are rewound, because repair is usually cheaper than a new motor purchase. Therefore, rewinding reduces the maximum theoretical penetration rate for efficient motors. The penetration rate is estimated to be around 6% per year, based on an average life of 15 years

5.1.1 Compressed Air Systems

Compressed air plays a very large part in the industrial field since it counts for approximately 11% of the current consumption. A survey conducted for five years

with the 6,000 hours operation of an air compressed system shows that energy accounts for 75% of the operating costs.

The output of a compressed air system is only 10% in most cases. Compressed air is an energy carrier which is difficult to control because it is expensive (0.06 to 0.3 per Nm³) and it has a high improvement potential of around 25% of possible energy saving on an average.

5.1.2 Cold Production Systems

Industrial refrigeration represents 4% of the electricity consumption in the industry and almost 7% of the domestic current consumption.

The food processing sector alone uses 57% of the electricity consumption is dedicated to the industrial refrigeration. The energy savings achieved in the industrial refrigeration sector is about 20% of possible savings on average.

5.1.3 Pumping Systems

Pumping systems represent approximately 25% of the worldwide current consumption. Studies have shown that significant energy savings could result from using more efficient equipment and appropriate control systems making it possible to save up to 40% of energy for an average lifetime of 15 to 20 years. The major two pump families are the centrifugal pumps and the displacement pumps. Centrifugal pumps with a 73% market share represent great possibilities of energy savings because it is considered that 75% of the pumping systems are oversized, most of them by 20%.

5.1.4 Ventilation Systems

Ventilation is a tool necessary for the proper operation of an industrial plant, ensuring the quality of production and the individual protection against the emission of pollutants or heat in premises.

The energy consumption of a plant represents on average 10% of the current consumptions of the industrial business. The indirect energy consumption to be considered is still higher when the air has a great energy content due to its conditioning for example heating and cooling.