Energy Trust & Platt Electric
Energy Savings Applications for VFDs

April 24, 2024

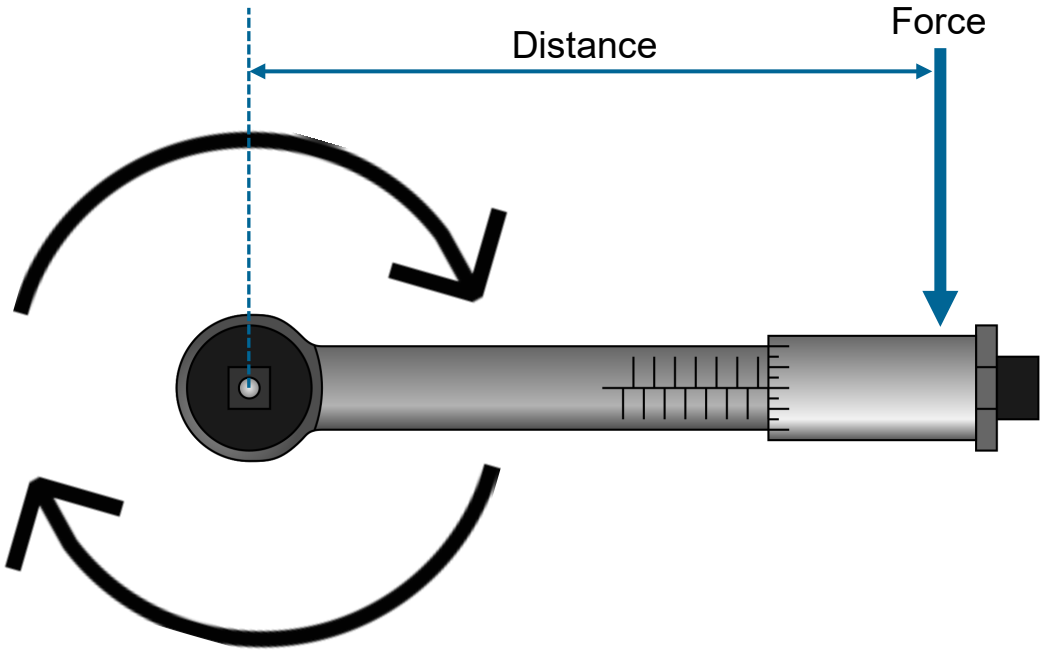
EnergyTrust of Oregon

Agenda

- Quick review of force, torque, speed, power and energy consumption
- Most common types of loads on motors
- VFDs and their application for energy savings
- Examples and discussion
- Q&A

