PumpTech Customer Education

http://www.Pumptechnw.com

Bellevue Moses Lake Canby

PumpTech Product Lines

PumpTech inc.

Two full time Mechanical Engineers
Licensed in OR, WA & ID

SolidWorks & E-Drawings Viewer

AutoCad Compatible Drawings

All Systems UL QCZJ Listed

Designed to HI Standards

HYDRONIX

iRover
Mobile HMI

METERMAN
Pump Systems
"For The Best In Flow Technology"

PumpTech inc.

Manufacturing Facility Canby, OR

HYDRONIX

iRover Mobile HMI

METERMAN Pump Systems "For The Best In Flow Technology"

PumpTech inc.

Installation, Maintenance & Repair

- 9 Full Time Service Technicians
- 3 Full Service Shops
- 6 Service Trucks
- 23 Ton Crane Truck
- 8 Ton Crane Truck
- 3 Ton Crane Truck
- 2 Ton Flatbed & Trailer
- 1 Ton Flatbed & Trailer

HYDRONIX

iRover Mobile HMI

METERMAN Pump Systems "For The Best In Flow Technology"

PumpTech Pipeline

Summer 2010 www.PumpTechnw.com Volume 1, Issue 2

PumpTech Inc. Serving the Pacific Northwest

PumpTech Pipeline

Providing Knowledgeable Solutions

Cornell Names PumpTech Its Top Industrial Distributor

Cornell Pump Company (Clackamas, Oregon) has named PumpTech its number one industrial pump distributor in the US. Cornell manufacturers a wide line of clear water, solids handling, hot oil and food processing pumps for numerous industrial applications.

Mike Shoemaker, PumpTech's Industrial Products Manager, accepted the award at the annual distributor's meeting in Chicago. Our industrial sales team covers Idaho, Oregon and Washington and focuses on the food processing, petrochemical, oil & gas, lumber, pulp & paper, power generation, and aluminum industries.

In addition to Cornell, PumpTech represents a number of other manufacturers of specialty industrial products. Congratulations to our industrial sales team !

PumpTech Named NW Master Distributor for Grundfos

Grundfos Pumps (Olathe, Kansas) has selected PumpTech as the Pacific Northwest master distributor for its Grundfos Dosing line of chemical metering pumps.

The product line includes a wide range of diaphragm metering pumps with flows to 1050 GPH and pressures up to 3000 PSI. Grundfos Dosing pumps offer a variety of metering technologies including digital dosing. Digital dosing pumps utilize stepper-motors that allow a 1000:1 turn down. In addition to dosing pumps, Grundfos offers a complete line of measurement & disinfection equipment including one of the best chlorine generators on the market.

Per this agreement PumpTech will stock $100,000 of Grundfos Dosing pumps to support sales in the Pacific Northwest. This inventory will be centrally located in our Canby, OR branch and will allow quick delivery to other distributors, end users, and OEM's. Additionally, this inventory will support our MeterMan division which manufacturers chemical metering systems in our Canby facility and also functions as the Grundfos Key Systems provider for the entire western United States.

PumpTech, Inc.
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12020 SE 32nd St #2
Bellevue, WA 98005
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Canby, OR
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Canby, OR 97013
503-659-6230

Moses Lake, WA
209 S Hamilton Rd
Moses Lake WA 98837
509-766-6330

Inside this issue:

Fall 2010 www.PumpTechnw.com Volume 1, Issue 3

PumpTech Inc. Serving the Pacific Northwest

PumpTech Pipeline

Providing Knowledgeable Solutions

PumpTech's Feature Rich Multi-Pump Controller

PumpTech's intelligent, multi-pump controller features an integrated PLC and Color Touch-Screen Human Machine Interface (HMI) that makes setup simple and extremely flexible. Up to four pumps can be set up for VFD control, across the line starting or a combination of the two.

The controller is preprogrammed for pump down, level control and booster applications. At start up all you have to do is select the application and follow the setup instructions on the screen.

The PLC provides for 22 digital inputs and 12 digital outputs. Also two 4-20mA or 0-10VDC transducer inputs are provided.

When motors are started across the line or via RVSS, "smart" motor

Continued on Page 4

QCEC Introduces New Refrigerated Sampler

Quality Control Equipment Company (QCEC) has introduced a new sampler with a modular refrigeration system. The refrigerator unit slides out for easy service or replacement. All units are made right here in the US and come with a 2 year warranty.

It features the same, time proven sampling technology that has set QCEC apart from its competition for over 40 years. All samplers use vacuum pumps rather than peristaltic pumps for higher reliability and accuracy. Vacuum pumps never need hose replacement and increase the sampling range by providing lifts to 28 feet and horizontal runs up to 150 feet. This provides lots of flexibility when locating the sampling unit.

The QLS model is the only sampler in the world that provides repeatable, self calibration and consistent sample size. It also provides flow - paced samples from a 4 - 20 input.

For more information on the features and benefits of QCEC samplers, contact your local PumpTech branch.

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Inside this issue:

newsletter@PumpTechnw.com

Pump ED 101

Centrifugal Pump Training Series

Centrifugal Pump Selection

Joe Evans, Ph.D

http://www.PumpEd101.com

http://www.Pump-Zone.com

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Pump Selection

Pump Quality

Pump Features

Efficiency

NPSH

Curve Shape

Window of Operation

Affinity Laws

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Pump Quality & Features

Quality

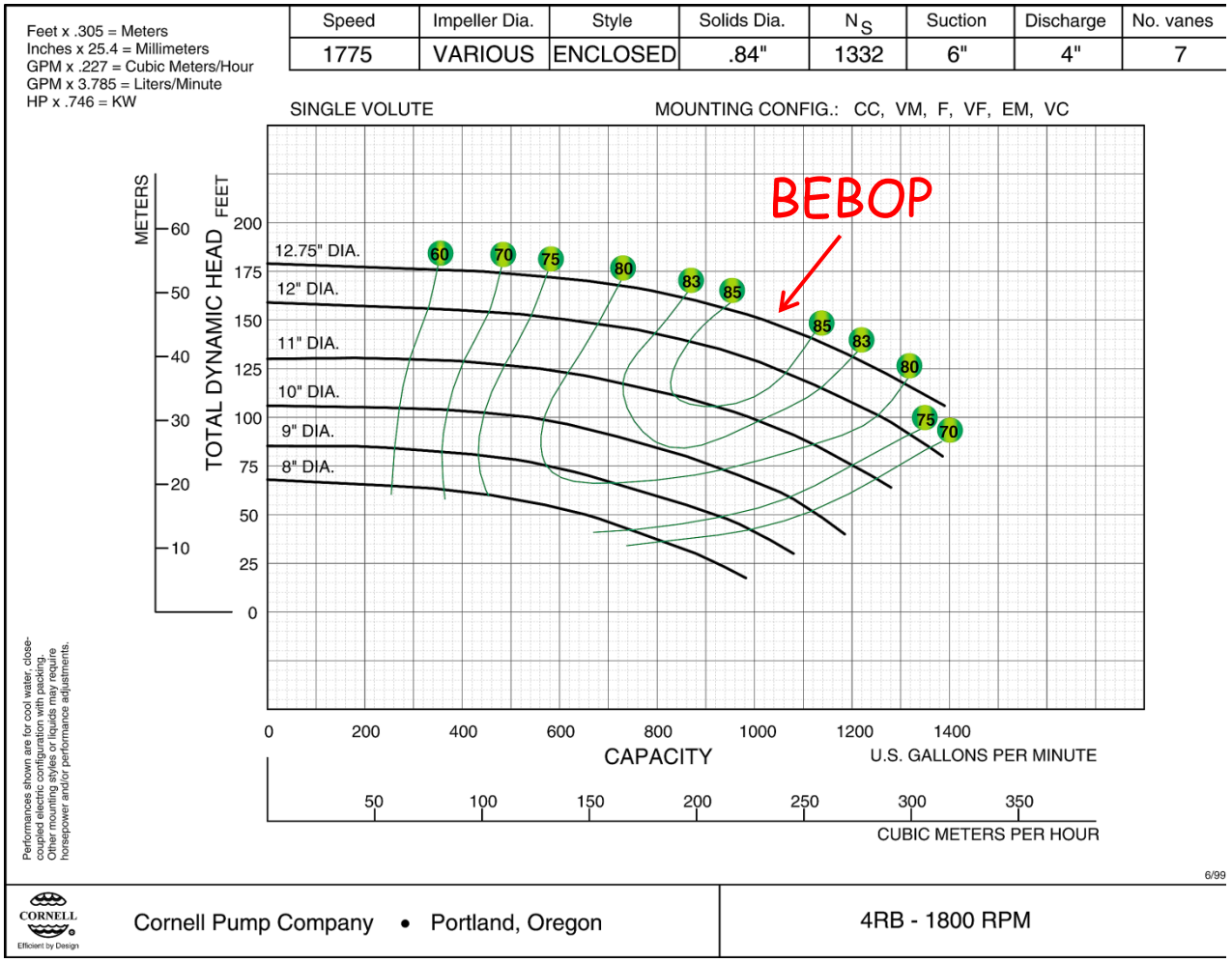
Price
Weight
History

Features

Seals
Coupling
Materials

The Performance Curve

- Efficiency
- BEP
- BOP



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Pump ED 101

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Motor & Pump Efficiency

Motor Efficiency = Mechanical Power / Electrical Power

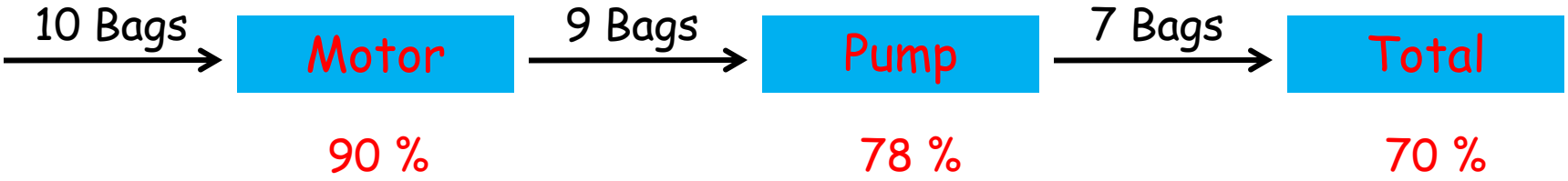
Pump Efficiency = Fluid Power / Mechanical Power

Total Efficiency = Pump Efficiency X Motor Efficiency

PumpTech INC.

Motor & Pump Efficiency

Total Efficiency = Pump Efficiency X Motor Efficiency



0.90 X 0.78 = 0.70 = 70%

Pump ED 101

Wire to Water Energy Calculator

	PUMP 1	PUMP 2
REQUIRED DATA		
Pump Operation - Hours / Day	8	8
Pump Operation - Days / Year	365	365
Pump Flow - GPM	1000	1000
Pump Head - Feet	150	150
Pump Efficiency - %	85%	75%
Motor Efficiency - %	94.1%	94.1%
Energy Cost in $/KWH	$0.11	$0.11
RESULTS		
BHP At Design Point	44.6	50.5
Wire to Water Efficiency - %	80%	71%
Annual Energy Cost	$11,347.54	$12,860.55
KW Per 1000 Gallons Pumped	0.589	0.667
Cost Per 1000 Gallons Pumped	$0.065	$0.073
PAYBACK		
Annual Savings - $$	$1,513.01	
Annual Savings - %	11.76%	
Cost of Pump 1	$9,000.00	
Cost of Pump 2	$7,200.00	
Payback - Years	1.2	

Note: When comparing two pumps, place the lower efficiency pump/motor in the Pump 2 column.

PumpTech inc.

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Sheet1 Sheet2 Sheet3

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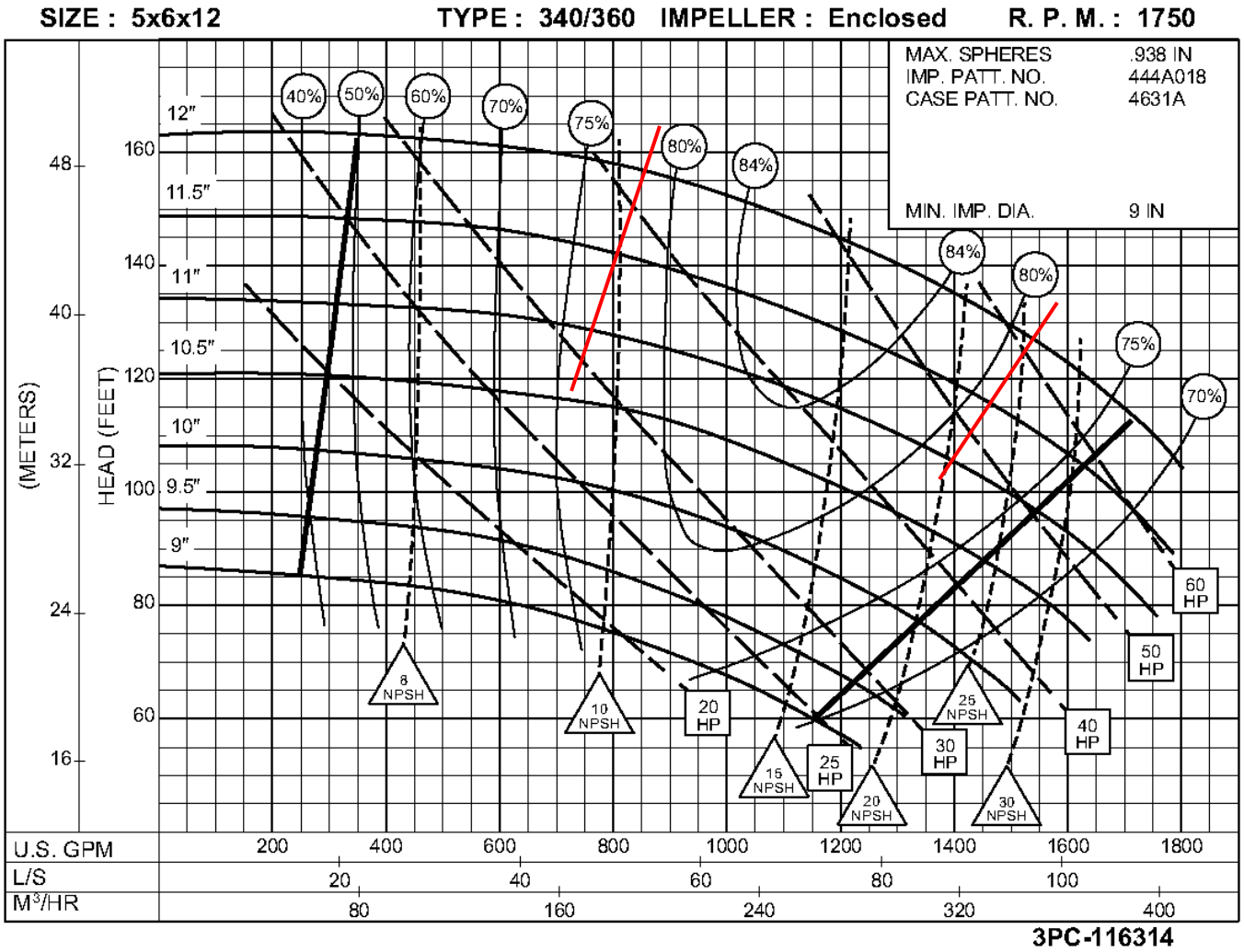
Off BEP Energy Cost Calculator

REQUIRED DATA	BEP	Off BEP
Pump Operation - Hours / Day	8	10
Pump Operation - Days / Year	365	365
Pump Flow - GPM	5000	4000
Pump Head - Feet	130	147
Pump Efficiency - %	87%	81%
Motor Efficiency - %	95.0%	95.0%
Energy Cost in $/kWh	$0.10	$0.10
RESULTS		
BHP At Operating Point	188.7	183.3
Wire to Water Efficiency (%)	83%	77%
Annual Pumpage (gal)	876,000,000	876,000,000
Annual Energy Consumption (kWh)	432,610	525,418
Annual Energy Cost	$43,261.04	$52,541.83
kW Per 1000 Gallons Pumped	0.494	0.600
Cost Per 1000 Gallons Pumped	$0.049	$0.060

Wide Efficiency Range



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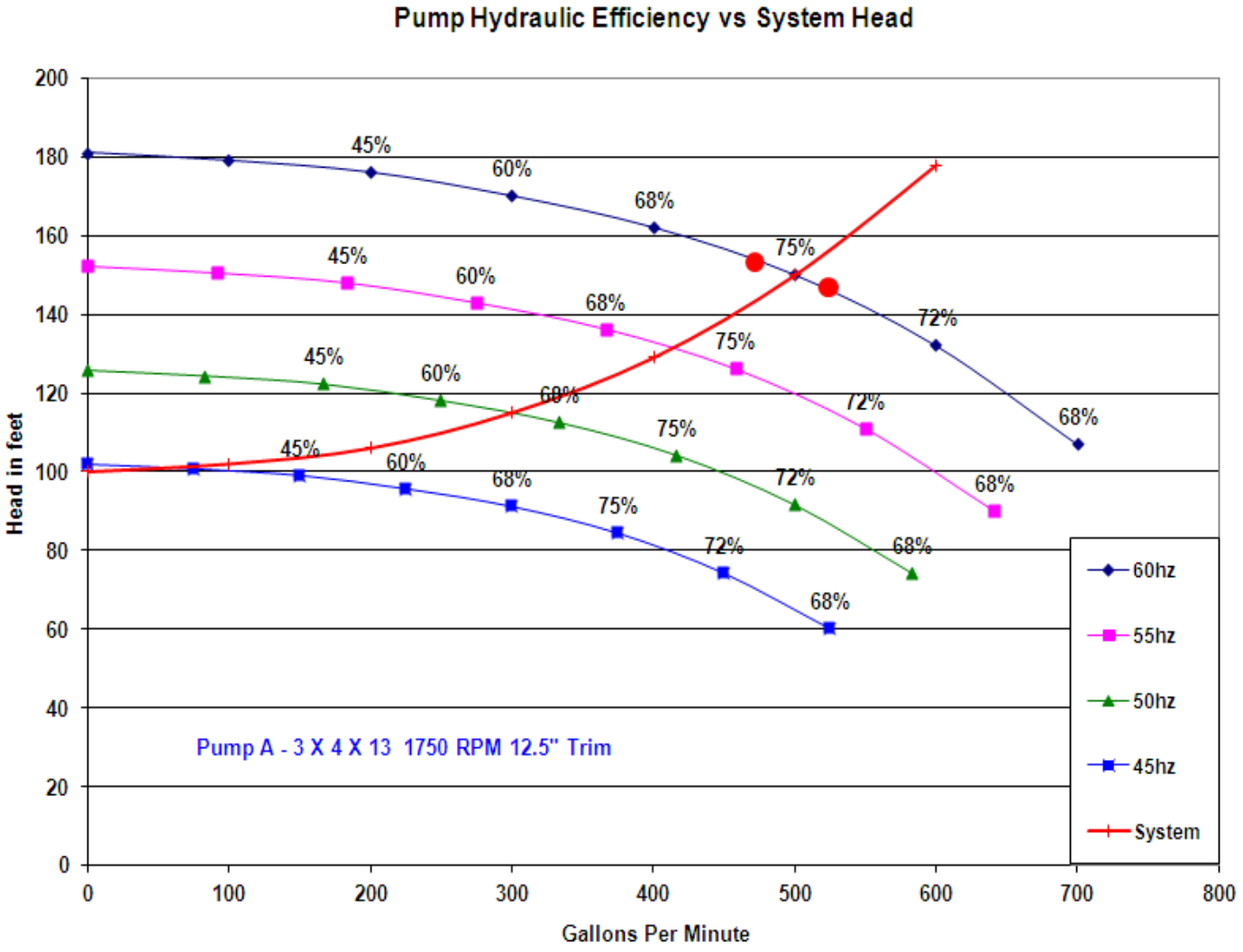
Narrow Efficiency Range



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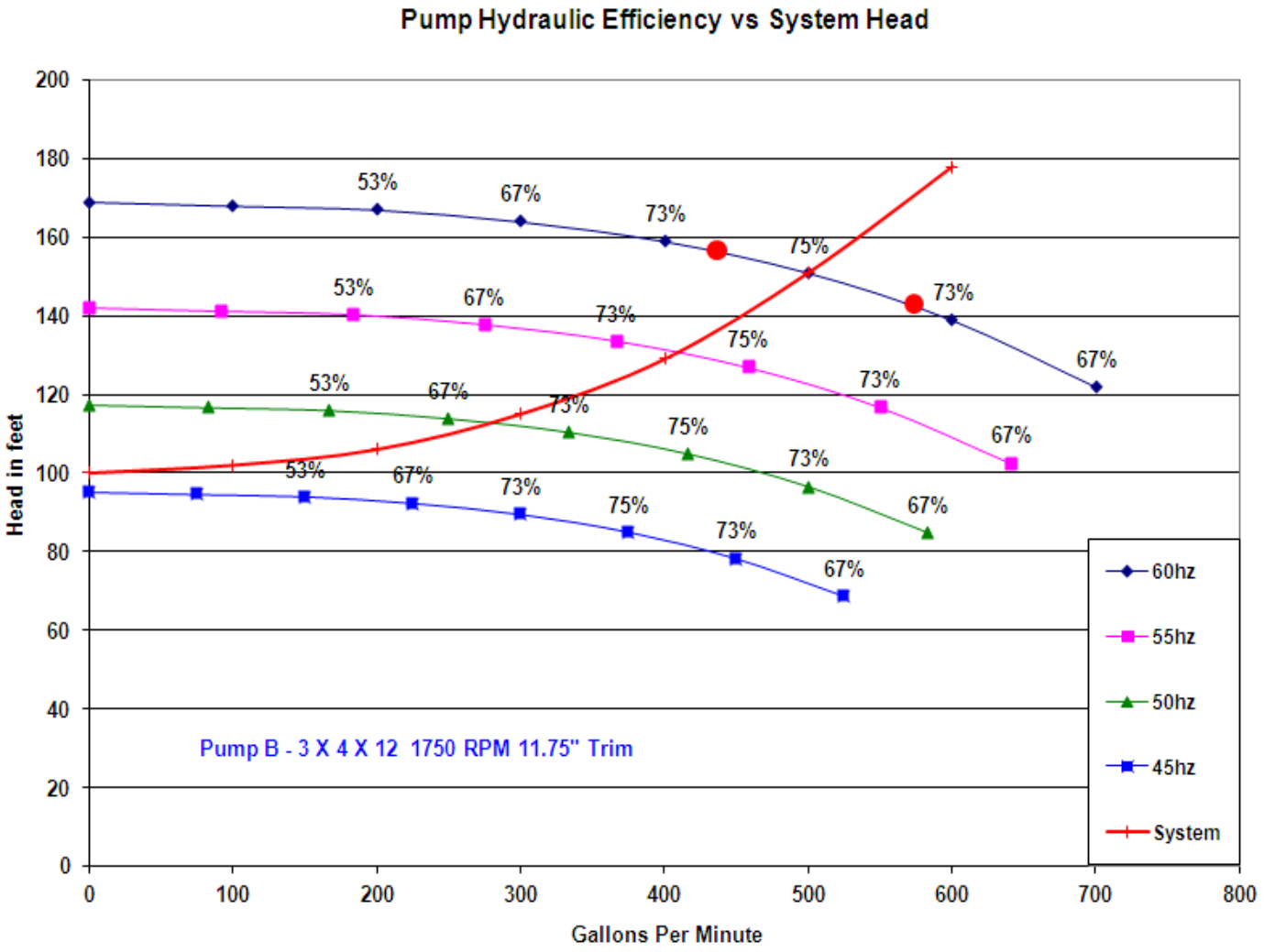
Wide Efficiency Range



