PUMPMAN

Ibrahim Hussein
EGYPTIAN
Born in 1953
Graduated in 1979
Faculty of Engineering: Mechanical DPT
Aviation & Aero-Space Project (missiles)

Working in Pumps since 1980

GOULDS Application ENG. : 80- 84

GORMAN RUPP: Area Manager in Arab Gulf Countries: 85- 89

TECH. Support Manager, ORASCOM:1997- 2004

Pump Business expert, since 2005

Now : SEDRA vice president

SEDR سيدر

30th anniversary

ASHRAE CAIRO CHAPTER

PUMPMAN

LECTURE 21st of June, 2009

1980 - 2010

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PUMPS-YSTEMS INTERACTION

بسم الله الرحمن الحيم

اللذين قال لهم الناس إن الناس قد جمعوا
لكم فاخشوهم
فزادهم إيمانا و قالوا

حسبنا الله و نعم الوكيل

فانقلبوا بنعمة من الله و فضل
لم يمسسهم سوء

صدق الله العظيم

ONE MAN CAN MAKE A DIFFERENCE

ASHRAE CAIRO CHAPTER

How you can contact PUMPMAN

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By Phone: 3386 8812

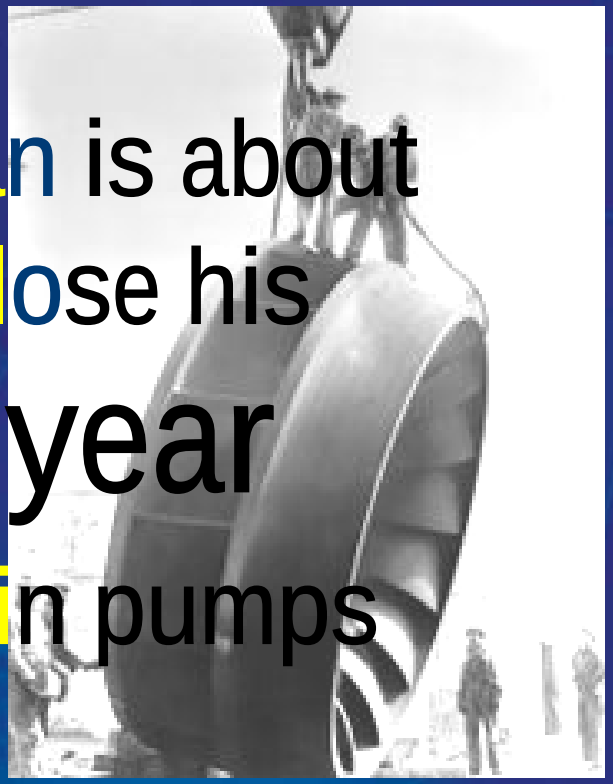
By Mobile: 012 04 12 538

By e-mail:

Epumpman21@yahoo.com

ASHRAE CAIRO CHAPTER

Pumpman is about
to close his
30th year
at work in pumps



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JUST ASK

YOU

Questions
System Design
Sales Support
Marketing Support
Spares & After-sales Support
Problem analysis
Fairs & Forums
Training & Coaching

The most economical
SOLUTION
In the market of
PUMPS

ME

Value

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Hydraulic Institute

PUMPS

CONTINUOUS FLOW PUMPS

STANDARD IMPELLER PUMPS

- RADIAL FLOW PUMPS
- MIXED FLOW PUMPS
- AXIAL FLOW PUMPS

MODIFIED IMPELLER PUMPS

- PERIPHERAL PUMPS
- Regenerative Rotating Jet

NON IMPELLER PUMP

- Bubble Maxwell Ejector

INTERMITTENT FLOW PUMPS

ROTAING PUMPS

- PROGRESSIVE CAVITY
- SCROLL
- VANE
- DIAPHRAGM
- LOBE
- SCREW
- GEAR

RECIPROCATING PUMPS

- SWASH PLATE PUMPS
- PISTON
- PLUNGER
- puppet

- ANCIENT EGYPTIAN PUMP
  - Archimedian Pump

CENTRIFUGAL PUMPS

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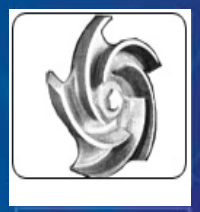
PUMPS SYSTEMS INTERACTION

CENTRIFUGAL PUMPS

Classification, w.r.t:

- IMPELLER w.r.t BEARINGS → Over Hung - In Between
- ORIENTATION of ROTATING AXIS → Horizontal – Vertical - Inclined
- ORIENTATION of VOLUTE SPLITTING → Horizontal – Vertical - Inclined
- NUMBER of IMPELLERS (Stages) → Single – Double - Multi
- INPELLER FACING → Single Face Impeller – Double Face Impeller
- SUCTION SPLITTING → Single Suction – Double Suction
- VOLUTE SPLITTING → Single Volute – Double Volute

NEXT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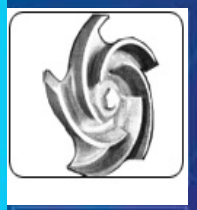
PUMPS SYSTEMS INTERACTION

CENTRIFUGAL PUMPS

Construction Materials: → NON METALLIC PUMP Chemical Pump

- ALL METAL PUMP
- ALL IRON PUMP Ferrous Alloys → Cast Iron, Cast Steel, Special Steel Alloy
- ALL BRONZE PUMP → BRONZE FITTED PUMP
- ALL St.St PUMP

HOW WE SHOULD SPECIFY → **HVAC PUMP**

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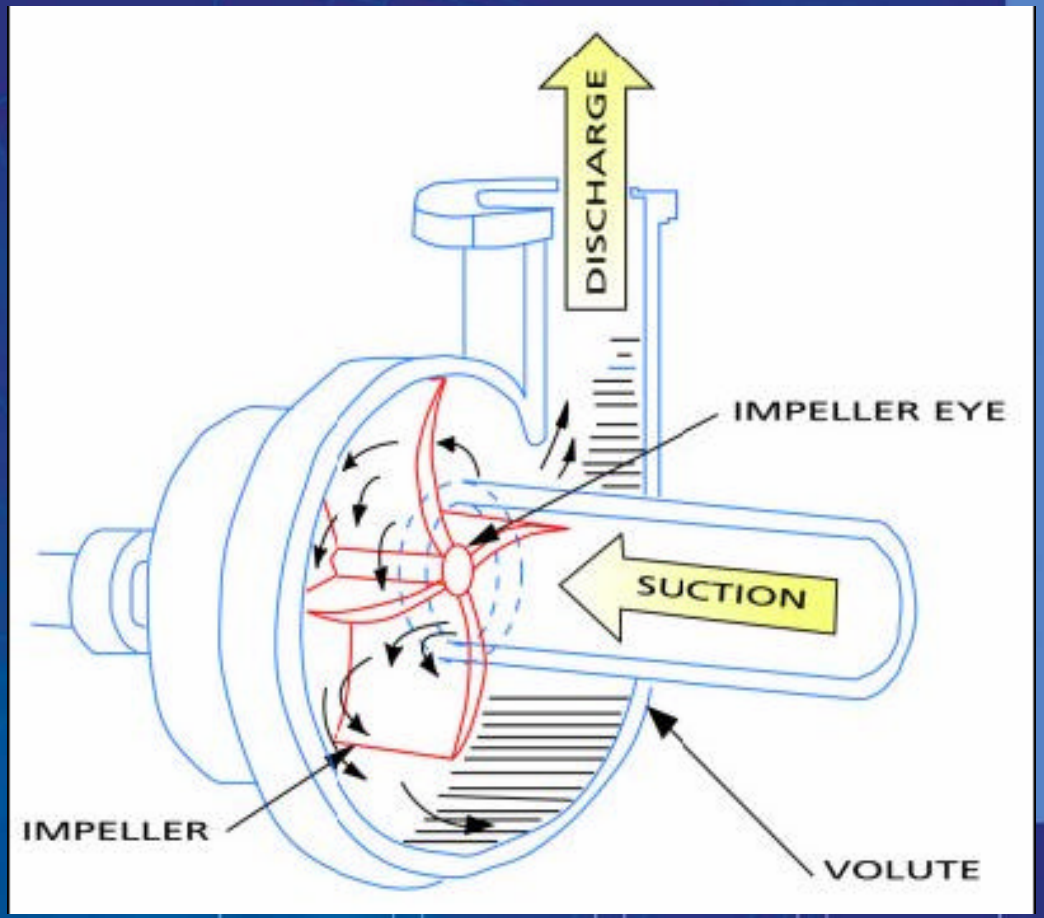
System Impact on Impeller

WHAT MAKES PUMP PUMPING?