Torque, Speed, Power and Energy Consumption

Force, torque, speed, power and energy consumption



Torque (NM or Ft Lbs) = force x distance

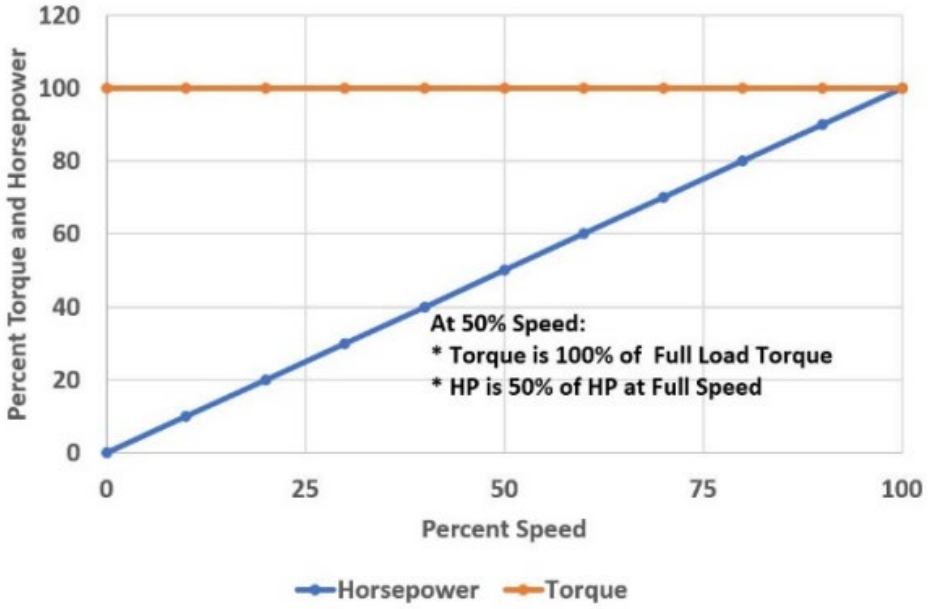
Power (kW or hp) = torque x speed

Energy Consumption (kWh or hp*h) = power x time

Most Common Types of Loads on Motors

Constant torque
Constant power
Variable torque

Constant torque loads

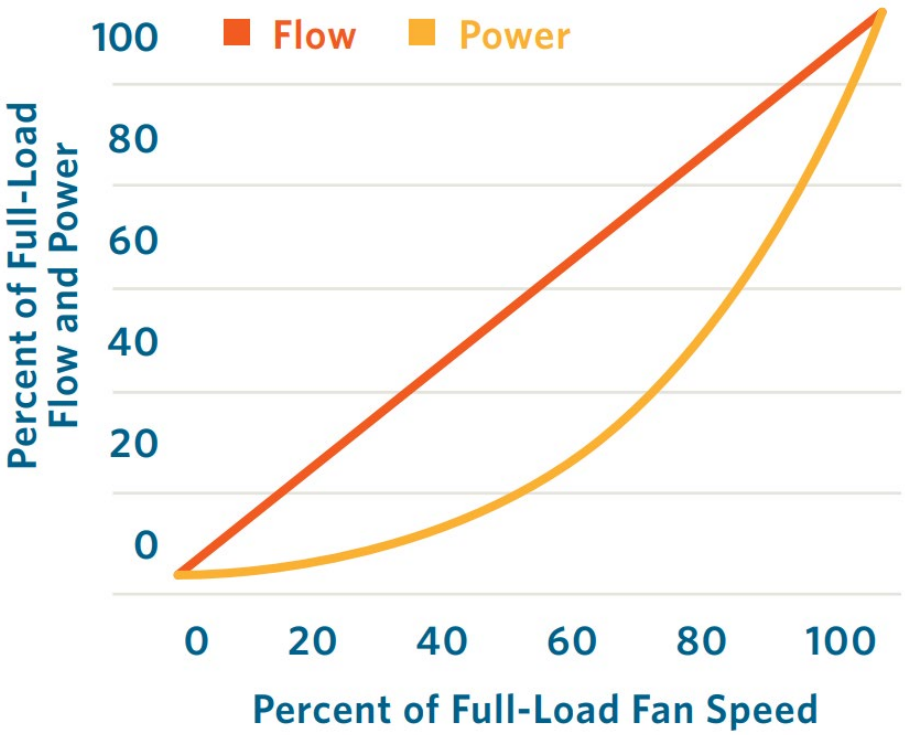


- Crane, conveyor, positive displacement pumps (most air compressors), saws
- kWh =torque * speed * hours

Constant power loads

- These are loads where less torque is required as the speed increases
- Think about chopping wood (actions where momentum is your friend)
- Chippers, milling machines, lathes, grinders, winders
- kWh = torque * speed * hours

Variable torque loads



- Torque required reduces substantially as speed reduces
- Centrifugal fans & pumps, agitators

Brentwood Corporation

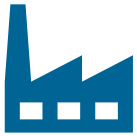
- On-demand Dust Collection System
- Including VFDs, isolation gates and master controller
- ~$500,000 in project cost
- $257,600 cash incentive
- 1,300,000 kWh/year savings
- $86,000 est. annual energy cost savings

"This is one of the most compelling capital projects we have ever completed because it offers real dollar savings in electricity and is not dependent on changing market or business demands..."

Dan Wagner, plant engineering and maintenance manager, Brentwood Corporation

VFDs and their Application for Energy Savings

Variable torque loads are the gold standard



Industrial + manufacturing facilities

<u>Airflow systems</u>
Dust collection
Process
Ventilation
Boiler combustion air fans

<u>Pump systems</u>
Primary process pumping
Heating and cooling water loops

<u>Agitators</u>

Agriculture, nurseries, dairies, irrigators

Ventilation systems
Dust collection
Agitators
Irrigation pumps
Boiler combustion air fans

Water + wastewater treatment facilities

Centrifugal blowers
Intake and discharge pumps
Pump and lift station pumps
Agitators (mixing)
Distribution pumps
Well pumps
Booster pumps

Other VFD applications for energy savings

Run time reduction

Will the installation allow for more off time?

Damped flow or bypass

Intake or discharge dampers

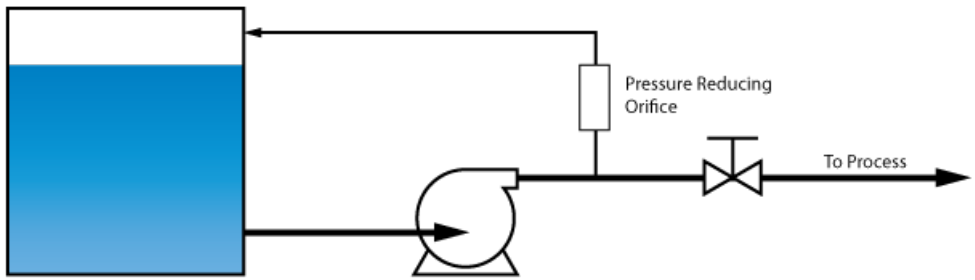
Throttling valves

Inlet guide vanes

Recirculation/bypass

Upstream or downstream optimization

Does adding speed control improve the operation of the upstream or downstream equipment/processes?



Conveyor discussion

- Does slowing a conveyor down reduce power required at the drive motor?
- Does it reduce the energy required to move the product?
- Is there any opportunity for energy savings?

