

September 2011



Tom Wells

How to Slash Power Usage Costs

Increase Hydraulic System Profitability

Ontario's Cheap Power Advantage Is Gone...

“For close to a century, cheap electric power was the cornerstone of Ontario’s industrial policy.

No more, says Adam White.

White is no disinterested observer. As head of the Association of Major Power Consumers of Ontario, or AMPCO, he’s a lobbyist for big manufacturing, mining and forest products firms.

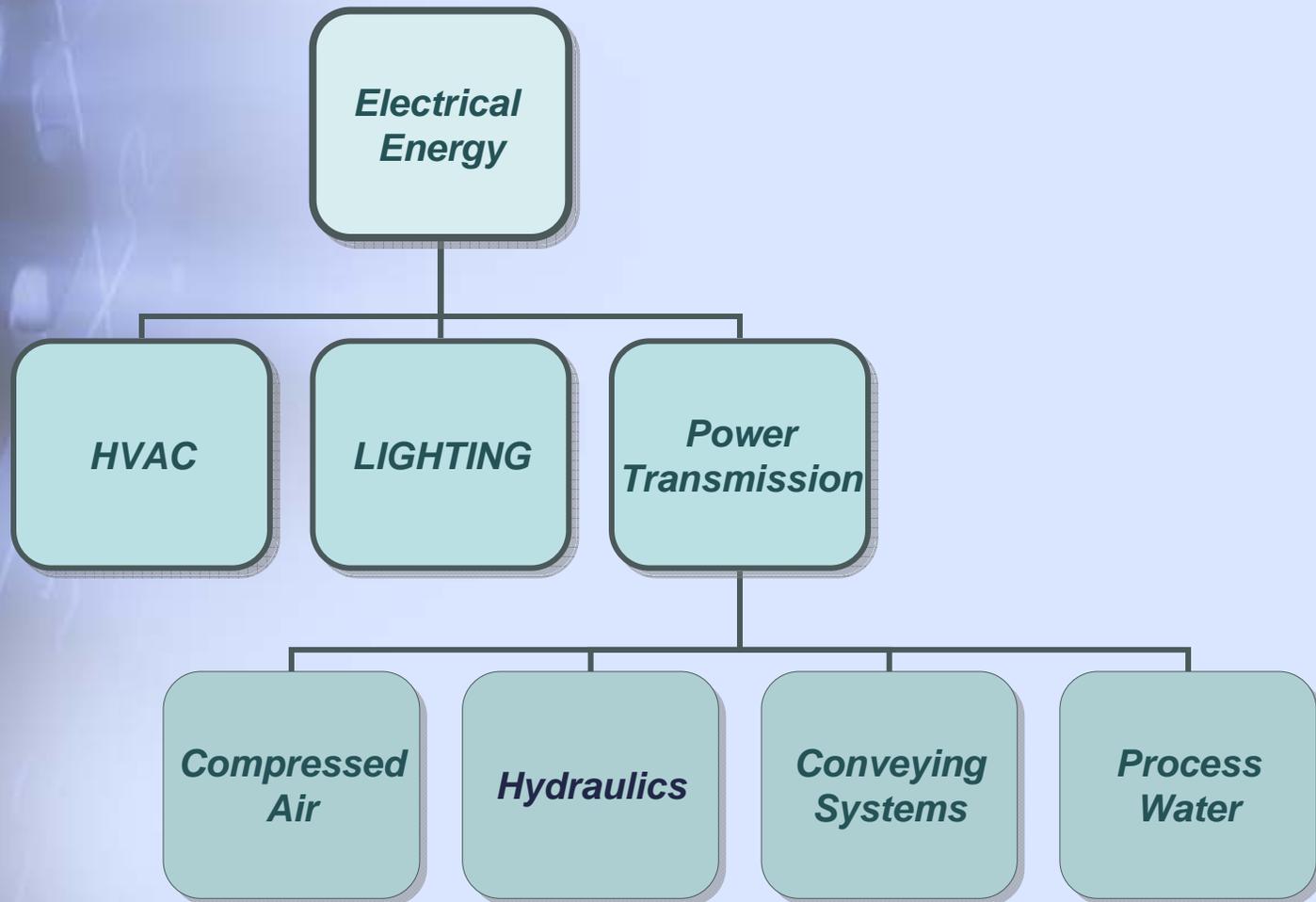
But White has a clear message for the firms he represents: Power prices are marching inevitably higher in Ontario, and the only salvation for big users is to make do with less...”