* Suitable suction conditions

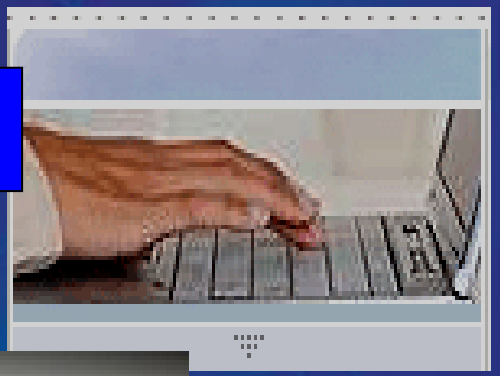
* Correct direction of Rotation

* Enough Energy to overcome flow resistances



System Impact on Pump

A tip for my Jr. Engineers:
BE WARE Of PAINFUL Fingers



Butterfly Style
Don't use it

Spider Style
Preferred

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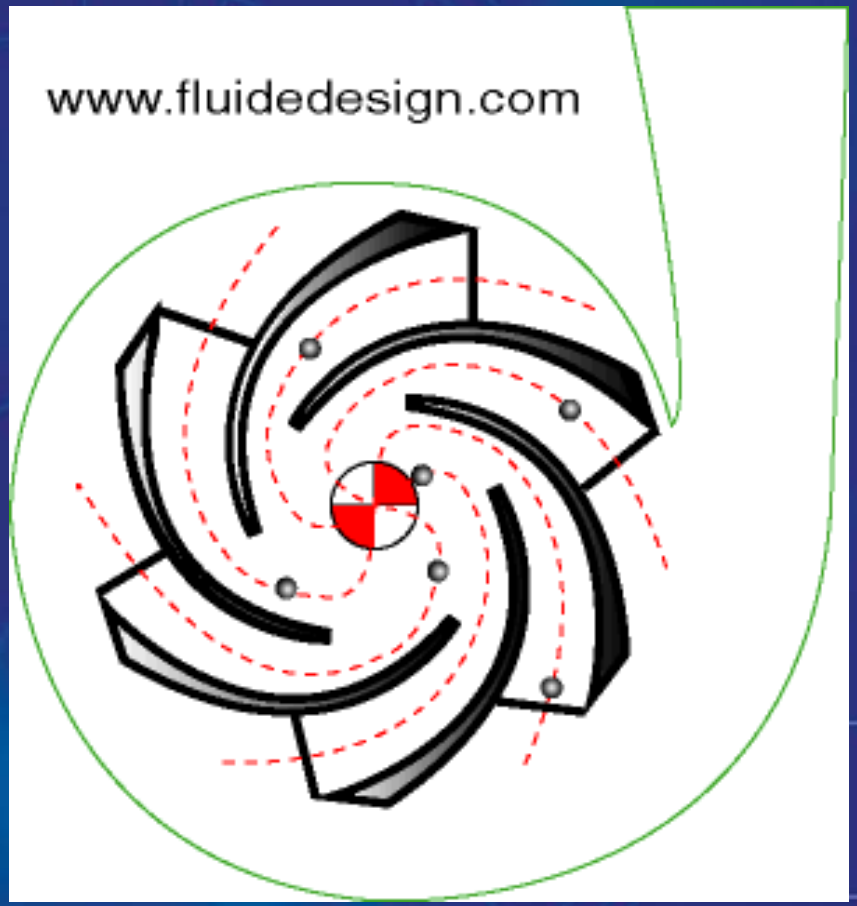
System Impact on a Pump

-Suitable Suction Conditions

-Proper Direction of Rotation
Usually Counter Clockwise

- Enough Energy:

$$P = \frac{Q \times H \times f}{Eta} \times \text{constant}$$



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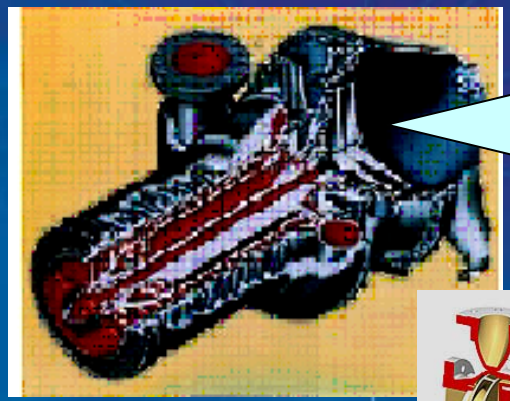
Pumps – Systems Interaction

What is bringing together these apparently different pumps?

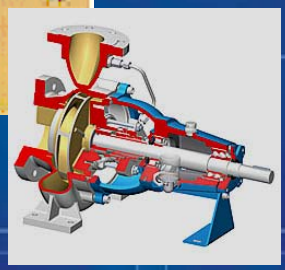
Hi P Pump, Barleif Buster

Pipe Line Booster Pump

Aquarium Circulating Pump



Rocket Liquid Fuel Turbo Pump



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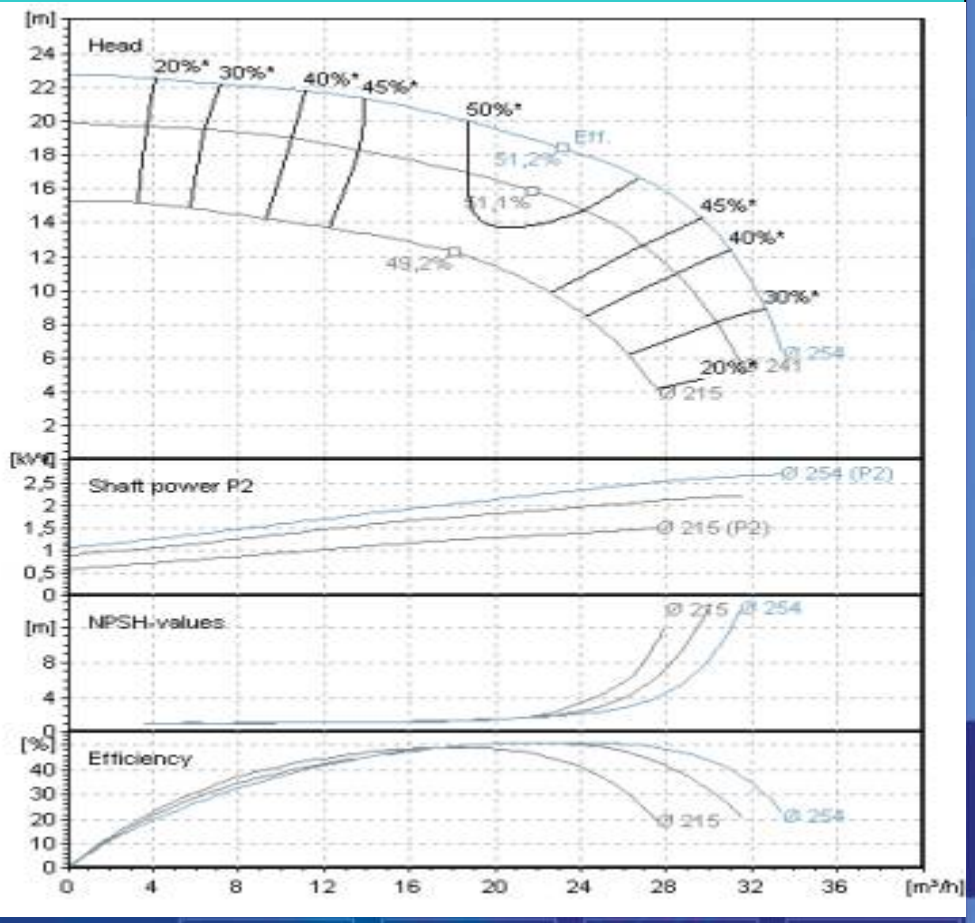
PUMPS – SYSTEMS INTERACTION

