

# Motor Systems Tool for efficient system design



EMSA 1



The 4E Electric Motor Systems Annex (EMSA) promotes the opportunities for energy efficiency in motor systems by disseminating best practice information worldwide. It supports the development of policies and internationally harmonised standards to improve the energy performance of new and existing motor systems with the aim of achieving 20% to 30% energy savings.

This briefing describes the Motor Systems Tool, a software tool developed by EMSA to optimise the energy performance of electric motor systems.

## Observations for Policy Makers

### The Motor Systems Tool:

- Is an easy to use, manufacturer-independent software tool that can strengthen national programs on industrial energy efficiency.
- Can support capacity building, training and awareness raising programs for end-users, the supply chain, university education and other stakeholders.
- Is most effective if implemented in conjunction with other policy measures like programs for energy management systems and energy audits.

### Key attributes:

- Impartial and widely applicable: it uses standardised models for all components to ensure that no specific products or manufactures are being favoured over others.
- Based on a unique 'system approach' that calculates the complete system efficiency taking into account all components of a motor system.
- Simple to use, as it gives a reliable efficiency calculation based only on a few core input parameters.
- Flexible to the needs and knowledge of users, as it also offers technical experts the opportunity for in-depth calculations.
- The tool is continuously updated and enhanced<sup>1</sup> and is freely available at [www.motorsystems.org/motor-systems-tool](http://www.motorsystems.org/motor-systems-tool).

**More than 1500  
downloads since  
first release**

The Motor Systems Tool was released in 2011, and has been updated regularly since then. It has more than 1500 downloads in over 70 countries. Support in the form of a guide, calculation example and exercise for fan systems is available from the website.

<sup>1</sup> see full development history at [www.motorsystems.org/motor-systems-tool/mst-tool-development-history](http://www.motorsystems.org/motor-systems-tool/mst-tool-development-history)

## More Information

All publicly available EMSA work outputs can be accessed at [www.motorsystems.org](http://www.motorsystems.org).

For further information on EMSA contact Maarten van Werkhoven at [mvanwerkhoven@tpabv.nl](mailto:mvanwerkhoven@tpabv.nl).

For specific questions on the Motor Systems Tool contact the developer Sandie B. Nielsen at [sbn@dti.dk](mailto:sbn@dti.dk).

## Optimising motor systems: the goal is system efficiency

Optimising motor systems is about choosing the right components and getting them to work well together to achieve maximum energy efficiency.

The Motor Systems Tool calculates the total system efficiency by combining the four key components of a motor system: the motor, drive, transmission and load (e.g. pump, fan, compressor, etc.). Using simplified models of standard components and data from real life measurements, the software provides a design tool that is widely applicable.

It helps engineers working in industrial plants, original equipment manufacturers, component suppliers, energy consultants, trainers and others working on optimising machine systems to design more efficient motor systems.

## Unique features

The Motor Systems Tool gives quick results on the energy use (kWh/year) and operating costs of the system based on only four characteristics entered by the user:

- **Motor power (kW) and efficiency level (IE1 – IE3):** it can be a standard motor or user-specific.
- **Connection to grid:** direct, or through frequency converter.
- **Transmission type:** none, gear or belt.
- **Load:** the type of machine that is driven (four different load types, for e.g. pump, fan, compressor, conveyor belt, etc.).

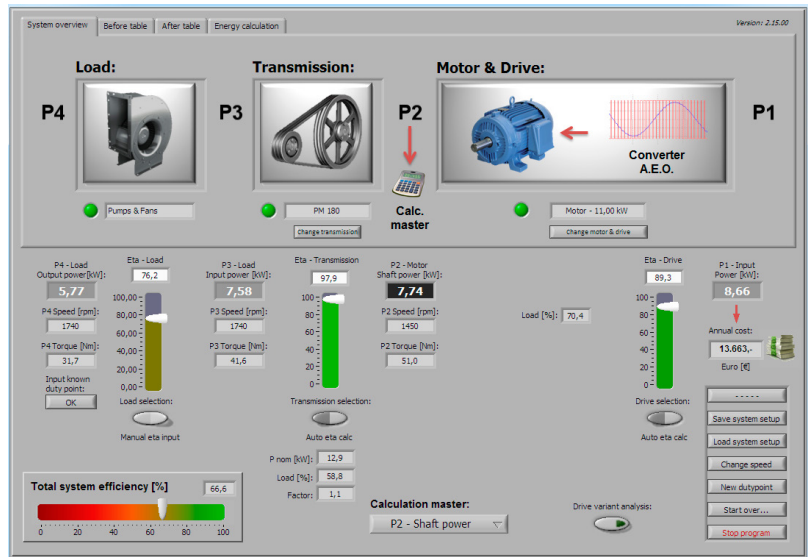
The user may then select more efficient options, e.g. switching components and/or duty points, and the Motor Systems Tool will identify the savings by comparing the 'before' and 'after' situation.

## Drive variant analysis

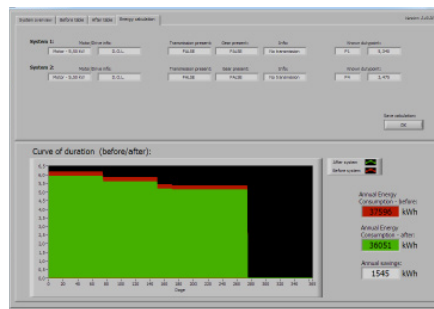
The 'drive variant analysis' gives the user an overview of the possible savings by using a variable speed drive and/or by switching to a smaller motor which can add up to 5% extra energy savings.

## In-depth analysis

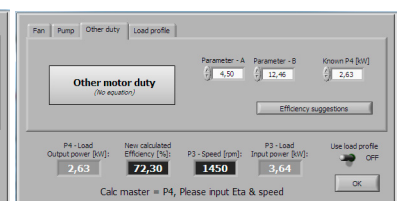
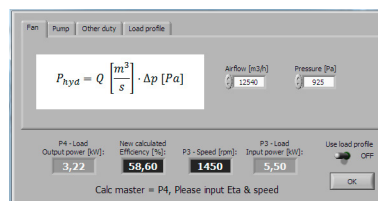
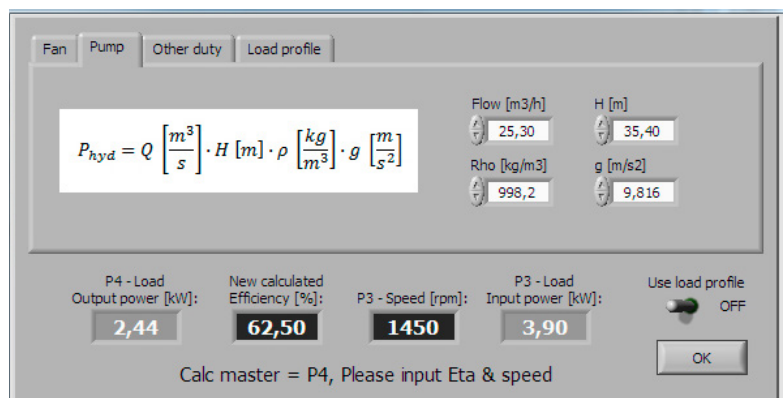
The user can design the optimal solution for a specific motor system by entering the exact load parameters of a pump, fan or other load.



Screenshot of the Motor Systems Tool



Before/after comparison



Application input