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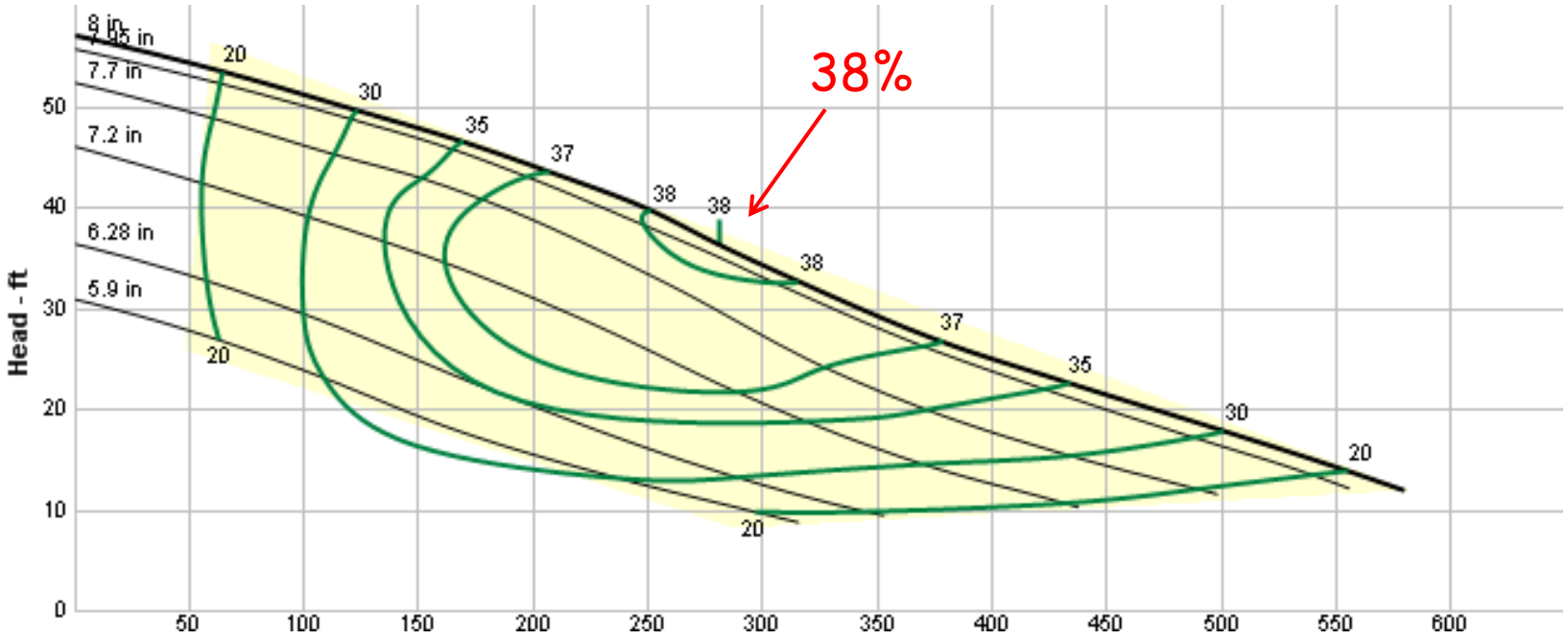
Would You Select This Pump ?



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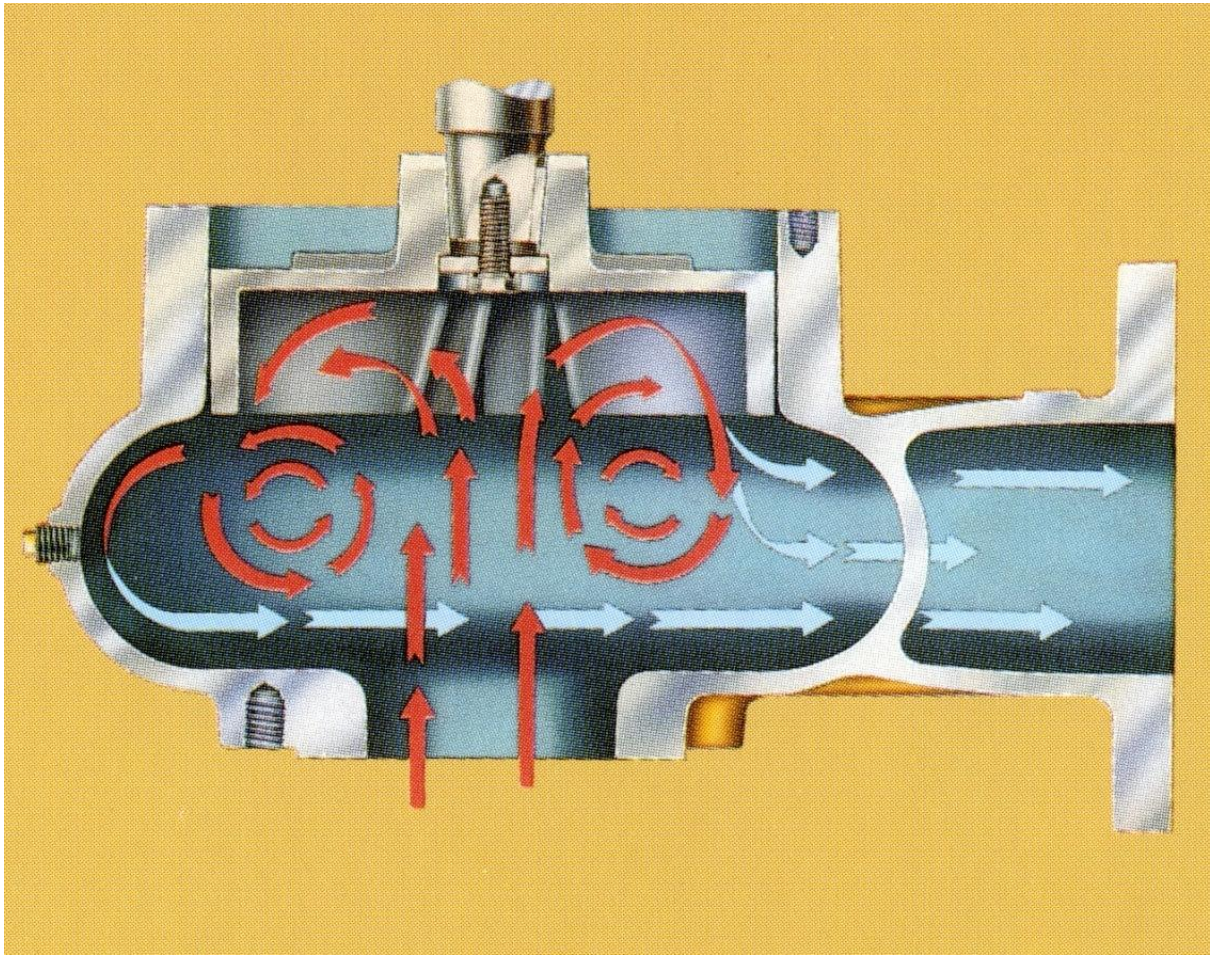
Vortex Action



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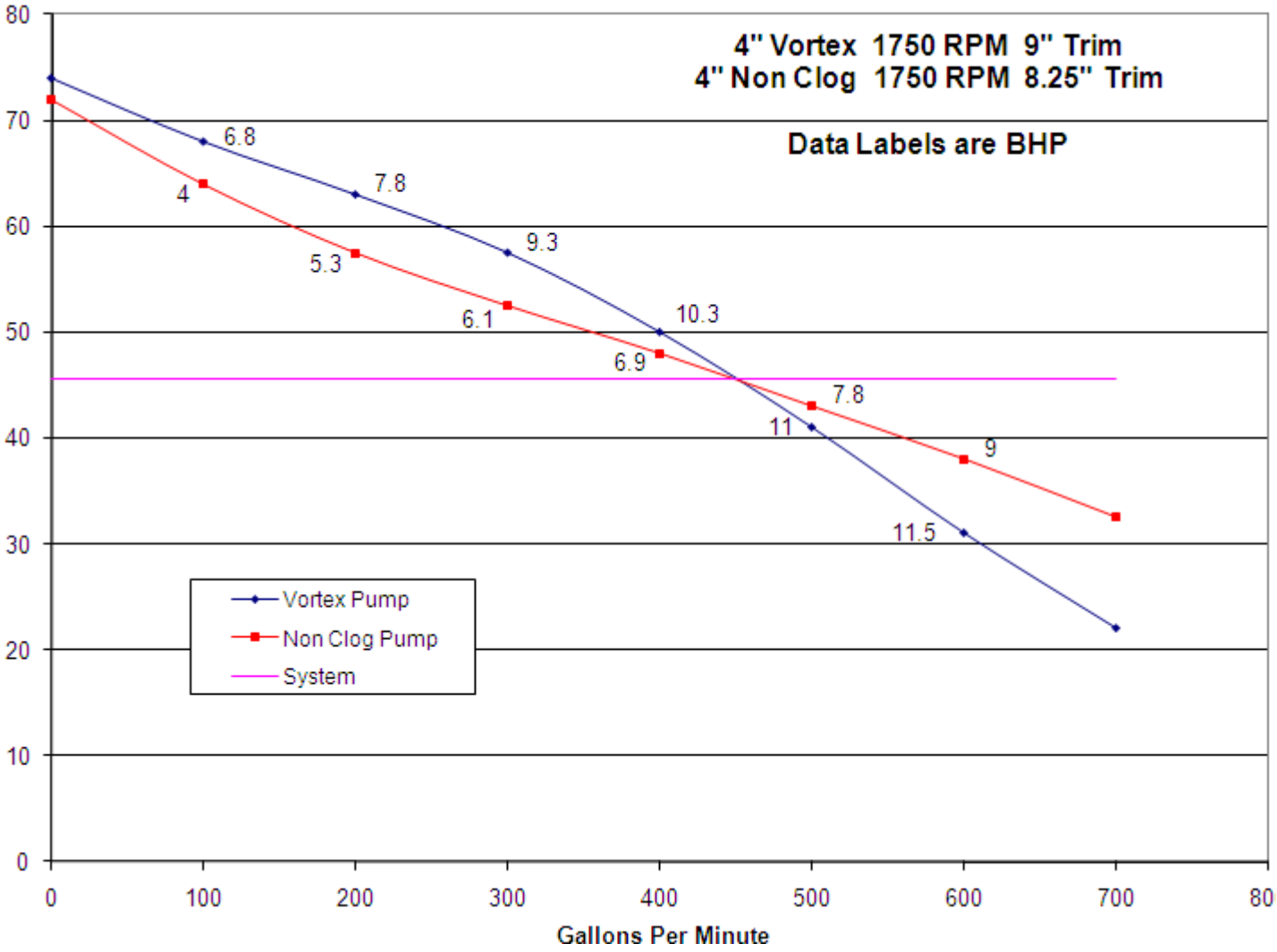
Vortex vs Non Clog



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Pump ED 101

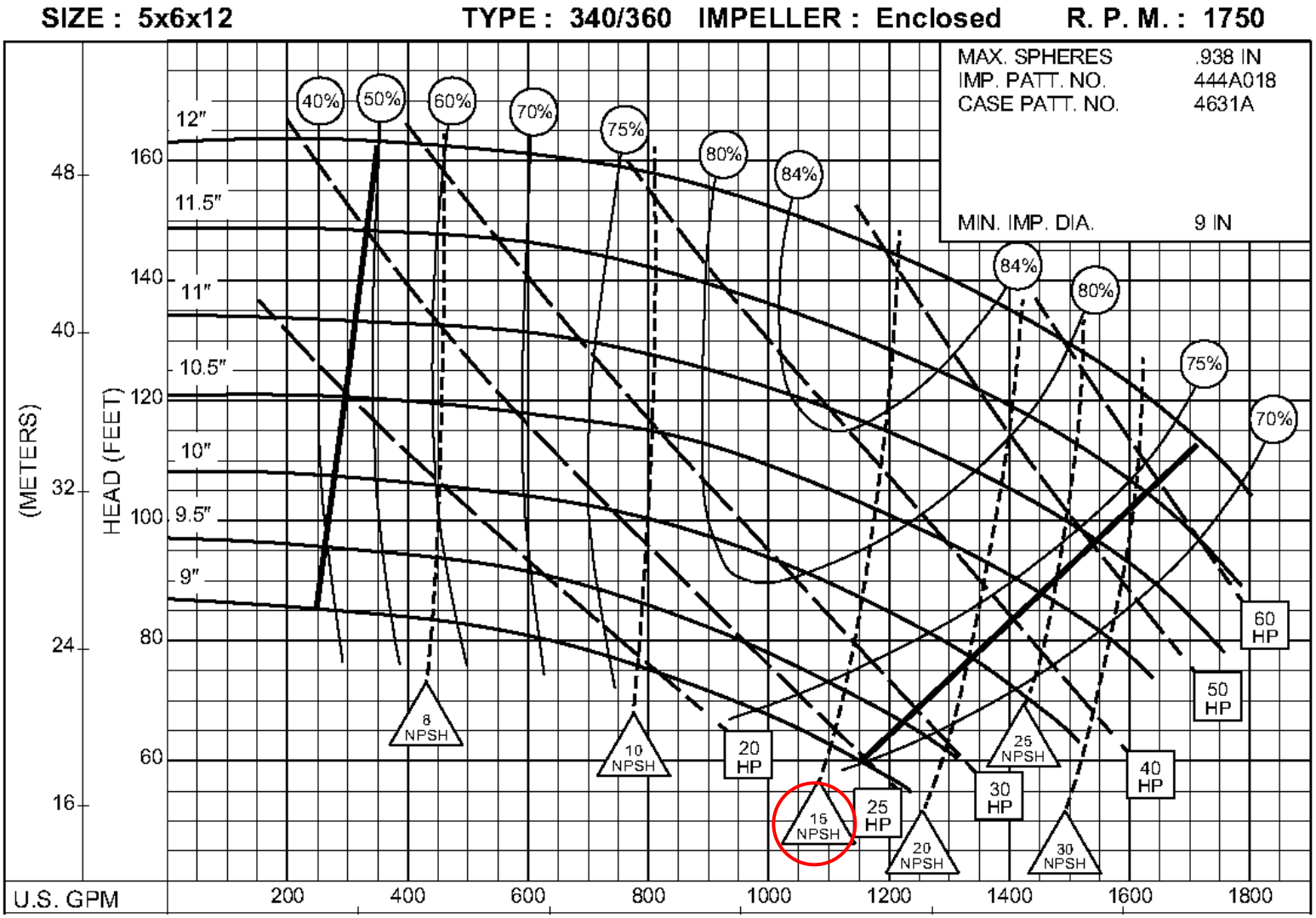
NPSH - Net Positive Suction Head

Two Types – NPSHr & NPSHa

In simple terms, NPSHr is the amount of pressure required at the pump's suction to prevent damaging cavitation.

It is a function of pump design.

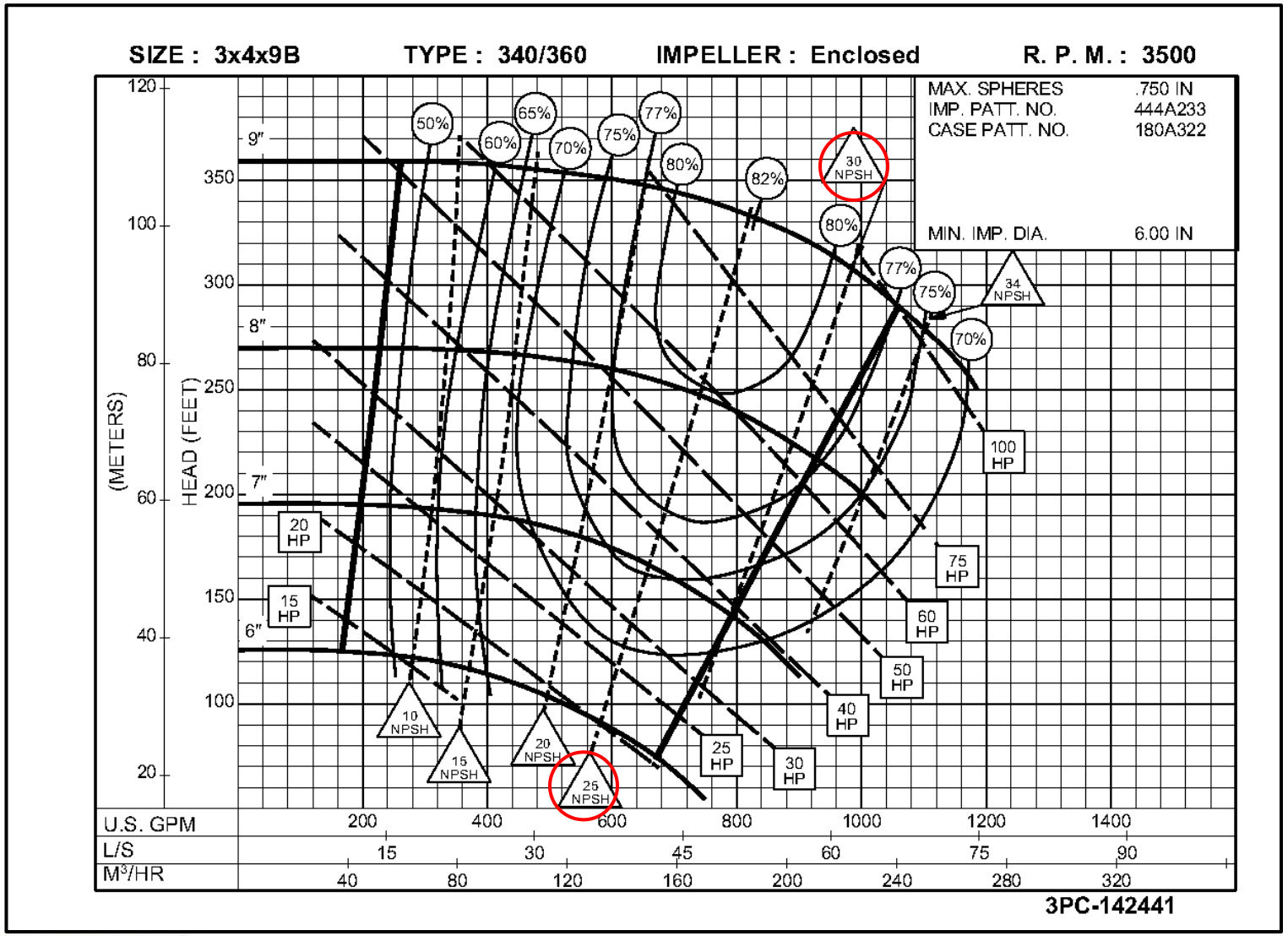
Relatively Low NPSHr



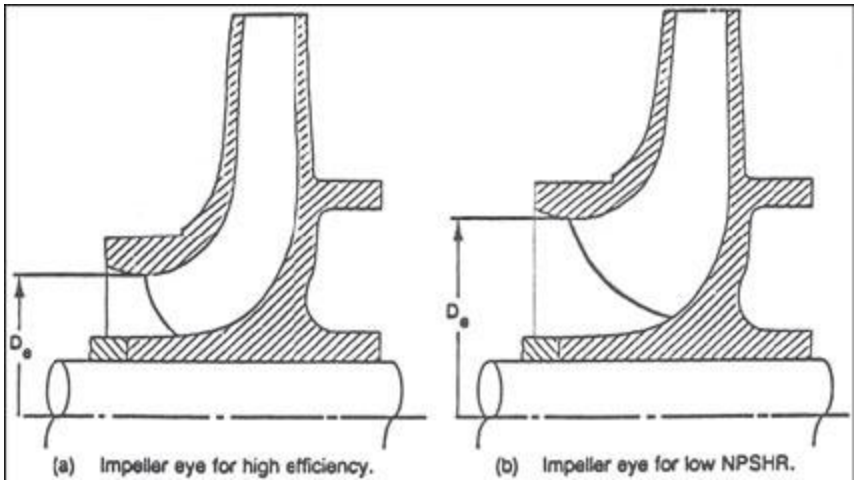
NPSHr @ BEP = 15'

