ENGINEERING
TOMORROW

Welcome to

CII GREENCO FORUM

Presented by : Anubhav Jha

GreenCO Mission: Improving Environmental Performance

by

Saving Natural & Financial Resources

Energy audit

- To reduce **energy costs**, a company should evaluate its **energy usage**
- An **energy audit** is a systematic examination of applications, capacity utilization.
- It also includes monitoring of **energy consumed** before and after

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How can we save Energy & Money?

- Saving Utility Expenses
- Saving Installed costs ->long term inefficiency ?
- Saving Maintenance costs

Energy audit

Utility Energy Saving & Cost Savings Estimations

- Energy cost
- Energy Efficiency
- Energy Efficient Equipment
- Power factor quality
- Demand at the time of start

The facts

65% of global industrial electricity is used by electric motors and 80% of cases Motors are Oversized causing in-efficiency.

The savings

20% of electricity is lost through traditional mechanical control

The finance

For every 1 USD spent on the capital costs of an electric motor, 100 USD will be spent running it over 10 years

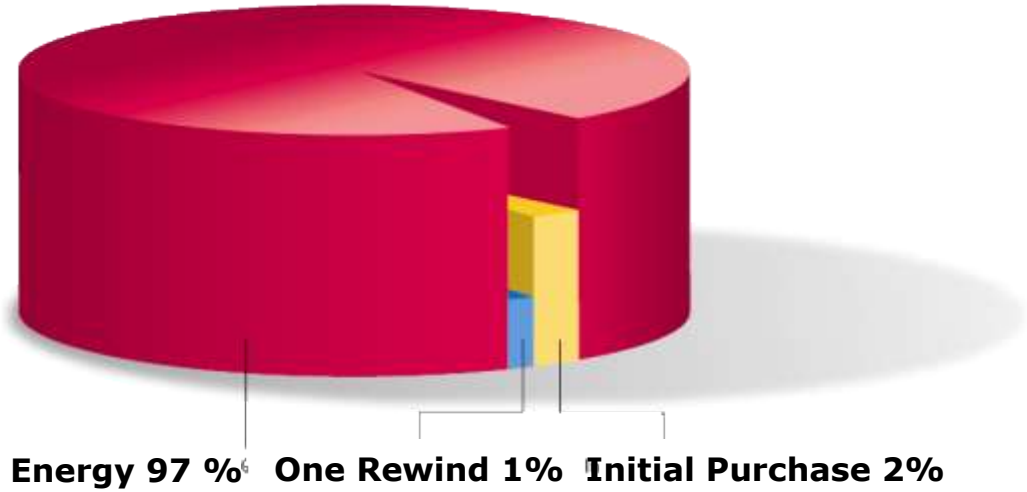
The products

FACT *Electricity used to drive motors produces an estimated 67 million tons of $C0_2$ annually and 12 percent of national greenhouse gases*
50% of total emission, results from Motor Use

What wastes energy?

- Oversized installations (motors, pumps, fans etc.)
- Un-necessary mechanical controls
- Inefficient motor applications
- Equipment running unnecessarily long hours
  - Stirrers on empty tanks
  - Deadheading pumps
  - Ventilation fans running 24/7
  - …and 1001 other applications

Life cycle cost of a motor



- Motors use 65% of electrical energy in sourcing units
- Motors run at less than 60% load and therefore low efficiency
- Motors can easily use their cost within 2 months of electricity charges
- Many motors run without control equipment (drives), where this would be energy and cost efficient
- Historically motors have been oversized “to be safe”

How to Save Energy Wasteage in Motors?

By Motor Speed Control as per Capacity Utilization

Same is Achived Using VFDs Variable Frequency Drives

What is Variable Frequency Drive?

What is Variable Frequecy Drive?

A variable speed drive converts the electrical power supply from fixed voltage and fixed frequency to a variable voltage and frequency – making it possible to adjust the speed of a standard electrical motor.

$$\text{Speed} = \frac{(120 \times \text{Frequency})}{\text{Poles}}$$

Why do you save energy?