<http://www.thestar.com/business/article/845060>

~ *John Spears, Toronto Star*

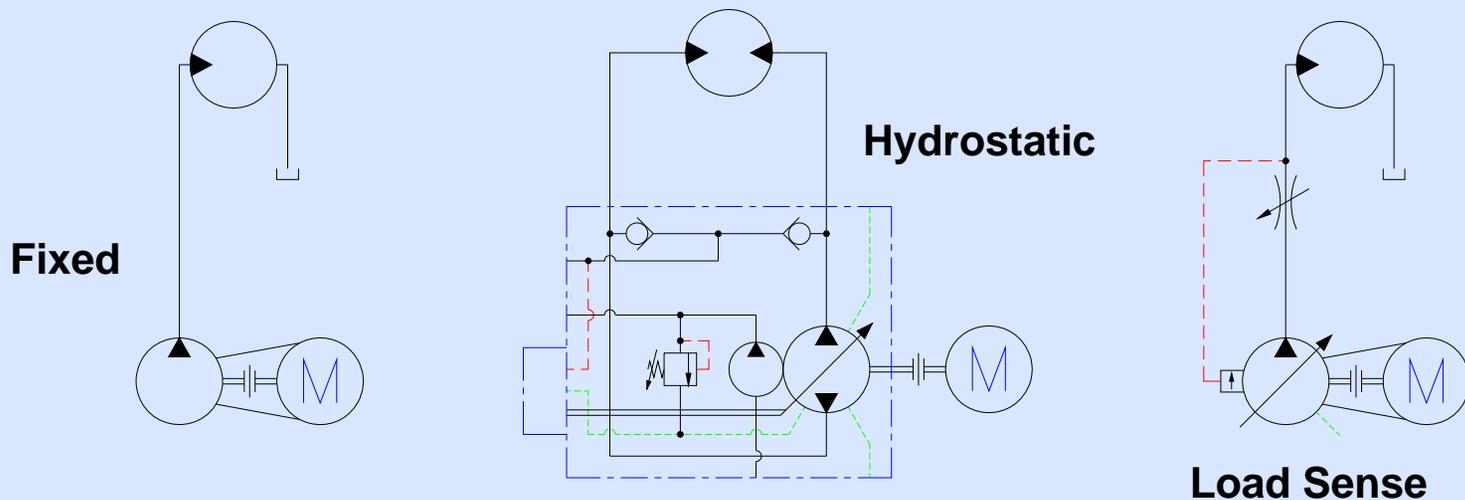
Energy Consumption

The Next Phase





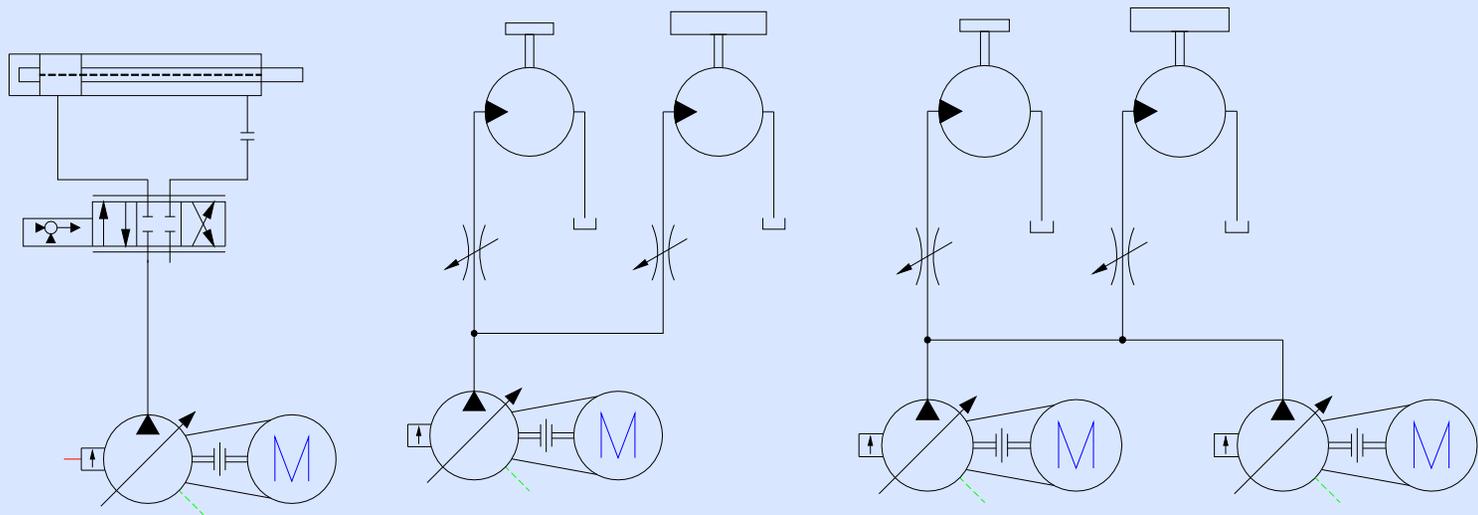
Efficient Hydraulic Systems Transmit Power



- *Efficient Components*
- *Efficient Designs with low metering losses*

Inefficient Hydraulic Systems

Transmit Power



- Some systems are inherently inefficient and have high metering losses, such as:
 - Servo positioning
 - Multiple actuators that are not load balanced
 - Multiple pumps



