

Energy Event 2010 – ESTA Seminar

Thursday 9th Sept 2010

Low and Zero Carbon Heating and Cooling Solutions – Maximising Energy Saving Opportunities and ROI



**MAKING
ENERGY
MAKE
SENSE™**

Armstrong Overview

- A privately owned international company that has much of its skill base in the UK.
- The UK business consists of 2 factories producing products & systems for the global 50hz market.
- A forward thinking company with an emphasis on energy, space & maintenance saving solutions.
- Award winning HVAC solutions from Pumps & heat exchangers to the worlds most efficient heating and CHW systems.



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1) Replace Existing Fixed Speed Pumps with More Efficient Equivalent



- Belt drive pumps have losses in belts
- Motors may be inefficient
- Pump hydraulics may be inefficient

- Old pump may have been oversized and could be replaced by a smaller pump
- Higher efficiency motor and hydraulics
- Energy savings of 20% are possible
- Pump accessories aids installation



2) Replace Existing Fixed Speed Pumps with Variable Speed

- Most applications are part load intensive and savings can be high with short paybacks
- System modifications will generally be required
- Where this is a problem a VSD can be used to slow the pump in a constant flow system and open the commissioning valve for some savings
- Integrated solutions can provide increased savings, reduced space and reduced installed cost



- Pre-configured, standalone zone controls are available for complex systems with diverse loads
- Avoids the necessity to modify the Building Management System
- Includes pump protection features not normally found in BMS

2) Replace Existing Fixed Speed Pumps with Variable Speed

White paper and calculation tools are available:

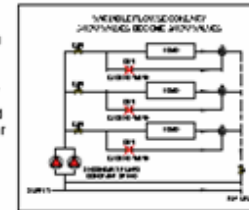
Conversion from Constant Flow System To Variable Flow

HOW TO SAVE PUMPING ENERGY IN HYDRONIC HVAC SYSTEMS

Hydronic HVAC equipment is typically oversized, even for design day conditions. Design day conditions are the design flow and head losses necessary to meet system load loss calculations based on the listed higher design and lowest temperature periods for the geography. Many times equipment is oversized by design to lessen the risk of an equipment redesign being necessary due to system calculations errors and/or building govt codes during construction.

As the carbon design day conditions in most parts of the world is rarely met, a great deal of energy is wasted by over pumping and/or circulating to optimize the installed equipment. Most installed hydronic HVAC systems are constant flow systems using constant speed pumps and as the system load varies with the outdoor temperature and building use the excess conditioned water in the HVAC hydronic system is circulated past the loads through bypass lines and returns to the source. In such systems the potential for energy savings and reduction in electricity bills is high and this paper discusses ways to quite easily achieve those goals.

CONSTANT FLOW SYSTEM TO VARIABLE FLOW SYSTEM



system from a constant flow system. The first step is to determine the pump flow rate. The flow rate is then divided by the number of loads to determine the flow rate per load. The flow rate per load is then used to determine the pump size for the variable flow system.

CONSTANT FLOW SYSTEMS

Constant flow systems are the most common type of hydronic system. The first step in converting a constant flow system to a variable flow system is to determine the pump flow rate. The flow rate is then divided by the number of loads to determine the flow rate per load. The flow rate per load is then used to determine the pump size for the variable flow system.

When converting a constant flow system to a variable flow system, it is important to determine the pump flow rate. The flow rate is then divided by the number of loads to determine the flow rate per load. The flow rate per load is then used to determine the pump size for the variable flow system.

CONSTANT FLOW SYSTEMS TO VARIABLE FLOW WITH VARIABLE SPEED

When converting a constant flow system to a variable flow system with variable speed pumps, it is important to determine the pump flow rate. The flow rate is then divided by the number of loads to determine the flow rate per load. The flow rate per load is then used to determine the pump size for the variable flow system.

IVS Sensorless Payback Summary Form - Complete Project				
IVS SENSORLESS PAYBACK CALCULATION				
Fixed Speed Op Cost	Variable Speed Op Cost	Annual Savings		
£3,960.00	£1,080.00	£2,880.00		
	Cost of Sensorless	Annual Savings	Years to Payback	
	£6,200.00	£2,880.00	2.2	
Installation Savings (Sensor & Wiring):	£800.00			
	Cost of Sensorless	Power + Inst Savings	Years to Payback	
	£6,200.00	£3,680.00	1.7	
Avg. Lifespan of IVS pump unit (years)	Annual Savings	Inst. Cost Adder for IVS	Total Lifetime Return on Investment	
40	£2,880.00	£6,200.00	£109,000.00	
CARBON TRUST LOANS CALCULATION				
Existing system annual energy usage (kWh)	Variable speed system annual energy usage (kWh)	Annual energy saved (kWh)		
39600	10800	28800		
		CO ₂ Saving (T CO ₂ p.a)	Potential Loan Value	Loan Term (Yrs)
		15.47	£10,310.78	4

3) Upgrade the Complete Heating System

- Modular heating systems with complete integration of controls, boilers, pumps, expansion, metering etc are available
- Integration of components and sophisticated control allows seasonal efficiencies of 94% to be achieved



Packaged Plant Room Case Study

Address: 1111
 City: London, UK
 Date: 2018

"It was only when we analysed the energy costs up to the end of the first year, that we realised just how much we could save on packaged plant rooms had we had the top player. The equipment has paid for itself in just a year, and will continue to deliver cost savings throughout its life."