Pump ED 101

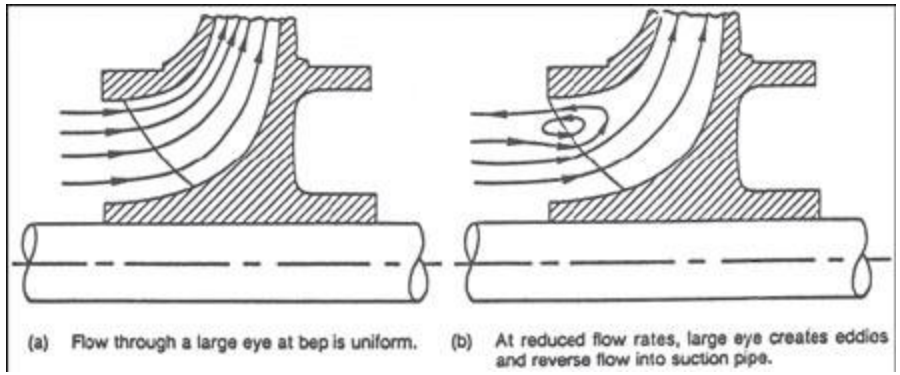
Relatively High NPSHr



Eye Diameter Effect on NPSHr



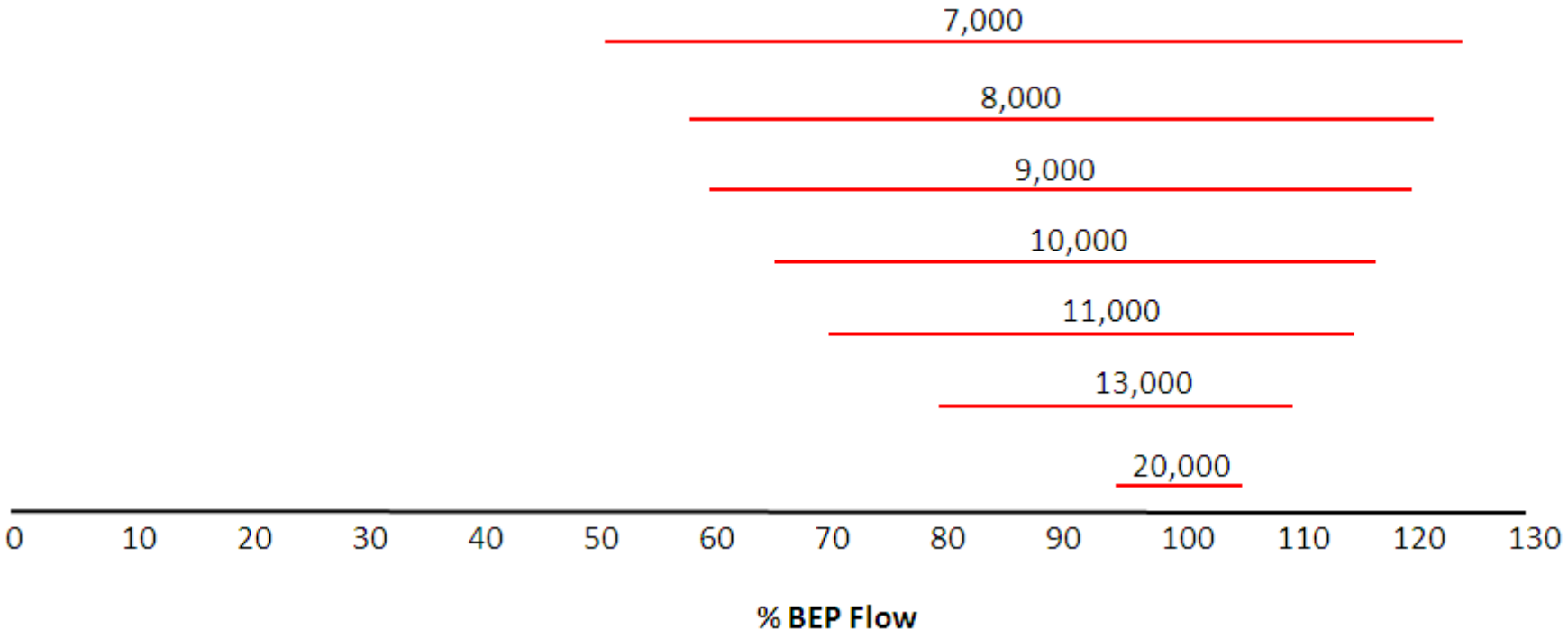
(a) Impeller eye for high efficiency. (b) Impeller eye for low NPSHR.



(a) Flow through a large eye at bep is uniform. (b) At reduced flow rates, large eye creates eddies and reverse flow into suction pipe.

Stable Window of Operation

Suction Specific Speed



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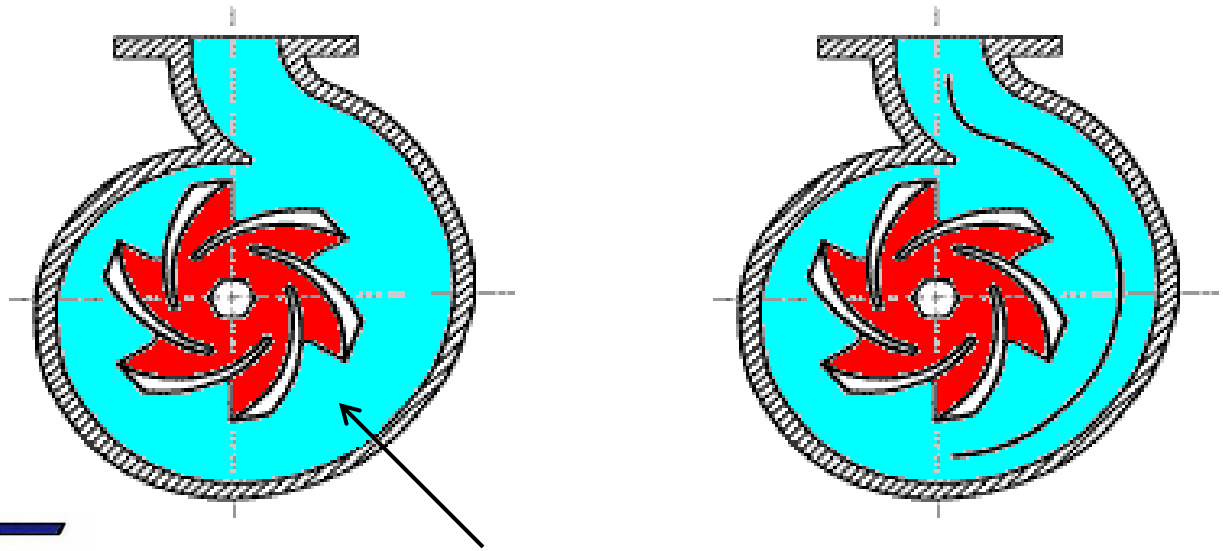
Suction Recirculation Cavitation

Occurs on the high pressure side of the vane

Suction Recirculation Cavitation

Radial Thrust

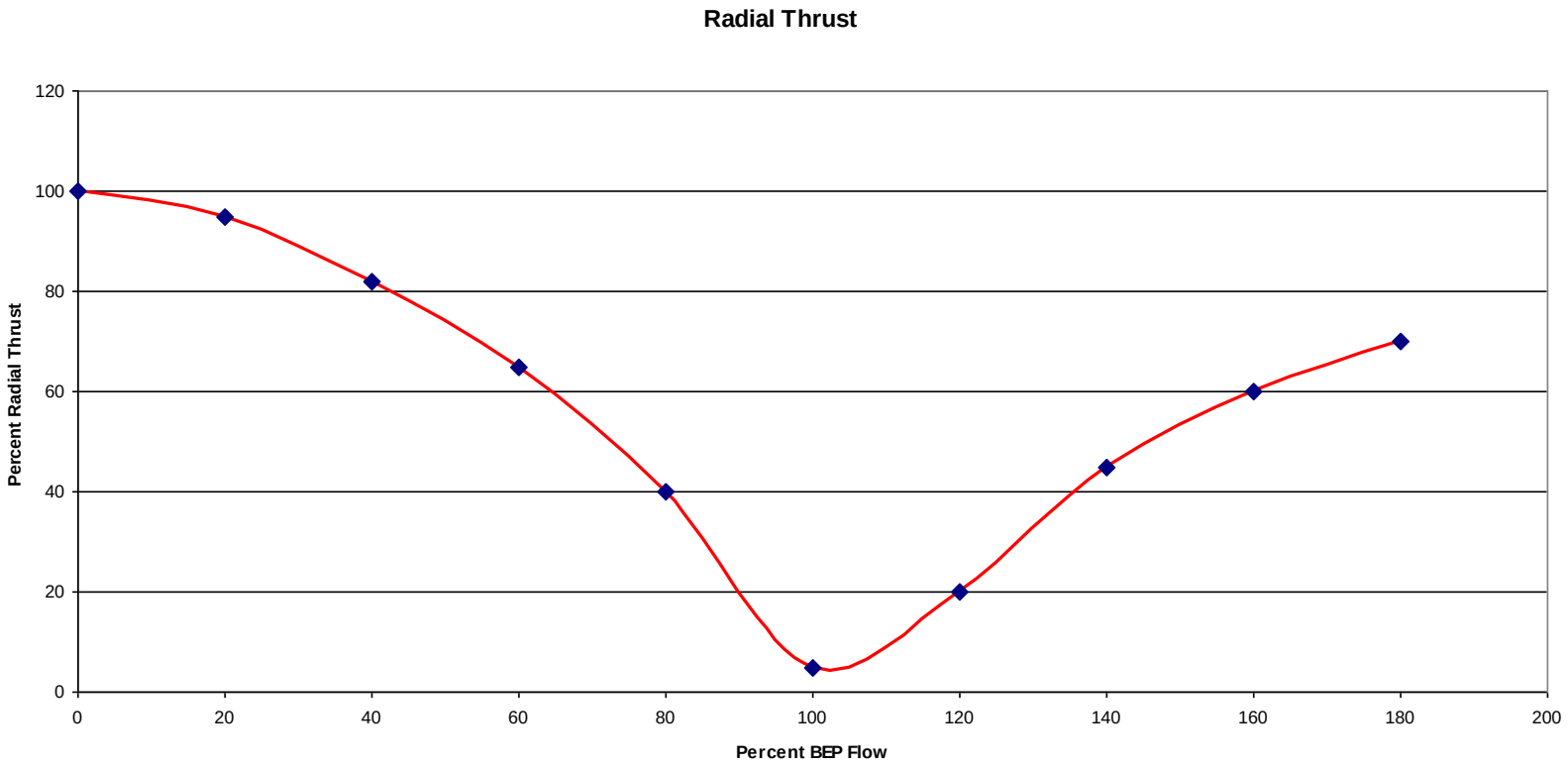
- A force that acts perpendicularly to the pump shaft
- Forms about the periphery of the impeller due to uneven volute geometry
- A function of total head and the width and diameter of the impeller
- Usually reaches a maximum at or near shut off head



Radial Thrust - Problems

- Causes Excess Shaft Deflection
  - Increased Seal Wear
  - Increased Wear Ring Wear
  - Increased Radial Bearing Load
  - Vibration
- Fixes ?
  - Increase Shaft Diameter or Shorten Overhang
  - Best Fix – Operate at BEBOP

Radial Thrust versus % BEP Flow



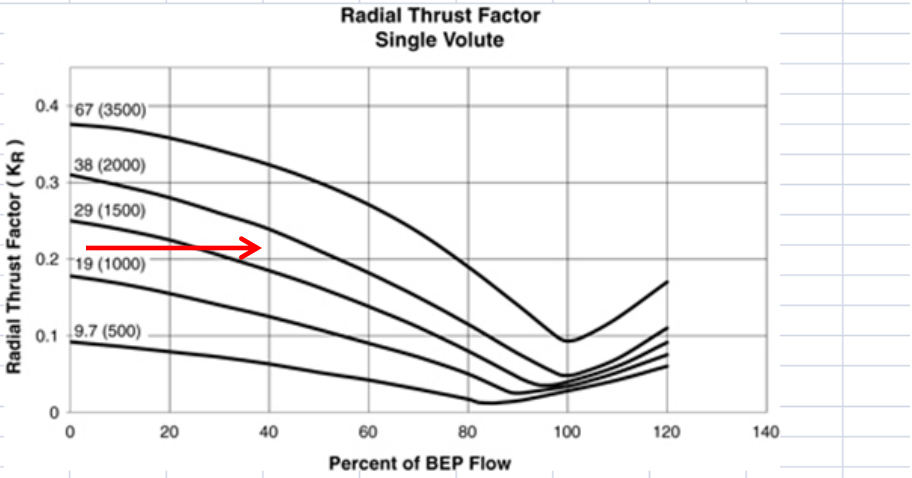
Radial Thrust Calculator

Radial Thrust Calculator - Joe Evans www.PumpEd101.com

Radial Thrust (PSI): $F_R = K_R \times (H \times s/2.31) \times D_2 \times b_2$

Enter the required data in the highlighted cells. If you do not know the pump specific speed use the Ns calculator below.

Thrust Factor (K_R) @ flow point (from graph)	0.21
Head (H) per Stage @ flow point in feet	138
Specific Gravity (S)	1
Impeller Diameter (D2) in inches	11.88
Impeller Width (b2) @ discharge in inches	3.5
F_R (Unbalanced Radial Thrust in lbf) =	522



Pump Specific Speed: $Ns = N \sqrt{Q} / H^{0.75}$

Enter the required data in the highlighted cells

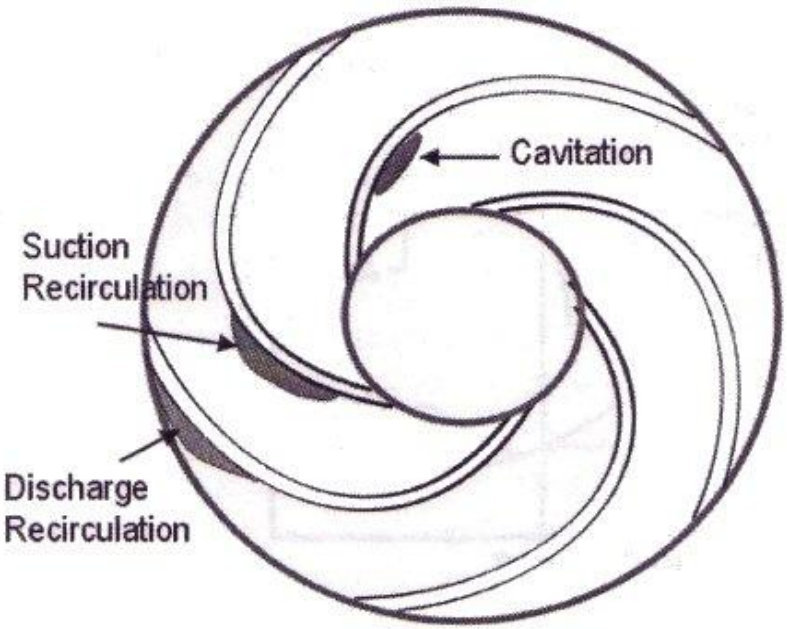
Pump RPM (N)	1750
Flow (Q) @ BEP	1200
Head (H) @ BEP	110
Ns =	1785

Instructions

The numbers in ( ) are Pump Specific Speed (Ns). The curves represent the radial thrust factor from 0 to 120% of BEP flow for that particular specific speed. Select a point on the X axis that corresponds to the point to be evaluated on the pump H/Q curve. The thrust factor is the value on the Y axis where the curve intersects the selected X axis value. For values of Ns that fall between the ones shown you may interpolate the intersection. Impeller width (b2) is the width in inches at the discharge including the shroud(s). The example shown is for a sewage pump with a specific speed of 1785, operating at 40% of BEP flow. At 100% of BEP flow, radial thrust is reduced to 59 lbs. Worst case? This pump is approved by the manufacturer for flows as low as 21% of BEP. At that flow point, radial thrust reaches 660 lbs.

Off BEBOP Flows - Recirculation

- Three types of recirculation can occur when a pump is operated to the left side of the performance curve.
- Normal recirculation increases with wear ring clearance & reduced flow.
- Suction & Discharge recirculation increase as flow is reduced.
- The resulting recirculation cavitation will cause internal damage over time.



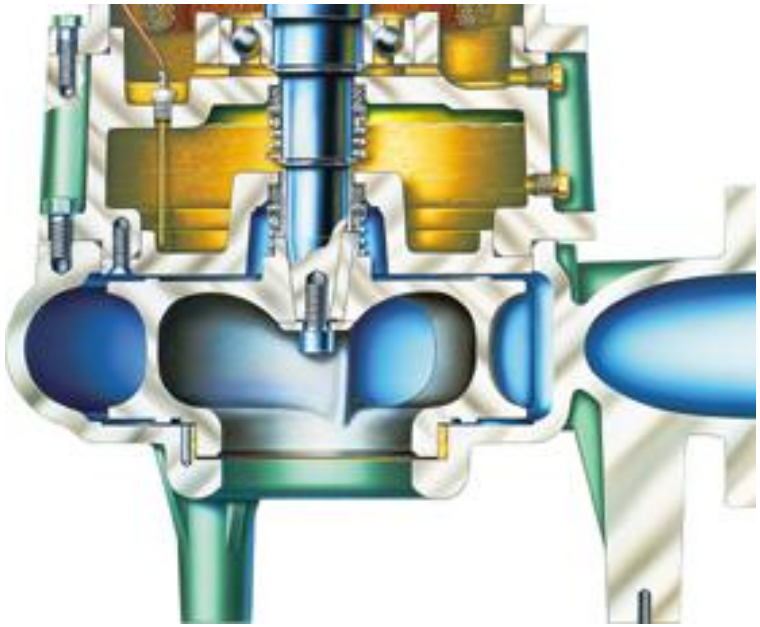
Wastewater Pump Designs

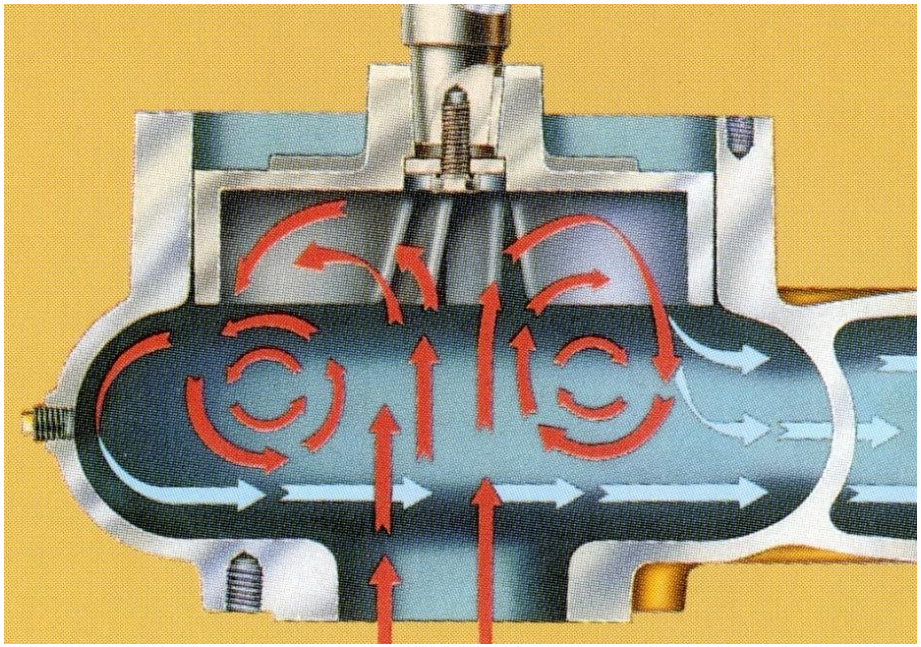
Nonclog

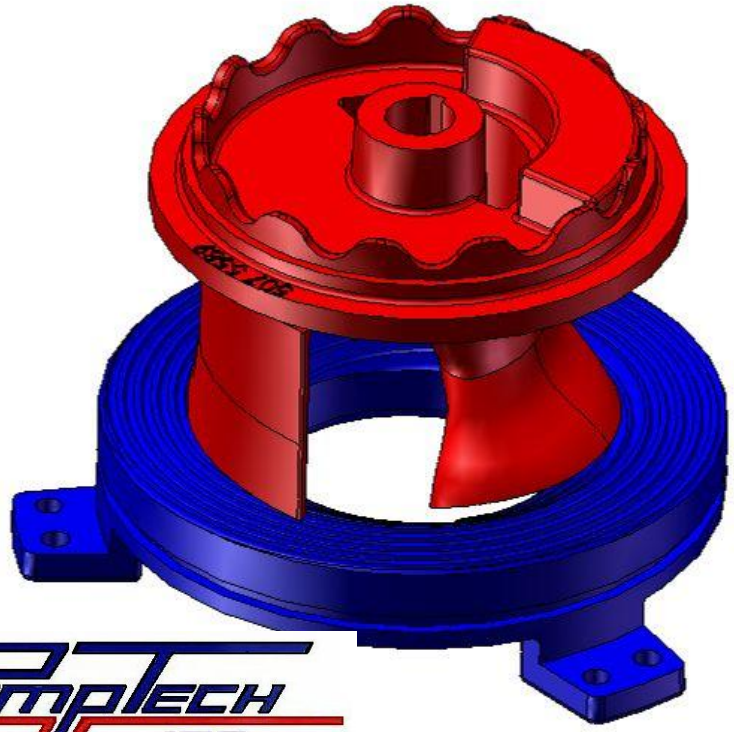
Vortex

Monovane

Chopper







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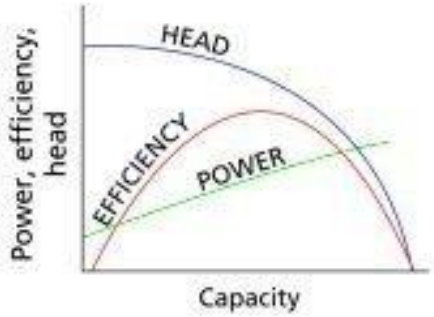
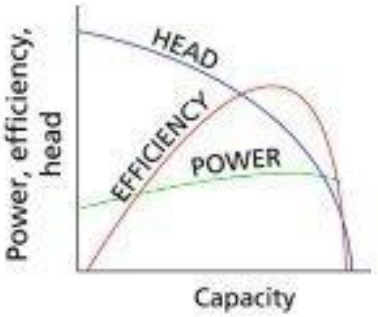
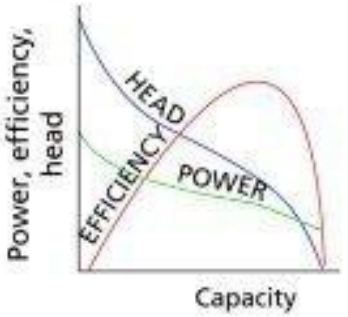
Curve Shape