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Wasted Pressure Drop

Consumes Energy & Creates Heat

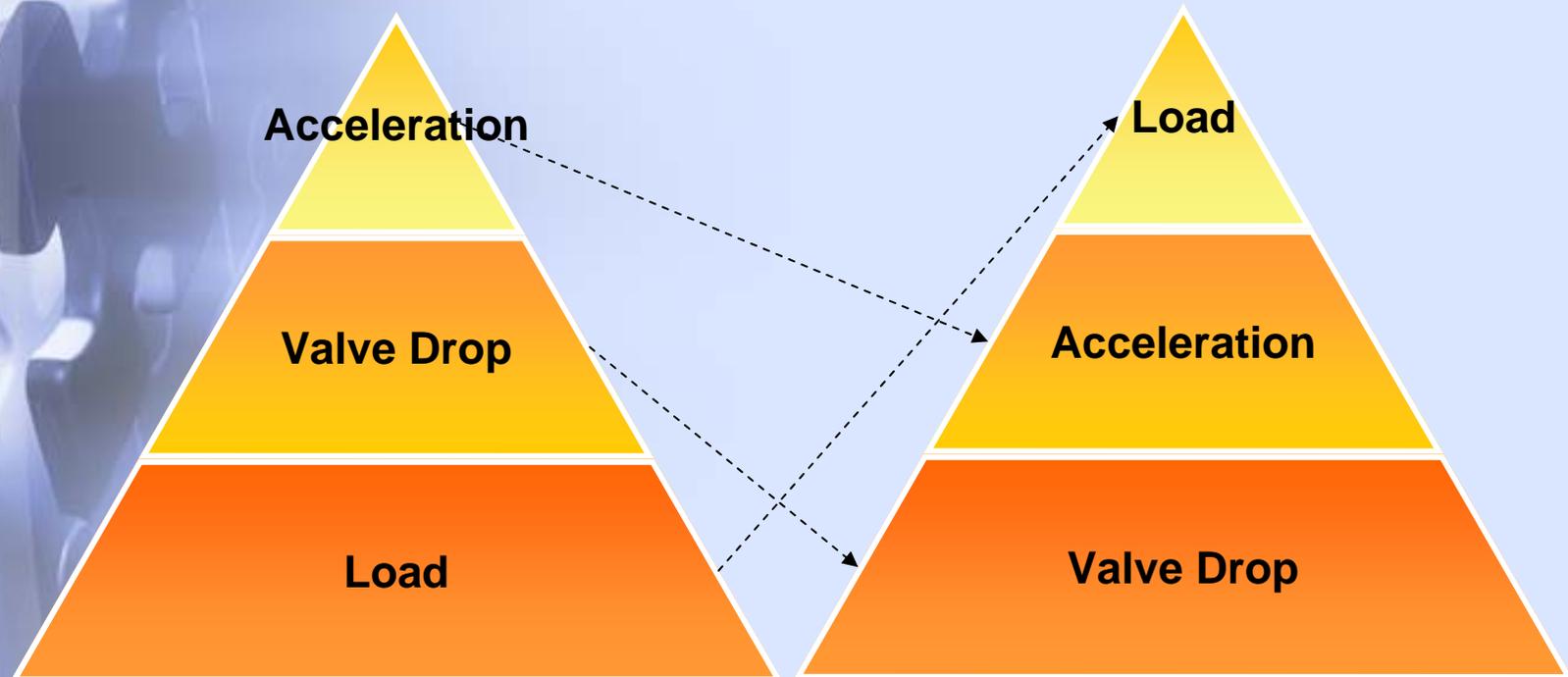
$$HP = \frac{GPM * PSI}{1714}$$

$$BTU / hr = \frac{GPM * PSI * 2545}{1714}$$



Servo Positioning Losses

The more moves per minute, the more inefficient



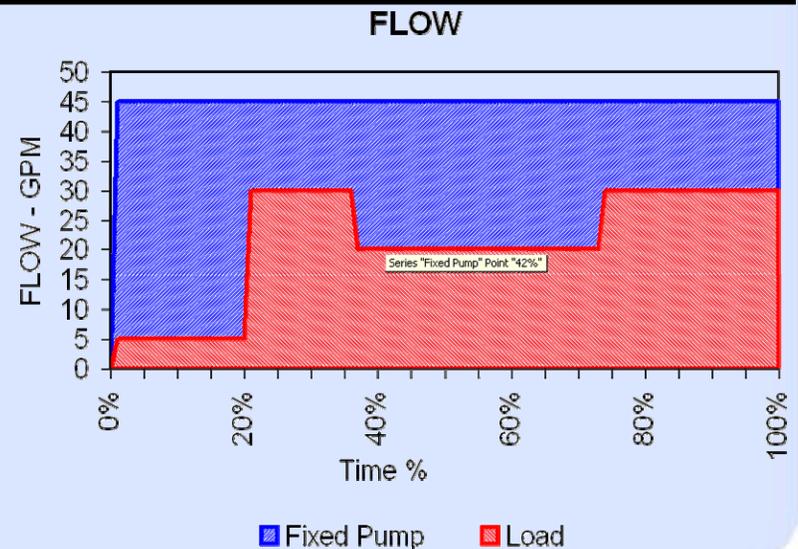
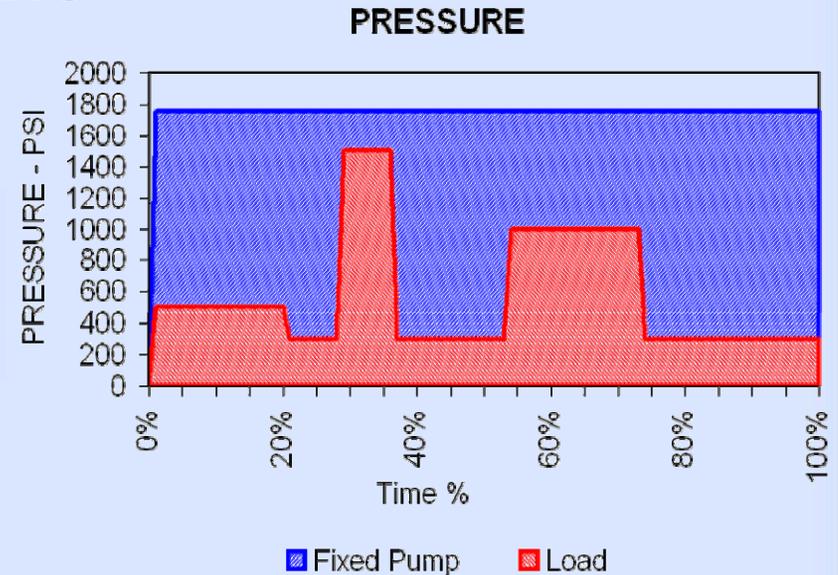
- **Question to ask:** Are you using 80% of the valve opening at your maximum velocity? Less than that may indicate more system pressure than required

