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Norma Baru
Bandar Rendah Karbon

Mechanical Design (Pump) for Sustainable Low Carbon Cities

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Mechanical Design (Pump) for Sustainable Low Carbon Cities

- It's a new normal yet we are not compromising on Energy
- Low carbon cities not just for residential and commercial but also for industries and manufacturing.
- For Engineers, the goal is efficient design
- That's why they are called engineers – the movers, ever thinking
- Innovation doesn't happened over night, though sometimes it does.
- It's how engineers look at things and transform into workable.

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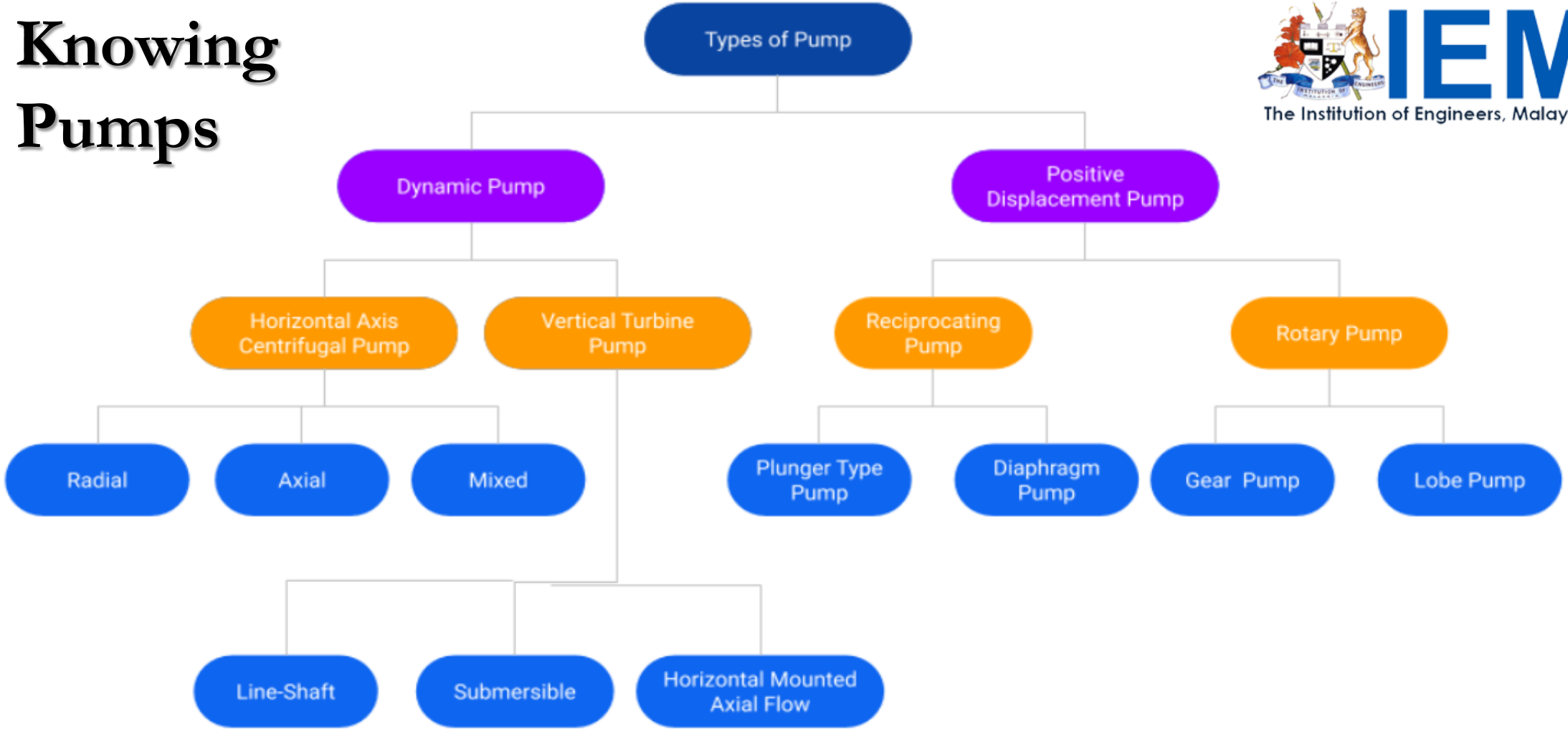
Knowing Pumps



