

WELCOME

KISHOR PUMPS

HIGH TECHNOLOGY TAILOR-MADE PUMPS

...SINCE 1963



WELCOME

Presentation on:

“Energy Efficiency in Wastewater Pumping Systems”

By:

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For:

CII, IPMA & SIEMA organised

National Conference on Pumps

Theme: Energy Efficiency in Pumping Systems

Coimbatore

21 November 2009



Overview

What is Energy Efficiency?

Why to achieve Energy Efficiency?

How to get to Energy Efficiency in Wastewater Pumps?

1. *Selecting the right pump for the application*
 - a) *Process duty or transfer duty*
 - b) *Solids content*
 - c) *System curve characteristics*
2. *Selecting the proper & suitable pump control system*
3. *Ensuring proper maintenance of pumps & piping*



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Energy efficiency in pumps consists of:

- a) **Electrical Efficiency** i.e. efficiency of electrical components.*
- b) **Mechanical Efficiency** i.e. efficiency of mechanical components of the pump.*
- c) **Hydraulic Efficiency** i.e. how efficiently the desired liquid is being delivered to the desired point.*



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For wastewater pumps, energy efficiency involves methodologies and practices to deliver the wastewater from the source to destination with minimal consumption of energy.



What factors affect energy efficiency?

The operational parameters that affect the efficiency of pumps for wastewater applications are:

- a) The characteristics of the liquid being pumped:
 - Solids content, lesser the better**



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Why energy efficiency?

Energy efficiency offers a powerful and cost-effective tool for achieving a sustainable energy future.

Improvements in energy efficiency reduce the need for investment in energy infrastructure, cut fuel costs and increase competitiveness.

Environmental benefits can also be achieved by the reduction of greenhouse gas emissions and local air pollution.



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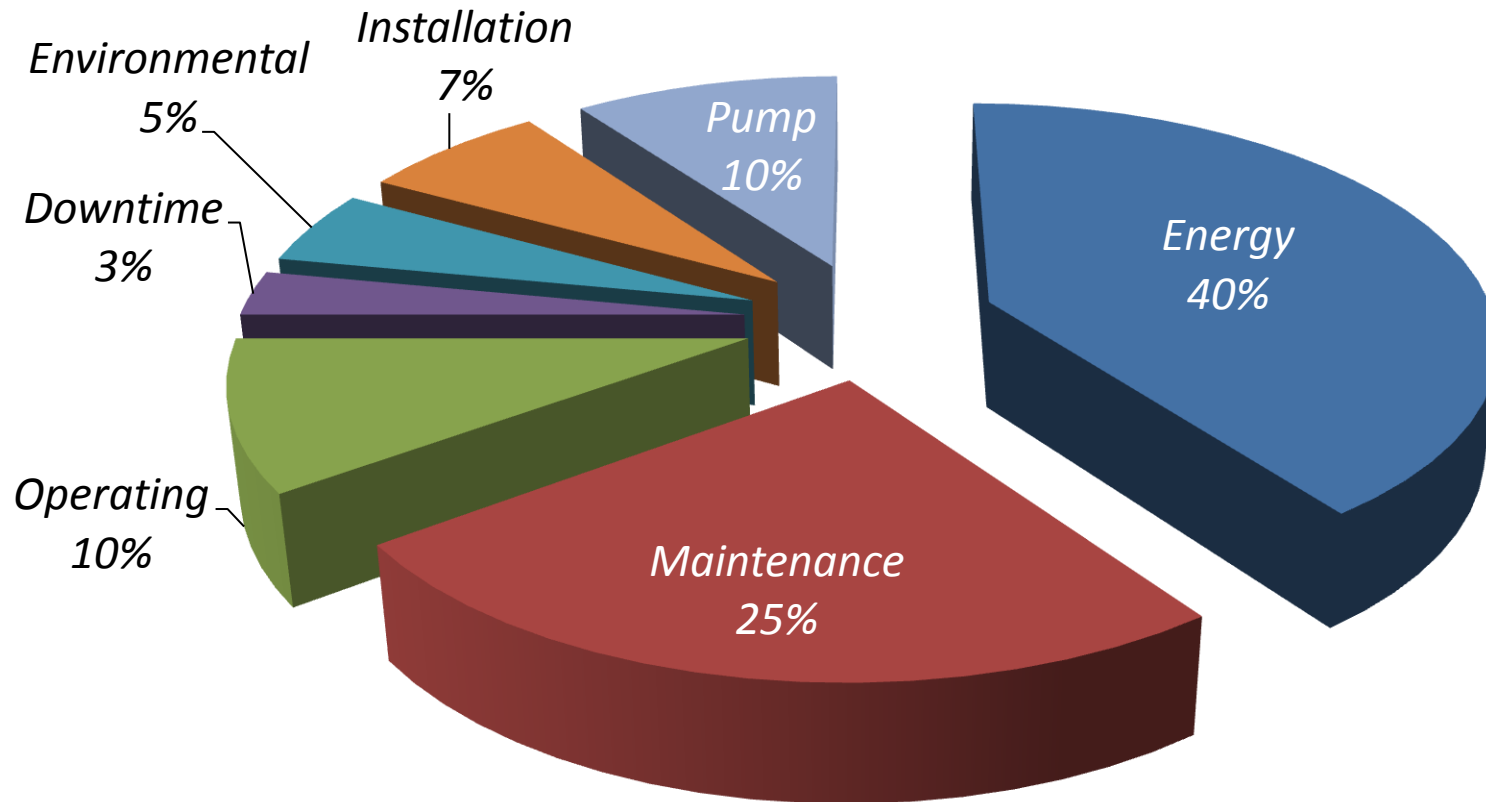
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“An improvement of 20% in energy efficiency can help avoid capacity addition of around 30,000 MW. This, in turn, can save investments worth Rs 1.2 lakh crore and which is about 25% of the 5 lakh crore in investments required.” - Hon. Sushil Kumar Shinde, Power Minister

