



MOTOR CHALLENGE



THE EUROPEAN MOTOR CHALLENGE PROGRAMME

An initiative promoted by the European Commission



Energy use is one of the keys to our high standard of living. Nevertheless, use of energy poses challenges for Europe: reducing dependence on imported energy sources; minimising environmental impact; maintaining the competitiveness of European industry. Climate change, in particular, is one of the main challenges our society will face in the coming years, requiring concerted efforts from all Europeans. The fulfilment of the Kyoto commitment for the reduction of Greenhouse Gas emissions cannot be obtained without action from public and private organisations in all fields of our economy.

Reducing the energy consumption of electric motor driven systems, which account for up to 30% of all electricity used in European Union, is among the priorities of the European Union "Intelligent Energy for Europe" programme. Examples from the field have shown that from 30% to 50% of electricity used for pumps, compressors, or fans could be saved through improved operations and maintenance, or by investment in energy-efficient motor systems. In most cases, such actions are not only profitable, but also maintain or improve production quality and reliability.

The **Motor Challenge Programme** is a European voluntary programme promoted by the European Commission to aid companies in improving the energy efficiency of their electric Motor Driven Systems. The Challenge focuses on Electric Drives, Compressed Air, Fan and Pump systems, for which it has been demonstrated that there exists a large technical and economic potential for energy savings.

Any organisation wishing to contribute to the Motor Challenge Programme objectives can participate.

- Companies that **use** Motor Driven Systems can request "**Partner**" status.
- Organisations, (in particular companies that **supply** Motor Driven Systems and components) wishing to aid the Commission and Member States in carrying out the Motor Challenge Programme may become "**Endorsers**".





Motor Challenge **Partners** will be aided in **reducing operating expenses**, through profitable, cost-effective measures. Furthermore, they will receive public recognition for their contribution to achieving the objectives of the European Union's energy policy:

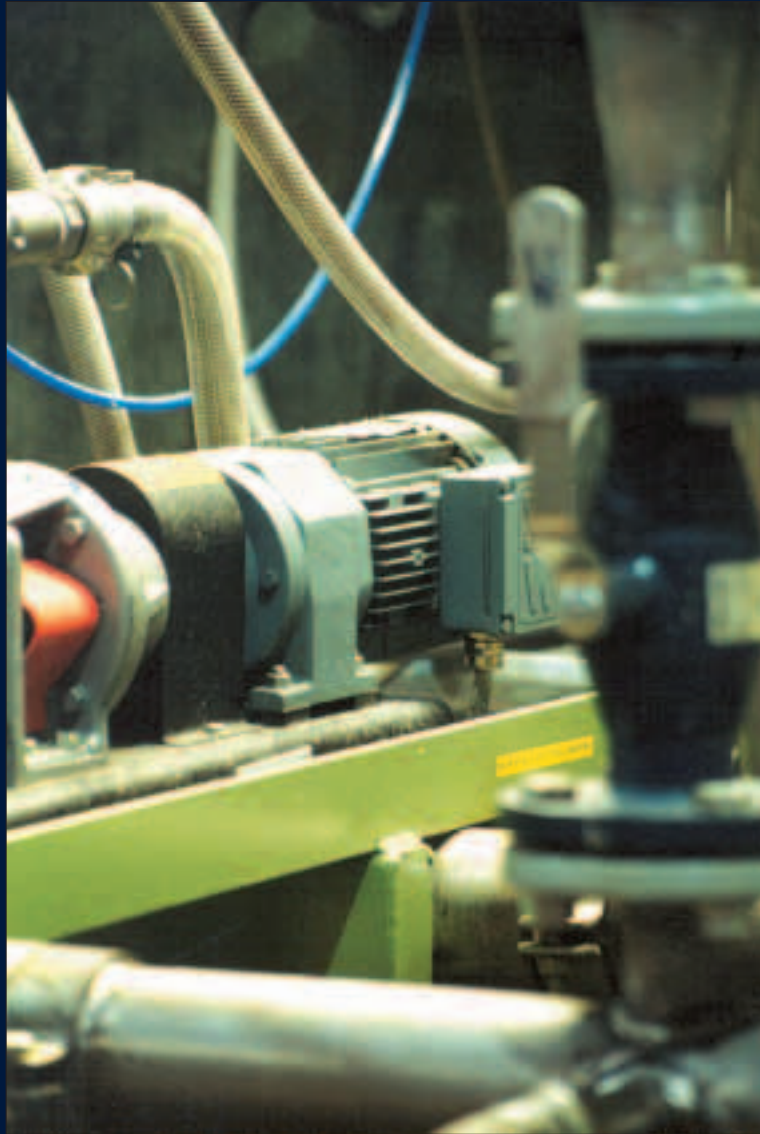
- minimising environmental impact, and in particular reducing CO₂ emissions;
- improving the competitiveness of European industry;
- reducing dependence on imported energy sources.

