MULCAHY CO.

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Since 1929

MULCAHY MINUTE

ENGINEERED FLUID HANDLING AND HVAC SOLUTIONS

ALWAYS AMAZED AND EVER CHANGING

BY: DAN CHUDECKE

In my time in hydronics (close to two decades) no one single change has amazed me more than the increased use of variable speed pumps. Early on we could maybe justify variable speed on 5 hp pumps, now we routinely see pumps down to the 40 Watt ranges employ variable speed. The big question about applying variable speed in the real world has been "How do I control it?".

Different systems and applications and systems employ different schemes.

Delta P—Ideally for pumps in closed loop systems you would simply maintain differential pressure out in the system at various critical point(s) and get continuous feedback as to whether or not the pumps are running at a sufficient speed. For medium to large systems the extra cost of the sensor(s) is easily paid for in lower operating costs. The same sensors installed in a smaller system can make the move to variable speed less justifiable. With VFD's getting smarter and PLC's getting cheaper, some newer methods of variable speed control are being marketed.

Delta T – In this type of scheme, the pump speed is varied up and down based on the system average temperature drop/rise. Any sensors installed are either in the pump or a very short distance away.

System Curve – This system utilizes some preprogrammed algorithms and internal sensors to determine what speed it should be running at. Any change in system flow is felt immediately and adjusted. No external sensors are generally needed.

Both of these newer systems operate on a set of assumptions that may or may not apply to your system. Neither approach will achieve the same degree of turndown and energy savings as using differential pressure sensors. However both systems are likely less expensive and intrusive to install, especially in a retrofit scenario.

If differential pressure sensors are not a practical option, then a sensor less system curve scheme is preferable to a Delta T system. Delta T is in reality an arbitrary number selected during design. At what DT a system will actually operate at is impossible to predict if you throw in things like outdoor air reset, finned tube running wild with a few 3 way valves for minimum flow concerns. Delta T systems require significant heat load in order to operate and a return trip to test. System DT is also VERY slow to change adding substantially to the lag a control system will have to contend with.

Proper setup of a system curve requires knowing what the full speed conditions the pump was selected for. Spot checks can be made at the time of setup to test if the pumps are providing sufficient pressure at lighter conditions. No heat load is necessary, only the ability to flow.

GLYCOL PART III—PUMP CURVE CORRECTION

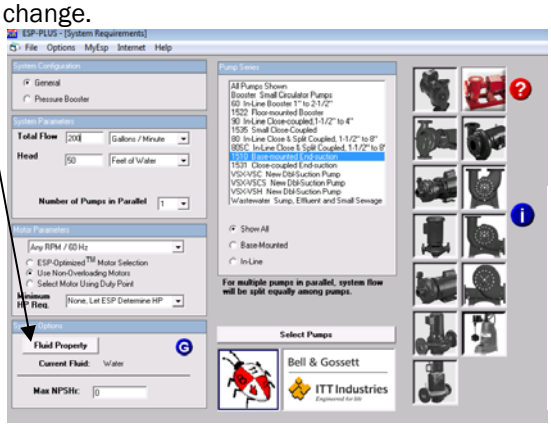
Pump curves are all based on pumping water. However, when we pump glycol things change in three different areas.

1. Heat transfer correction -Usually resulting in an increase in flow
2. Pressure drop correction -Both from the increase in flow and viscosity
3. Pump curve correction -Mainly correcting for the viscosity change

In this article we will cover #3, Pump curve correction. (#1 Heat Transfer correction was covered in Volume 12, Issue 1, #2 Pressure drop correction was covered in Volume 12, Issue 2). However, both the previous articles results will be used in this final step. Just to review, viscosity means resistance to pouring. The higher the viscosity, the thicker the fluid. The following is what changes when you pump viscous fluids with a centrifugal pump:

- The brake horsepower requirement will increase.
- You will notice a reduction in the head the pump will produce.
- Some reduction in capacity will occur with moderate and high viscosities.
- The pump's efficiency will decrease.

Rather than print and publish a number of curve booklets with the numerous temperatures and concentrations of glycol we turn to B&G's software selection program to help modify our selections. Using the Fluid Property button in ESP-PLUS we are able to change the fluid and the temperature and our selection will be modified. The first curve (below) shows a water selection and the second curve (to the right) shows a corrected curve reflecting a modification for Glycol (the green curve). Notice that the corrected curve is almost on top of the blue water curve. However, the BHP and efficiency change.