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Industrial Pumps

ANSI Centrifugal

Lobe/Sanitary

Self Priming Centrifugal

Rotary Gear

Horizontal Split Case

Metering/Dosing

Reciprocating Plunger/Piston

Air Operated

High Pressure

Progressing Cavity

Submersible

Vertical Pumps

High Pressure Diaphragm

Magnetically Driven

Multistage

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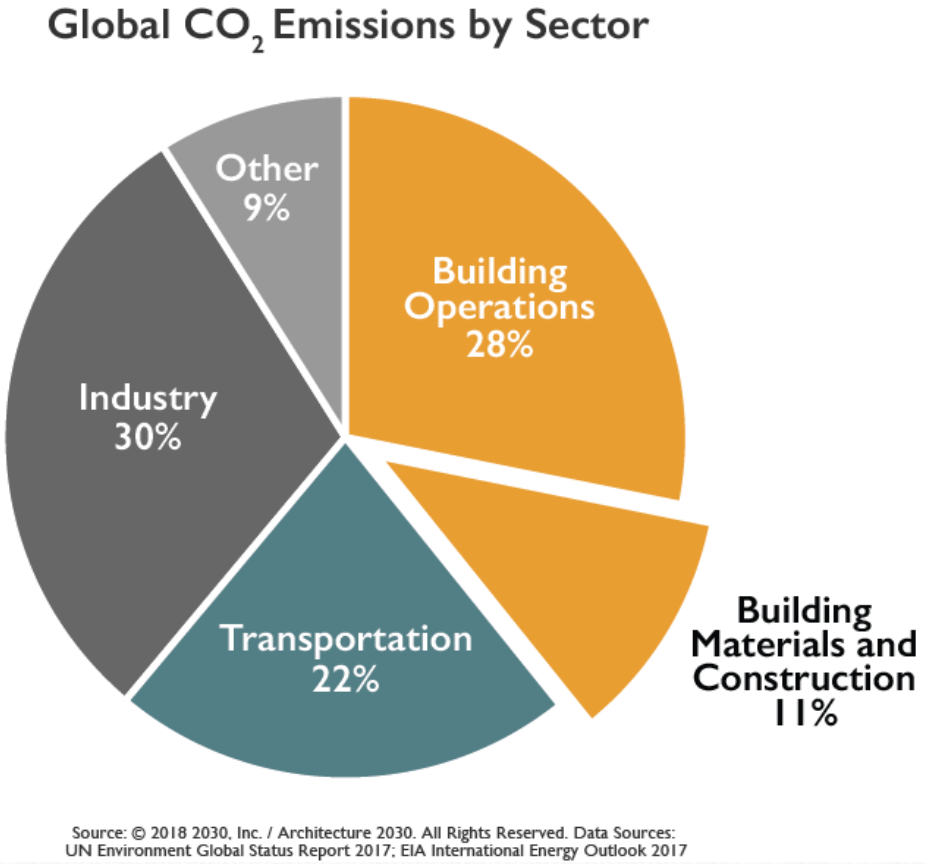
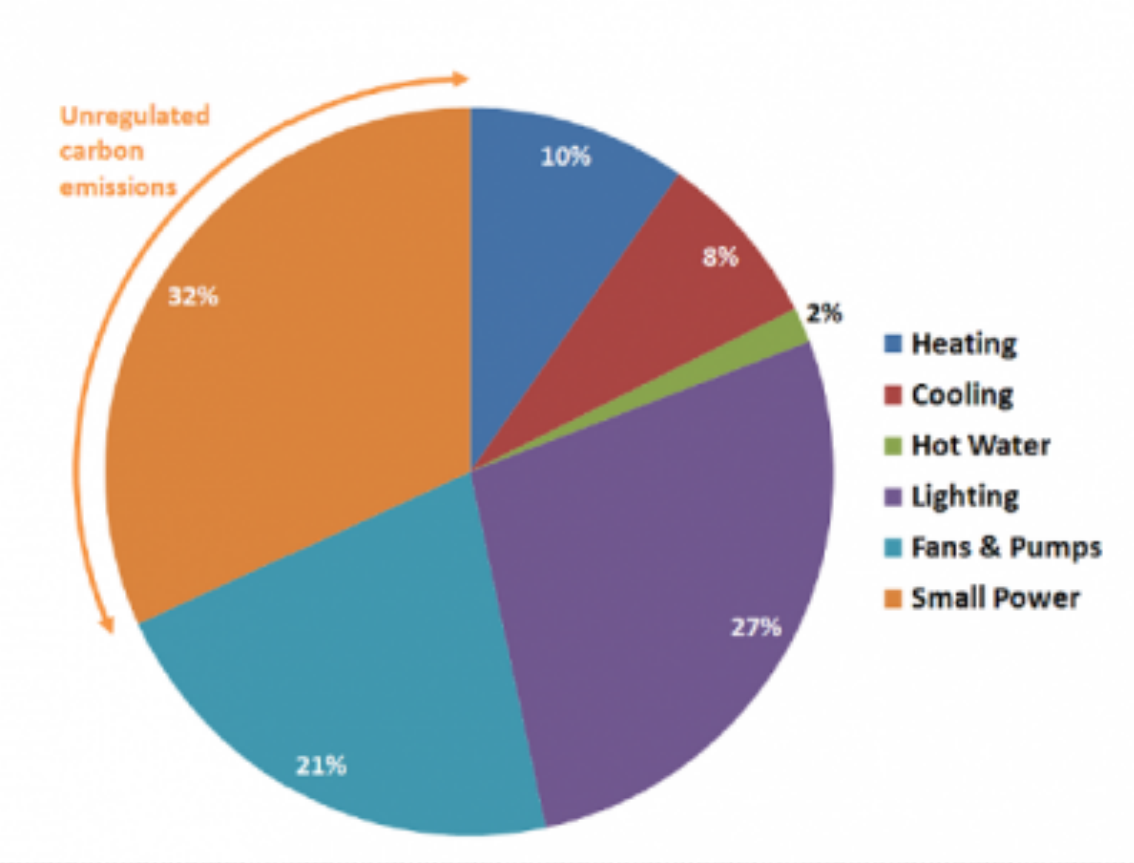
Do Pumps have any role in Low Carbon City?