Understanding The Work Being Done

Pressure X Flow = Power

*You don't need special meters –
just observe*

- ***What is a cycle?***
- ***Is the load always the same?***
In both directions





Estimating Savings

☑ Good Rules of Thumb

- An Electric motor “idling” (no load) consumes:
Approximately 25% of nameplate power
(Older motors can draw up to 30-35%*)

Rule of thumb for estimating savings:

1HP = \$650/year @ 10¢/kwHr (7 x 24 x 52wks) (fully loaded)

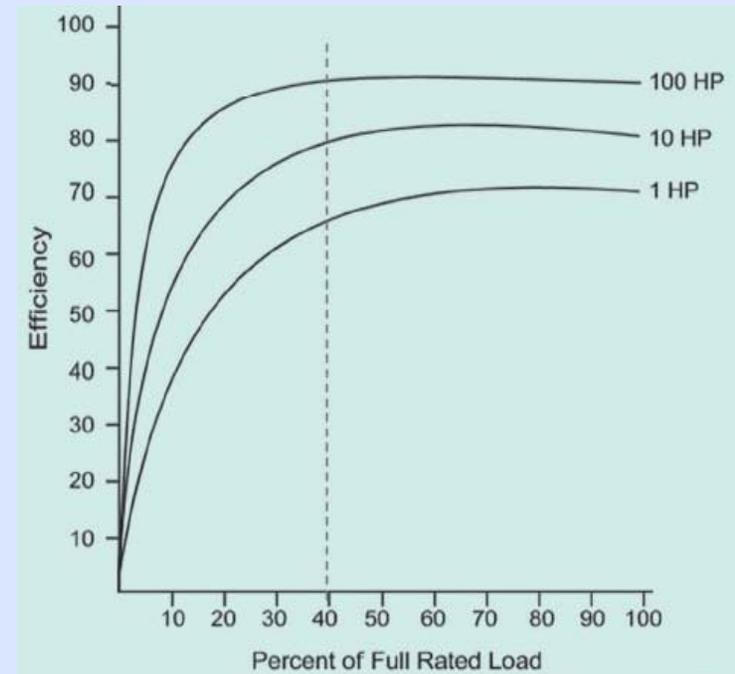
- 100HP Fully Loaded = \$65,000/year for electricity if fully loaded
- 100 HP Idling = \$16,250 per year

* Measured amps are much higher, but taking into account the power factor, this is a reasonable assumption. Power Factor is the ratio of real power versus apparent power

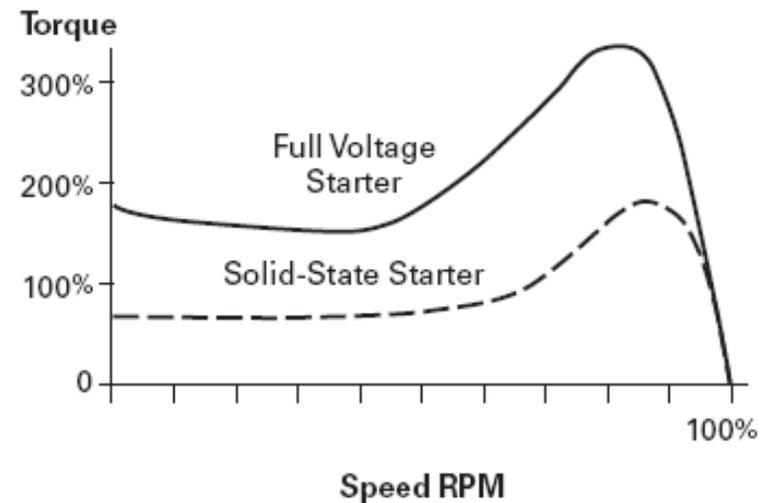
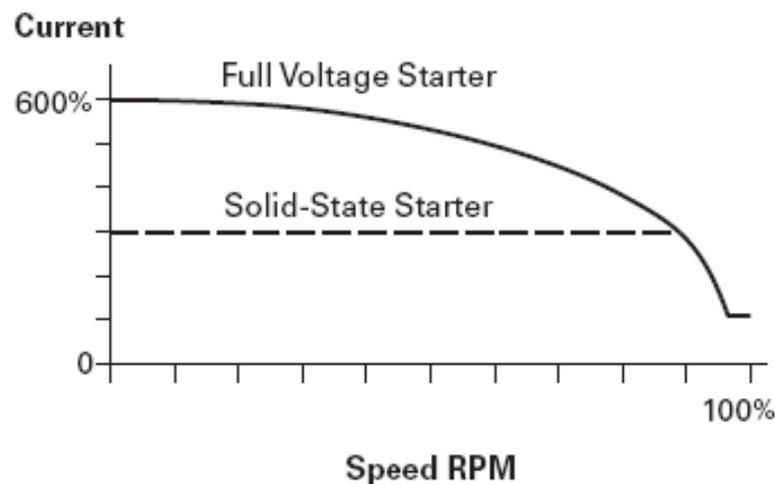