The Shown Performance Curve is a general NON OPERATIVE pump curve

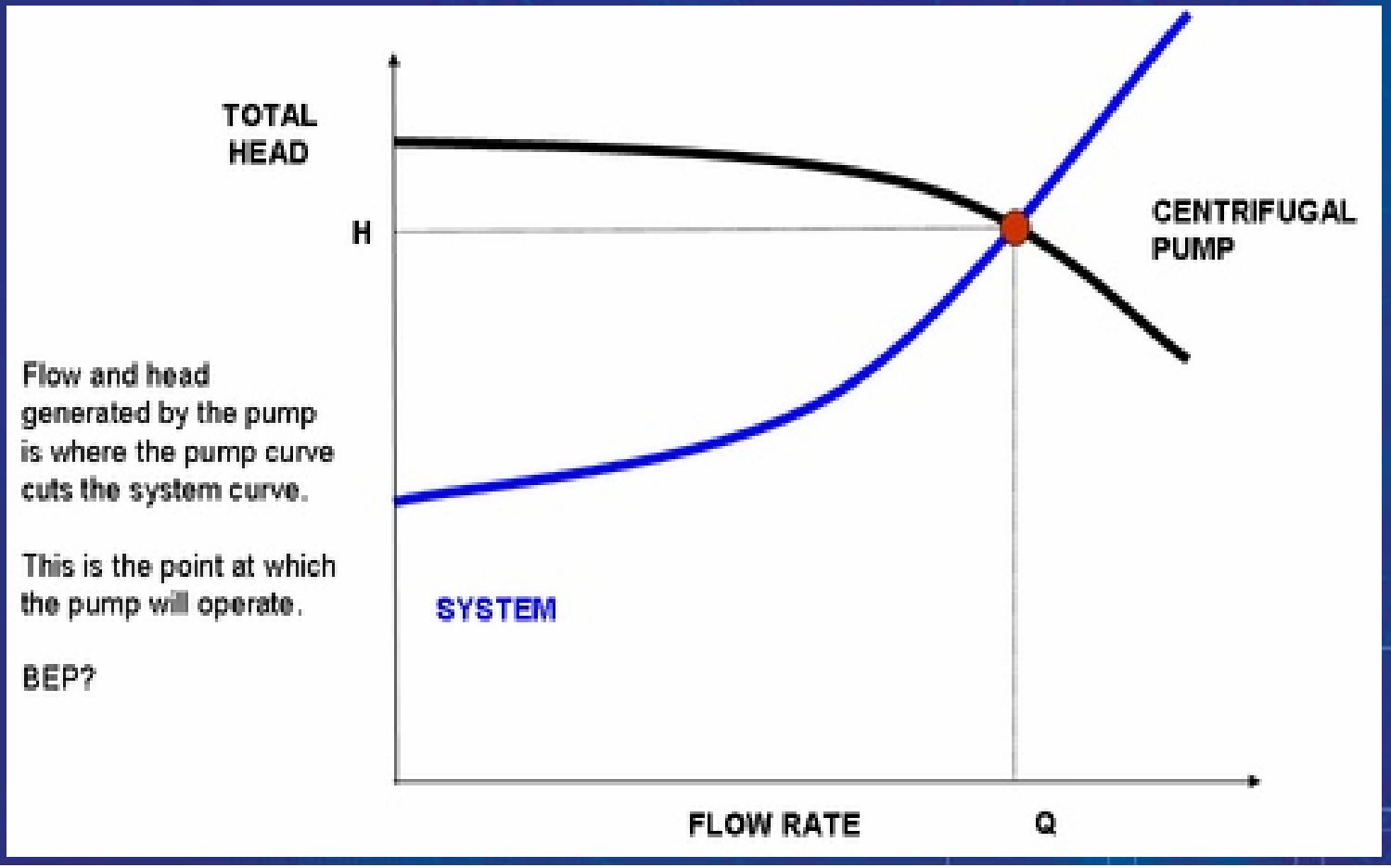
This CURVE:

- Considers the pump in isolation from the system
- Simplest approach
- System determines pump performance & efficiency
- Good design = pump operating at Best Efficiency Point (BEP) + reliable
- System cost drivers are significant
- Pump performance cannot be determined without doing a system analysis



PUMPS – SYSTEMS INTERACTION

Pump Performance curve becomes OPERATIVE when it is superimposed by the System Head Curve



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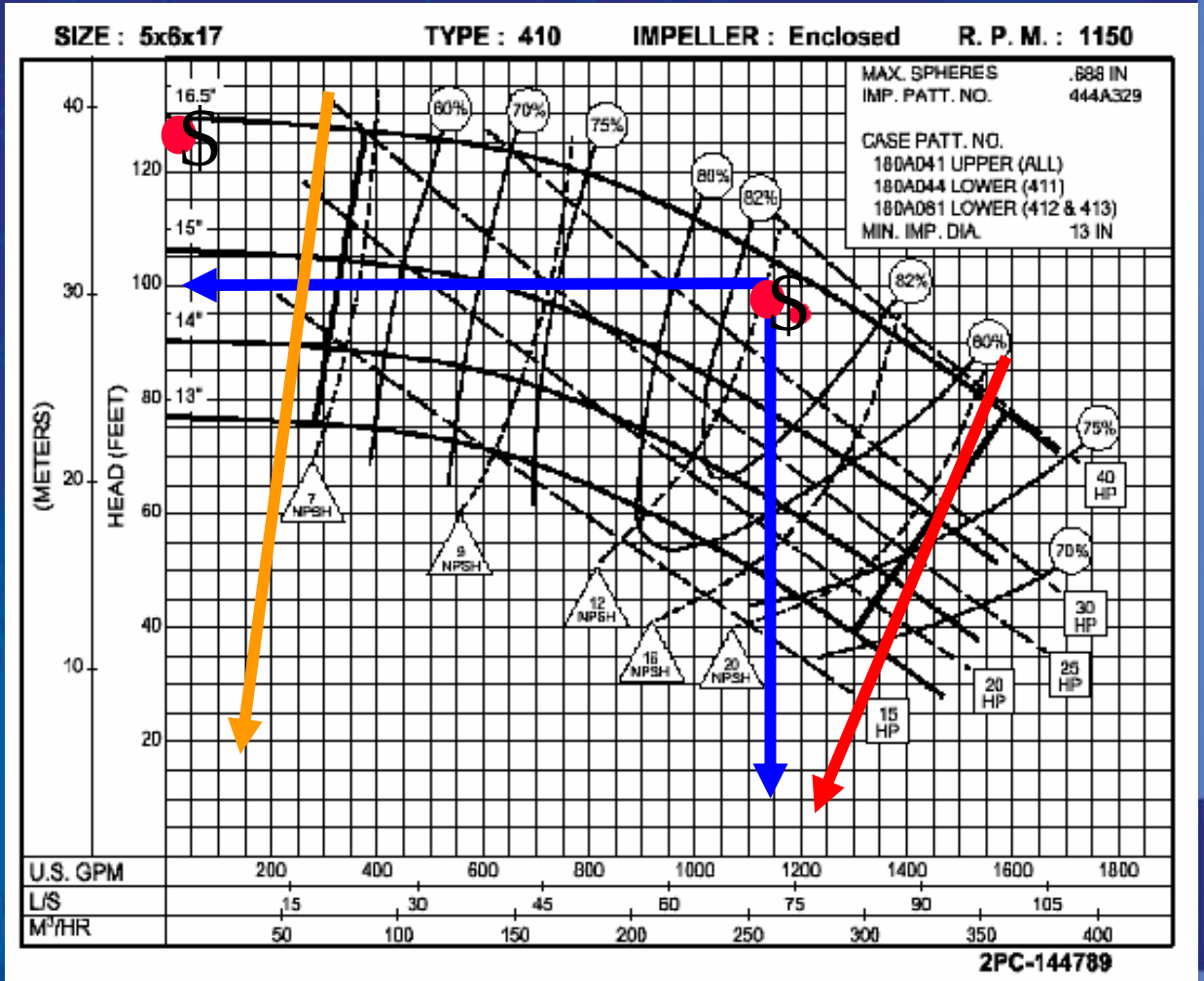
System Impact on Impeller

PERFORMANCE CURVE

Pump Type
Pump Size
Fixed Diameter Type
Fixed Speed Type

Enclosed Impeller
Shrouded Impeller
Rotating Speed
Maximum Diameter
Less than Cutwater D
Minimum Diameter
Larger than Hub D
DUTY POINT:
Location:
- Over / Under Sizing"
- Sh. Off / Min. Flow / CAV
- B.HP: working / duty
- Eta: working / duty
- NPSHr