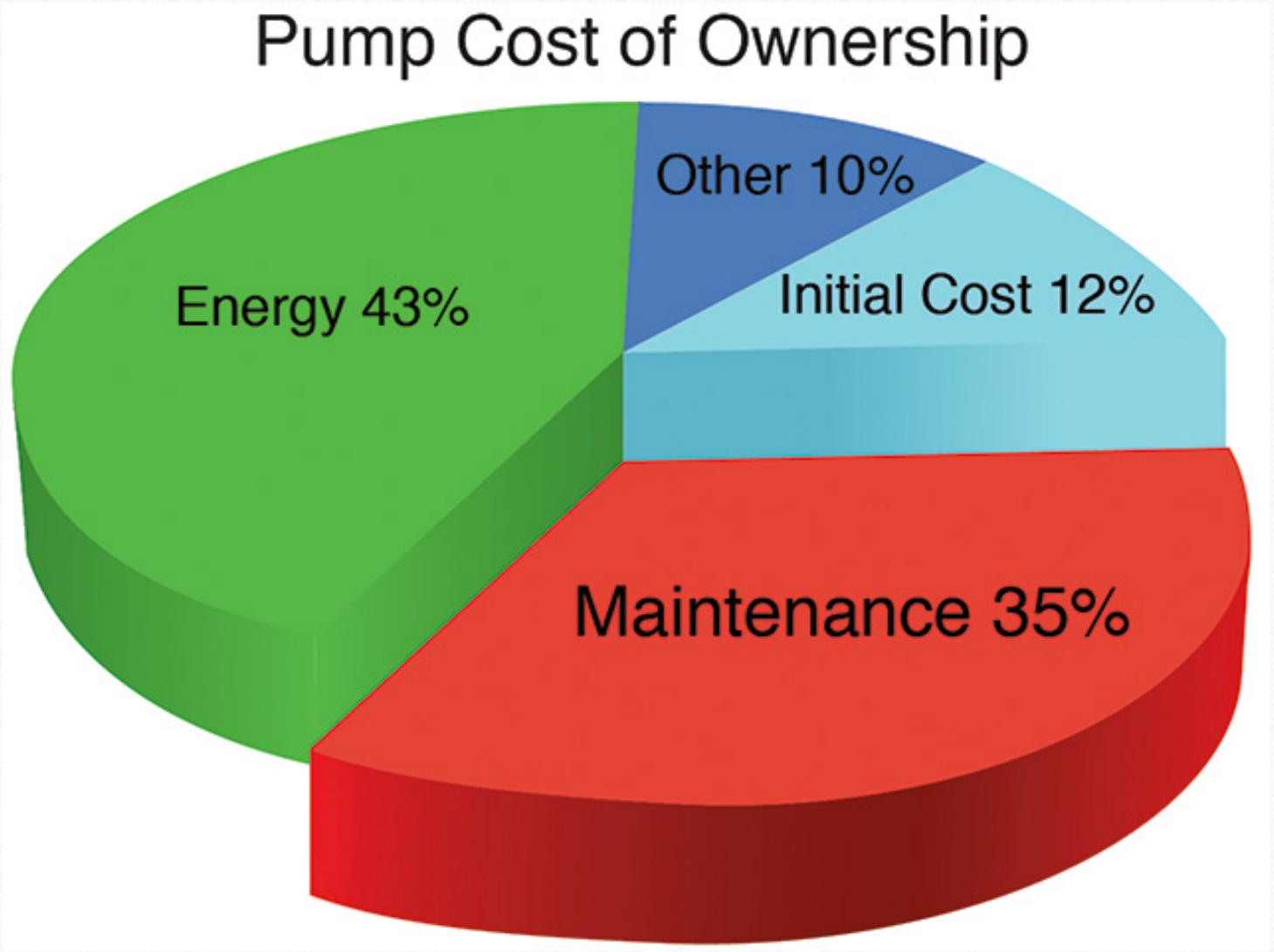
- We need pump. Absolutely.
- Either in industries or building services – No choice.
- But the question remains, How efficient are the pumps?
- Efficient here is a huge word, the meaning is deep.
- Starts from the sizing up calculations till choosing the right type for the purpose.
- Why did we choose this topic today?

