



## Energy & Savings Calculator

**Customer:** Jo Blogs Manufacturing Site  
**Site:** UK  
**Plant:** Multi 5.5kW Circulation Pumps  
**Date:** 12-Oct-06  
**Survey by:** D. Davies

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We have estimated the above speed profiles, whereas the eventual speed control profile could be adapted through careful monitoring of the respective plant.

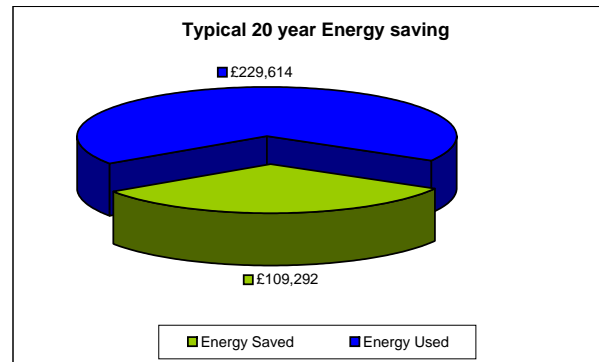
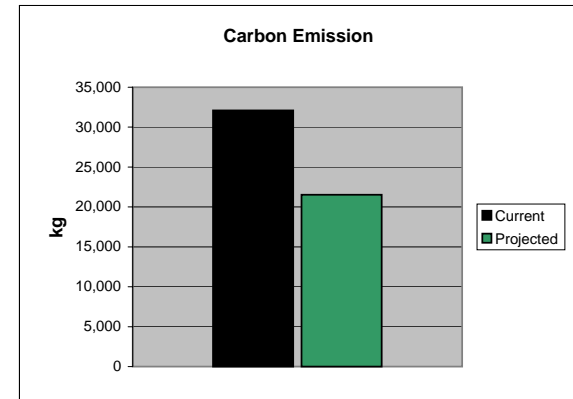
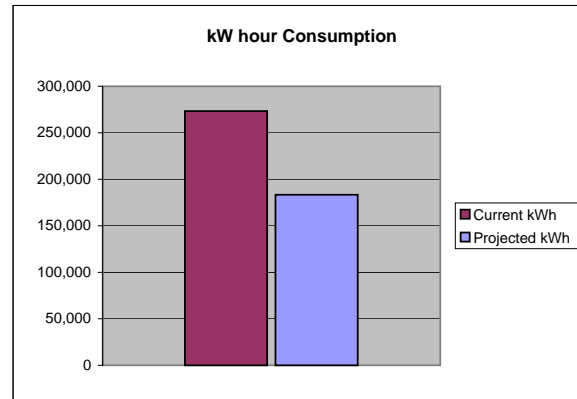
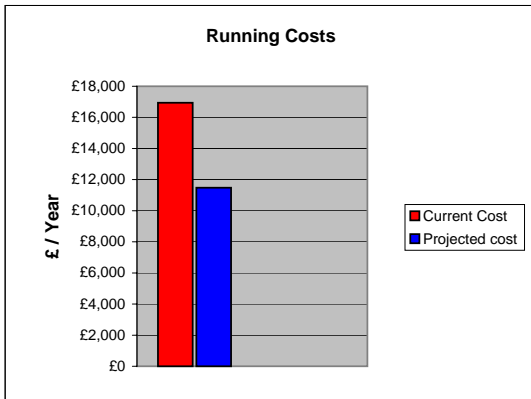
For purposes of calculation, we have indicated a speed profile as follows:-

90% speed for	70%	of the operational time during the day tariff
85% speed for	30%	of the operational time during the day tariff
80% speed for		of the operational time during the day tariff
90% speed for		of the operational time during the night tariff
85% speed for	100%	of the operational time during the night tariff
80% speed for		of the operational time during the night tariff

The subsequent overall Electrical Consumption (kWh) has reduced from	<b>273,312</b>	to	<b>183,415</b>	a reduction of kWh	<b>89,897</b>
The subsequent financial cost (£/year) has reduced from	<b>£16,945</b>	to	<b>£11,481</b>	a reduction of	<b>£5,465</b>
The subsequent carbon emissions (kg) have reduced from	<b>32,084</b>	to	<b>21,531</b>	a reduction of kg	<b>10,553</b>
The subsequent carbon dioxide emissions (kg) have reduced from	<b>117,524</b>	to	<b>78,869</b>	a reduction of kg	<b>38,656</b>

These calculations are based on the pump / fan affinity laws and as such are a theoretical indication of energy savings; although all effort is undertaken to ensure accuracy actual savings may differ from these results depending on unquantified system variables..

Note: Carbon dioxide and Carbon calculations are based on the DETR Environmental Reporting Guidelines 1999



20 Year Energy Figures	
Energy Saved	£109,292
Energy Used	£229,614
<b>Total Energy Saving</b>	<b>32.2%</b>

## Overall Plant Payback Period

Payback is essentially a function of Costs of the ACH 550 Variable Speed Drives / Savings in Running Costs

However, true Payback needs to take into account Implementation Costs which encompass the following;