How Did I Lose 25%?

- Saving more energy does not mean just turning off the motor
- Using soft starts takes peak off and saves energy. Sometimes rebates are available



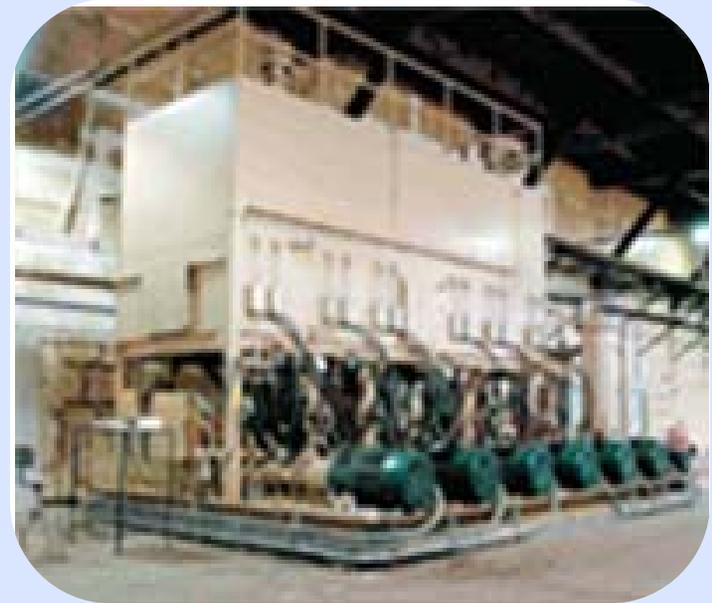
Soft Start vs. Across The Line Starting



- *Hydraulic pumps have low inertia*
- *Hydraulic systems can be started “unloaded”*

A Misconception

- Particle Board Press retrofitted in 2004
- 5 - 150hp motors are started 14 times per hour with soft starts
- The motors run 6°C above ambient (cooler than a motor running continuously)