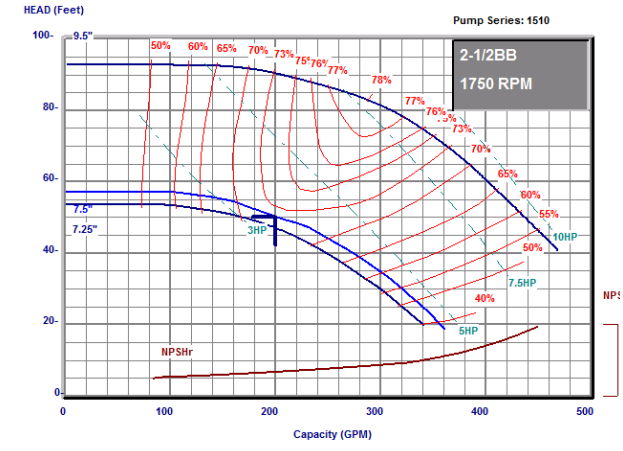
In this scenario we are non-overloading with both selections, however you can see how the BHP can manipulate a HP change on your selection.

Published from the ITT B& G Pump Data THE manual:

VISCOSITY-CENTRIFUGAL PUMP PERCENTAGE OF WATER CHARACTERISTICS—APPROXIMATE GUIDE

Viscosity S.S.U.	Capacity	Head	Efficiency
31.5	100%	100%	100%
500	95%	98%	80%
1000	92%	97%	70%
2000	89%	94%	60%

100% Ethylene Glycol at 70 degrees has a SSU of 88.5



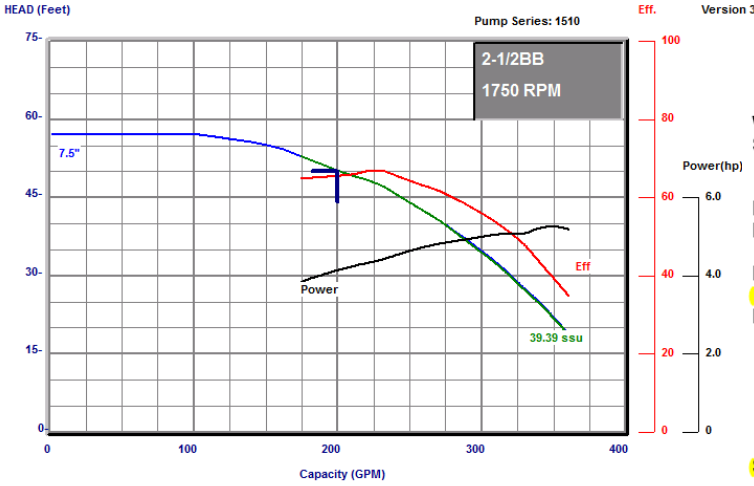
Version 3.8.1

Pump Series:	1510	Pump Size:	2-1/2BB
Flow Rate: (GPM)	200	Total Head: (Feet)	50
Pump Speed (RPM)	1750	NPSH req: (Feet)	6.67
Weight: (lbs)	265	Cost Index:	116
Suction Size: (in)	3	Suction Velocity: (fps)	8.7
Discharge Size: (in)	2.5	Discharge Velocity: (fps)	13.4
Impeller Diameter: (in)	7.5	Efficiency:	72.45
Max Imp. Dia. : (GPM)	9.5	Duty Flow/Max Flow (%)	56
Max. Flow: (GPM)	360	Min. Rec. Flow: (GPM)	50
Flow @ BEP: (GPM)	197	Selected Motor Size (kw)	3.73
Motor Power, HP:	5	Duty-Point Horsepower (kw)	2.64
Pump Power (BHP):	3.54	Maximum Power (kw)	3.42
Max Power (BHP):	4.58	Aprox. FLA (230/460v):	13.0/6.5
Frame Size:	184T		

System Fluid: Water

Bell & Gossett
ITT Industries

GLYCOL...CONTINUED



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Flow @ BEP: (GPM)	197	Selected Motor Size (kw)	3.73
Motor Power, HP:	5	Duty-Point Horsepower (kw)	2.82
Pump Power (BHP):	3.78	Maximum Power (kw)	3.65
Max Power (BHP):	4.89	Aprox. FLA (230/460v):	13.0/6.5
Frame Size:	184T		

System Fluid:	Ethylene Glycol
Spec. Gravity:	1.067
Viscosity:	39.391 SSU SSU
Temperature:	60 F
Percent:	50.000 %

Suction Size = 3 "
Discharge Size = 2.5 "

Min Imp Dia = 7.25 "
Max Imp Dia = 9.5 "
Cut Dia = 7.5 "

Design Capacity =200.0 GPM
Design Head =50.0 Feet
Motor Size =5 HP

The Power and Eff. curves shown are for the cut dia. impeller.
The Power and Eff. curves shown are corrected for viscosity.
Both uncorrected and corrected performance curves are shown.
Viscosity (SSU)= 39.39 / S.G. = 1.07

Bell & Gosse
ITT Industries

WHAT IS ECM?

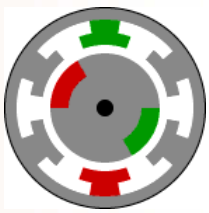
Bell & Gossett has introduced a new line of energy efficient pumps that uses a unique technology to achieve significant energy savings.