Dust collection fan motor?

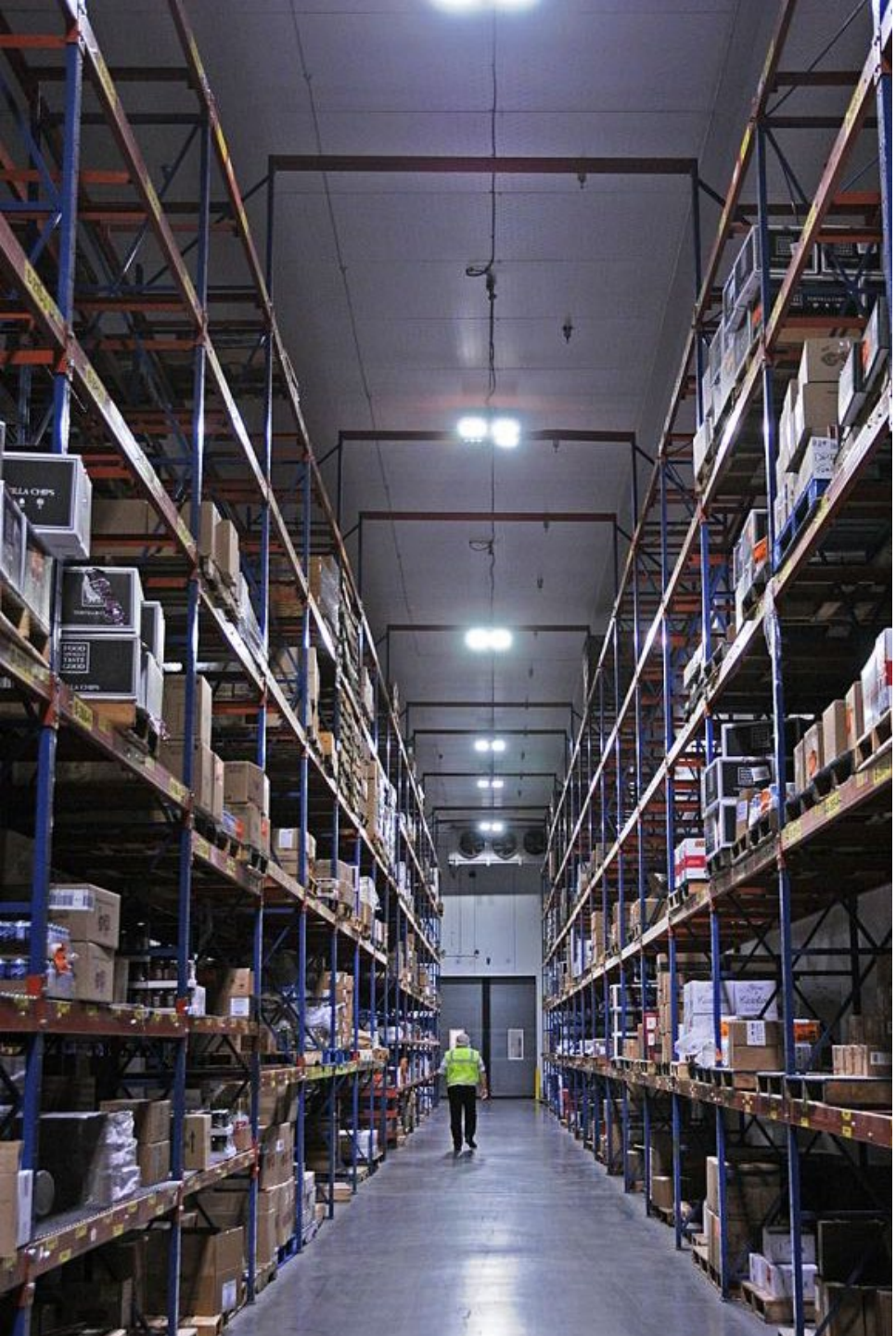
- Does slowing down reduce power required at the drive motor?
- Does it reduce the energy required to move the same volume of air?
- Is there an opportunity for energy savings?

What other examples are you curious to discuss?

- Chipper?
- Well pump?
- Air compressor (AKA positive displacement pump)
- Cooling fan?

Questions to ask?

- How will the VFD change the system's operation?
- Will speed control improve operation of upstream or downstream equipment?
- Is the current system throttled, restricted or bypassing in some way?



VFD incentives

- Rebates:
  - New pumps up to 22.5hp
  - Fans up to 22.5hp
  - Irrigation pumps up to 25hp
- Incentives for VFDs over that size need to be calculated
  - $0.30/kWh
  - Up to 70% of eligible cost!

Energy Trust of Oregon

When to check in with Energy Trust of Oregon

- Are you building a new or adding on to your facility?
- Is the company considering capital equipment or controls purchases?
- Are you going through significant changes in production or occupancy?
- Do you want to investigate system optimization?
- Do you have sustainability or CO2 reduction goals?

Thank you

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