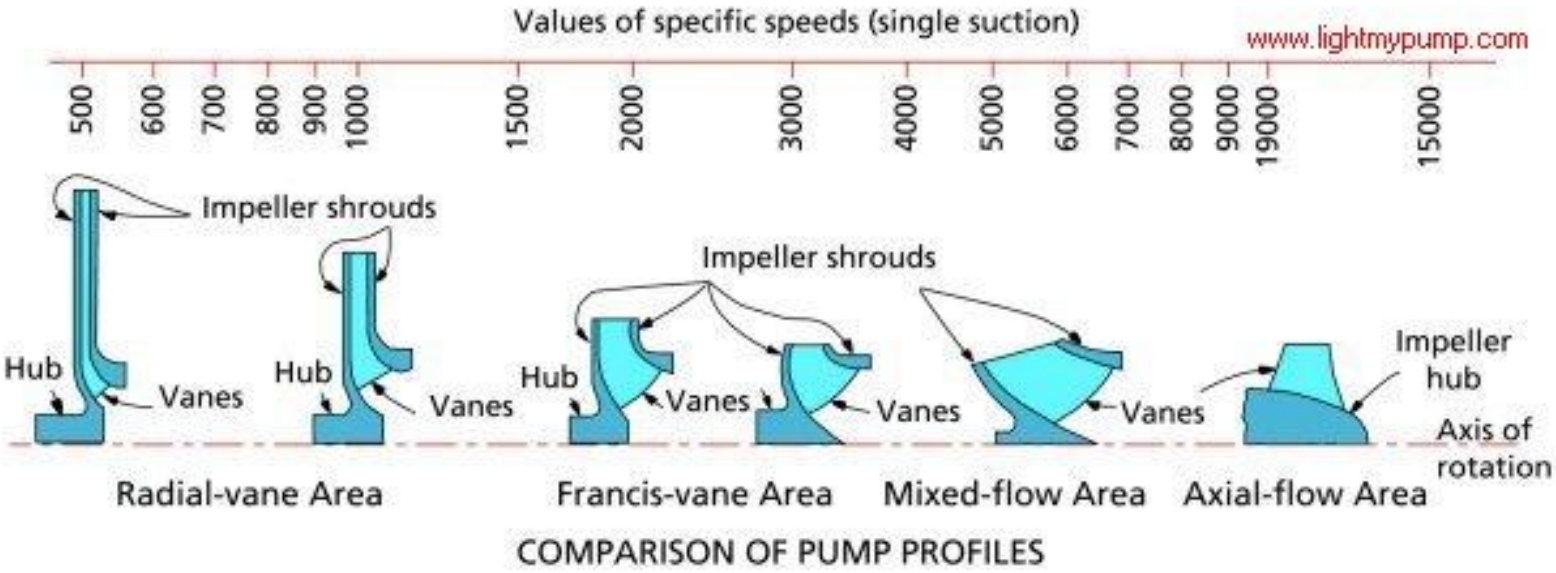
The shape and slope of the performance curve can have a significant effect upon pump selection.

Pump Specific Speed









COMPARISON OF PUMP PROFILES

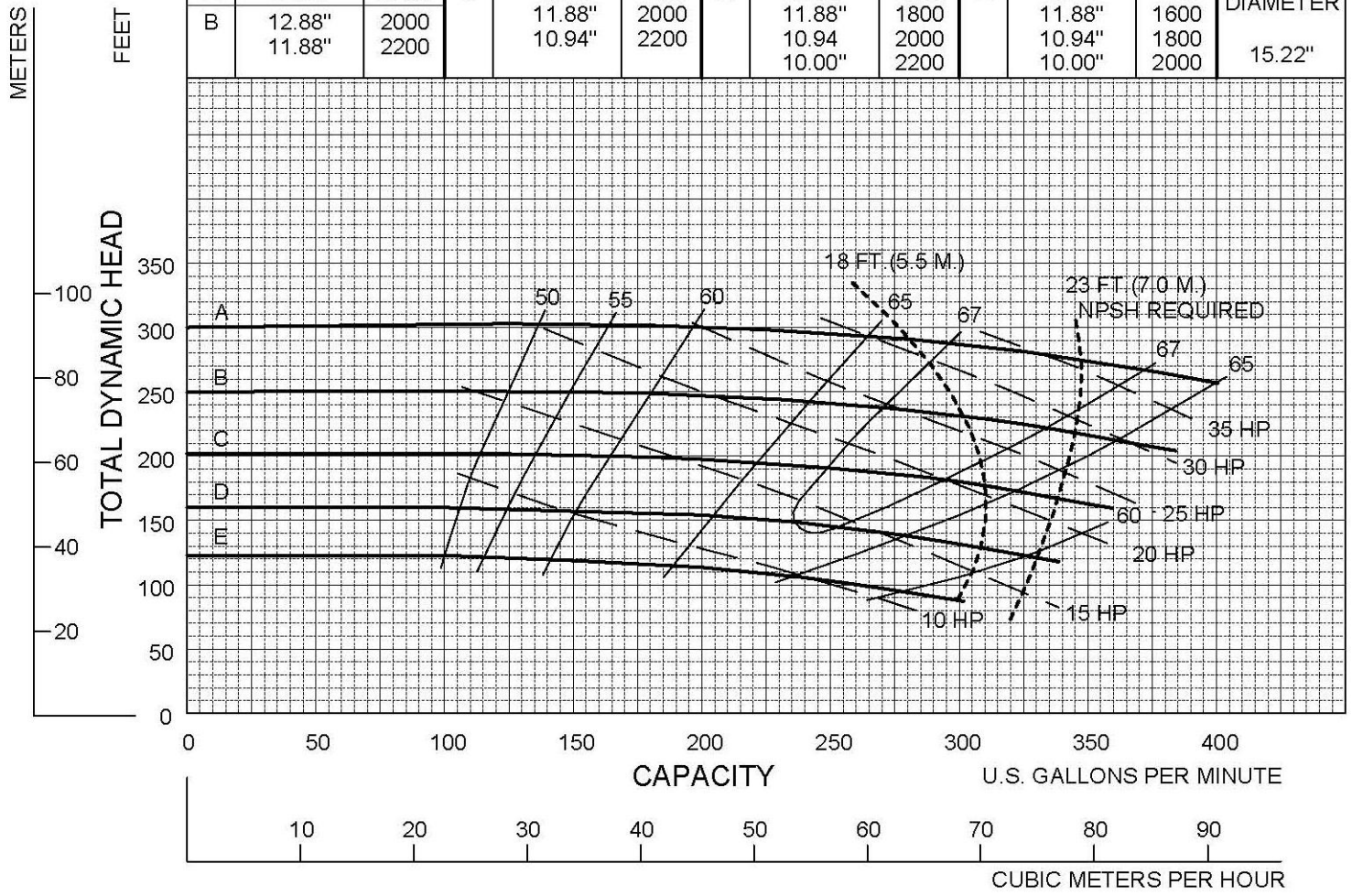
Feet x .305 = Meters
Inches x 25.4 = Millimeters
GPM x .227 = Cubic Meters/Hour
GPM x 3.785 = Liters/Minute
HP x .746 = KW

Speed	Impeller Dia.	Style	Solids Dia.	N_S	Suction	Discharge	No. vanes
VARIOUS	VARIOUS	ENCLOSED	.38"	605	4"	2.5"	7

SINGLE VOLUTE

MOUNTING CONFIG.: CC, VM, F, VF, EM, VC

HQ	TRIM	RPM	HQ	TRIM	RPM	HQ	TRIM	RPM	HQ	TRIM	RPM	FULL DIAMETER
A	12.88"	2200	C	12.88"	1800	D	12.88"	1600	E	12.88"	1400	
B	12.88"	2000		11.88"	2000		11.88"	1800		11.88"	1600	
	11.88"	2200		10.94"	2200		10.94	2000		10.94"	1800	
							10.00"	2200		10.00"	2000	15.22"



erformances shown are for cool water, close-
upled electric configuration with packing.
her mounting styles or liquids may require
rsepower and/or performance adjustments.

PumpTech Inc.

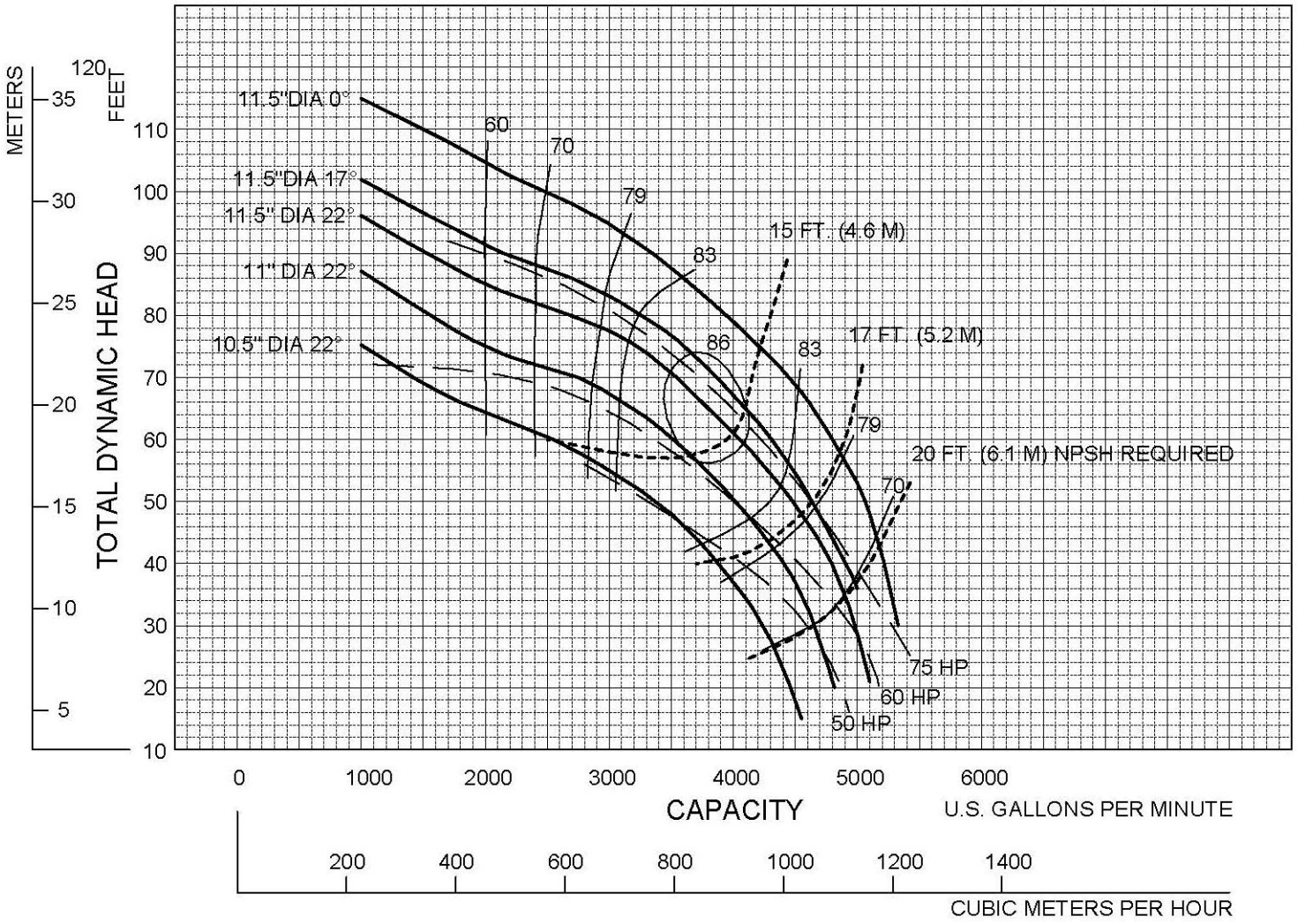
Pump ED 101

Feet x .305 = Meters
Inches x 25.4 = Millimeters
GPM x .227 = Cubic Meters/Hour
GPM x 3.785 = Liters/Minute
HP x .746 = KW

Speed	Impeller Dia.	Style	Solids Dia.	N_S	Suction	Discharge	No. vanes
1780	VARIOUS	ENCLOSED	1.38"	4800	10"	10"	5

DOUBLE VOLUTE

MOUNTING CONFIG.: CC, VM, F, VF, EM, VC



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orsepower and/or performance adjustments.

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Pump ED 101

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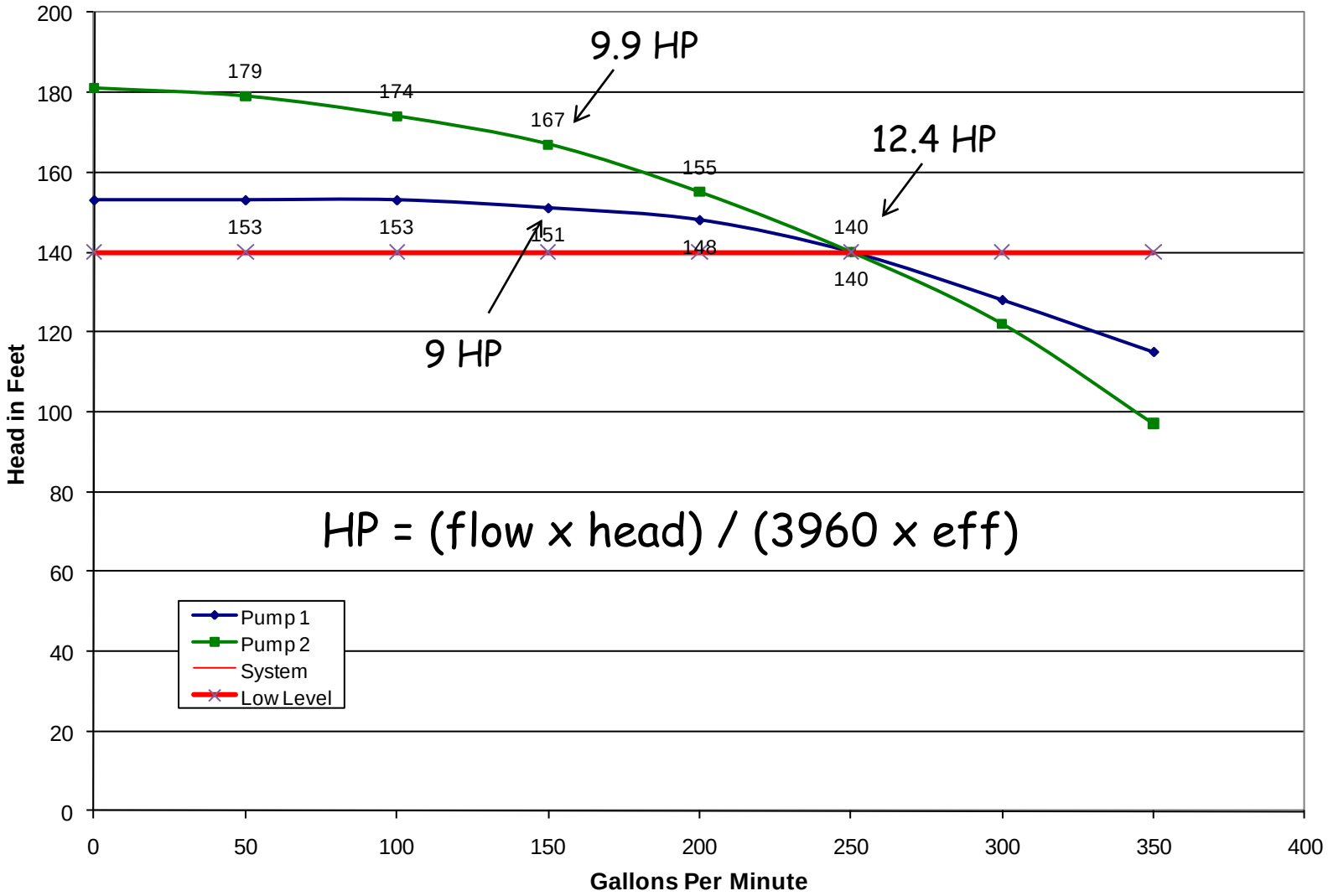
PRV Control


9.9 HP
12.4 HP
9 HP
179
174
167
155
153
153
151
148
140
140
HP = (flow x head) / (3960 x eff)
Pump 1
Pump 2
System
Low Level
Head in Feet
Gallons Per Minute
0
20
40
60
80
100
120
140
160
180
200
0
50
100
150
200
250
300
350
400

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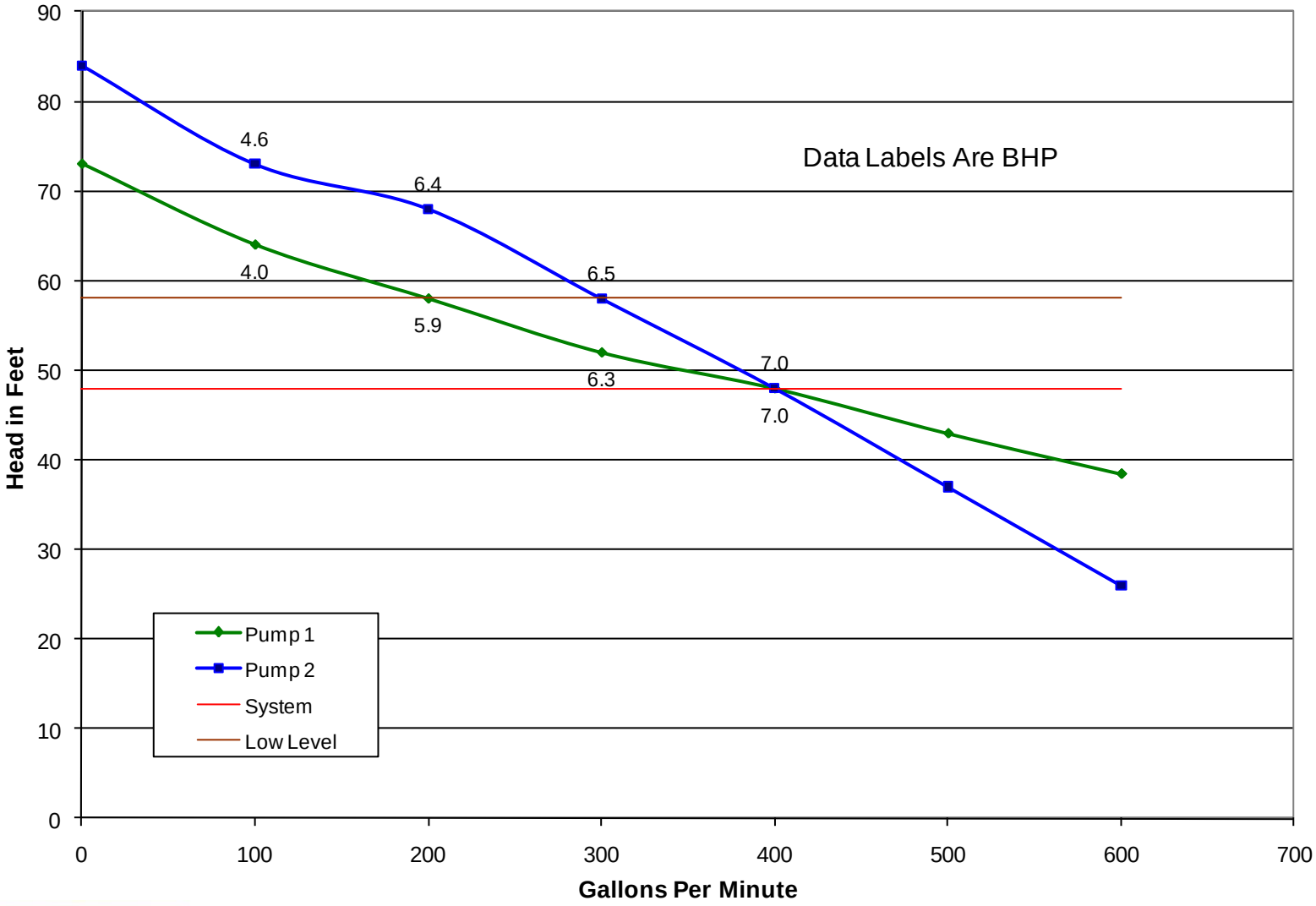
Pump Down



