



The Motor Control Warehouse

Energy Saving case Study On a 22KW Centrifugal Fan Application

MCW Hints & Tips 0015

Introduction

At a time of ever increasing energy cost, using variable speed drives to control motor speed instead of the traditional fixed speed direct on line, star/delta starters or soft starters can save energy and money.

This case study details the actual savings achieved on a typical application and the methods used to achieve these savings.

As part of our customer's energy saving program, The Motor Control Warehouse installed an Energy meter to monitor the energy consumption of a 22kW centrifugal fan connected to a star/delta starter in a manufacturing environment.

During the initial monitoring of the energy consumption, the centrifugal fan was controlled by the original star/delta starter. This had been the method of controlling the fan since the machine was initially installed/commissioned. After the fan had been running for over 390 hours the exact run-time and energy consumption was recorded.

The Motor Control Warehouse then replaced the star/delta starter for a 22kW open loop Inverter.

After optimising the Inverter settings, the fan was used in normal production and after approximately 300 hours, as with the star/delta starter the exact run-time and energy consumption was recorded.

This case study compares the energy consumption of the centrifugal fan when driven by a star/delta starter and an Inverter.



Equipment Used

Energy meter.

ISK/MT171 120A 3PH 4 wire Electric Meter

Variable Speed Inverter.

The Inverter used is listed on the Enhanced Capital Allowance website and qualifies for the enhanced capital allowance. For further information on the enhanced capital allowance please refer to the document in appendix A. *Enhanced Capital Allowance*.

With reference to the Inverter settings, to maximise energy saving the spin-start, dynamic voltage/frequency functions and acceleration/deceleration times were enabled or optimised. The dynamic voltage/frequency function is designed for applications where power loss should be kept to a minimum.

The reference speed of the centrifugal fan was reduced from 3000rpm to 2750rpm as speeds below 2750rpm caused the pressure to fall below the low vacuum threshold.

Results

Energy Consumption.

The table below displays the monitoring time and energy consumption since the meter was fitted.

Control Method	Time	Total energy consumption	Average energy consumption per hour
Star/Delta starter.	394 hours	7139kWh	18.11kWh
Inverter.	298 hours	3169kWh	10.63kWh

Table 1.

You can see from the figures in the table above that fitting an Inverter has introduced an energy saving of **41.3%**

Chart 1 displays the projected energy consumption of the star/delta starter against the Inverter over 12 month period based on 16 hours production per day, 5-day production per week.



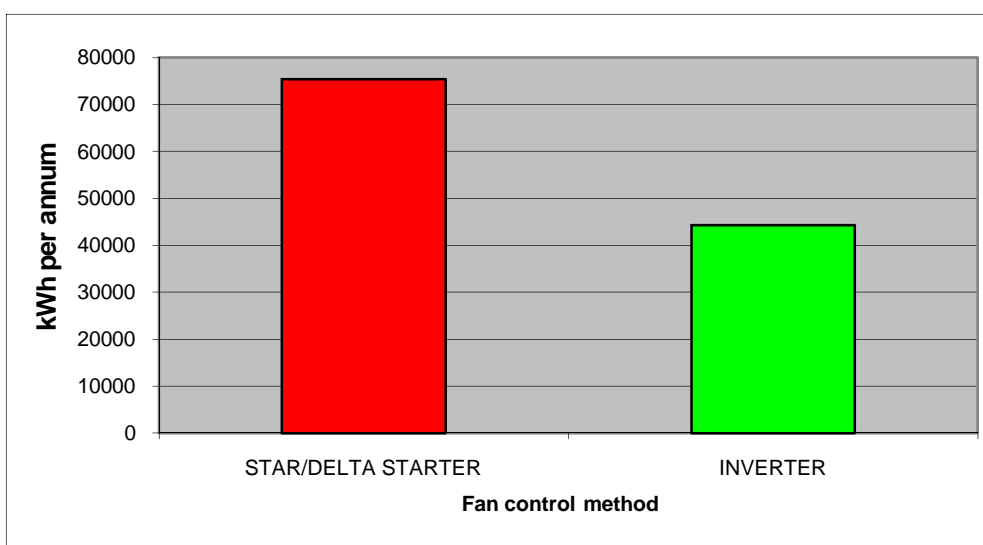


Chart 1.

Cost Saving.

When you convert the energy saving into cost saving, the table below displays the projected cost saving per annum at various kWh tariffs and various working patterns:-

Production hours per annum	Cost saving per annum at various tariffs per kWh		
	5p	10p	15p
16 hours for 5 days/week/year	£1555.84	£3111.68	£4667.52
**19.86 hours for 5 days/week/year	£1931.19	£3862.38	£5793.57
24 hours for 5 days/week/year	£2333.76	£4667.52	£7001.28
16 hours for 6 days/week/year	£1867.01	£3734.01	£5601.03
24 hours for 6 days/week/year	£2800.51	£5601.02	£8401.53
16 hours for 7 days/week/year	£2178.17	£4356.34	£6534.51
24 hours for 7 days/week/year	£3267.27	£6534.54	£9801.81

Table 2

** This example is based on the actual hours logged during the monitoring period. Based on the production hours recorded and a tariff of 10p per kWh, the payback time is less than 12 months, but as previously mentioned the Inverter does qualify for Enhanced Capital Allowance so the payback time

appendix A. *Enhanced Capital Allowance.*



Maintanance Saving.

Although it is very difficult to quantify, as a result of the lower speeds and increased acceleration/deceleration rate the stress on the motor and impellers are reduced thus increasing life expectancy and reducing the maintanance cost.