Global CO2 Emissions by Sector



Global CO2 in Building services (Typical)




Pump Cost of Ownership
Other 10%
Initial Cost 12%
Energy 43%
Maintenance 35%

Criteria for a Good Pumping System Design

1. Have a proper calculations – never over design
2. The piping design determines the pump size, still many engineers at times overlook this.
3. Piping material matters.
4. Pump selection ie type and the size (both)
5. Have a flow meter and pressure gauge.

Why Engineers oversize the pumps?

- Indecisions of the building need.
- Safety factors (Why?)
- Future plans to extend the service.
- Poor Piping design – size, materials and layout

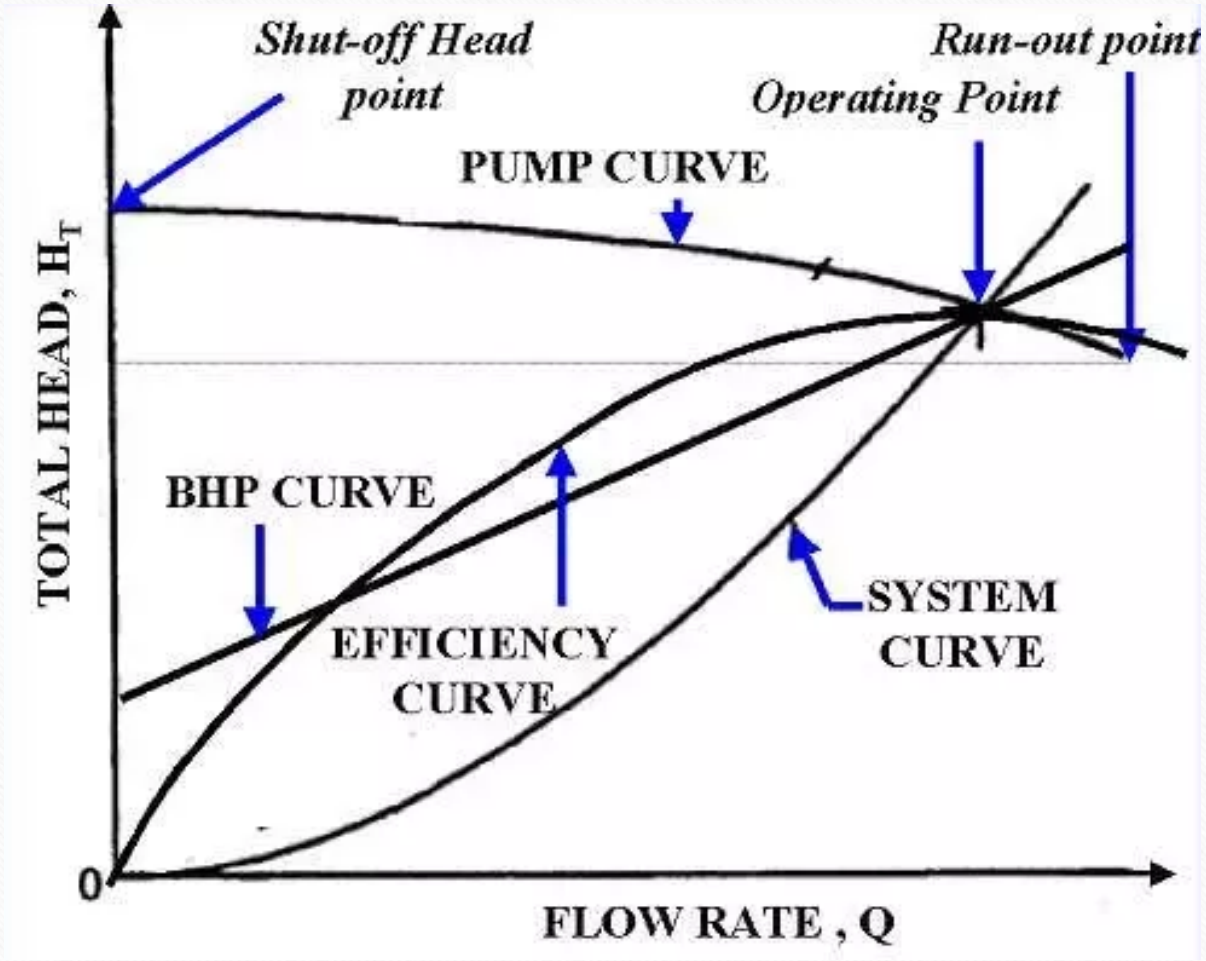
Common mistakes of safety factors..

1. Static head – usually building height is fixed, why do we need safety factors?
2. Piping run – safety factors are needed if engineers unsure of their design, can be avoided.
3. Bends, valve etc.. Can be tricky, usually engineers are helpless as sub-contractors alter the piping route at site.
4. Client expects for future expansion – wrong planning.

Consequences… of wrong design

- Larger pump which work as desired.
- Larger motor, which will be less efficient.
- Maintenance cost will increase.