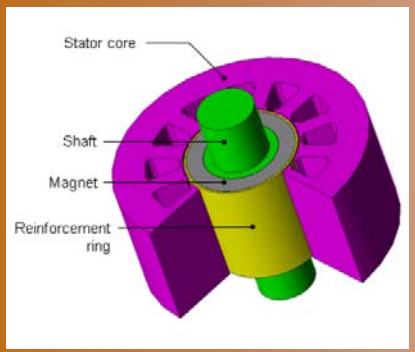
Featuring ECM (Electronically Commutated Motor) technology and a patented spherical motor design, the ecocirc® eliminates the need for a conventional shaft, seal and bearing assembly. The rotor/impeller is the only moving part in the entire pump and it is magnetically balanced on a stationery ceramic bearing inside the pump housing to provide silent, long-lasting operation.

But what is ECM technology? From the outside the motor looks just like a standard induction motor. The two biggest differences are:

1. A pump mounted driver in the form of a circuit board in the motor housing.
2. Permanent magnets on the rotor

Permanent Magnet Motor Technology: With a permanent magnet motor, there is a permanent magnet on the rotor. Power is pulsed on and off electronically to create the magnetic field in the stator. This process is known as commutation. With the Eco series, the rotating magnetic field is controlled by a microprocessor which reduces current to increase efficiency. The magnets on the rotor react with the magnetic field causing the rotor to rotate. In the figure to the right, you can see how the north and south poles of the rotor and stator are interacting. There is a rotating magnetic field where the positive and negative charges are attracted to each other. No"slip" and reduced current requirements mean better efficiency ECM motors enjoy the advantages of:





- Having a better speed versus torque characteristic
- High dynamic response
- High efficiency
- Long operating life
- Noiseless operation
- Higher speed ranges

PCB with microprocessors allow for controllability of ECM motor

Electronically Commutated Motor (ECM) – inherently more efficient than induction motors with the capability of being controlled by a microprocessor

MULCAHY
Engineered Fluid Handling and HVAC Solutions
2700 Blue Water Road No. 100
Eagan Minnesota 55121
phone 651.686.8580
fax 651.686.8588
www.mulcahyco.com

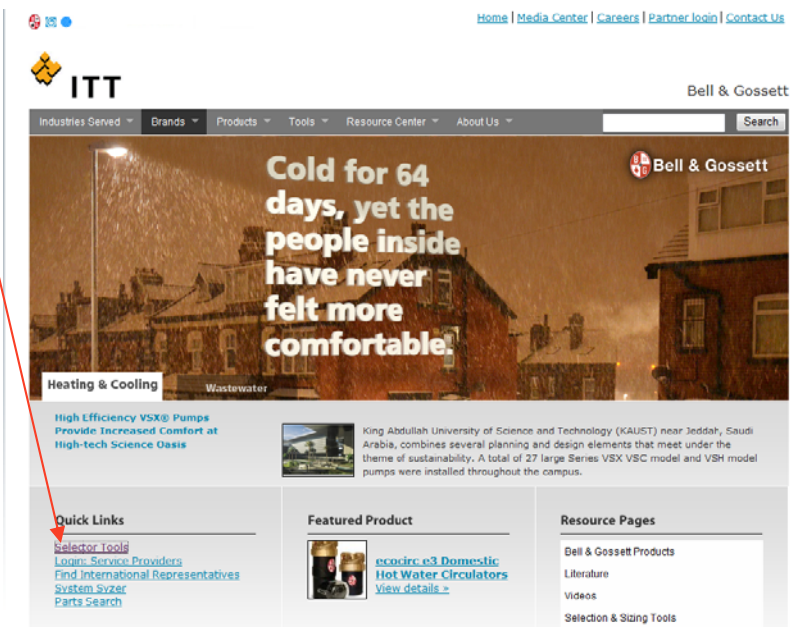
E N G I N E E R E D F L U I D H A N D L I N G A N D H V A C S O L U T I O N S

NEW….BUT THE SAME….

xylem
Let's Solve Water

As the old saying goes the only constant is change. The parent company of some of our premier product lines, ITT industrial, is going through reorganization. It is breaking up its diverse holdings into separate publicly traded companies and one of those entities will result in the largest water technology company in the world. The new company Xylem (a Greek word referring to the part of a plant that transports water) will encompass several brands involved in various aspects of water technology. Bell & Gossett will be part of this new Xylem company. This change will affect B& G positively as it can be more focused on it's primary market.

The biggest change that Mulcahy Co. customers will notice is the new website; www.completewatersystems.com . Your old links will still work, but now you will be redirected to a spot on the new website. The new website retains the same ESP-Plus online pump selection program but also now includes ESP-Design Plus which includes tools to help design systems for pressure booster and sewage/sump applications. The new website also includes several additions to the Revit and 2d/3d CAD files as well as several previously unavailable submittal sheets.



The new web site will take a little getting used to, but is not difficult. Please feel free to give us call if you want a little assistance learning the new system. There has also been a few "technical difficulties" related to the split, as web services move from one server environment to a new one, but by the time you read this newsletter these shifts should have been completed.