Summary

Changing the 22kW centrafugal fan control from a star/delta starter to an Inverter introduced an energy saving of 41.3%. Depending on the electricity tariff and production demands significant savings could be made by changing existing star/delta starters to a similar system.

Please note that the figures stated in this case study are actual values taken from an application and should only be used as an indicator of the possible savings. The amount of energy saving and payback time will be application specific.

In addition to selling the Inverters, The Motor Control Warehouse also sell high efficiency motors from 1.1kW to 55kW. These motors offer upto a further 5% energy saving. If used as replacements they are also covered by the Enhanced Capital Allowance scheme and they will save energy.

If you have any queries regarding the information provided in this report please contact enquiries@motorcontrolwarehouse.co.uk or call 01686 688948.





The Motor Control Warehouse

Enhanced Capital Allowances For Energy

Saving plant And machinery

MCW Hints & Tips 0006

Enhanced Capital Allowances (ECAs) enable a business to claim 100% first-year capital allowances on their spending on qualifying plant and machinery and where variable speed drives and EFF1 high efficiency motors are concerned as these are:

- Energy-saving plant and machinery - motors and drives

Businesses can write off the whole of the capital cost of their investment in these technologies against their taxable profits of the period during which they make the investment.

Claiming an Enhanced Capital Allowance

ECAs are claimed in the business's income tax or corporation tax return the same way as other capital allowances. The documentation you need to make an ECA claim depends on the type of energy-saving equipment purchased. This section will tell you all you need to know about making an ECA claim for products from different technology categories.

In essence if the equipment being purchased and installed is listed on the ECA web site at the time of purchase. Then a valid claim can be submitted with the Companies annual tax return.

Technology types

There are two different groups of energy-saving technology that qualify for an ECA.



- Listed products meet the criteria presented in the Energy Technology Criteria List (ETCL) and are listed on the Energy Technology Product List (ETPL).

Listed products

Listed products are those that qualify for an Enhanced Capital Allowance (ECA), and appear on the Energy Technology Product List. If the equipment you purchase is listed, making a claim should be straightforward.

Claiming for listed products

For products on the Energy Technology Product List, you can claim on the cost of the equipment itself, and other costs directly involved in installing it. These include:

- Transportation — the cost of getting equipment to the site.
- Installation — cramage (to lift heavy equipment into place), project management costs and labour, plus any necessary modifications to the site or existing equipment.
- Professional Fees — if they are directly related to the acquisition and installation of the equipment.

Any remote or indirect costs do not qualify for the ECA — for example, staff time spent taken to select the right equipment. Remember, only new equipment is eligible for an ECA — used or second hand equipment does not qualify.

If the product you purchase forms part of a larger piece of equipment, you should refer to the published claim values section of the ECA website to find out what proportion of the total cost qualifies for the ECA.

For further information on Budget 2008 and guidance and advice on what costs qualify for an ECA claim, consult your tax advisor or visit the HM Revenue and Customs (HMRC) website.

- Non-listed products also meet the ETCL but are not listed on the ETPL.

Non-listed products meet the Energy Technology Criteria, but don't appear on the Energy Technology Product List (ETPL). Claiming for these items is slightly more complex, and the process changes depending on which technology group the product is in.

Non-listed products fall into four categories. Click on the link for each one to find out what you need to do to make a claim:



- Component based automatic monitoring and targeting equipment (AMT).
- Combined heat and power (CHP).
- Lighting.
- Pipework insulation.

Why are products in these categories not on the ETPL?

To claim an allowance on component based AMT or CHP equipment, companies need to get certification from the Department for Environment, Food and Rural Affairs – it is not simply a matter of installing a particular product. Therefore, eligible equipment in these two categories doesn't appear on the ETPL.

With lighting and pipework insulation, there are so many product variations that it would be impractical to list all of them. Manufacturers of equipment in these an ECA. categories will be able to advise customers on which of their products are eligible for an ECA. Those that have completed 'Energy Technology List supplier assessments' are listed on this website.

While the process of claiming an ECA is always the same, the steps you need to take to make a valid claim can vary.

Some products that don't qualify for an ECA might have one or more components that do. For these, there will be a claim value to show how much of the total cost is eligible for an ECA. Find out more about claim values.

What are claim values?

A claim value can be applied to a piece of equipment that is not supported by the Enhanced Capital Allowance (ECA) scheme, but has components that meet the energy technology list criteria.

Take, for example, *a motor* that qualifies for the Energy Technology Criteria List (ETCL) but sits within a non-ETCL qualifying compressor. The claim value equals the proportion of the total investment that qualifies for the allowance, and should be used when making a claim.

How do claim values work?

If you invest in a stand-alone item that meets the ECA energy criteria, you can claim the full cost of the product and related installation costs. However, if you purchase a piece of equipment that doesn't qualify, but has components that do, you can only claim for the costs relating to these. The remainder of the equipment will be eligible for a Capital Allowance.



How do you calculate the claim value?

Products that often form a small part of a larger piece of equipment have published claim values that should form the basis of an ECA application. Use the dropdown menus on the ECA web site to find out the claim values for different technologies and sub-technologies.

How do you claim an ECA?

ECA claims should be submitted as part of your normal corporate or income tax return.

It's important to retain all documents relating to your ECA claim, including invoices, dated screen prints from the ECA website and anything from the company that installs the equipment. HMRC may investigate any aspect of a tax return and you should have all necessary evidence to hand to support your claim.

For more information please refer to HM Revenue and Customs web site (HMRC) and the sections below:

- CA20000 - Plant and Machinery Allowance (PMA)
- CA23100 - PMA: First year allowance (FYA)

Link to ECA web site

<https://www.eca.gov.uk/etl/default.htm>

Carbon trust advice line telephone number - 0800 085 2005.