Affinity laws of pumps/fans

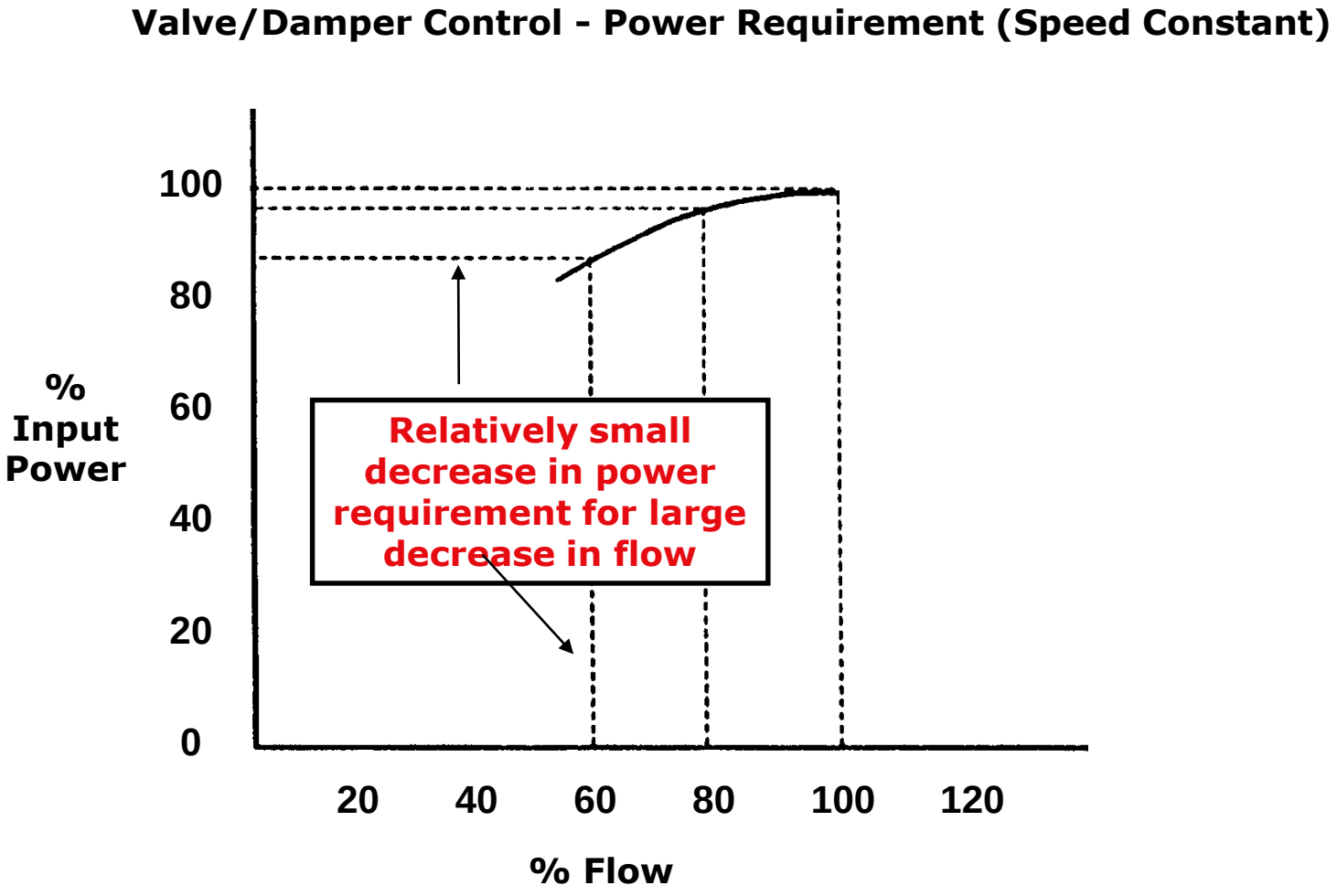
- Affinity laws decribes the link between speed (n), flow (Q), head (H) and power (P) of the pump.
- Specially the link between P and n is essential in when optimazing the energy consumption of the pump
- The power (P) needed is proportional to the cube of the speed (n) or flow (Q)
- Reduced Flow = Reduced Power

Flow $\frac{Q_1}{Q_2} = \frac{n_1}{n_2}$

Head $\frac{H_1}{H_2} = \left(\frac{n_1}{n_2}\right)^2$

Power $\frac{P_1}{P_2} = \left(\frac{n_1}{n_2}\right)^3$

Why do you save energy?