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SYSTEM HEAD CURVE

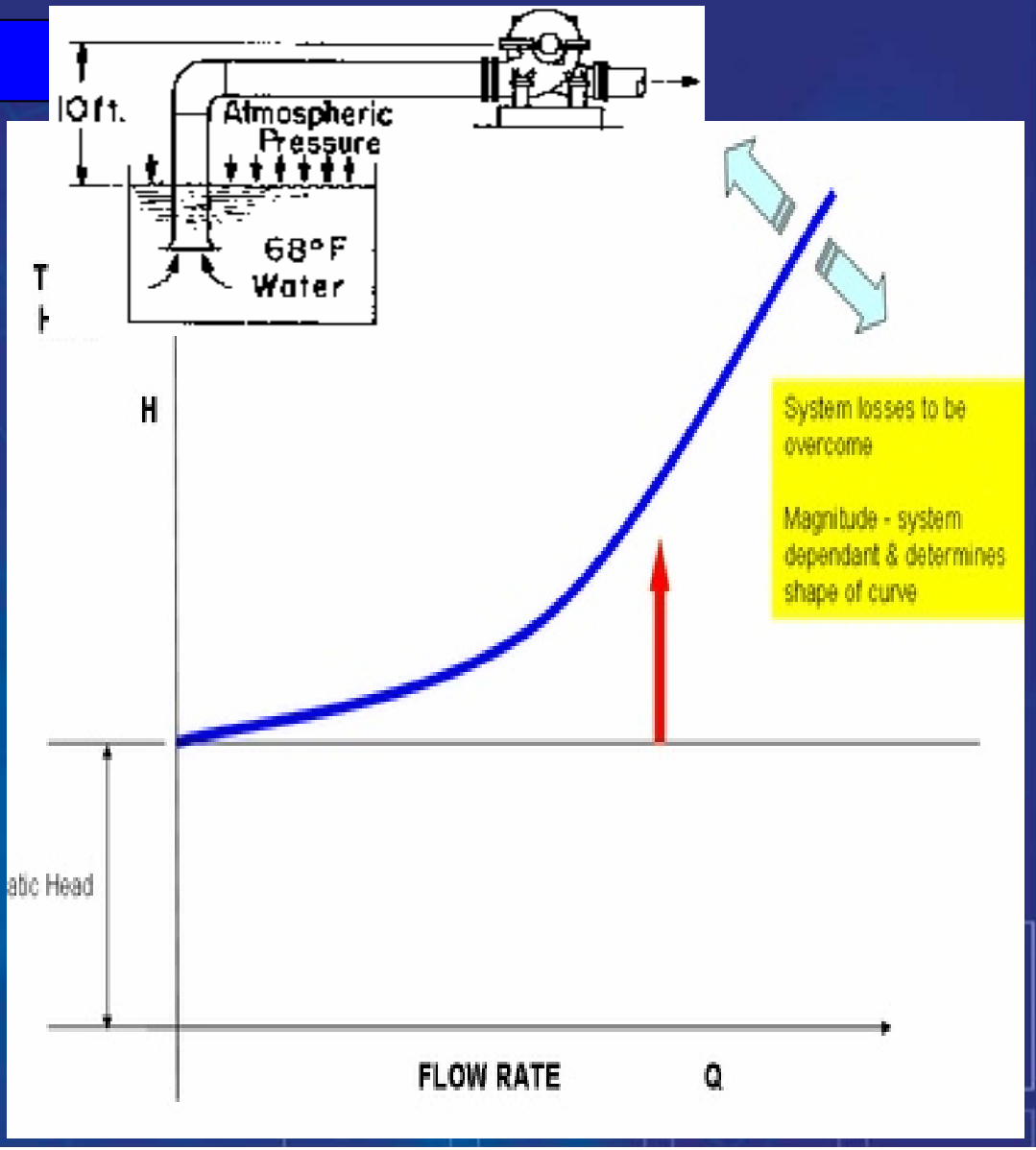
SHC consists of two components:

The Static Loses:

Which is a vertical component on the H axis and equals:
The static lift of the fluid from its drawn level to its pumped level

The Dynamic Loses:

Which is a parabolic part of the curve starts where the Hs ends and equals: the sum of all dynamic loses due to:
-The intake velocity
-Friction with internal pip walls



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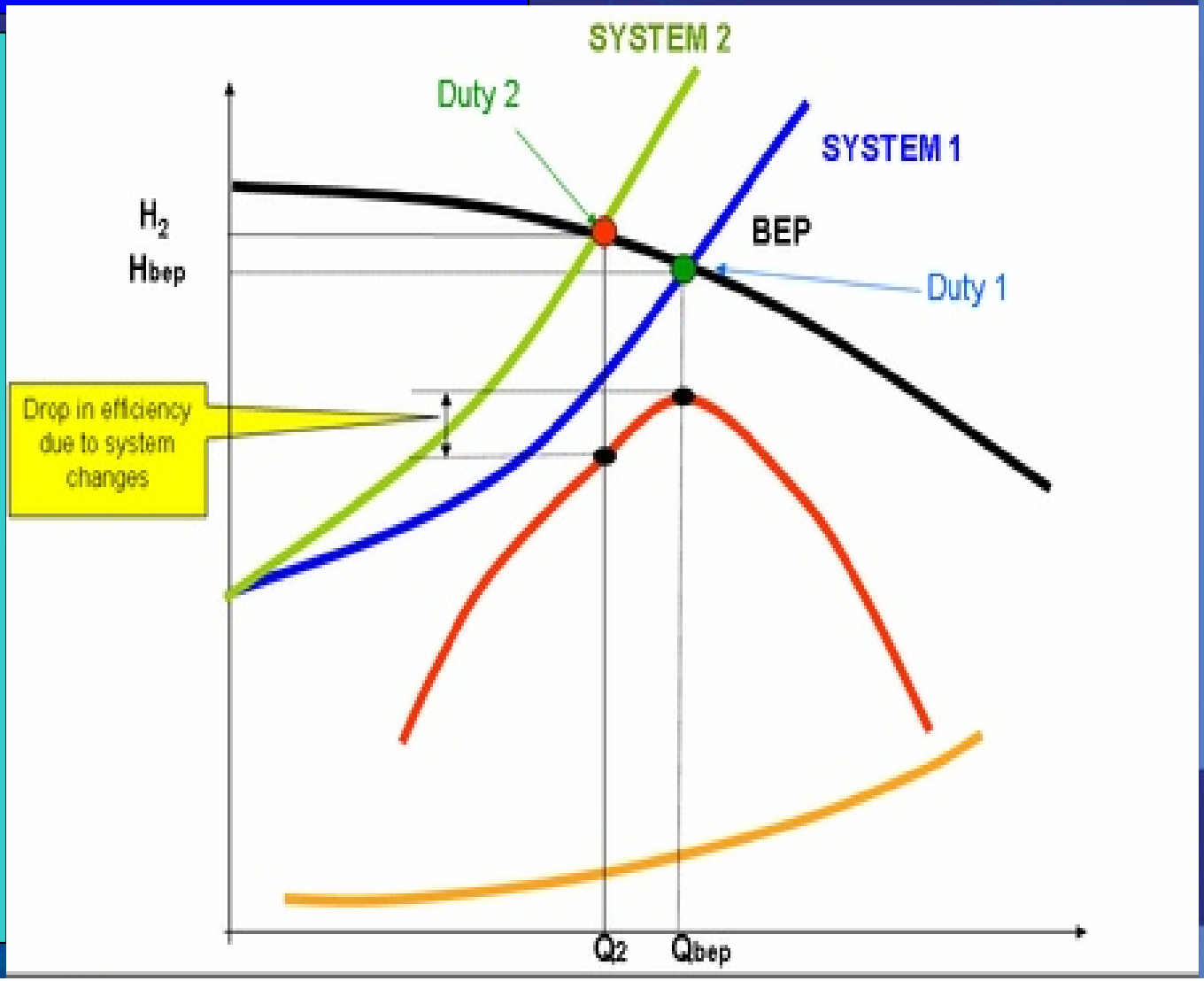
SYSTEM HEAD CURVE