- Fitting the VSD's adjacent to the motor onto uni-strut framework or directly onto a wall
- Modifying the existing control panels power wiring to effectively by-pass the original starters
- Modifying the starter control circuits in conjunction with the existing controls strategy
- Disconnection and re-routing of the existing local power cable from the local isolator mains output into the VSD'S mains input terminals and install new PVC/SWA power cable from the VSD to the motor
- Supply and Installation of new control transducers and wiring (if required)
- Supply and Installation of new control cabling from the existing control panels into the ACH 550 VSD
- Engineer and Commission the BMS/Control System (if installed) and prove operation to Engineers (to be done by BMS supplier)
- Commissioning of VSD
- Provide O + M Manuals and modify / supply control panel wiring diagrams
- However, do note that the ABB ACH 550 Variable Speed Drives can be readily programmed in "Closed Loop Control" whereby a new temperature/pressure detector can be wired directly into the VSD to provide local control, without the need for expensive interfacing into a BMS System outstation that may not be conveniently located

## Project Specific Installation Notes

This installation will require:

- Wall mount the VSD adjacent to motor
- Supply new cabling with containment from the existing starter to the VSD and from the VSD to the motor
- Install new local motor isolator
- Install new control cabling between the VSD and the control panel
- Modify the panel controls to interface with the VSD

## Project Specific Operational Notes

- The new inverter would be operated under closed loop pressure control through the BMS

## General Notes

Installation works completed by the customers competent in house staff under Drive Control Ltd supervision would reduce implementations costs and improve payback.



**ENHANCED CAPITAL ALLOWANCES**

As an incentive for business to invest in energy savings (low carbon technologies), the government announced that designated equipment, as specified in the UK energy technology list will now qualify for tax relief in the form of Enhanced Capital Allowance (ECA).

Enhanced Capital Allowances are given at 100% of expenditure in the first year. This means that the whole of the qualifying investment can be set against tax for the year in which the equipment was purchased. This provides a significant cash flow boost over the normal Capital Allowance of 25% on a reducing balance basis, which would spread the tax relief over a much longer period.

All energy saving variable speed drive projects qualify for ECA.

**It is important that the company accountants are made aware of energy saving variable speed drive capital projects.  
The relevant costs of the projects should be included on the company tax return to claim all Enhanced Capital Allowances.**

<b>ECA Calculations</b>											
	<i>Normal Capital Allowance</i>	<i>ECA</i>	<i>First year saving with ECA</i>	<i>Savings second year onward</i>	<i>Balance remaining after first year</i>	<i>Months remaining after first year</i>	<i>Monthly saving second year onward</i>	<i>Months remaining to repay after first year</i>	<i>Non ECA equipment costs</i>	<i>Non ECA equipment payback time</i>	<i>Payback period including ECA</i>
			£	£	£	£	£		£	Months	Months
Corporation Tax Rate %	30	30	£7,562	5,465	-572	3.3	455	-1.3			<b>10.7</b>
% of expenditure to which allowance applies	25	100									
Nominal investment	£6,990	£6,990									
Amount set against tax	£1,748	£6,990									
First year recovery @ 30% tax	£524	£2,097									
<b>ECA cash flow benefit in first year</b>		<b>£1,573</b>									

Note that other factors need to be taken into account, which will improve the Payback Period, although it is not possible to put an actual cost to these savings.

- Improve both the motors efficiency and power factor.
- Possible reduction in Max. demand tariff
- Reduction in motor maintenance due to reduced starting currents and mechanical impact, particularly on couplings.
- Greatly improved motor monitoring, above that of a conventional overload, ensuring no sudden motor failures.
- Reduced wear on the Drive Belts with associated supply and fitting cost reduction.
- Reduction in maintenance costs and replacement of conventional switchgear.
- Infinite flexibility of the air / water system which will lead to omission of noise and turbulence.
- Improved system performance through better and faster control responses.
- Simplified commissioning procedures.

The ABB ACH 550 is a sensorless vector controlled Variable Torque HVAC Variable Speed Drive dedicated specifically for HVAC Building Services applications with the following features:

- 1). Pre - Configured HVAC application macros. Macros for supply & return fans, cooling tower fans, booster pumps, & condensers are programmed into the drive.
- 2). Assistant control panel as easy to use as a mobile phone. The panel is detachable & able to copy parameters from one drive to another , the panel can also be mounted on the cabinet with a special fixing kit.
- 3). Factory fitted standard features comprising:
  - EMC filters for first environment.
  - Swinging Dc chokes. ABB's patent pending swinging DC choke lets the ABB drive for HVAC deliver, at partial loads, up to 25% less harmonics to the network compared to a normal choke of an equal size.
  - Motor overload protection with PTC or PT100
  - Modbus, N2 & FLN fieldbus connectivity. Commonly used HVAC fieldbuses are embedded into the memory of the drive, ensuring they are always there when needed.
  - Real time clock. External timer circuits are no longer needed, with a real time clock for starting & stopping the drive or changing the speed according to the time of day or night. This helps save energy & increases the efficiency of the entire HVAC system. It also facilitates maintenance by keeping a timed log of events.
  - Interactive assistants. Three interactive assistants facilitate the start up, maintenance and diagnostics of the drive, enabling set-up without the need to refer to manuals.
  - Help button. The control panel has a built in help function to guide the user, enabling clear text advice without the need to refer to manuals.
  - Flux optimisation. The magnitude of the flux varies depending on the load. This results in reduced energy consumption and lower noise levels. Silent operation mode further reduces noise in domestic applications.
  - Full flow at 40 degrees C in IP 21 & IP 54. The drive is rated for continuous operation to 40 degrees with full current.
  - HVAC software without compromise. The ABB drive for HVAC delivers a complete solution with a tailor made configuration that will save you time & money.
  - Full power range, from 0.75kW to 355kW covering the vast majority of HVAC applications.