Why energy efficiency?

Typical Life Cycle Cost of a Wastewater Pump



Energy consumes about 40% of the operational cost over the lifecycle of the pump

Source: Hydraulic Institute



Why energy efficiency? - *Negawatts*

Negawatt is a megawatt of power avoided or saved from use on the energy grid.



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Negawatt is a megawatt of power avoided or saved from use on the energy grid.

Factoring in the line distribution losses, a kWh of energy saved at the point of consumption translates into a much larger saving upstream in the electricity supply chain.

Why energy efficiency? - *Negawatts*

Power Plant: 100 kWh
generated with app. 30% eff.



10 - 15%
loss



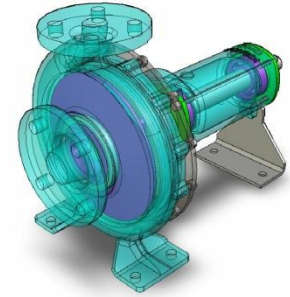
Transmission to Distribution
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App. 55 kWh available
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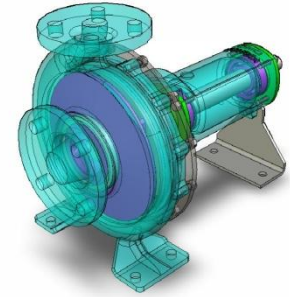
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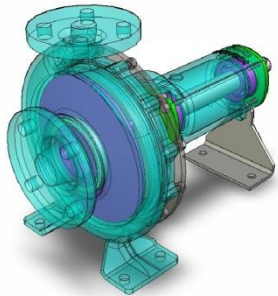
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App. 55 kWh available at pump out of 100 kWh generated



Save 1 kWh at pump



15 - 20% loss per kWh eliminated



Transmission to Distribution losses per kWh eliminated @ app. 20%



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Power Plant: Eliminate need to generate app. 12 kWh