"If a new system isn't considered properly at the outset, the efficiency of the system can be lost."

ARMSTRONG

Lancashire Constabulary Cuts Energy Costs & Reduces Carbon Footprint

Background: Lancashire Constabulary, a tier 1 at all 4 of its 100+ stations, with 3000 staff, has a large footprint. The Lancashire Constabulary has a large footprint, with 3000 staff, 1000+ vehicles, and 1000+ vehicles. The Lancashire Constabulary has a large footprint, with 3000 staff, 1000+ vehicles, and 1000+ vehicles.

Challenge: Lancashire Constabulary is responsible for 100 buildings in the county, including police stations and community centres. The Lancashire Constabulary is responsible for 100 buildings in the county, including police stations and community centres. The Lancashire Constabulary is responsible for 100 buildings in the county, including police stations and community centres.

Project: The system for each of the 100 buildings is a modular heating system. The system for each of the 100 buildings is a modular heating system. The system for each of the 100 buildings is a modular heating system.

Results: Lancashire Constabulary has a number of benefits. The system for each of the 100 buildings is a modular heating system. The system for each of the 100 buildings is a modular heating system. The system for each of the 100 buildings is a modular heating system.

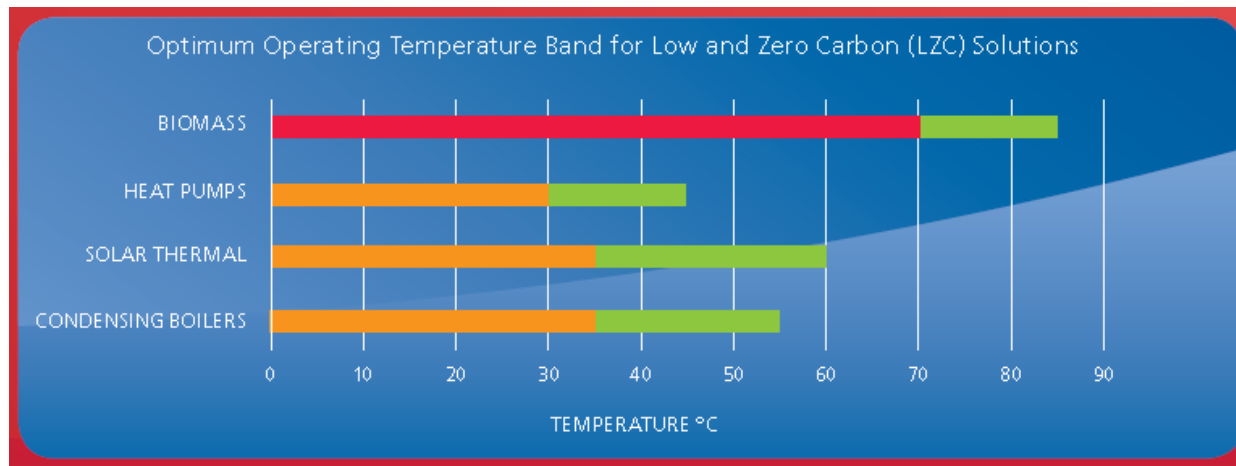
Energy (kWh)	Cost (£)
Energy consumption before	~1,000,000 kWh per annum
Energy consumption after	~200,000 kWh per annum
Energy savings	~800,000 kWh per annum

- Modular design and flexibility of layout makes the system ideal for existing installations
- Large systems can be built in a packaged plantroom

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4) Add Renewable Technologies to your Heating System

- To produce the expected savings renewable technologies need to be integrated
- Low and zero carbon technologies have different optimum operating points and 'bolting together' does not often work



5) Upgrade the Chilled Water Plant to an Ultra-Efficient System

- Upgrading systems more than 3 years old will have a positive impact on energy and maintenance
- Demand based control with all variable speed is the most efficient (COP's of 7 for plant)
- Paybacks within two years are possible



- Upgrade measures can range from cooling tower and pump conversion plus plant controller to new chillers as part of an integrated plant package
- Energy consumption of the chilled water system can be reduced by 35 – 40%

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