Pump ED 101

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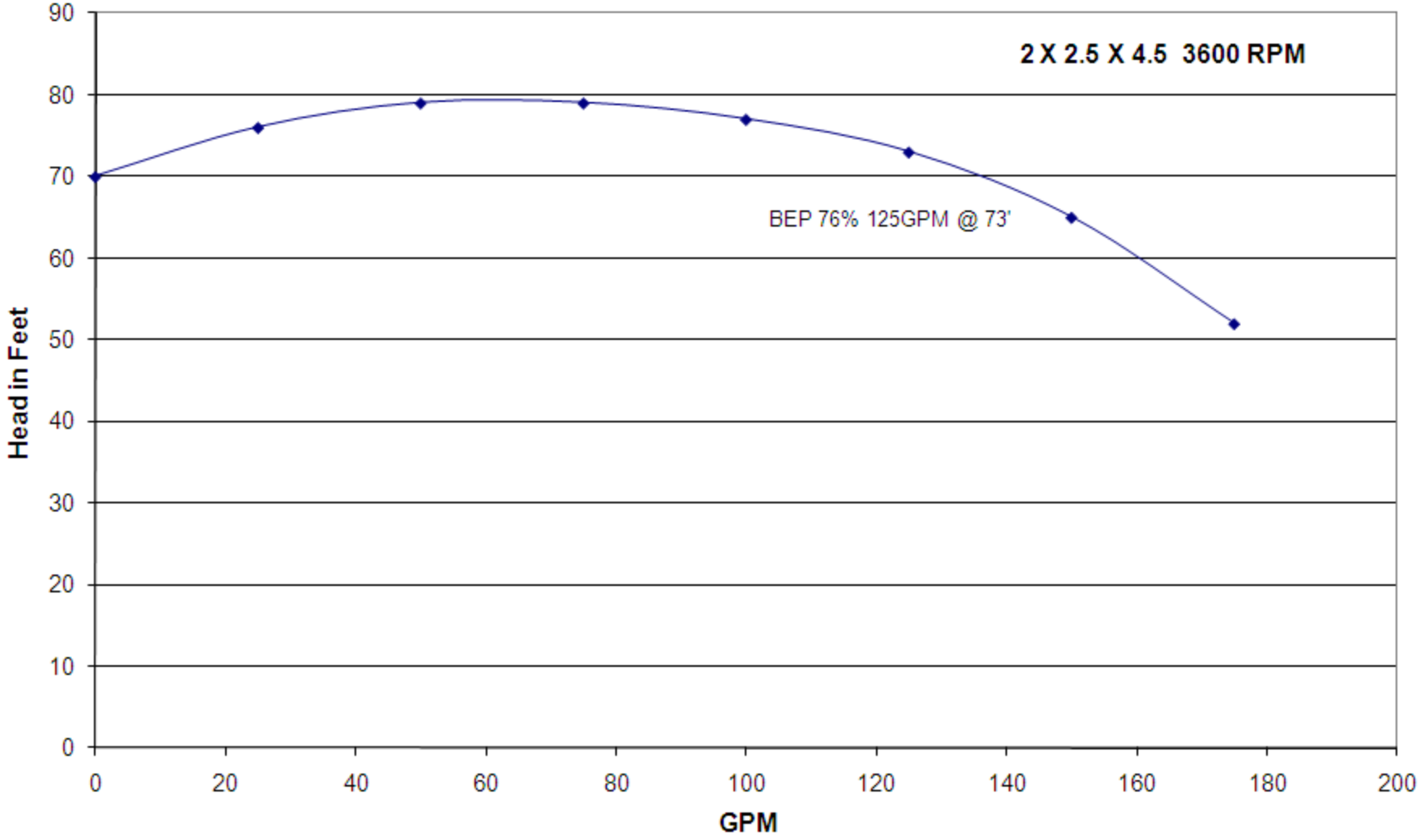
Unstable Curve



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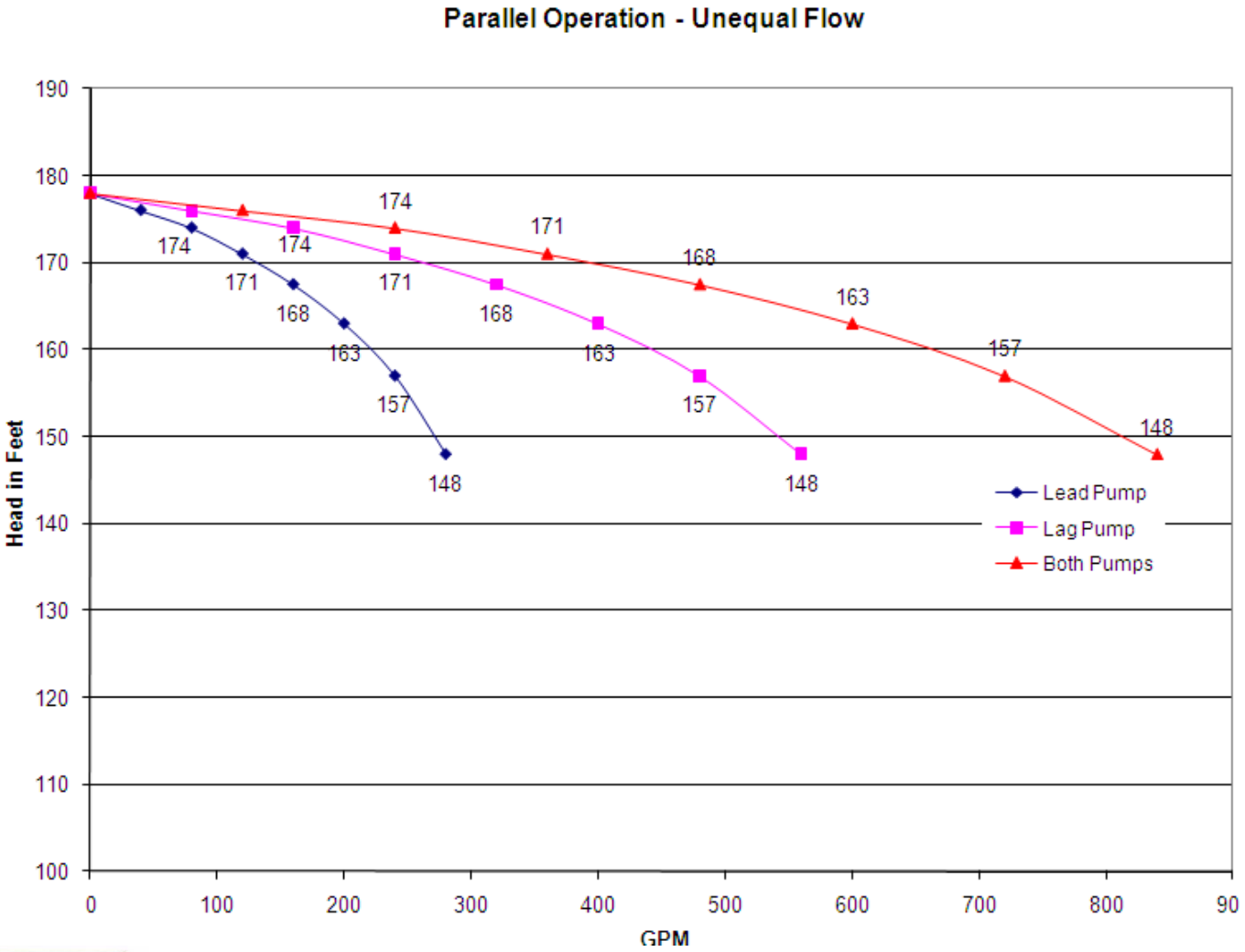
Parallel Pumps Constant Speed



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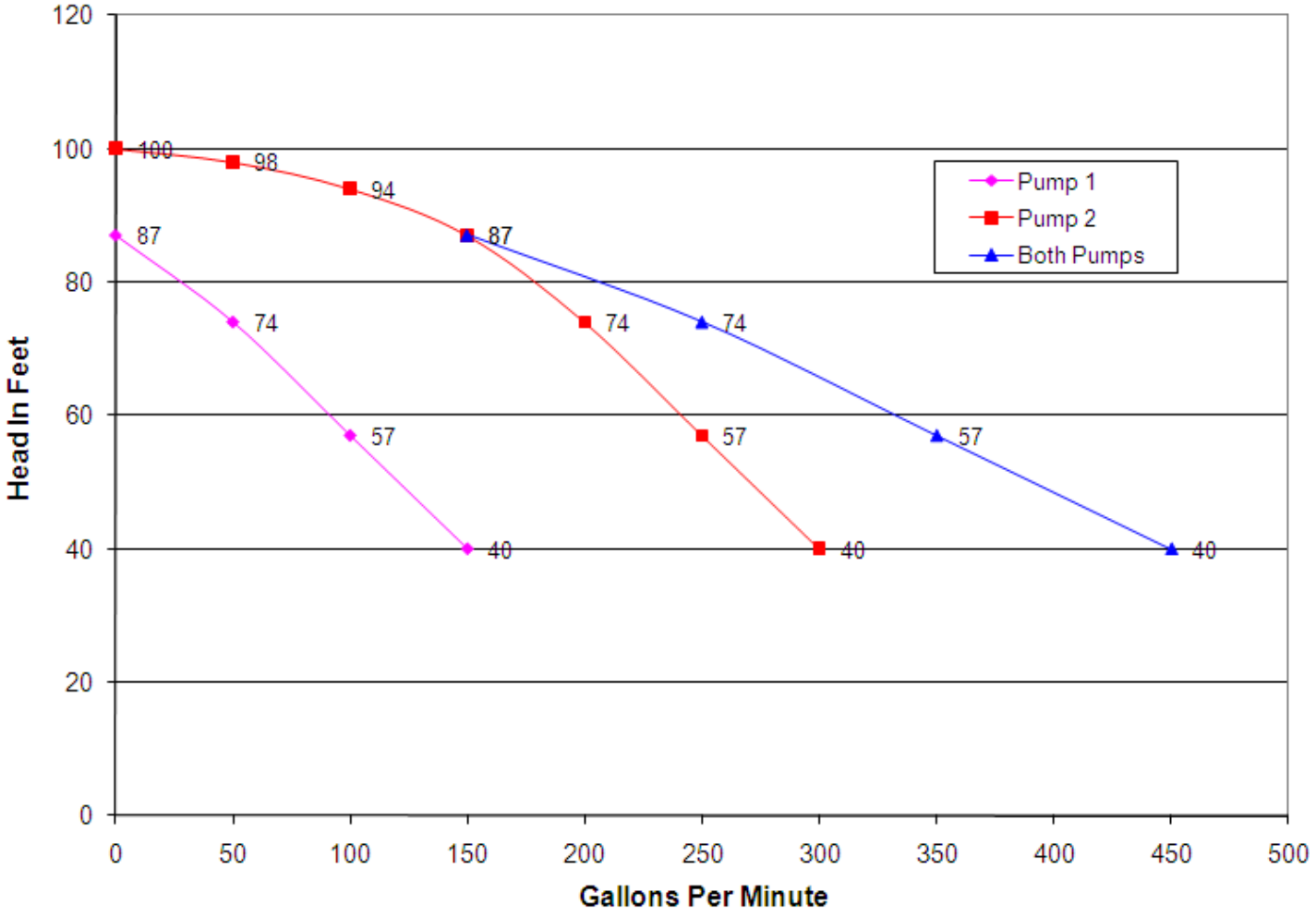
Parallel Different Pumps



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Parallel Pump Performance Analyzer with Variable Speed Options

Follow the five steps below to view the operation of multiple pumps operating in parallel.
Scroll down to row 60 for more detailed instructions.

1) Enter the chart title in yellow box # 1
   Enter the flow units in yellow box # 2
   Enter the head units in yellow box # 3
   Enter the piping data in box #4
   These items will be displayed on the charts.

1	Cornell 5RB 1780 RPM 13.5" Trim
2	Flow = GPM
3	Head = Feet
4	Piping = 1000', 12" Sch 40 Steel

2) Enter the number of pumps in the yellow cell on the right: 3

3) Enter eight 60 hertz flows In Q1 - Q8 (Cells H20 - O20)
   Enter the corresponding heads in H1 - H8 (Cells H22 - O22)
   (See instructions below when entering fewer than eight points)

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
500	750	1000	1250	1500	1750	2000	2250
H1	H2	H3	H4	H5	H6	H7	H8
200	195	187	178	165	148	125	100

4) Enter the pump's hydraulic efficiency in Ef1 - Ef8 (Cells H27 - O27) that correspond to the flows in Q1 - Q8.

Ef1	Ef2	Ef3	Ef4	Ef5	Ef6	Ef7	Ef8
0.60	0.72	0.80	0.84	0.86	0.86	0.83	0.74

5) To plot a system curve, enter the various flow points from minimum to maximum design flow in SQ1 - SQ8 (Cells H36 - O36). Calculate the corresponding system heads and enter them in SH1 - SH8 (Cells H38 - O38). Each value should contain elevation, pipe friction and valve / fitting losses. (See instructions below)

SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8
0	1000	2000	3000	4000	5000	6000	6500
SH1	SH2	SH3	SH4	SH5	SH6	SH7	SH8
100	102	107	117	129	145	165	175

Pump ED 101

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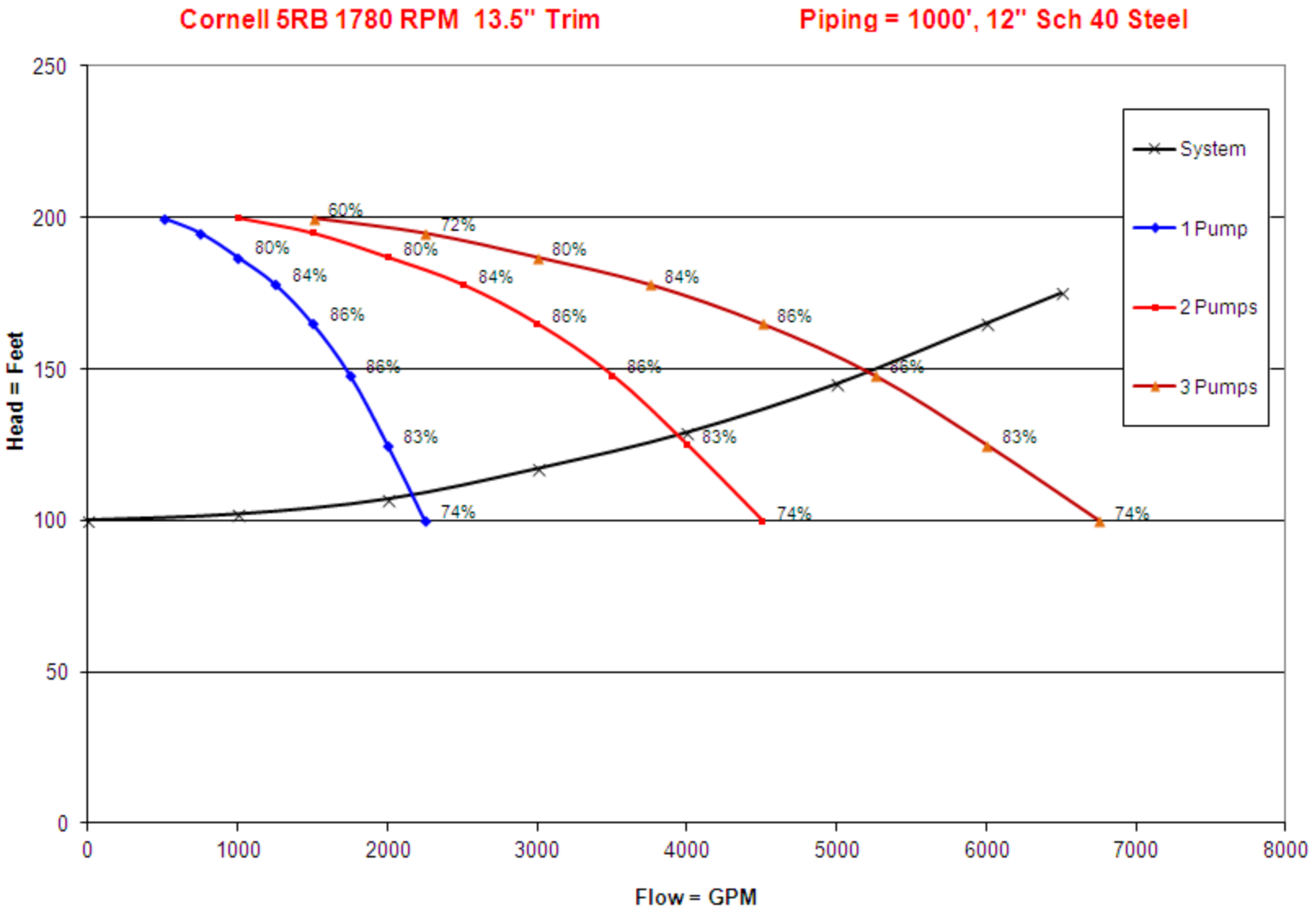
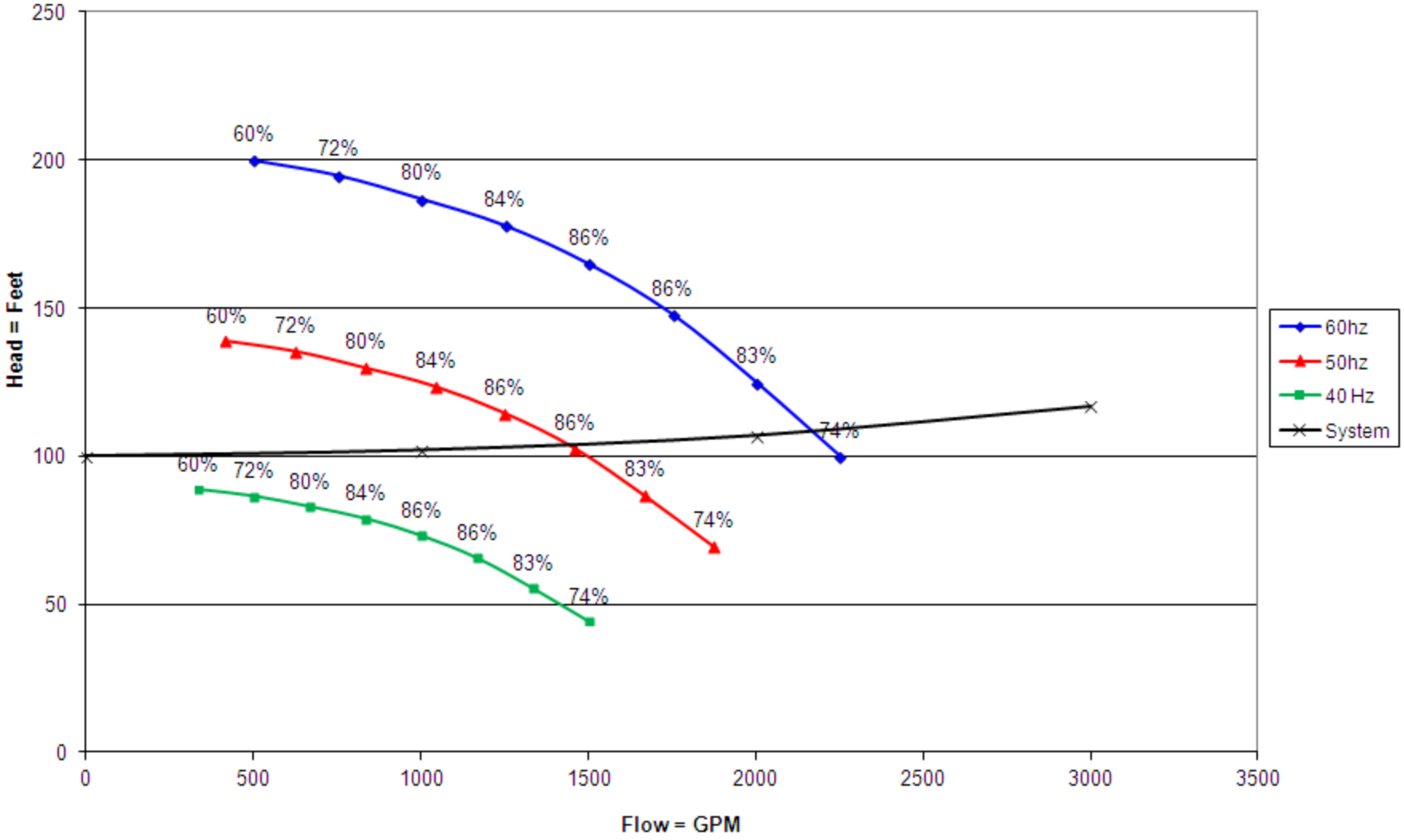

Cornell 5RB 1780 RPM 13.5" Trim
Piping = 1000', 12" Sch 40 Steel
Head = Feet
Flow = GPM
250
200
150
100
50
0
0
1000
2000
3000
4000
5000
6000
7000
8000
System
1 Pump
2 Pumps
3 Pumps
60%
72%
80%
80%
80%
84%
84%
84%
86%
86%
86%
86%
86%
83%
83%
83%
74%
74%
74%

