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Electrical efficiency



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Dear Partners of Go Eco,

Skåne Energy Agency (SEA) was appointed to handle the specialist technology category “Electrical Efficiency.

Below You´ll find a brief presentation of various important issues on electrical efficiency. Of course a lot more can be mentioned but in addition we recommend You to study the two references named in the end of the document.

Introduction

“Electrical efficiency” from a system point of view includes all steps in the process from generation of electricity to storage and final use of electricity in various applications. In this case we prefer to limit our task to the most potential part of the system, the electrical engine, for three reasons:

First, electrical engines for pumps, fans and other driving purposes consumes as much as 70% of the electrical energy used by the industry and almost 50% by the complete society. Hence every step of efficiency measures concerning electrical engines has a major impact on the all over energy situation. The recently introduced technology of using electronic power control/frequency alteration in order to adjust the power/effect to the momentarily load positively influences the demand for power supply and dimensioning of the equipment for electric supply (cables, fuses, transformers and generation of electricity). In principal what You achieve is a possibility for a down-scaling of the complete system which normally gives You a direct pay-back.

Secondly, the EU-commission in 2009 issued an important directive regulating design and performance of electrical engines with launching dates for purchasing of new electrical engines.



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Thirdly, the European organization for manufacturers of electrical engines, the CEMEP, recently introduced a new classification system which put higher demands of quality/efficiency of electrical engines for the future.

The classification of CEMEP matched with the latest EU-directive on eco-design forms the foundation for the application of electrical engine for the coming decades.

N.B. Since the trading market for electrical engines is international and huge You might find engines of foreign brands with false or altered figures in order to comply with the new, strict rules of EU.

Technical options - saving potentials

To understand the functions and possibilities for efficiency measures in systems where electrical engine are used a number of factors has to be taken in consideration. However, with the wide knowledge and experience from efficiency measures that has been carried through in a large number and sizes of enterprises , it can be stated that efficiency target on 20-50% for systems with electrical engines is realistic and common.

In brief the two most common situations being surveyed at an industrial operation with electrical engines involved are

- Engines running at a constant speed/rpm
- Engines running at variable speed/rpm

It's quite common that engines (fans, pumps etc) are switched on at the start of the shift and switched off at the end of the shift regardless the alteration in operation.



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The crucial question to save energy is :

- when is there a need for the engine to be running?
- is it possible to run with a electronic power control guided by the load, to apply a frequency converter ?

This can simply be analyzed by observation and written notices from the shift. A limitation in running periods and /or the use of electronic power control has an immediate effect on the energy cost. This is probably one of the best efficiency measurements to be applied.

For all type of engines further efficiency possibilities lies in the fine tuning and adjustment of the engine including measurement of voltage, currency, vibrations, load, overhauling schemes etc.

Electrical engines are designed to have the best operational efficiency at 100 % or 75% load. At a load of 50% of the engines capacity the operational efficiency falls sharply and the energy is transformed into heating (losses)of the engine. This is the reason for the importance of choosing an electrical engine with a precise capacity in relation to the load to save energy. Since the cost of the engine is linked to the capacity of the engine this also influence the investment budget positively.

There is a lot to be considered and be brought up about the design, purchasing and use of electrical engines. Most of these facts are included in the attached brochure from CEMEP and we strongly recommend You to study this to update Your knowledge about electrical engines. It also includes electrical engine standard for international types of engines as well as an interesting Life Cycle Cost analysis on electrical engines to be noticed being an major argument for exchange of old engines. We also recommend You to study the EU-directive on design and efficiency http://ec.europa.eu/enterprise/policies/sustainable-business/ecodesign/index_en.htm



Checklist for Electrical Efficiency

1. Is time of operation of the machine/engine adjusted to the real demand ?
2. Have You checked that the engine is correctly dimensioned for it's purpose?
3. Are old fans and pumps being changed to new energy efficient equipment?
4. Is this calculated and included in Your investment budget for the next coming years?
5. Is this calculated and included in Your investment budget for the next coming years?
6. Is cooling air from processes /engines re-used?
7. Do You use electronic power control like frequency converters for engines?
8. Are You aware of the cost of electricity related to electric engines?
9. Do You get a specification on hourly basis about use of electricity? If Yes in Q8 , what's the level of use when there is no operation on premises?
10. Do You know the peak performance i.e. the maximum output (kW) of the plant?