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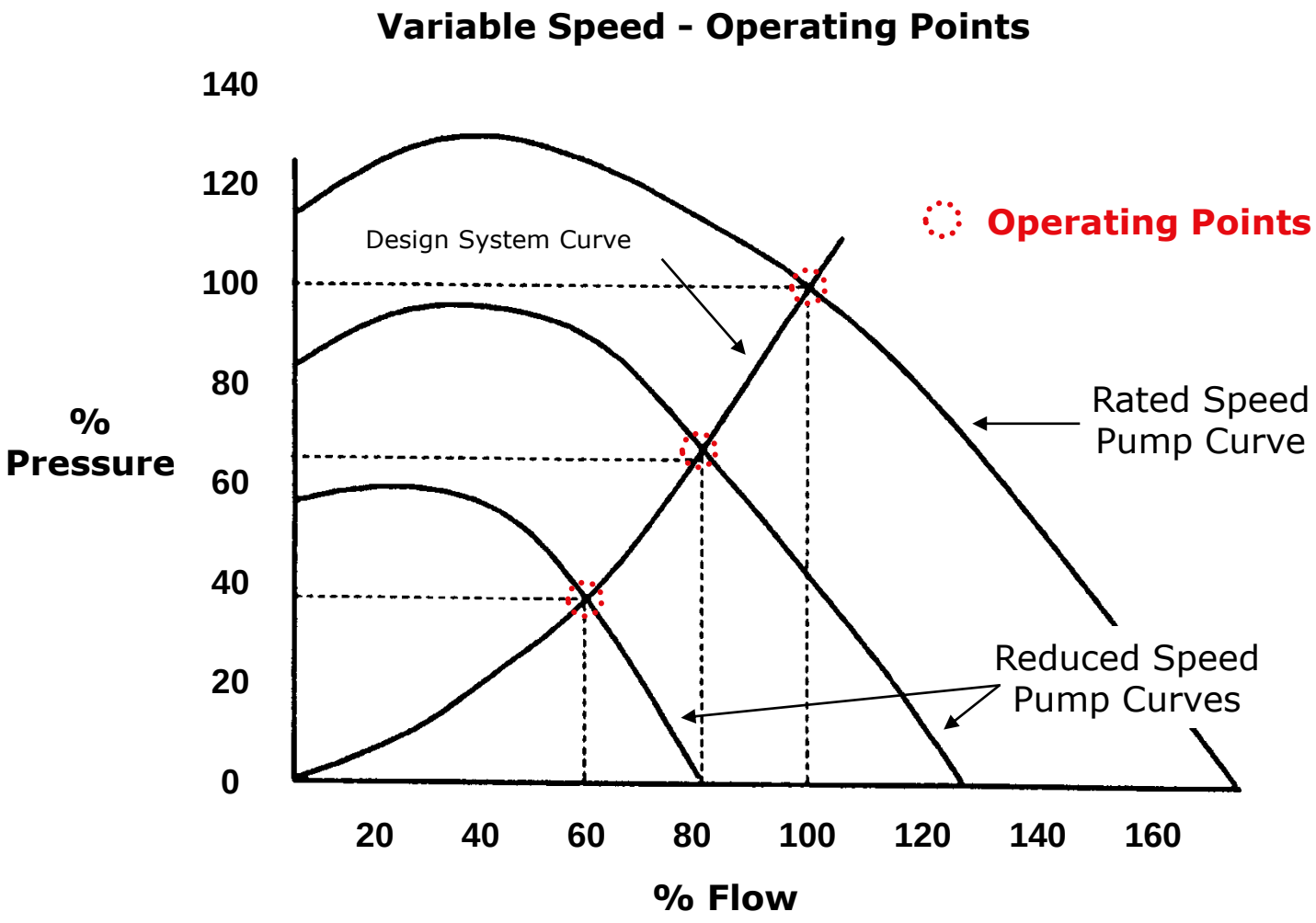