Dialoging With Audience



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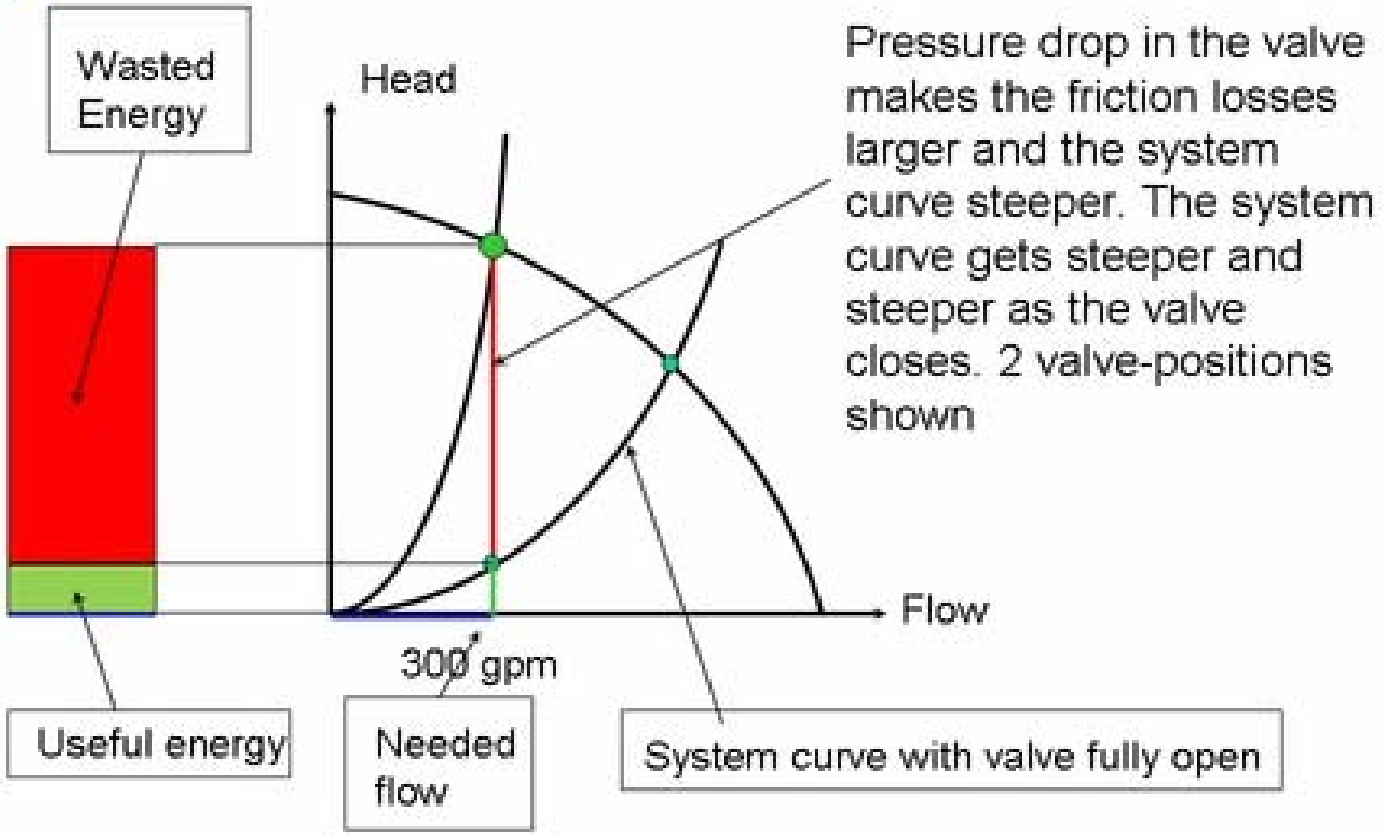
SYSTEM HEAD CURVE

With constant speed pumps:

Use Flat curve and multi-pumps in duty according to the demand

More Throttling:
The duty point moves further left on the pump curve



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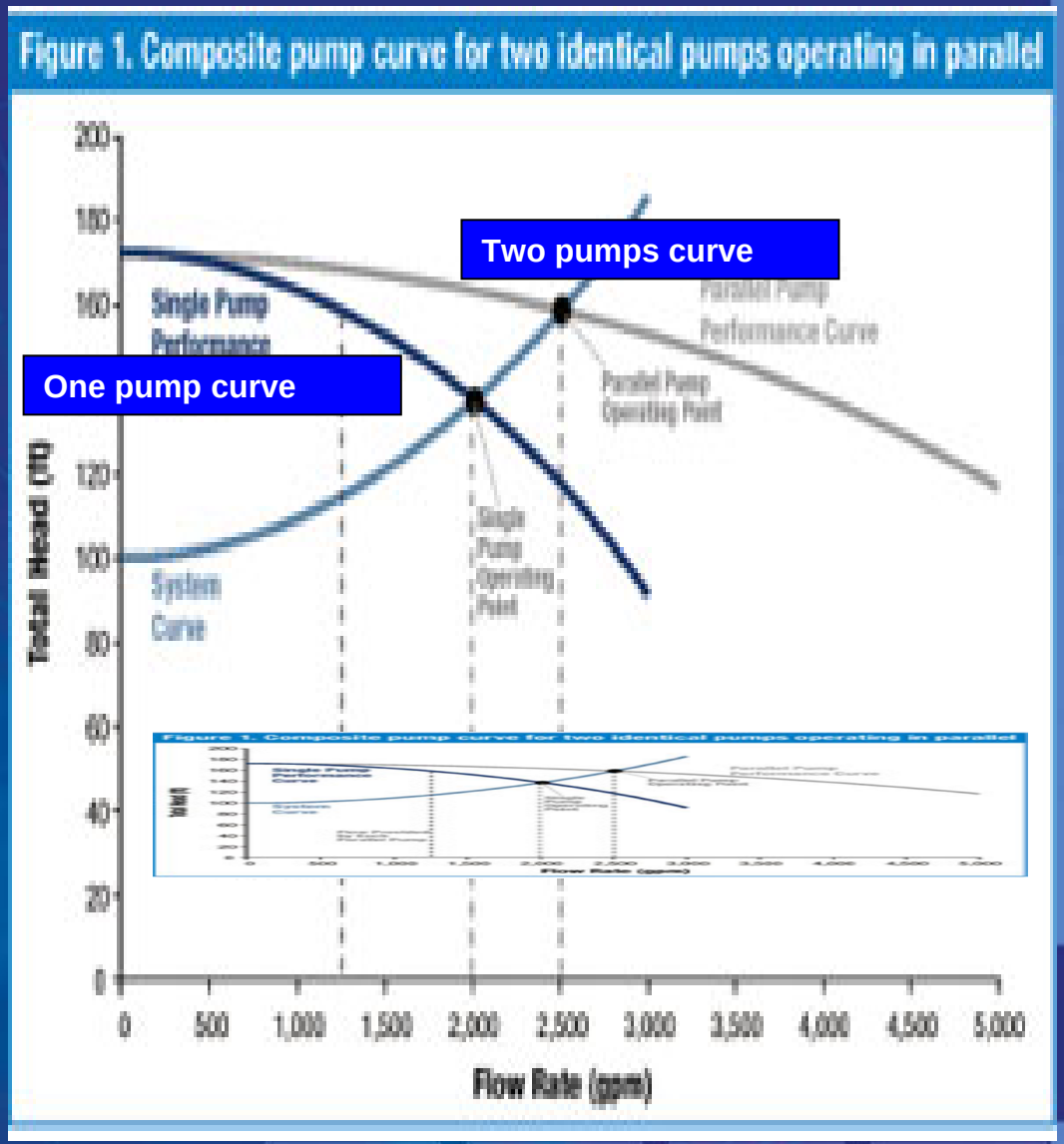
SYSTEM HEAD CURVE With Milti-fixed speed pumps

The multi pump fixed speed systems prefer A steeper curve

When the pumps add in parallel the summation curve becomes flatter = better performance



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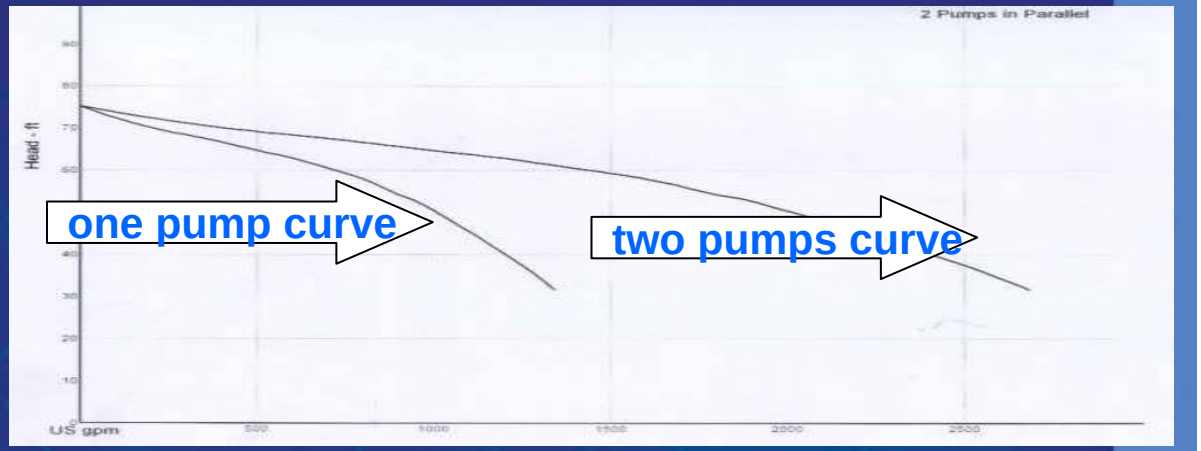