The Motor Challenge Programme is totally voluntary: companies are free to decide whether they want to join or not, and they may withdraw from the programme at any time without prejudice.

The core of the programme is an **Action Plan**, by which a Partner commits to undertaking specific measures to reduce energy consumption. The Partner company determines which production sites, and which types of systems, are covered by the commitment. The scope of the commitment is flexible, and can be limited to a single shop, or may include all of the company's European production sites.

Motor Challenge Partners will receive aid, advice and technical assistance from the Commission and from participating National Contact Points in formulating and carrying out their Action Plan. Companies should be able to:

- maintain or improve both the Reliability and the Quality of Service of the systems concerned;
- realise the major portion of technically and economically feasible energy savings.





Be recognised as an environmental leader fighting global warming.

Recognition by the European Commission:

- Plaques on your buildings/production plants
- Press releases
- Website
- Exclusive use of the Motor Challenge logo
- Inclusion in the partnership catalogue
- Participation in the Motor Challenge awards

In addition, national promotion campaigns are being carried out in most European countries, including, in particular, communication events in major European fairs and articles in national newspapers and technical magazines.

Unnecessary electric motors

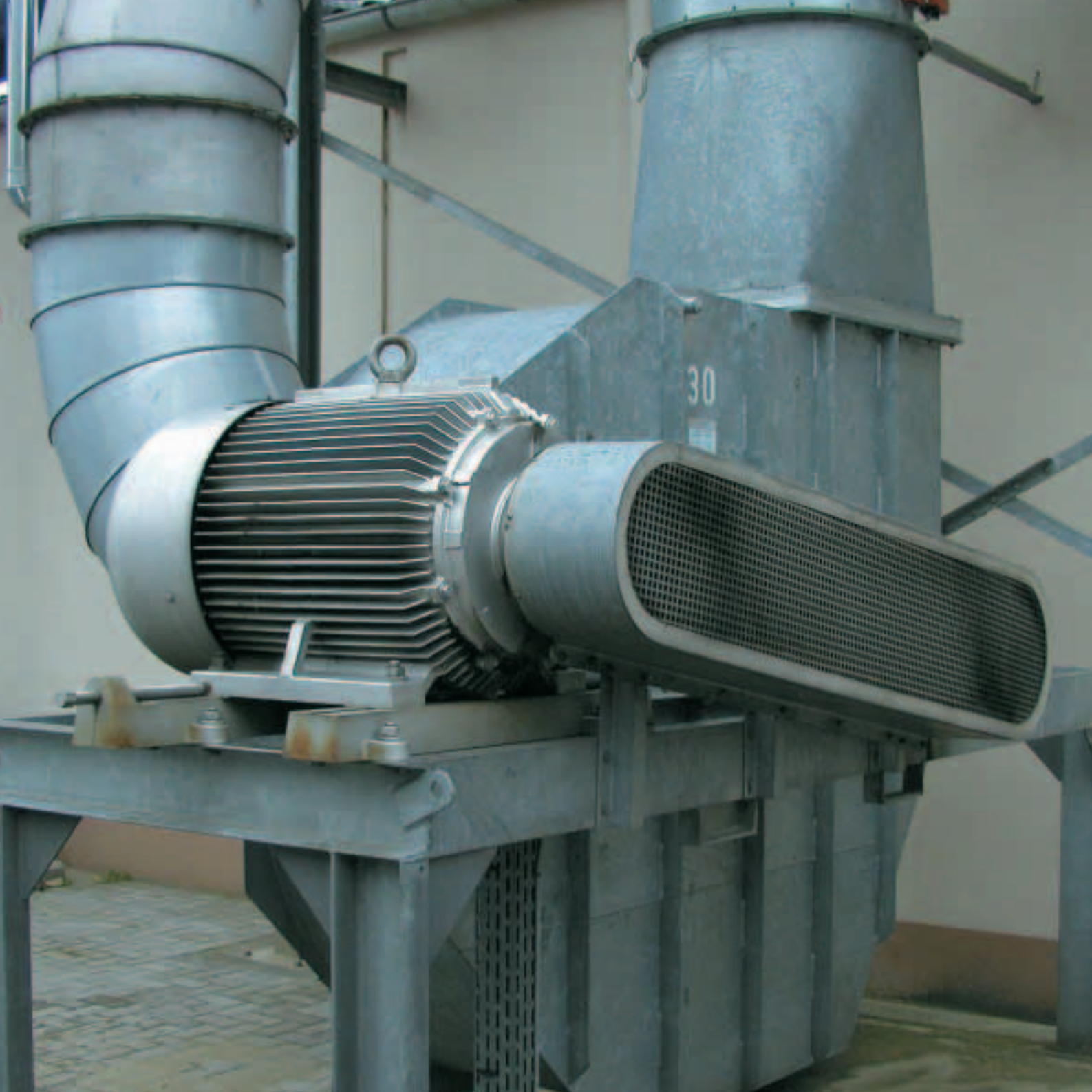
Description: LKAB, a mining company, uses powerful electric motors to drive conveyor belts in its Kiruna dressing plant. Careful measurements of energy requirements during operations were conducted in collaboration with an energy utility. The results showed that the energy consumption was 370 kW, while the installed capacity was 900 kW (two motors at 450 kW each).