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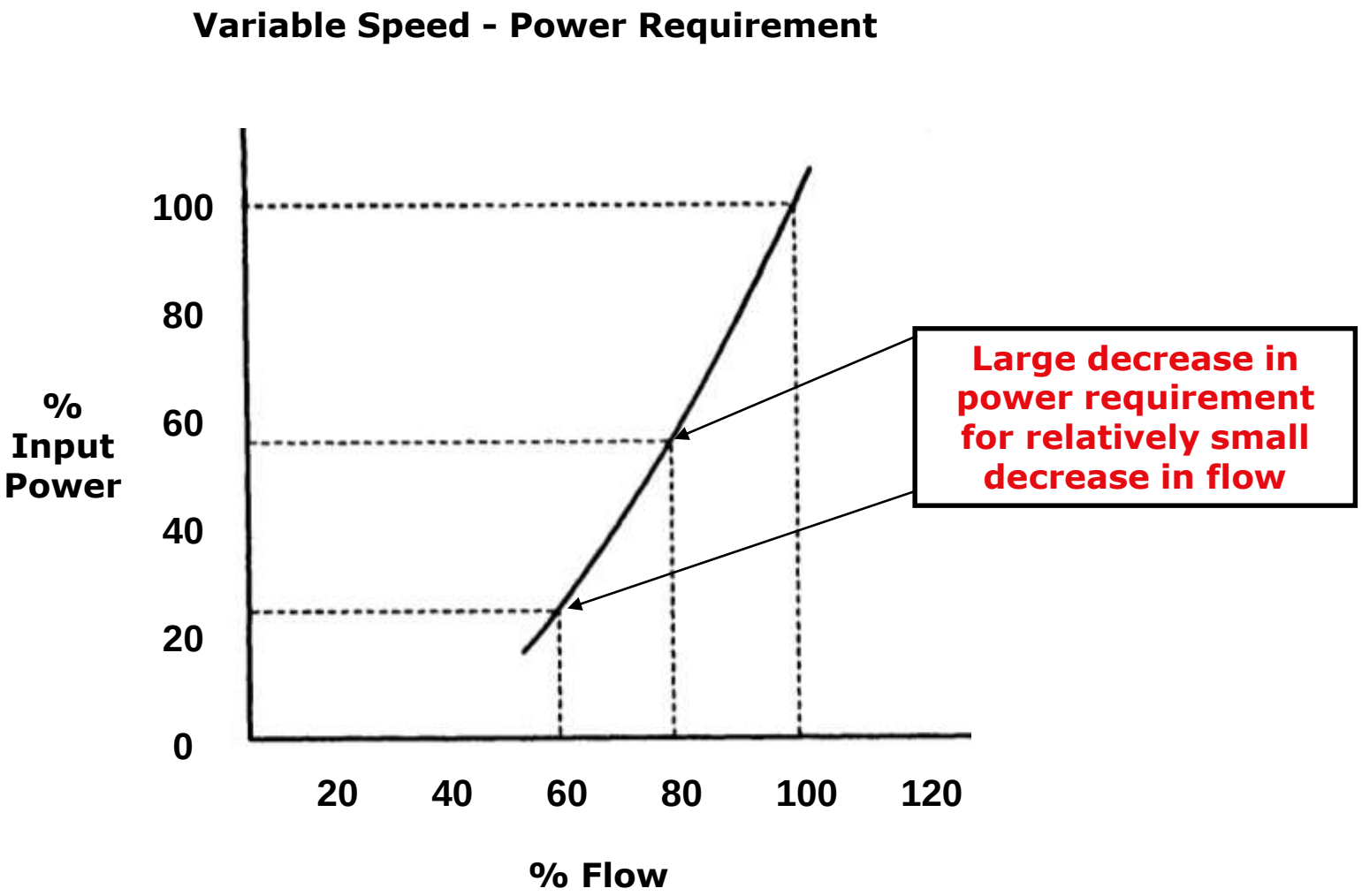


CONSIDER THIS

- 95 % of AC Motors have no Controls.
- 50% of above are used in Fan and Pumps.
- Majority of them are over sized.
- Typical controls are Dampers and Valves .
- Applications like Compressors, Pumps and Fans use vast amounts of Energy.
- An average Motor consumes its own value in Energy in approx. 40 days of running.