*

Cornell 5RB 1780 RPM 13.5" Trim

Piping = 1000', 12" Sch 40 Steel



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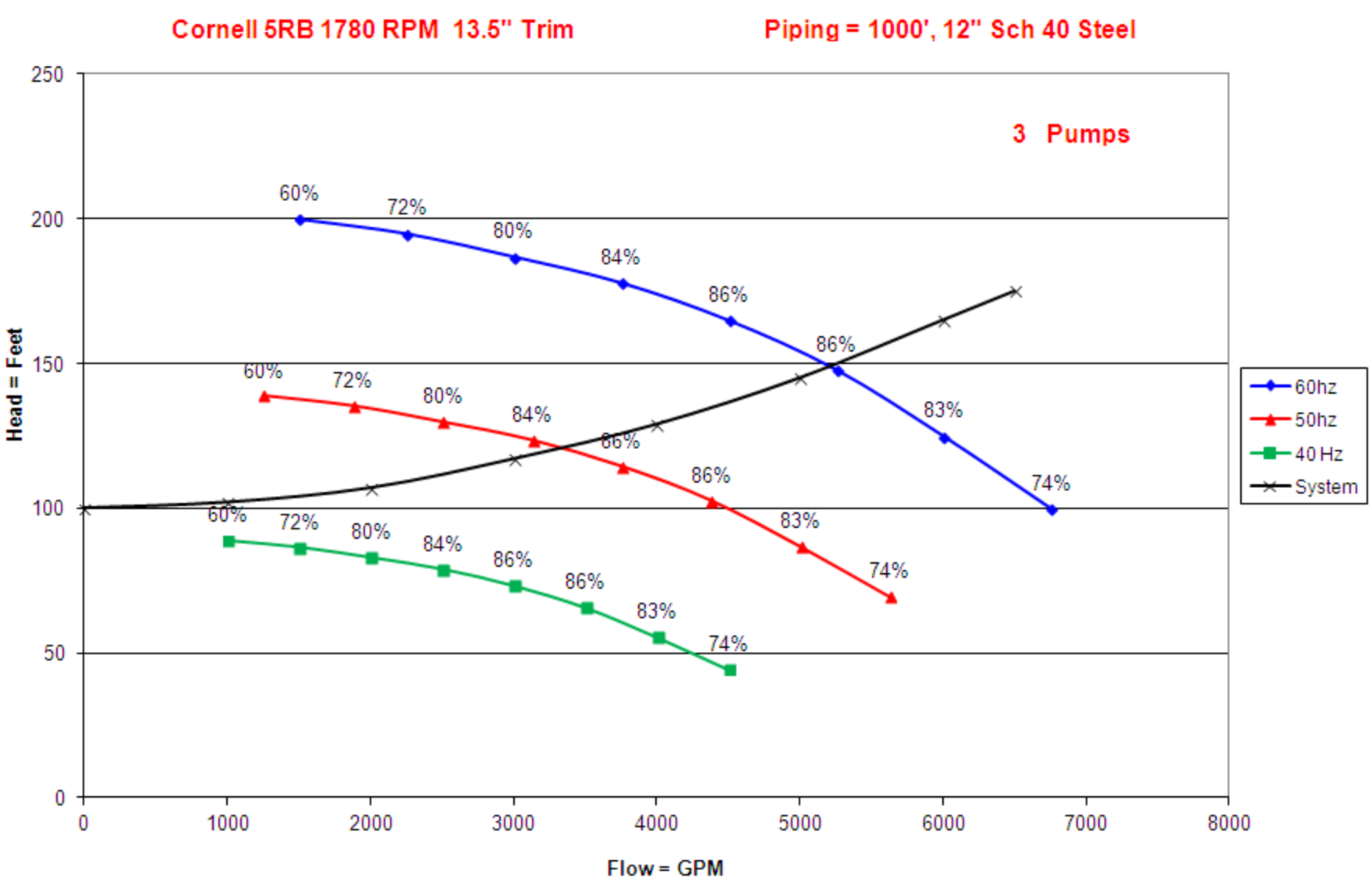
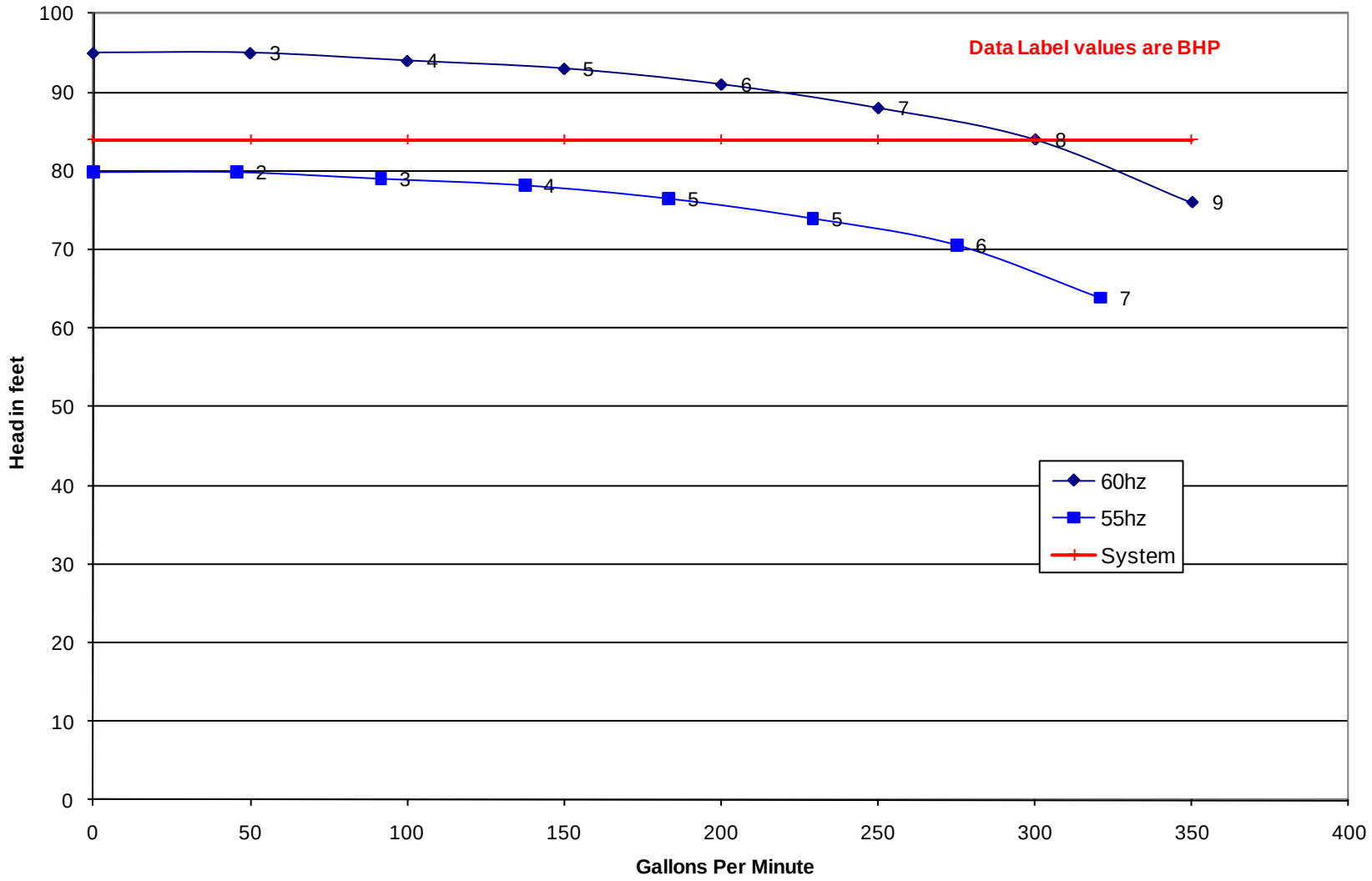
Pump ED 101


Cornell 5RB 1780 RPM 13.5" Trim
Piping = 1000', 12" Sch 40 Steel
3 Pumps
Head = Feet
Flow = GPM
250
200
150
100
50
0
0
1000
2000
3000
4000
5000
6000
7000
8000
60%
72%
80%
84%
86%
86%
83%
74%
60%
72%
80%
84%
86%
86%
83%
74%
60%
72%
80%
84%
86%
86%
83%
74%
60hz
50hz
40 Hz
System

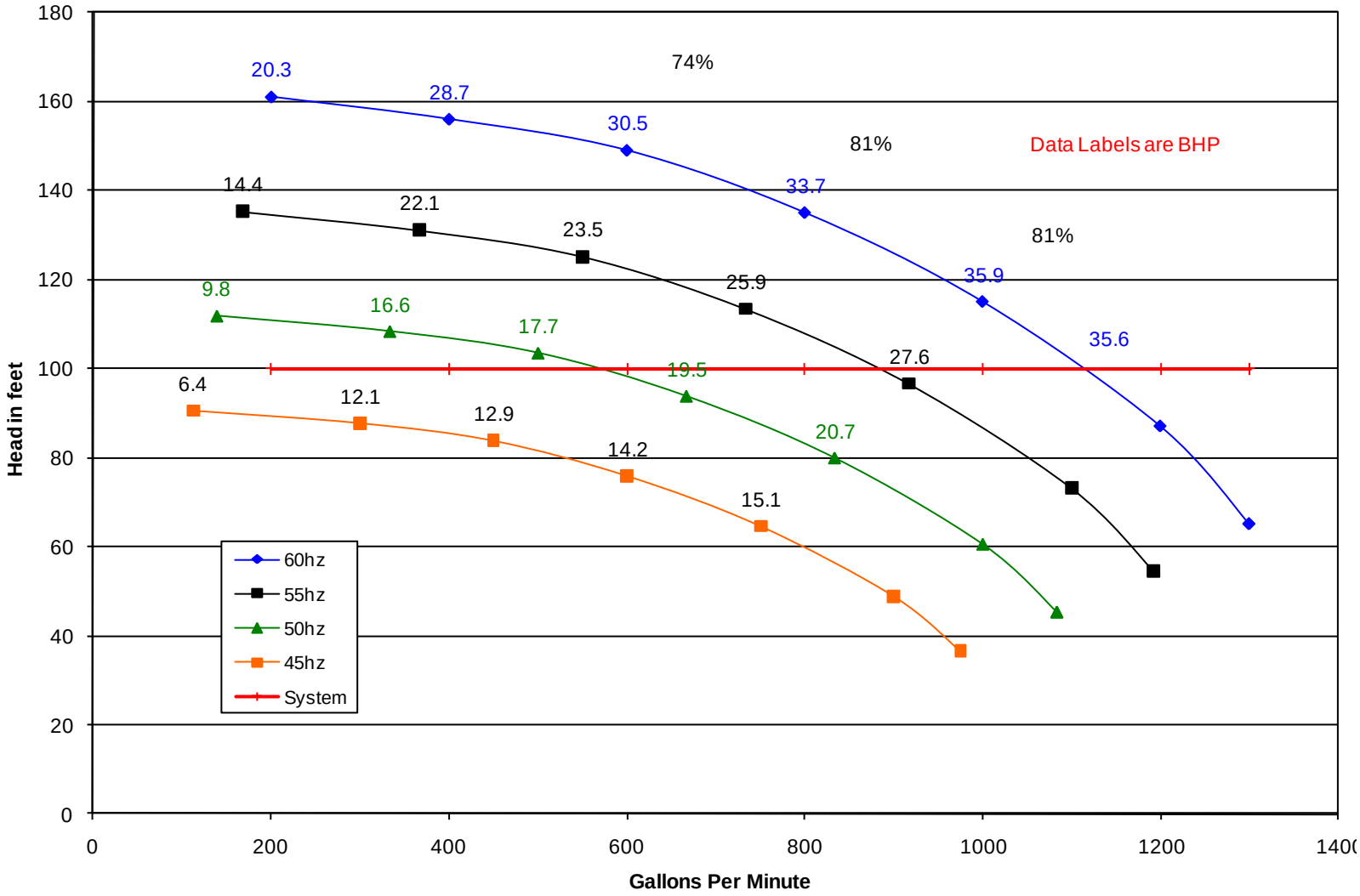
*

Flat Curve

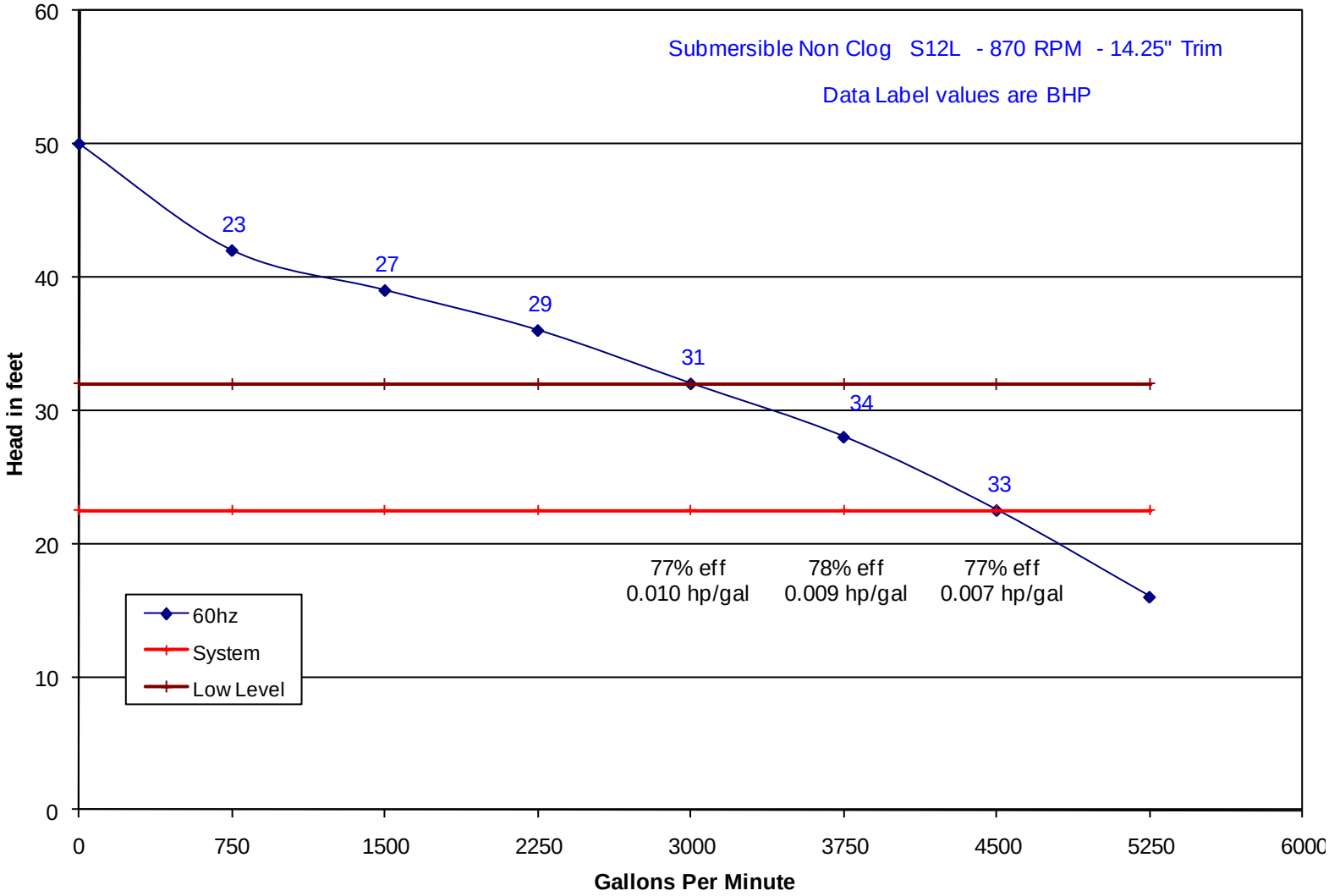

Data Label values are BHP
Head in feet
Gallons Per Minute
60hz
55hz
System
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
400
3
4
5
6
7
8
9
2
3
4
5
5
6
7

*

Steeper Curve



Level Control – Power Savings



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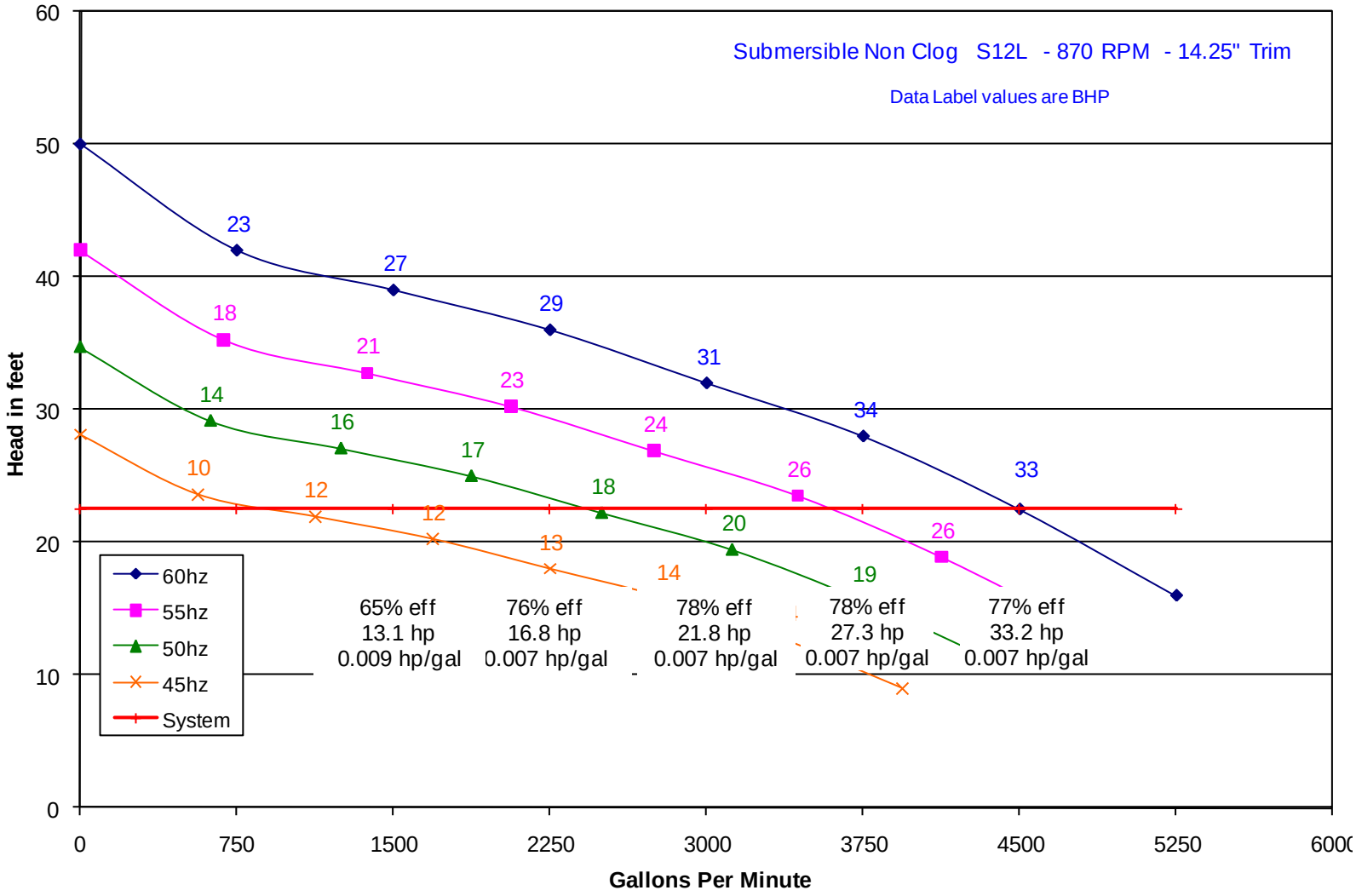
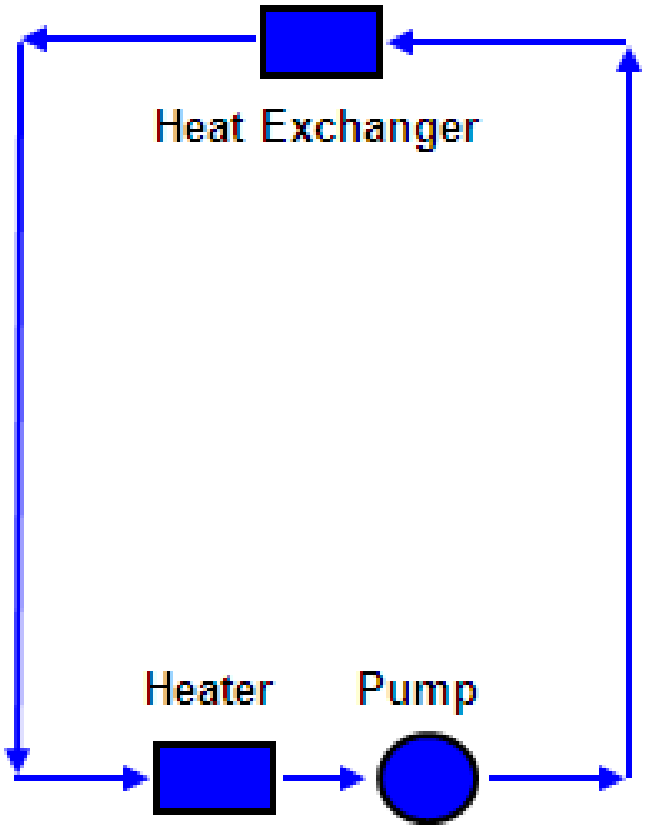
Pump ED 101