Pump system curve



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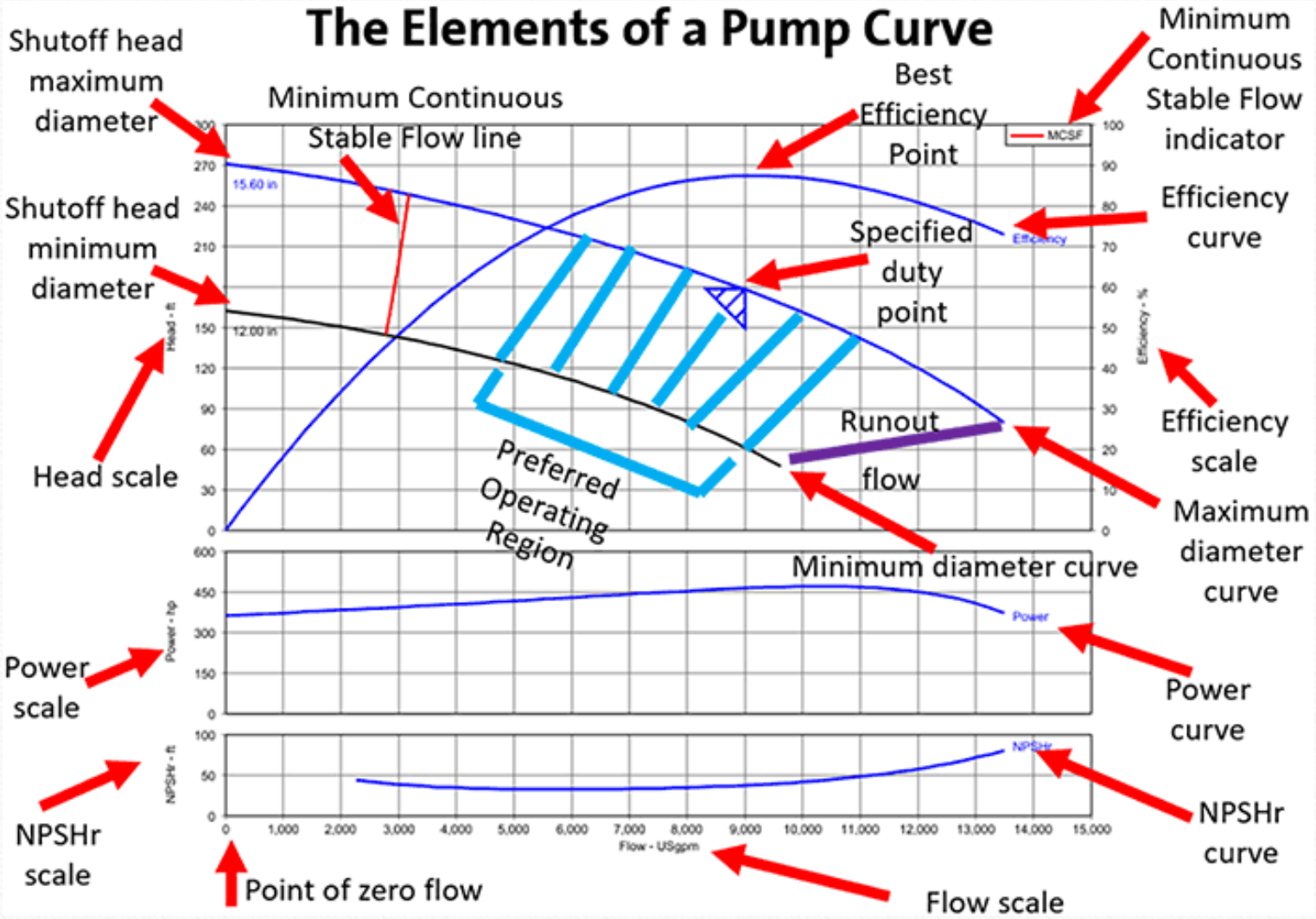
The Elements of a Pump Curve
Shutoff head maximum diameter
Minimum Continuous Stable Flow line
Best Efficiency Point
Minimum Continuous Stable Flow indicator
Shutoff head minimum diameter
Efficiency curve
Specified duty point
Head scale
Efficiency scale
Runout flow
Preferred Operating Region
Maximum diameter curve
Minimum diameter curve
Power scale
Power curve
NPSHr scale
NPSHr curve
Point of zero flow
Flow scale
15.60 in
12.00 in
MCSF
Efficiency
Power
NPSHr
Head - ft
Efficiency - %
Power - hp
NPSHr - ft
Flow - USgpm

Remedy

- Change piping if inner part corroded or have sediments.
- **Trimming** the **impeller** often reduces operating horsepower, which brings up the question of replacing the **pump** motor with a smaller one.
- Variable speed drive
- Maintenance that restores design parameters.

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