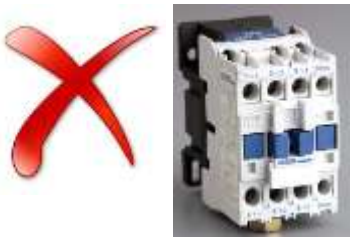
The action

Running a motor with a variable frequency drive at 80% speed only requires slightly more than 50% of the energy

Key Benefits to use VFDs

- Saves energy – “excess capacity” of systems
- Better regulation and control of the Process
- Reduces overall equipment and installation costs
- Reduces maintenance costs due to smooth start.
- Reduces installation costs.
- Reliable Start/Stop & Synchronization
- Reduction in Maximum Demand
- Starting Current restricted to 100% of full load current.
- Improved Power Factor.
- Huge Energy Saving with Nominal Speed Control

Additional Benefits of Using Variable Frequency Drives



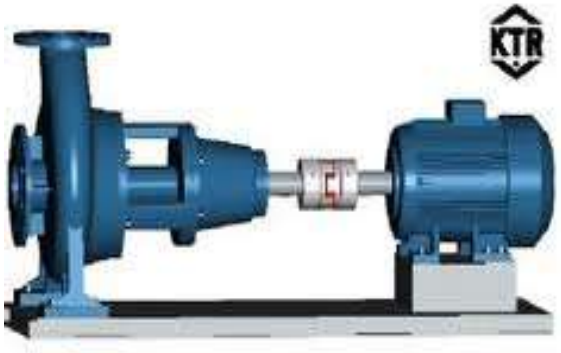
Eliminate starters /Contactors

Eliminate PF correction capacitors

Eliminate Protection devices OLR,SC,Single phasing etc

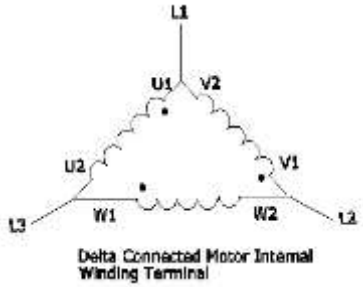
Eliminate measuring devices like Ammeter ,Voltmeter etc

Additional Benefits of Using Variable Frequency Drives



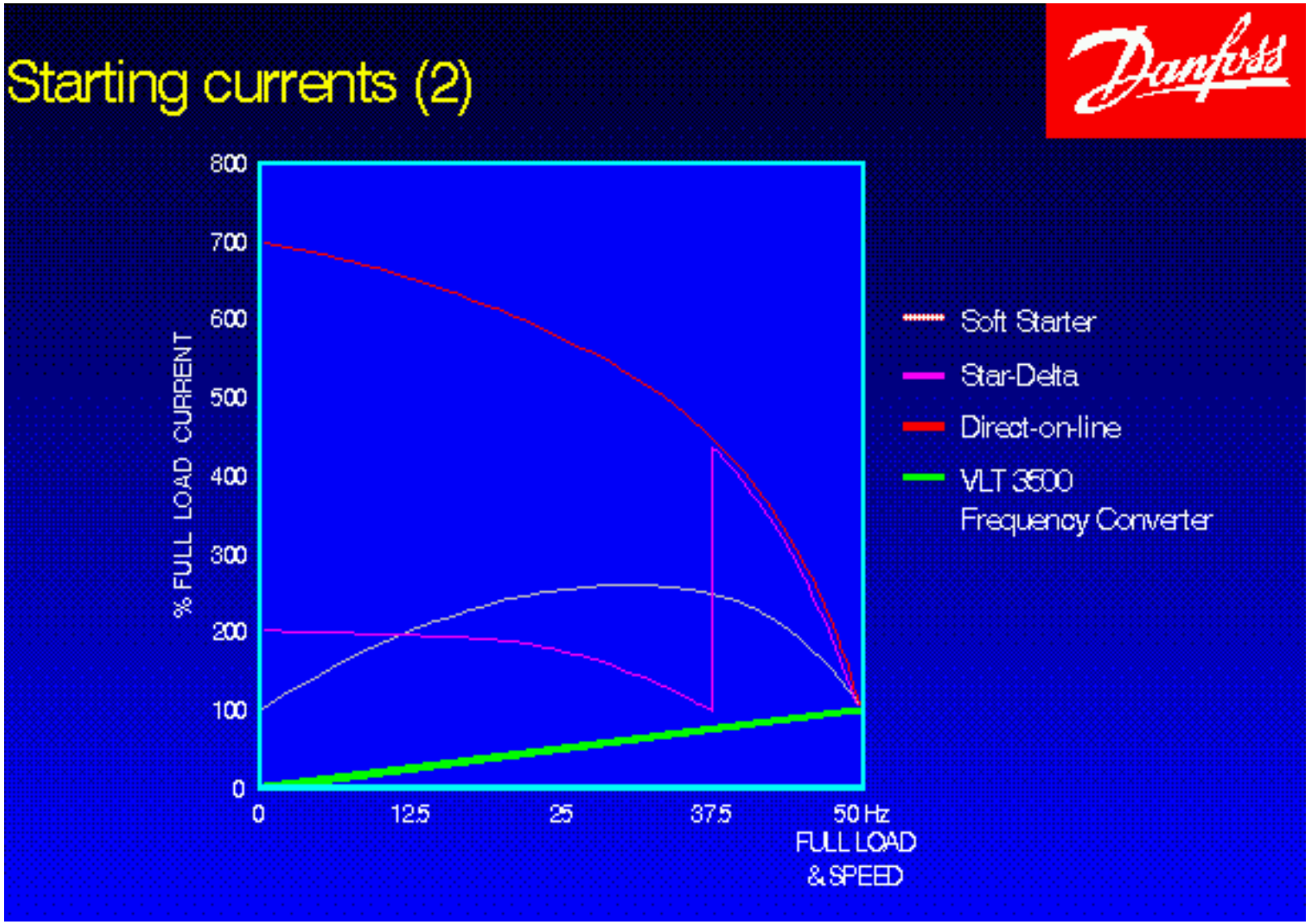
Reduces Mechanical stress due to smooth start.