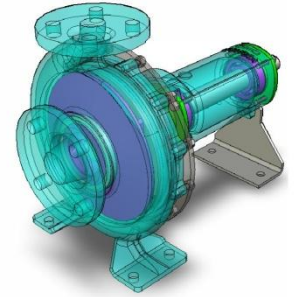
Why energy efficiency? - *Negawatts*

Losses in system

100 kWh generated

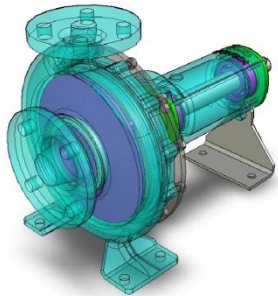


~55 kWh available



Eliminate losses in system

Save 1 kWh at pump

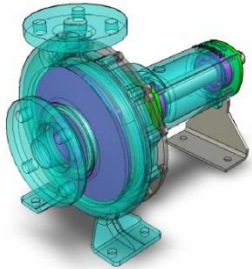


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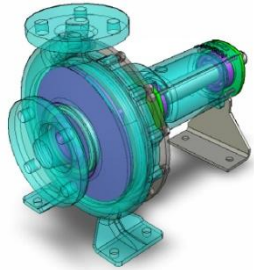
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For Indian grid conditions, 1 kWh of energy saved in pump operation results in the elimination to generate about 12 kWh.

Pumps in industry and agriculture consume app. 35% of the electricity generated. India generates about 850 TWh of electricity.

*If only 1,000,000 pumps save just 1 kWh per day, it will eliminate the need to put up **one 1,000 MW power plant.***



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What factors to consider while selecting the right pump for wastewater pumping?

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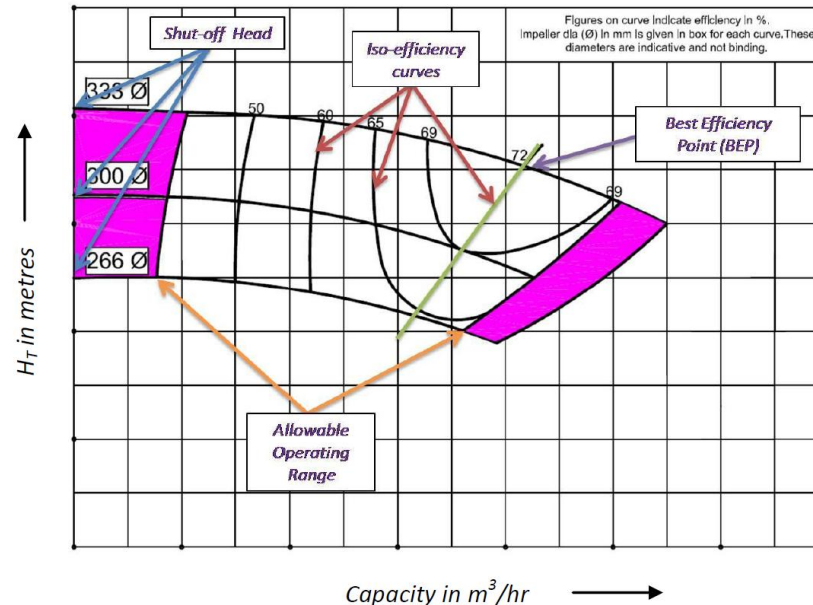


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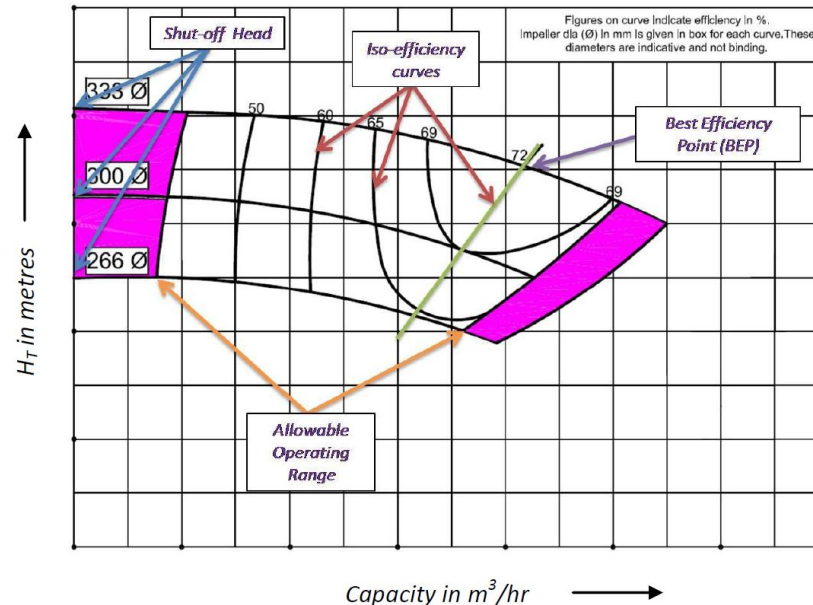
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- *Most wastewater pumps used for transfer duty – desirable to operate smaller pumps for longer time than larger pumps for shorter time.*