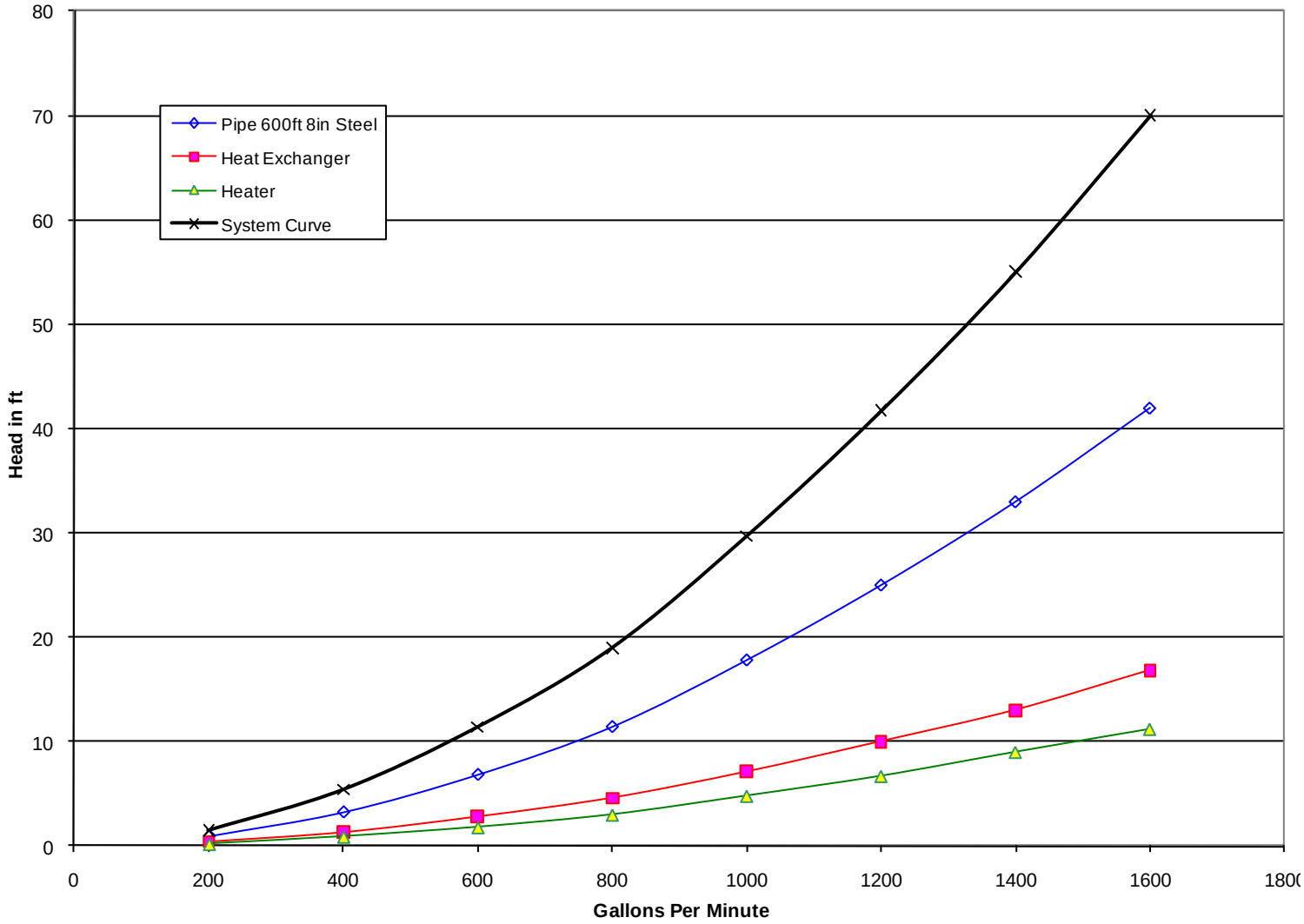
Level Control – Power Savings



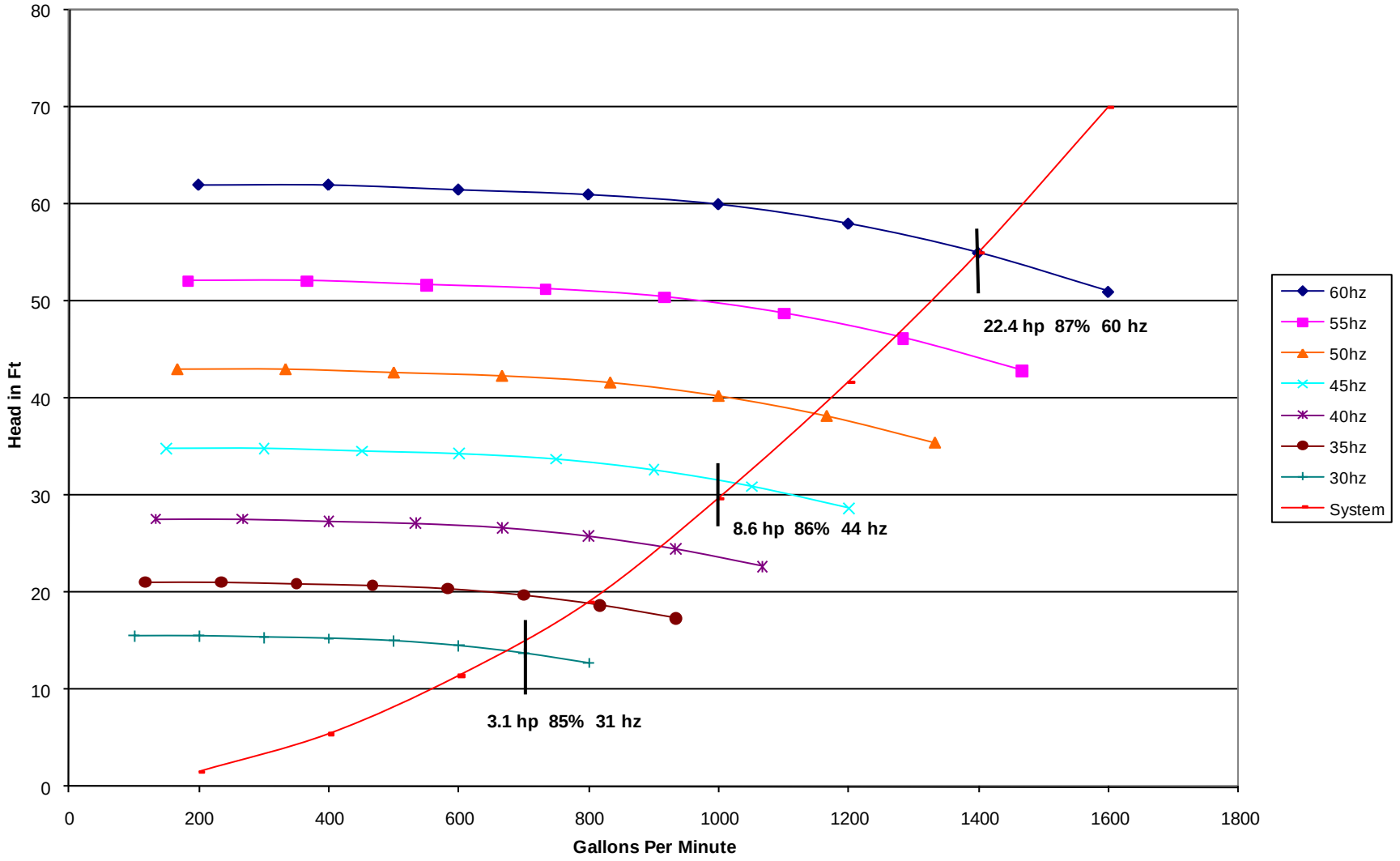
VFD Control Circulation



VFD Control Circulation



Closed Loop Circulation vf/vp



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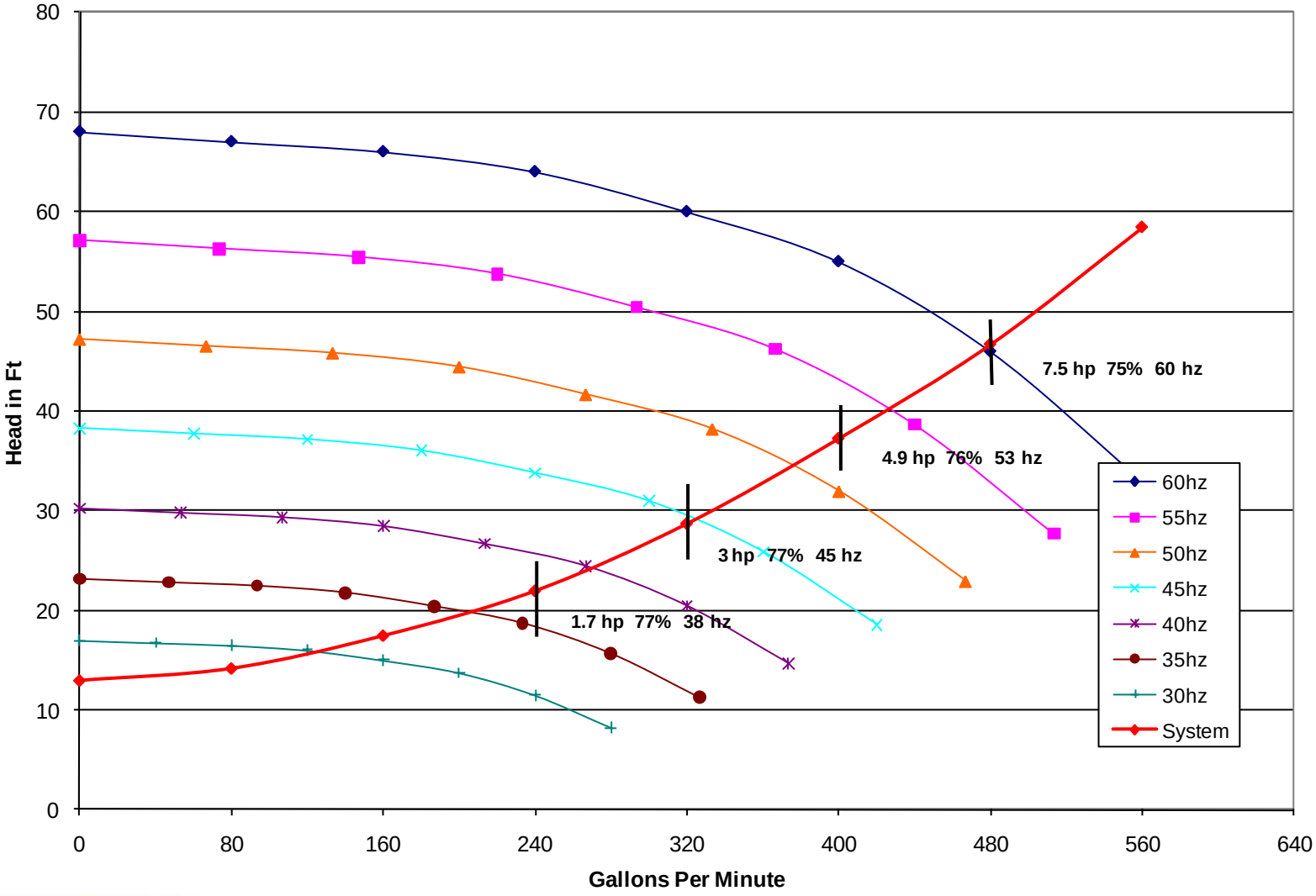
Open Loop Circulation vf/vp



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Variable Speed Pump Analysis (VSPAnalysis) - with Autoplot

Joe Evans, Ph.D 10/1/2010 http://www.PumpEd101.com http://www.PumpTechnw.com

Follow the steps below to view the operating characteristics and potential power savings of a centrifugal pump under VFD control.
Scroll down for more detailed instructions and an explaination of the included example.

1) Enter the pump description in the yellow box to the right

Cornell 5RB 1780 RPM 13.5" Trim

2) Enter eight 60 hertz flows In Q1 - Q8
See instructions for fewer than eight points

Enter the corresponding heads (in ft) in H1 - H8

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
500	750	1000	1250	1500	1750	2000	2250
H1	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**
200	195	187	178	165	148	125	100

3) Enter the pump's hydraulic efficiencies (.xx) in Ef 1 - Ef 8 that correspond to the flows in Q1 - Q8.

Ef 1	Ef 2	Ef 3	Ef 4	Ef 5	Ef 6	Ef 7	Ef 8
0.60	0.72	0.80	0.84	0.86	0.86	0.83	0.74

4) Enter the design point flow, head & Ef (.xx) in Qd, Hd & Efd

Qd	1850	Hd	140	Efd	0.85

5) Enter BEP Q, H, Ef (.xx) & NPSHr in Qb, Hb, Efb & Nrb

Qb	1700	Hb	154	Efb	0.86	Nrb	14

6) Enter motor efficiency (.xx) in Efm, speed (RPM) in RPM and electrical power cost per kWH (.xxx) in $/kWH

Efm	0.90	RPM	1780	$/kWH	0.100

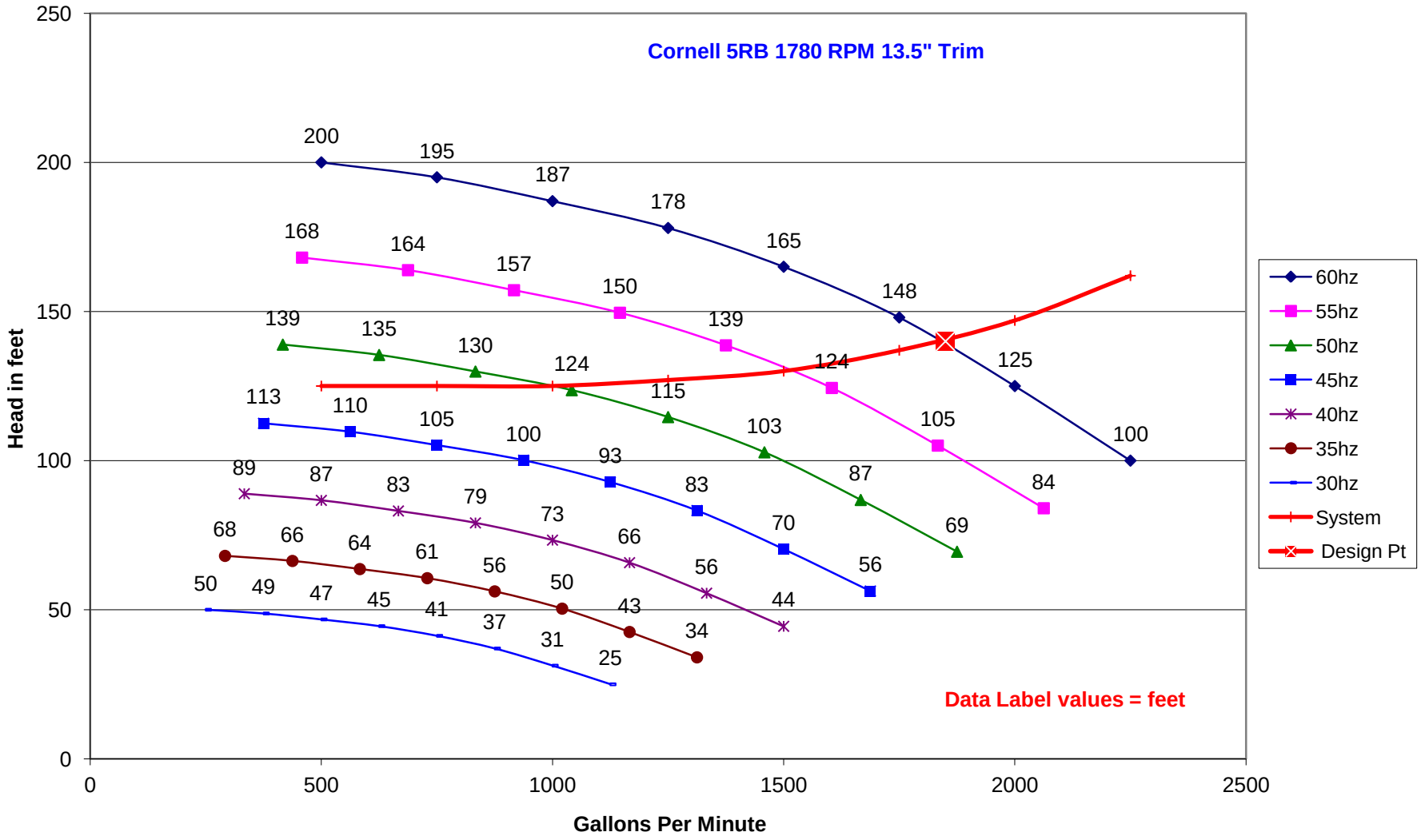
7) To plot a system or constant pressure curve, enter the system heads (in ft) in SH1 - SH8 that correspond to the flows in Q1 - Q8. (See Instructions below)

SH1	SH2	SH3	SH4	SH5	SH6	SH7	SH8
125	125	125	127	130	137	147	162

VSPA | Pump Head | Pump Efficiency | Pump BHP | kW per 1000 Gal | Cost per 1000 Gal | Useful Calculations

*

Pump Head vs System Head



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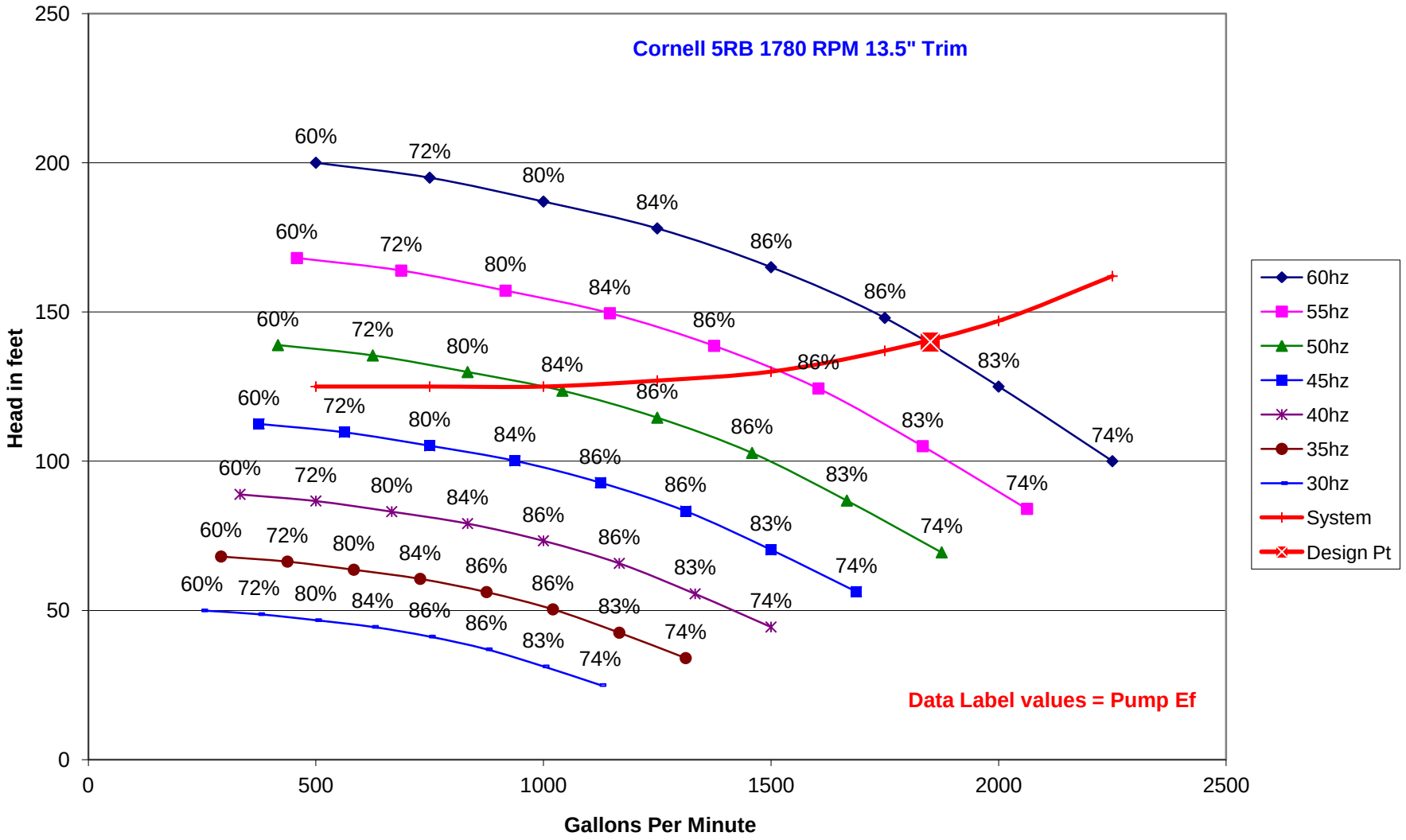
Pump Hydraulic Efficiency vs System Head



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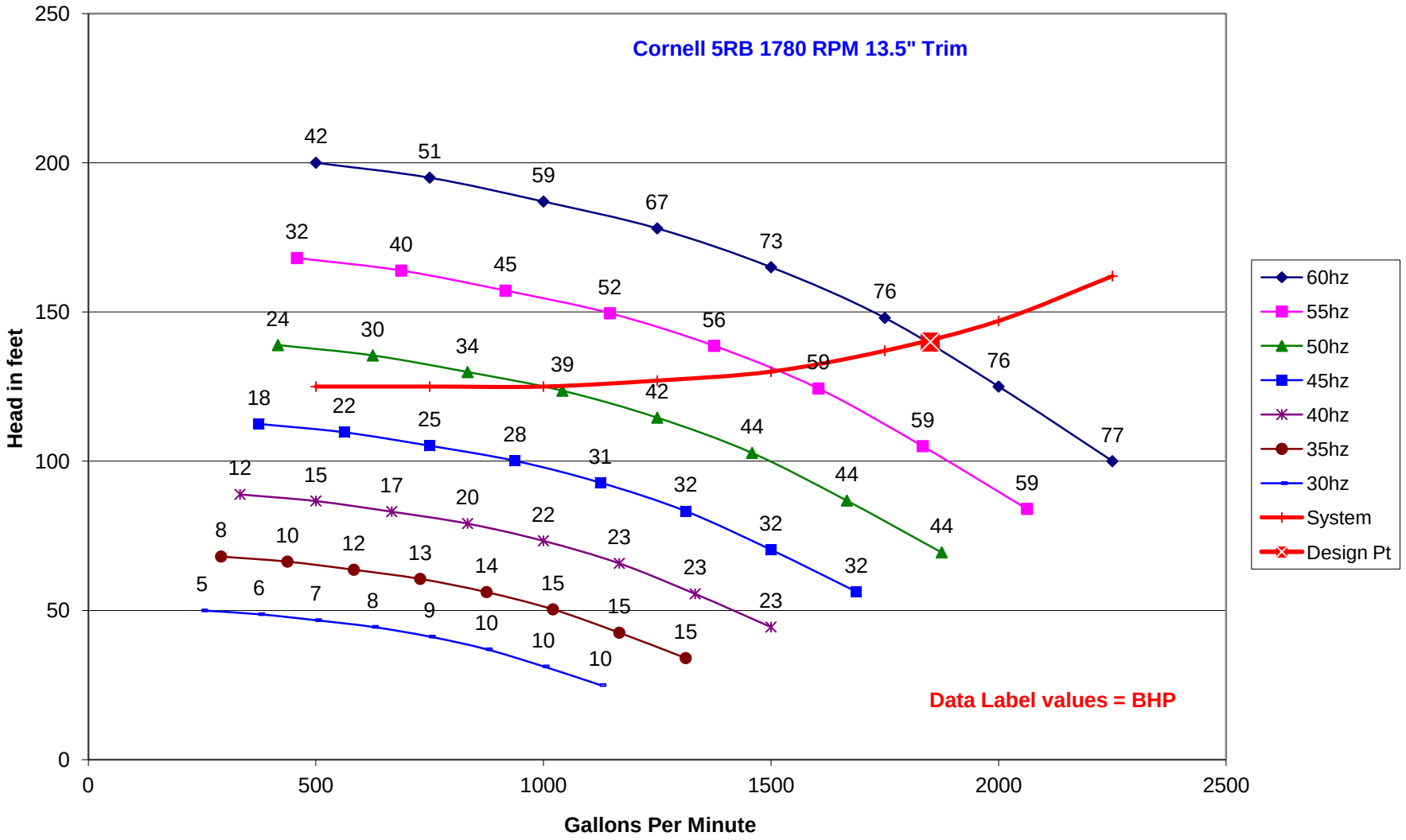
Pump BHP vs System Head