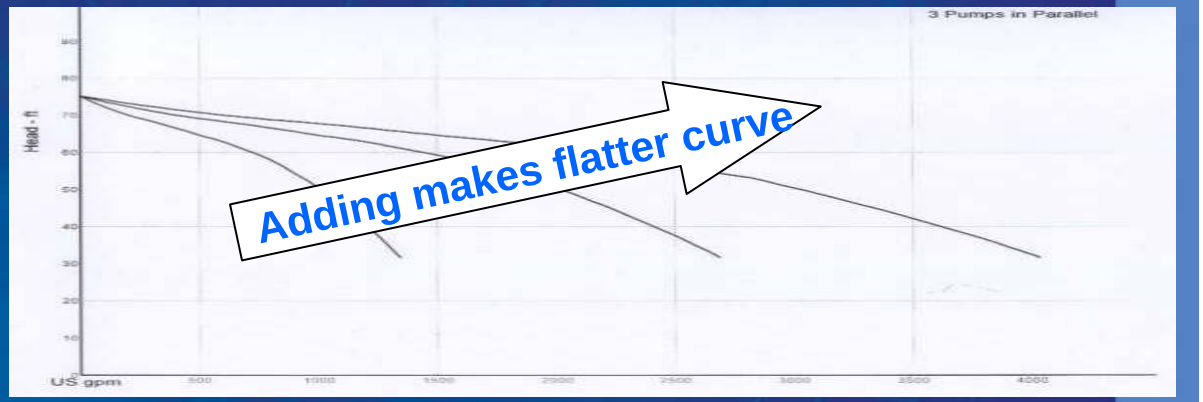

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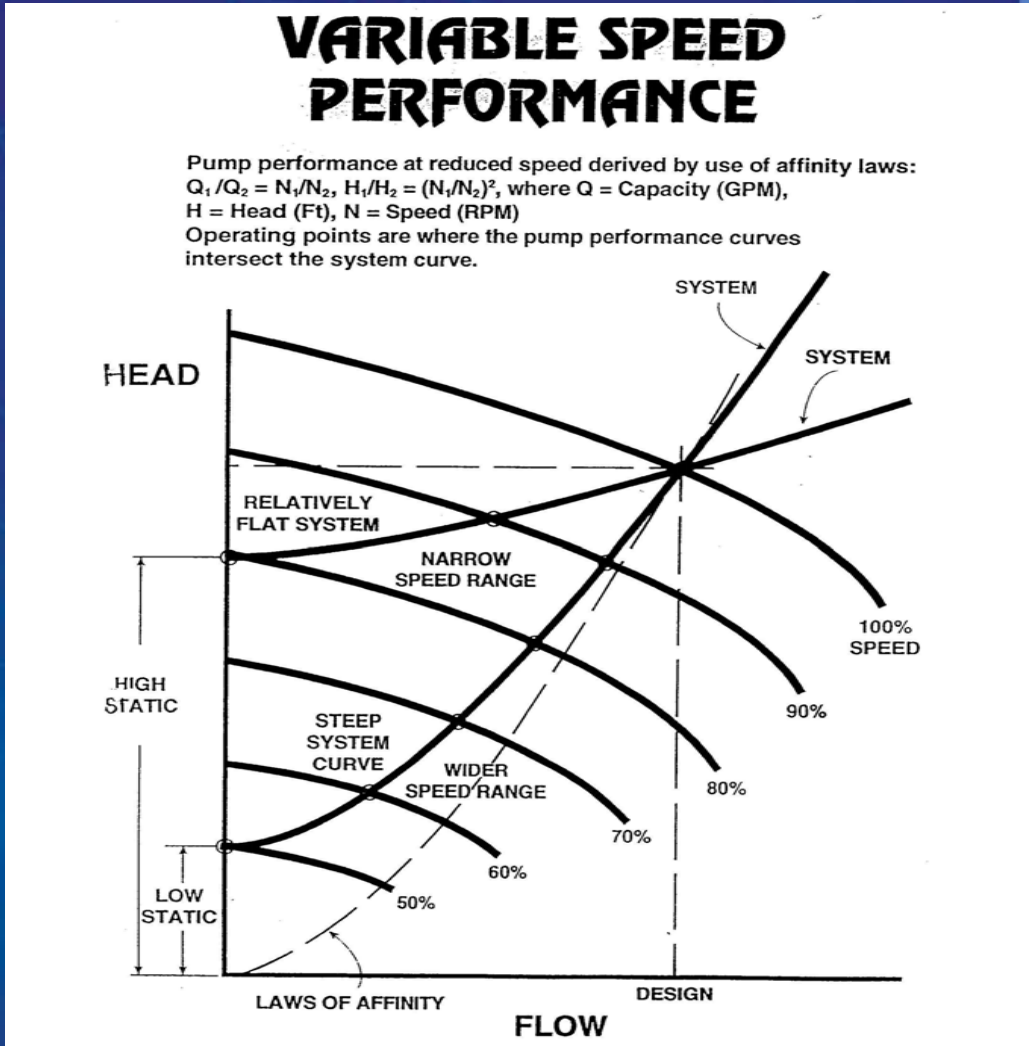
SYSTEM HEAD CURVE with VSD pump

The VSD pump may prefer a flatter curve, yet not so much flat
The VSD margin is about 30% of maximum speed
The generated curves are not forming parallel twins at different speeds

The lower the speed the flatter the curve becomes

When the pump perform at lower speed the curve becomes flatter yet with lower performance characteristics



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SYSTEM HEAD CURVE

With constant speed pumps:

Use **Flat** curve and a single o r two pumps in duty according to the demand
FLATTER or STEEPER

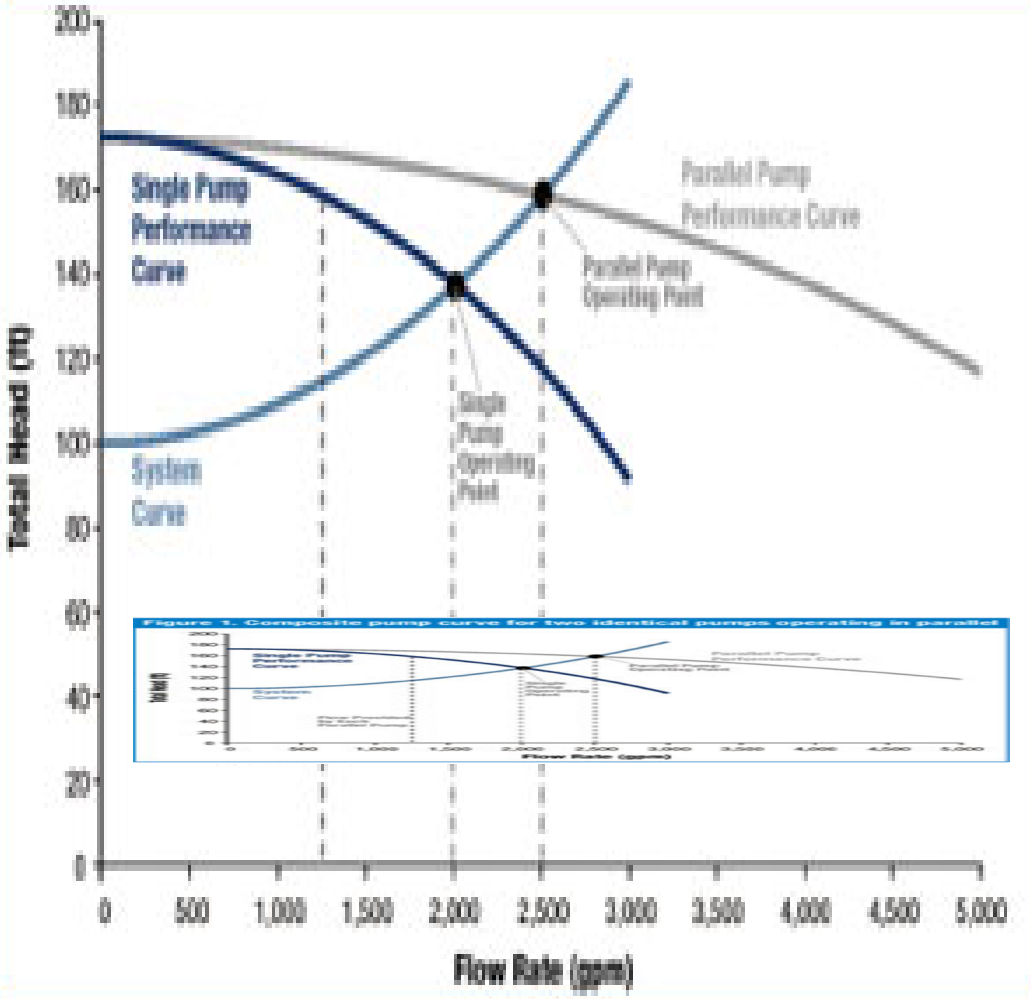
Only Rate of change of H w.r.t Q Will tell:
H0.5 = H at 0.5 Q BEP
H1.5 = H at 1.5 Q BEP
H 5 = H0.5 / H1.5