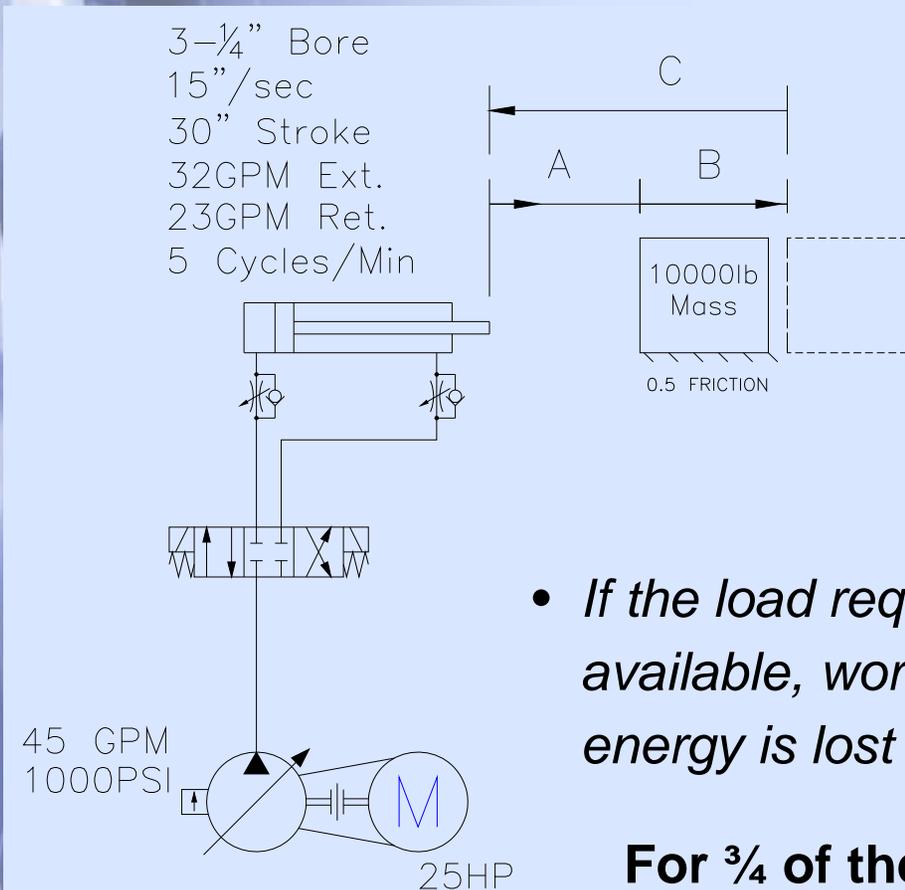


Low Hanging Fruit

Energy Wasters

- Hydraulic Power Units with over 50hp
- Clamp and hold applications
- Where there is high idle time
- Where there is “off shift” work
- Where a large portion of the stroke is doing no work