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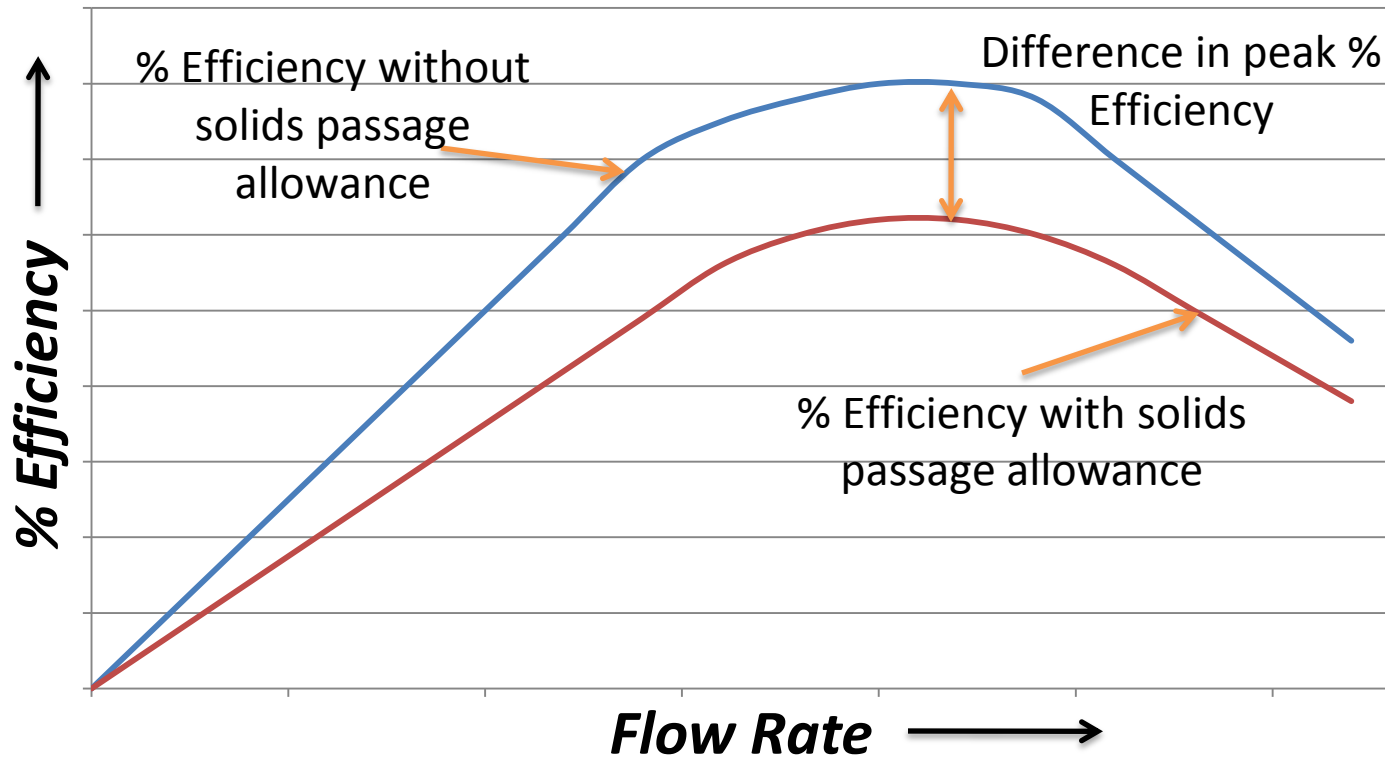
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 - d) In jacketed submersible pumps, choking of jackets reduces the efficiency since motor heats up.