H 5 = 0.35 or lesser, FLAT
H 5 = 0.65 or more, STEEP

0.35 < H5 < 0.65

QUASI-CIRVE
The Best for multiple systems

Figure 1. Composite pump curve for two identical pumps operating in parallel



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SYSTEM HEAD CURVE

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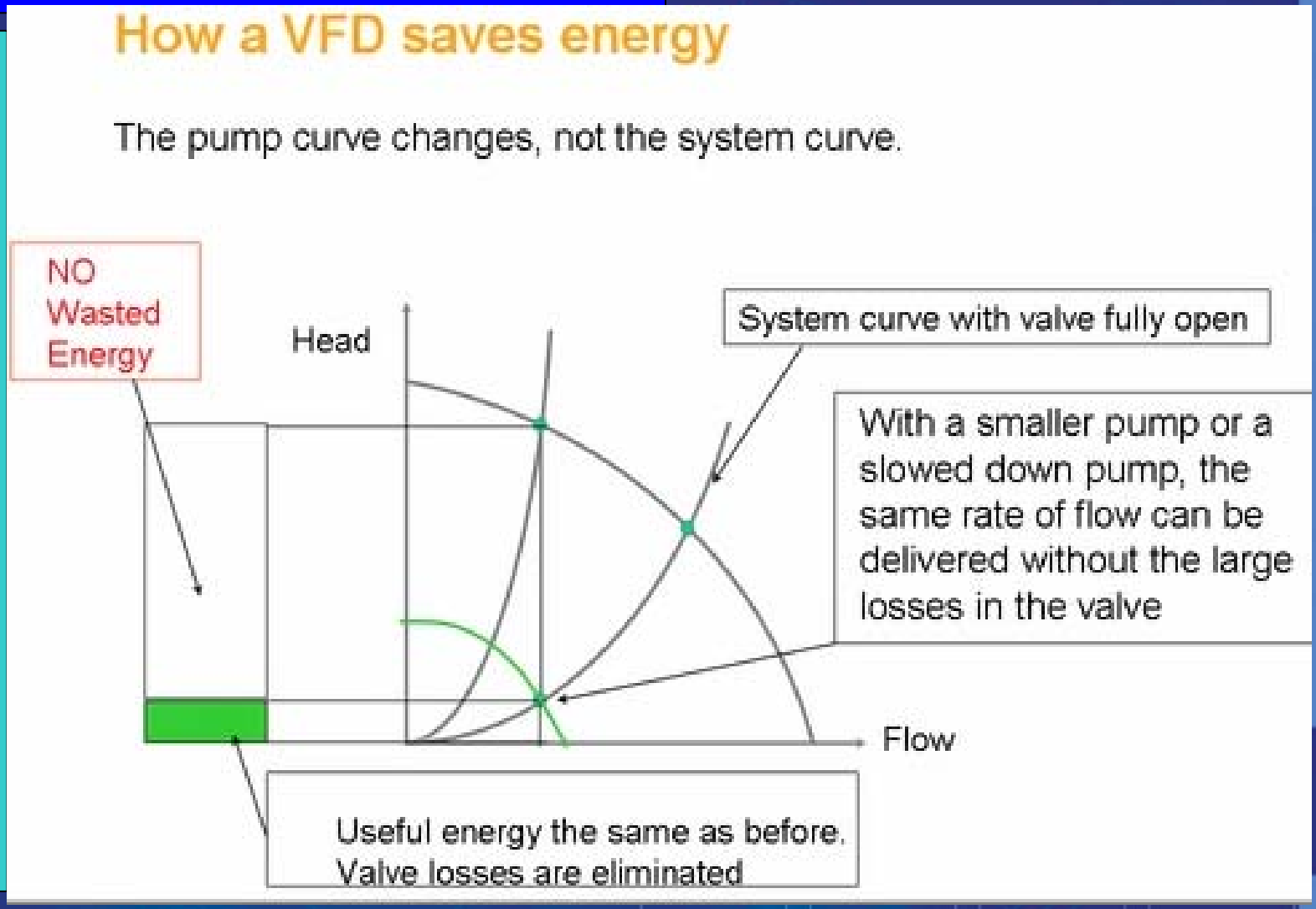

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WHAT is a PROPER SUCTION ?

$$N.P.S.H._{avail.}(ft\ \ fluid\ \ absol.\ ) = -(\Delta H_{F1-S} + \Delta H_{EQ1-S}) + \frac{v_1^2}{2g} + (z_1 - z_s + H_1) + H_A - H_{vt} \qquad [4]$$

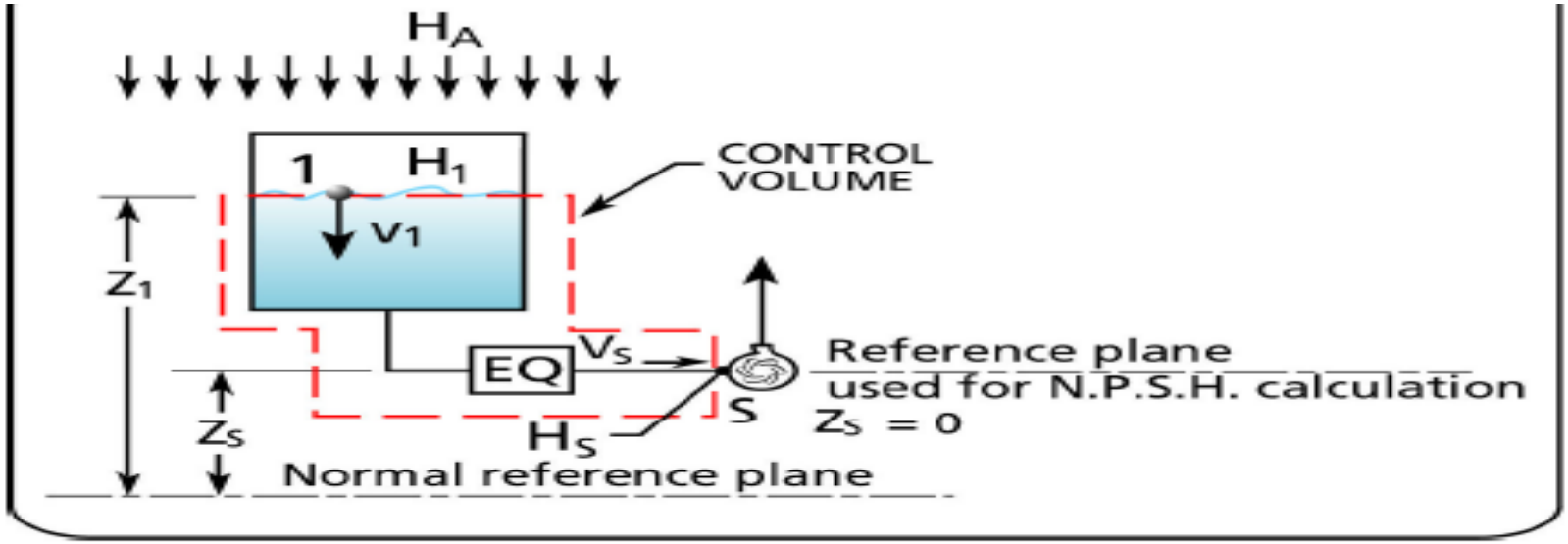

Figure 8 Meaning of the variables used for calculating the N.P.S.H.A.