- High stroke counts per minute
- Where the heat exchangers are big

Comparing Hydraulic Approaches



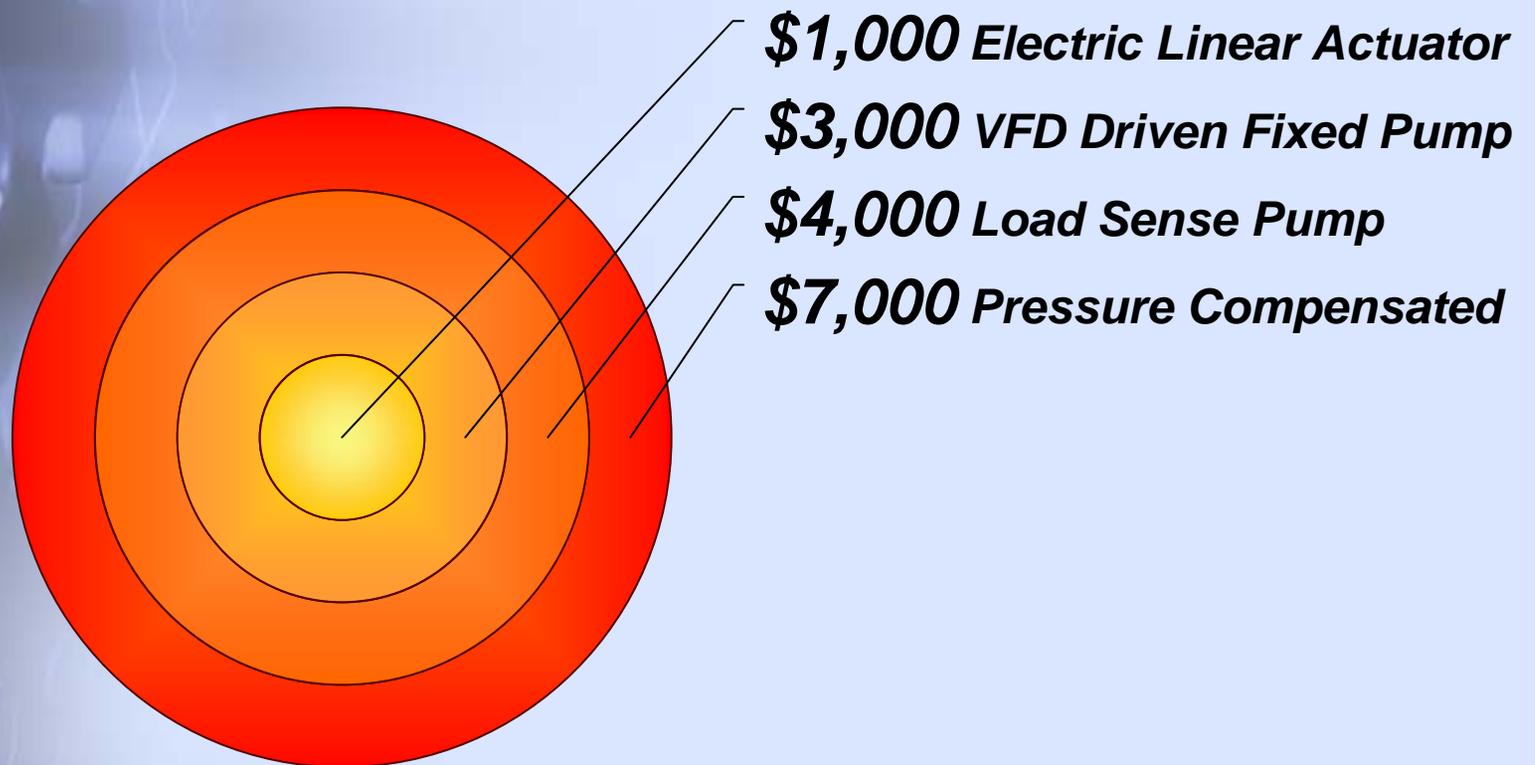
- A typical example of what we do every day
- Based on the flows required we selected a PVM 098 (45gpm)
- Runs 24/7/48 (8,064 hrs)
- Approx 50% duty cycle