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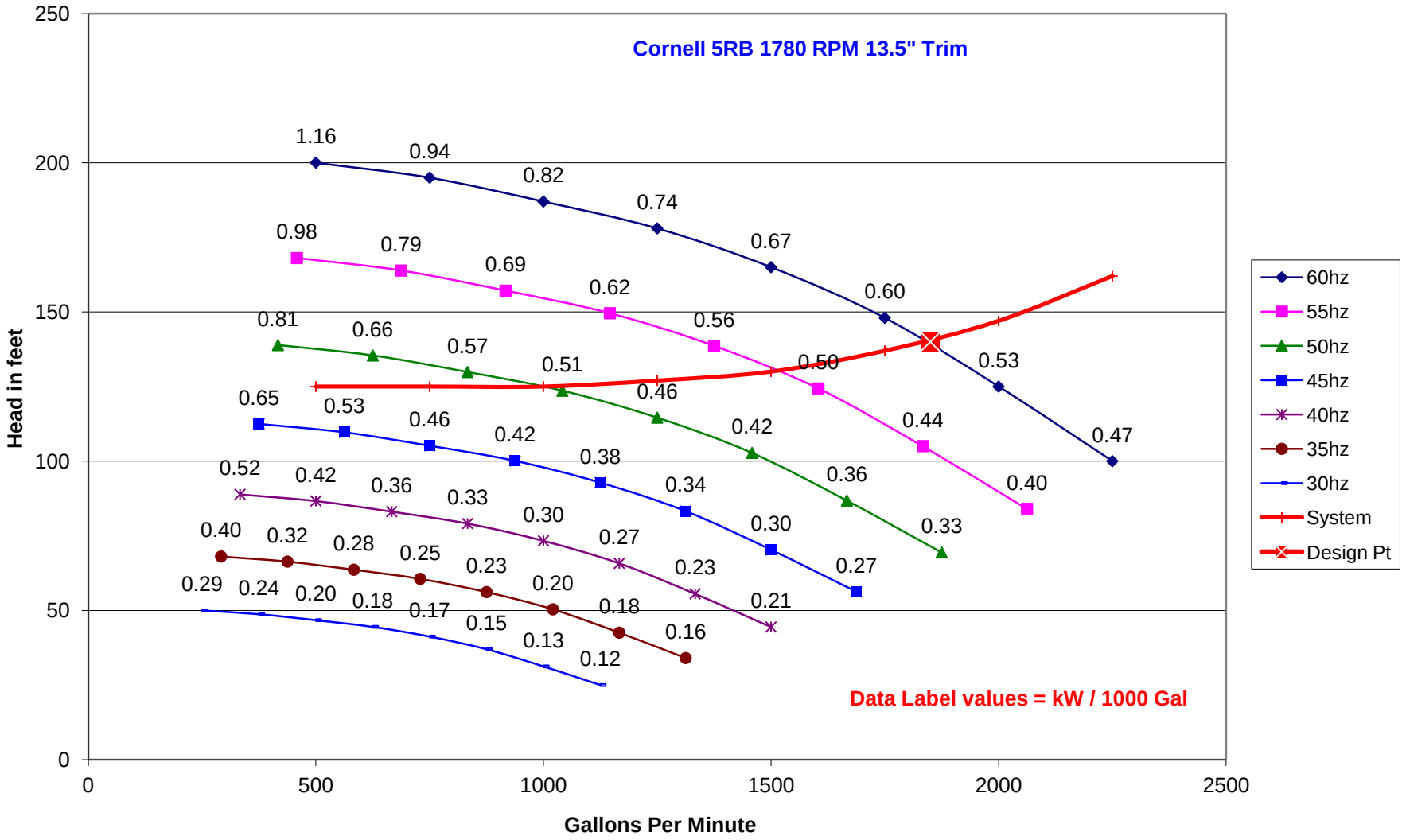
Power / 1000 Gallons Pumped



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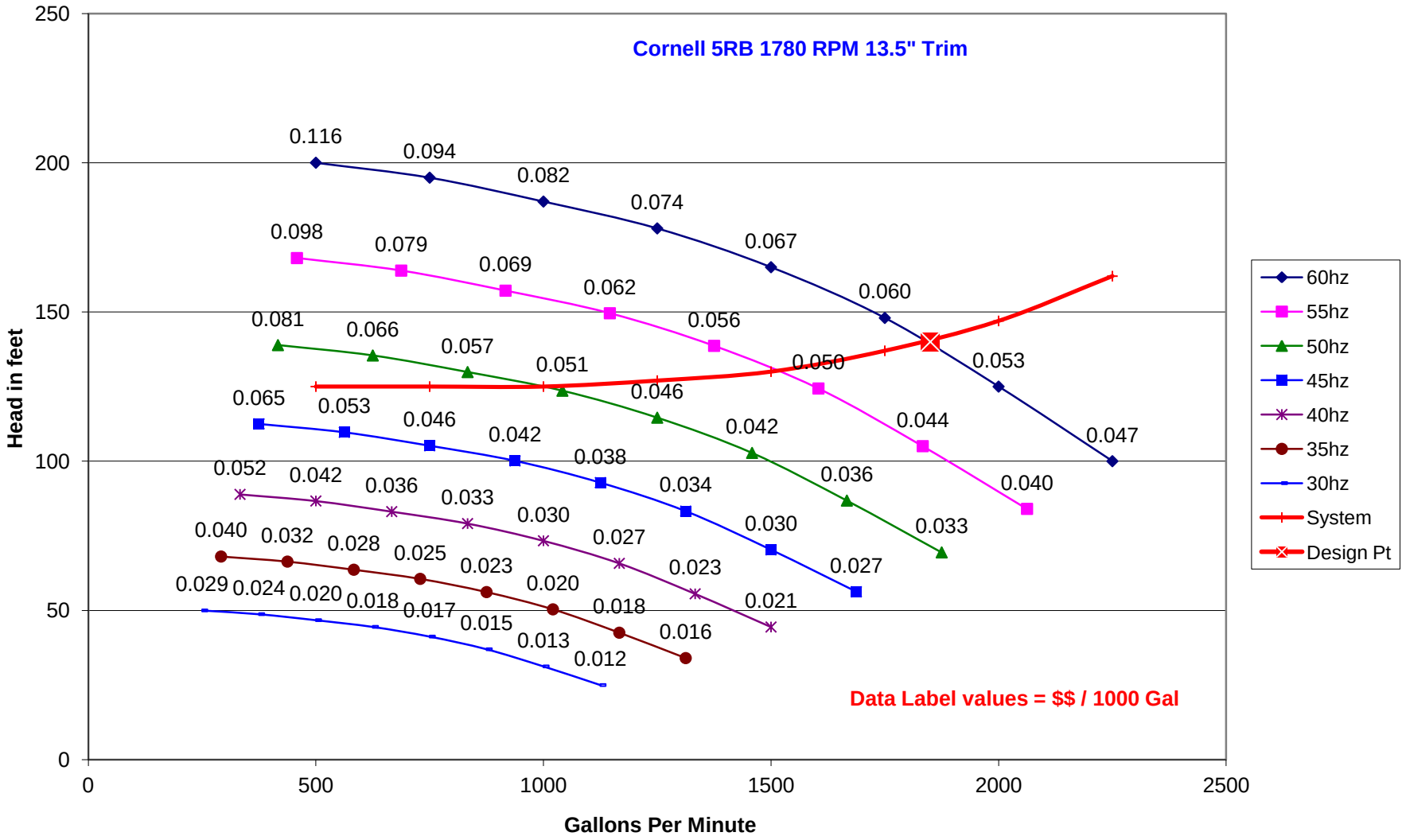
Cost / 1000 Gallons Pumped



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VFD Control – Multiple Pumps

2 Pumps – 1 Drive

2 Pumps – 1 Drive & Contactors

2 Pumps – 2 Drives

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Q12 | Vertical Multistage (25HP)

Variable Frequency Parallel Pump Analyzer (Beta)

Joe Evans, Ph.D 7/4/10 Customer Education PumpTech, Inc http://www.PumpEd101.com

Follow the five steps below to view the operation of two identical centrifugal pumps under VFD control.
Scroll down for more detailed instructions.

1) Enter the pump description in the yellow box to the right: Vertical Multistage (25HP)

2) Enter eight 60 hertz flows In Q1 - Q8 (Cells H20 - O20)
Enter the corresponding heads (in ft) in H1 - H8 (Cells P20 - W20)
(*See instructions below when entering fewer than eight points)

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	H1	H2	H3	H4	H5	H6	H7	H8
50	100	150	200	250	300	350	400	280	271	262	252	240	225	206	182

3) To plot a system curve (static), enter the head (in ft) in SH1 - SH8 (Cells P62 - W62). (See instructions below)

SH1	SH2	SH3	SH4	SH5	SH6	SH7	SH8
206	206	206	206	206	206	206	206

4) Enter the pump's hydraulic efficiencies in Ef 1 - Ef 8 (Cells P67 - W67) that correspond to the flows in Q1 - Q8
Enter as a decimal equivalent. (See instructions below)

Ef 1	Ef 2	Ef 3	Ef 4	Ef 5	Ef 6	Ef 7	Ef 8
25%	45%	55%	60%	67%	72%	78%	76%

5) Click on the various tabs to view pump performance.

VFPPA Data Input | One Pump | Two Pumps | 45-60 Hz Curves | 55 & 60 Hz Curves | 50 & 55 Hz Curves | 45 & 50 Hz Curves

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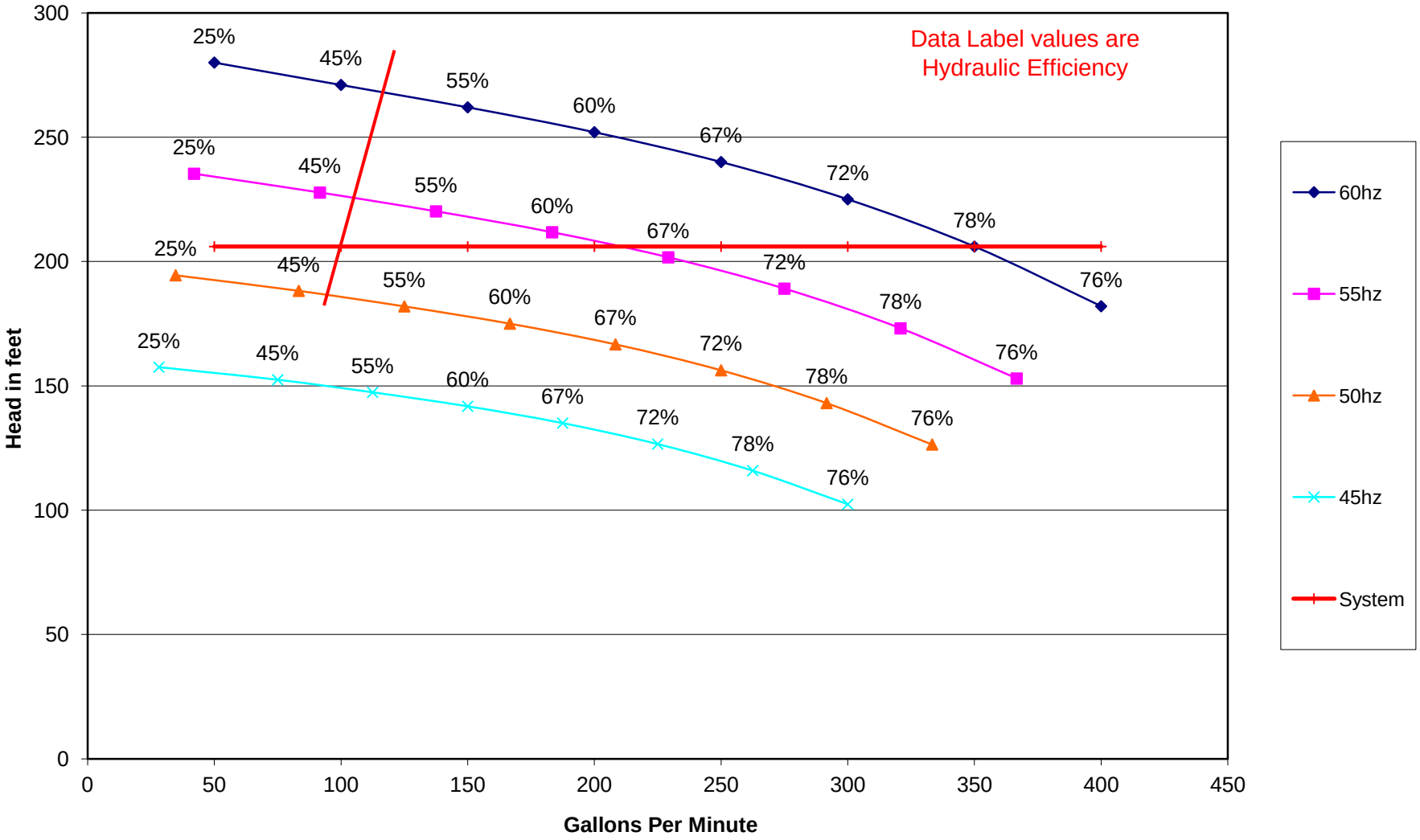
Vertical Multistage (25HP)



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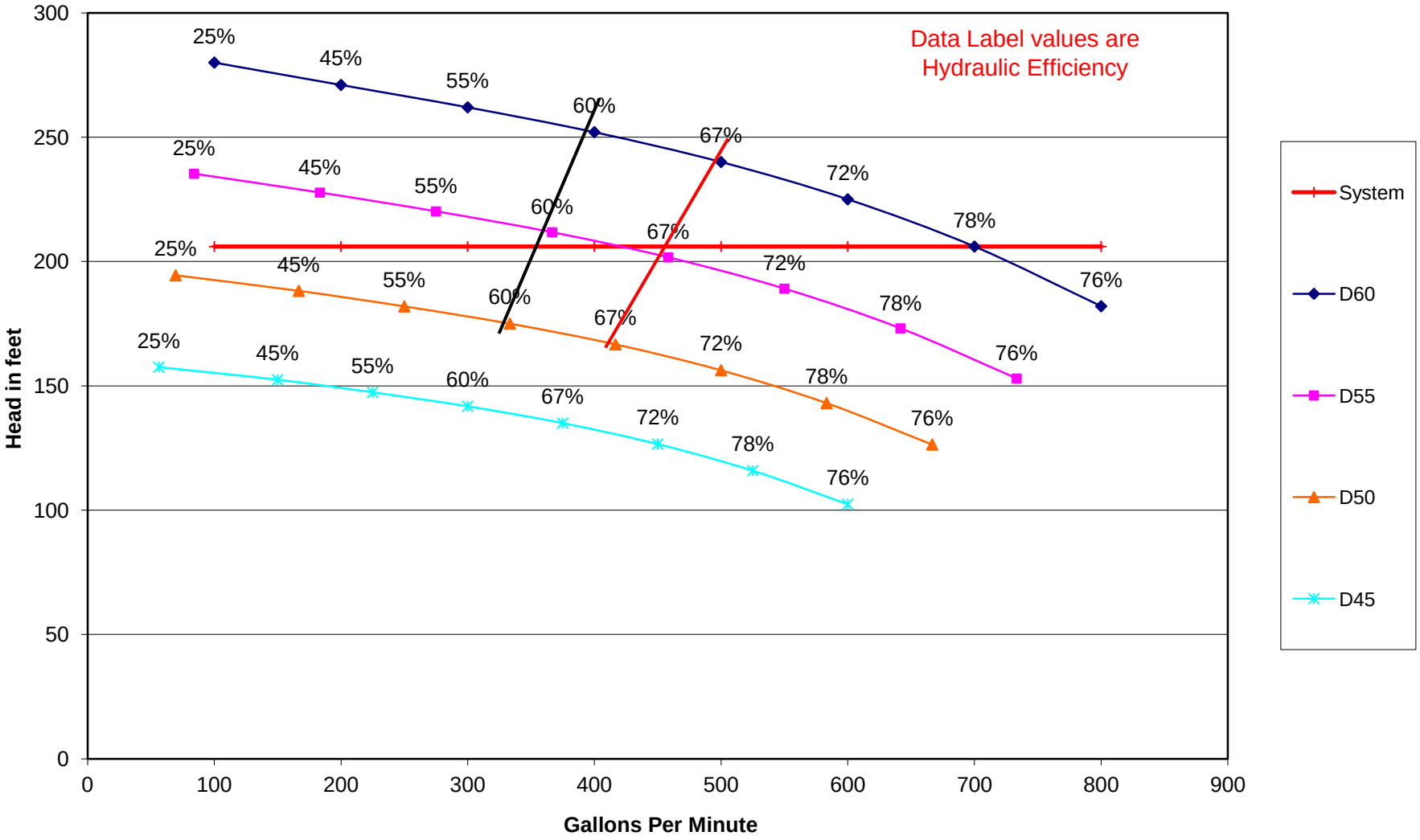
Vertical Multistage (25HP)



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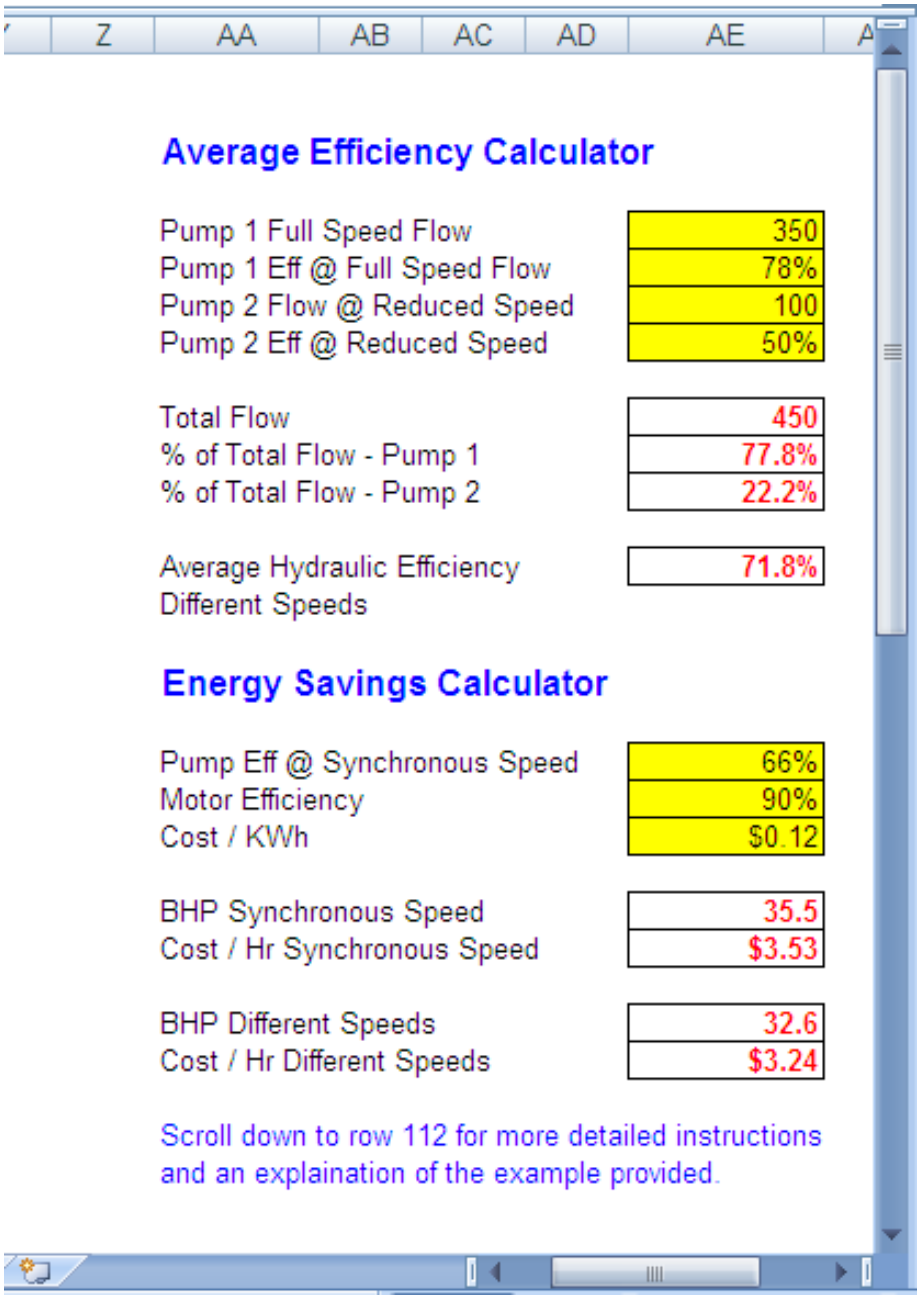
Z
AA
AB
AC
AD
AE
Average Efficiency Calculator
Pump 1 Full Speed Flow
Pump 1 Eff @ Full Speed Flow
Pump 2 Flow @ Reduced Speed
Pump 2 Eff @ Reduced Speed
350
78%
100
50%
Total Flow
% of Total Flow - Pump 1
% of Total Flow - Pump 2
450
77.8%
22.2%
Average Hydraulic Efficiency
Different Speeds
71.8%
Energy Savings Calculator
Pump Eff @ Synchronous Speed
Motor Efficiency
Cost / KWh
66%
90%
$0.12
BHP Synchronous Speed
Cost / Hr Synchronous Speed
35.5
$3.53
BHP Different Speeds
Cost / Hr Different Speeds
32.6
$3.24
Scroll down to row 112 for more detailed instructions
and an explaination of the example provided.

Pump ED 101

Centrifugal Pump Training Series

Centrifugal Pump Selection

Joe Evans, Ph.D

http://www.PumpEd101.com

http://www.Pump-Zone.com