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SYSTEM HEAD CURVE

What makes a curve,,,,

A **Steeper** curve

OR

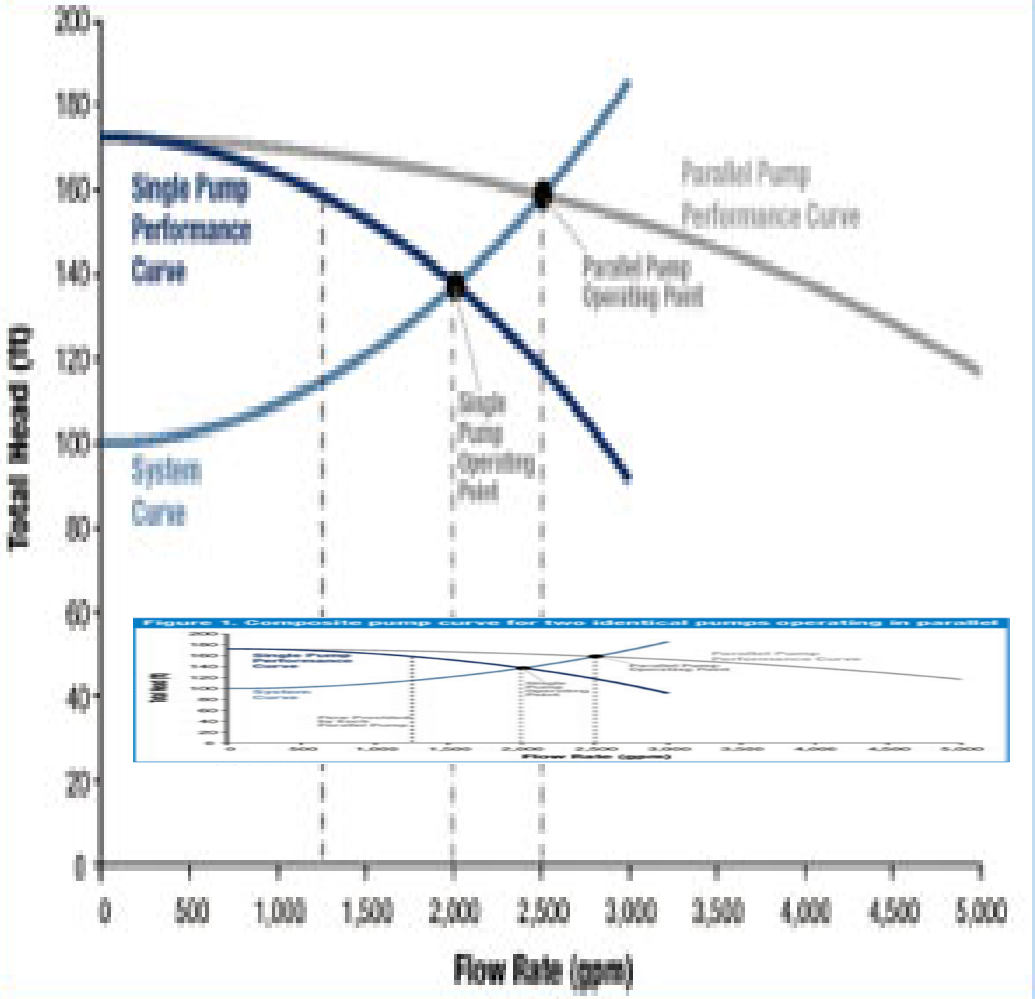
A **Flatter** curve

The H-Q gradient: **dH/dQ**

The Pumpman QUASI CURVE formula is a good measure of

dH/dQ

Figure 1. Composite pump curve for two identical pumps operating in parallel



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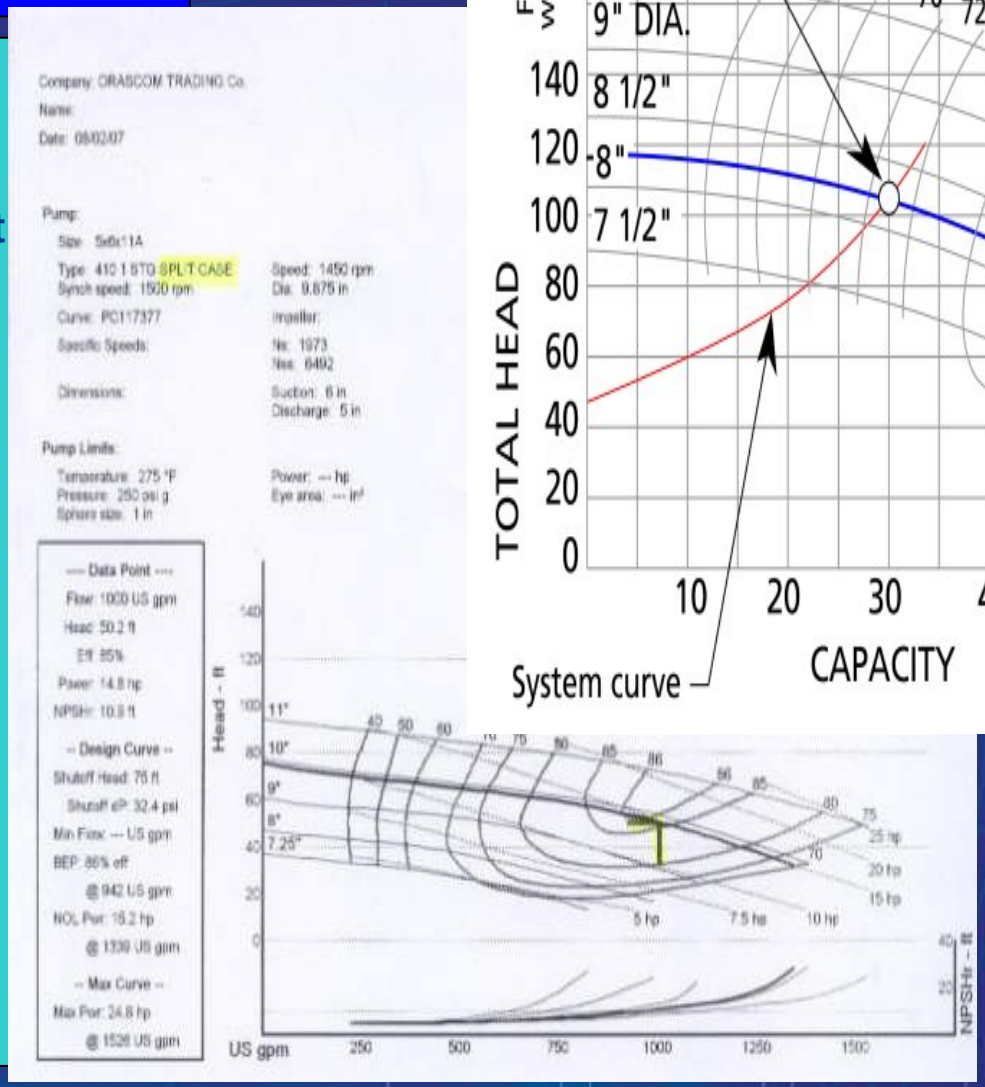
How to get Actual Duty Point ?

Evaluate the process
Flow Rate as a figure in GMP

Get its 50% and 150% , at least

Use the 3 values to obtain the
The TDH per each from tables
or formula :
by adding the static head to losses of both suction and discharge

The obtained 3 values allow you to draw the curve in RED
Which is the
SHC
System Head Curve



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Have YOU Gotten SOMETHING NEW ?

Break

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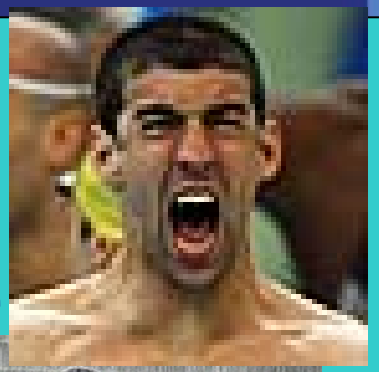
Have YOU Gotten SOMETHING NEW ?

WORK is…

Torture



Punishment

Routine

Mission

Pleasure

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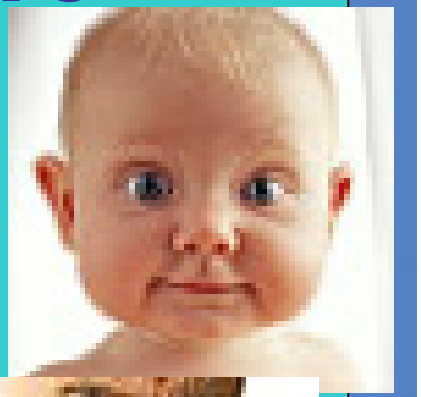
Have YOU Gotten SOMETHING NEW ?

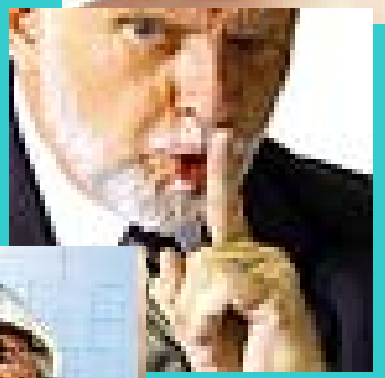
WORK Is Pleasure

To make like that:

Keep working with,
The Passion of a BEGINNER



The Commitment of a Expert
And



The Seriousness of a PRO

Before END

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Have YOU Gotten SOMETHING NEW ?

REMEMBER ME

The Pump Professionals

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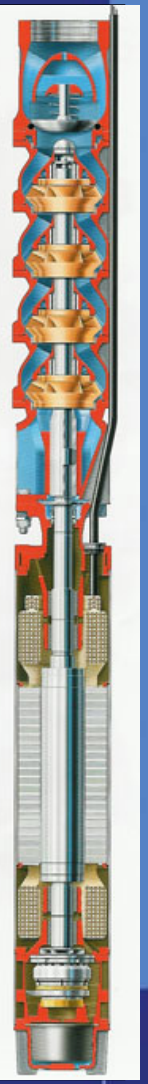

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