Action taken: One of the two motors, along with its transmission, could be removed. This same measure could be carried out on a total of eight conveyor belts with equally large installed capacity.

Results: Reduced energy costs by € 105,000 per year, reduced maintenance costs following the removal of 8 motors and 8 transmissions, lower reactive power consumption, etc.

Profitability: The pay-off time was approximately 0.3 years (including the costs for measuring power consumption).





Control of process ventilation

Description: A workshop used a number of process air suction fans to reduce the amount of airborne particulate matter and chemicals, for the purpose of worker safety. These were equipped with manual on/off switches. However, worker self-discipline was poor in turning off the units after use or at the end of the workday.

Action taken: The units (20 in number) were equipped with timers that automatically shut them off after a pre-set delay at the end of the workday.

Results: Electricity consumption was reduced by 280 MWh/yr, which gave a savings of € 12,800 per year. In addition, district-heating consumption was reduced by 350 MWh/yr, which gave an additional savings of approx. € 10,500 per year. The total investment was approx. € 9,600.

Profitability: The pay-off time was approximately 0.4 years.

Energy Savings by reducing the size of a pump impeller

Description: A manufacturer uses a centrifugal pump to move condensate from a process and return to a boiler. Operational analysis showed that the pressure generated by the pump was considerably higher than was necessary. The high degree of throttling that was needed had led to instability in the system resulting in mal-operation and high maintenance costs.

Action taken: After discussion with the pump manufacturer the company decided to trim the diameter of the pump impeller from 320 mm to 280 mm, which allowed the pump to operate without throttling. Reducing the power required by the pump also allowed a smaller motor to be fitted, which produced further energy savings.

Results: The measures taken eliminated the instability (cavitation) and resulted in significant energy savings. The power consumption of the pump after impeller trimming fell by nearly 30%. Analysis showed that the energy saved by trimming the impeller was 197,000 kWh/year worth € 12,714 and in addition avoided maintenance costs that had previously cost € 4,285/year when the pump was cavitating. Reduced power required by a smaller impeller allowed the 110 kW motor to be replaced by a 75 kW motor. This smaller motor, operating closer to its peak efficiency, produced additional savings of € 1,071. The work involved in uncoupling, stripping and rebuilding the pump was modest and machining the outside diameter of the small impeller was a simple job. The cost to trim the impeller was € 371. Replacing the 110 kW motor with a new motor of 75 kW required an additional investment of € 3,600. Reducing cavitation at the throttling valve also reduced excessive vibration and unacceptable noise.

Profitability: The overall combined payback on both the impeller trim and motor size reduction is therefore just 11.4 weeks calculated from annual savings of € 18,070 on a total investment of € 3,971.





Optimising the compressed air supply of a car maker

Description: In 1997 the compressed air system of “plant 2” of German car maker Dr. Ing. h.c. F. Porsche AG in Stuttgart was made up of a water-cooled screw compressor (22.2 m³/min free air delivery, FAD) plus four water-cooled piston compressors of 15 m³/min each. Maximum operating pressure was 8.7 bar. Compressed air specialists of a compressor manufacturer staged an analysis of compressed air requirements, which showed the demand of compressed air varying from 15 to 65 m³/min. Processing all relevant data with the compressor manufacturer’s energy saving system a new compressed air system with optimised energy utilisation was designed.

Action taken: The new system was fitted in two stages, comprising only air-cooled screw compressors. Peak loads are being catered for by three machines with an FAD of 5.62 m³/min each, whilst four compressors with an FAD of 16.4 m³/min each provide the base load. All seven compressors are being co-ordinated depending on their relative workload by means of a compressed air management system.

Results: Optimising the compressed air system has led to a clear cost and energy saving: thanks to better utilisation of the compressors, and thanks to being able to lower the maximum operating pressure from 8.7 to 7.5 bar, the specific overall power rating of the compressor station was reduced from 8.19 to 6.19 kW/(m³/min). The overall savings amount to 483,000 kWh less electricity per year. Plus, of course, roughly € 55,000 savings per year, to which the cooling-water bill previously amounted. So optimising the compressed air system has, literally, paid off very reasonably.



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The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

Disclaimer: the examples in this brochure are self-reported by the companies. Energy savings potential is specific to each motor driven systems, depending on the installed technologies, the operating hours, the production pattern and other factors. All Motor Challenge upgrades shall be made in conformity with Community, national and local regulations. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use, which might be made of the contents of this brochure.



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