Reduces Maximum demand. (Examples on Next Sheet)



3 wire system instead of 6 wire.

Starting Current Comparison



Cooling tower

- Cooling towers typically use banks of fans, each feeding cooling cells
- Within cells, fan moves outside air through a spray of water, allowing heat to dissipate
- With variable speed control, the energy saving can be 60%
- With 100 kW total motor power and 4,000 h/year, this means:

Energy saving	About 200 MWh/year
CO_2 reduction	100 tons/year
Segment and application	HVAC, fans

Tyre manufacturer

- A tyre manufacturer replaced a hydraulic drive with a 500 kW AC drive for its new rubber mixer
- Estimated energy savings was 20%

Energy saving	About 400 MWh/year
CO_2 reduction	200 tons/year
Segment and application	Plastics and rubber, mixer

Plastics manufacturer

- A plastic film manufacturer upgraded its 93 kW compressor with AC drives and saved 37% off its energy bill
- After sealing all leaks, a transducer was installed to monitor system pressure
- Improvements are expected to save 8,000 Euro per year or 235,000 Euro over the installation's lifetime

Energy saving	About 203 MWh/year
CO_2 reduction	89 tons/year
Segment and application	Plastics and rubber, compressor

Chemical industry plant

- A chemical plant in China replaced its existing constant speed acid pumps and fans control with 8 x AC drives totalling 977.5 kW
- Applications run about 8000 hours a year
- 37% average energy saving
- Payback is about 6 months

Energy saving	About 1,200 MWh/year
CO_2 reduction	600 tons/year
Segment and application	Chemical, pumps and fans

Danfoss Drives is the leader in driving customers applications

A better tomorrow is
driven by drives

Danfoss Group Global

CLIMATE

While meeting the global climate challenge, our products also contribute to human productivity and well-being indoors by optimizing heating, ventilation and air conditioning systems.

FOOD

Our solutions meet the constant need for more and better food by improving agricultural productivity and keeping food fresh all the way to consumers with minimum waste.

ENERGY

No matter what we do, the goal is to optimize performance, increase efficiency and minimize waste. This means that our technologies enable our customers and society as a whole to get more from less.

INFRASTRUCTURE

We help build the roads, buildings and energy systems for the world's growing cities and support progress for people, communities and businesses across the world.

Danfoss **Segments**

DANFOSS POWER SOLUTIONS

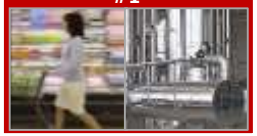
Hydrostatics #2

Work Function #1

Controls Division #2

DANFOSS COOLING

Automatic Controls #1



Commercial Compressors #2

Industrial Automation

DANFOSS DRIVES

Low Voltage Drives #2

Renewable #1

SMA

Silicon Power #6

DANFOSS HEATING

Residential Heating #1

District Energy #1

Hydronic Balancing #2

Your local AC drives partner

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