How to achieve energy efficiency?

- Solids Content: Two pump with same duty points & power rating

Difference in % efficiency with and without solids passage allowance

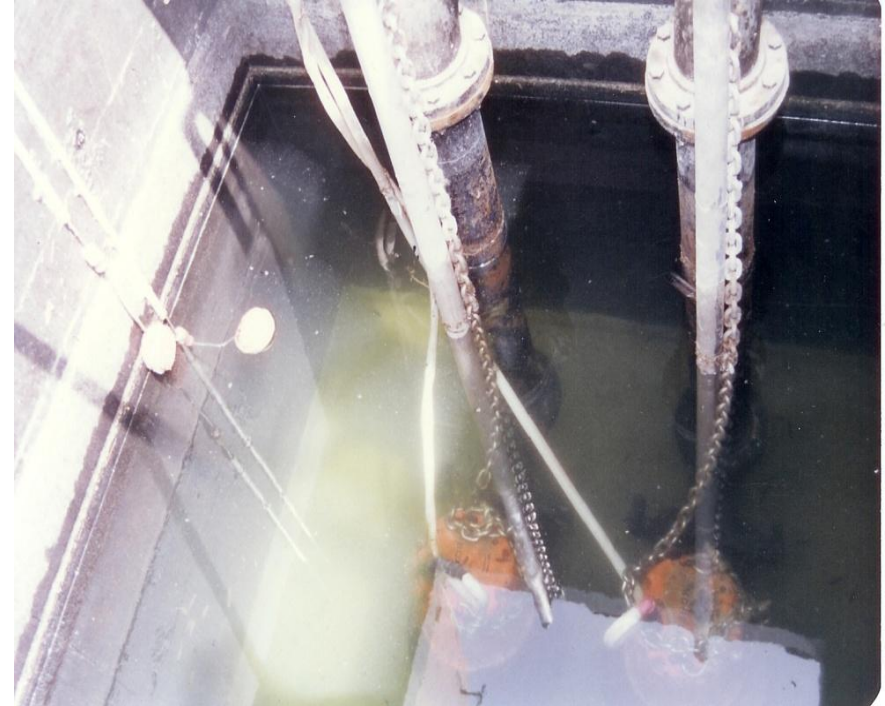


How to achieve energy efficiency?

- *Solids Content*



*Indian sewage
for recycling*



*Singapore sewage
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 - Eliminate all NRVs and joints (so piping losses go down).*
 - Velocity of liquid from pump can be adjusted to prevent fouling.*
 - For Sewage: Velocity of 3.5 m/s for vertical piping*
 - Velocity of 3 m/s/ for horizontal piping*



How to achieve energy efficiency?

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 - *Take the pump to the pipeline and not the pipeline to the pump to ensure an energy efficient pumping system.*



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- *System curve characteristics*
 - *Take the pump to the pipeline and **not** the pipeline to the pump to ensure an energy efficient pumping system.*
 - *Periodic review of duty points is essential.*
 - *Essential to design piping to avoid air traps. Especially essential for wastewater / sewage applications since gases may occupy the air traps.*



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How to achieve energy efficiency?

2. Selecting the proper & suitable pump control system:

Various methods are available for controlling pump systems for wastewater applications:

- a) variable speed control,*
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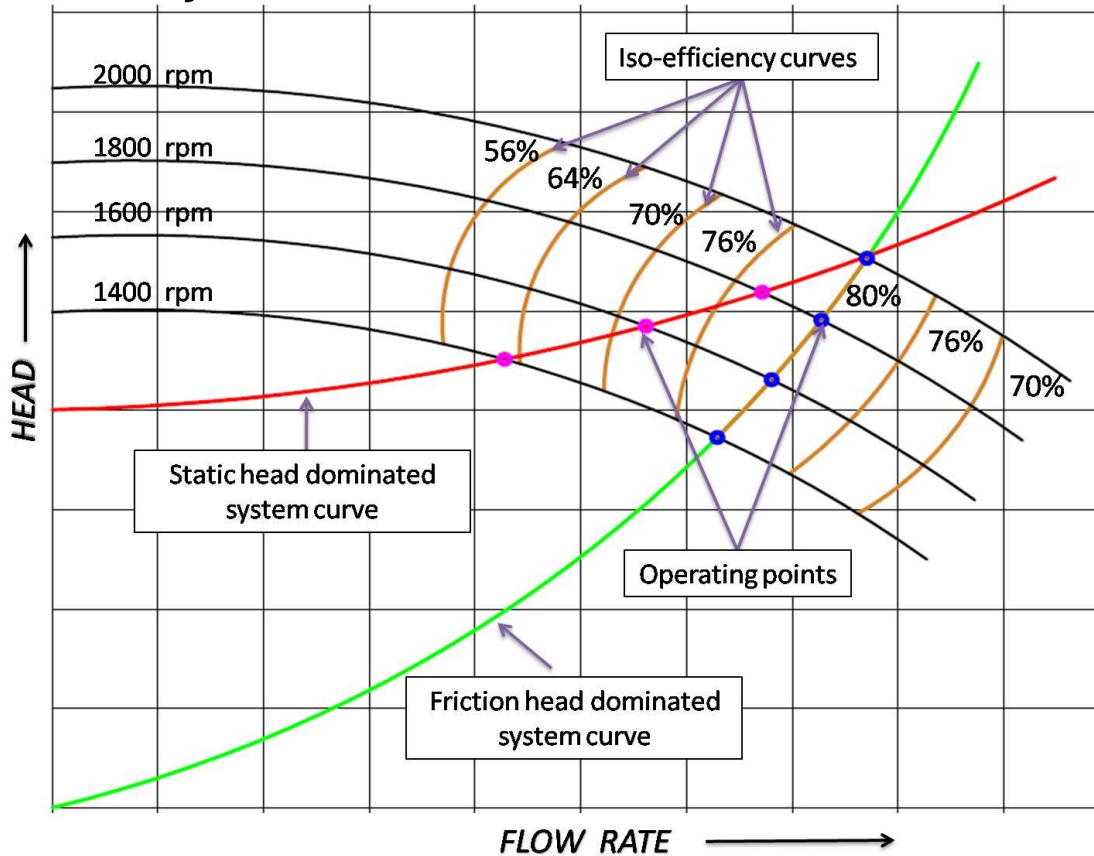
In general, variable speed control provides more efficient system operation than either throttle control or stop/start control.

For many wastewater pumping applications, installing a variable speed control onto a pumping system for transfer duty might introduce redundancy in the system since stop/start control is already present.

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Variable speed control systems are most effective in friction head dominated systems.





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Stability of electricity supply is essential.

Power factor to be maintained above 0.95 by capacitive banks to ensure minimisation of reactive power and increased motor efficiency.



Summary

Energy efficiency is about using less energy to provide the same level of service.

Energy efficiency of wastewater pumps depends primarily on the characteristics of the liquid being pumped and the system in which they operate.

Achieving energy efficiency in pumps critical for alleviating power shortage in India since a huge chunk of electricity generated is consumed by pumps. It also helps in reducing gas emissions.

Selecting the right pump for the wastewater duty is the first important step to achieve energy efficiency. Consideration should be given to the type of duty, the amount and characteristics of solids & the system characteristics.



Summary

Controlling the wastewater pumping system with suitable electronic or mechanical control systems is essential to reduce energy wastage and improve efficiency.

Various methods are available for controlling pump systems for wastewater applications like variable speed control, stop/start control & throttle control, out of which variable speed control is most efficient but has operational limitations.

Important to reduce the losses in the pipeline to reduce energy requirement.

Routine cleaning of piping systems is essential to maintain optimal performance of the pumping system.



THANK YOU

KISHOR PUMPS

We will be happy to serve you!

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