- *If the load requires less pressure than is available, work is done and the remaining energy is lost to heat*

For $\frac{3}{4}$ of the move no work is done!

Selecting The Right Technology

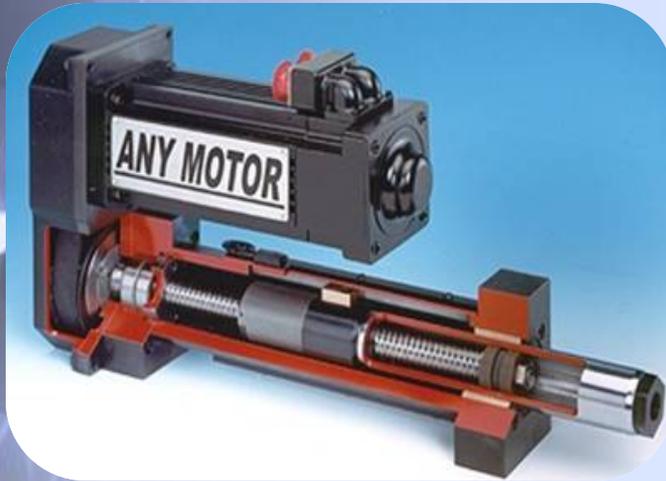
Energy Costs Per Year:





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Technology Comparison



Factors To Consider In Selection

Entire Installed & Operating Costs

- Does hydraulics already exist in the facility;
Advantage Hydraulics
- Duty cycle, speeds and shock loads; not a strength for Electric cylinders
- Environment, space and noise
- Heat and cooling costs above the primary pump costs
- Cost of ownership and operation after initial acquisition cost
- Where is your technical comfort zone

Summary Recap

- Energy costs will continue to rise. There may be significant savings to be had on the factory floor
- Idling electric motors consume approximately 25% of nameplate HP
- Start looking for gains at 50 HP and up:
 - * Clamp and Hold
 - * Off shift work
 - * High idle time
 - * Where no work is done
 - * Large heat exchangers
- “OFF” is extremely efficient, soft starts, VFD’s
- For new applications and upgrades, consider different technologies



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THANK YOU
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