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Energy Efficiency - Good for the Economy and the Environment



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F O R E W O R D

The ever increasing demand for electricity can be met only by developing sustainable and pollution-free energy sources as well as efficient power (energy) conversion methods. The world's population is rising and needs more power by the day. Changes in lifestyle, use of new innovations and inventions in households and industry and increasing urbanization demand more energy. To meet those demands and ensure reliable energy supply, there is a need for sustainable energy.

There is a synergy between sustainable energy and energy efficiency. More sustainable energy reduces the demand for energy and greater energy efficiency results in higher shares of sustainable energy. Energy efficiency is one of the easiest and most cost-effective ways to combat climate change, clean the air, and save consumers and businesses money.

Energy- efficiency and conserving technologies provide options to maintain social welfare with less energy and less environmental damages. Taking small steps towards adopting eco-friendly products has a huge impact on energy conservation that will help humans in the long run.

Improving the energy efficiency meets the dual objectives of promoting sustainable development and of making the economy competitive. Ministry of Power,

through Bureau of Energy Efficiency (BEE), has initiated a number of energy efficiency initiatives in the areas of household lighting, commercial buildings, standards and labeling of appliances, demand side management in agriculture/municipalities, small and medium scale enterprises and large industries including the initiation of the process for development of energy consumption norms for industrial sub sectors, capacity building of State Designated Agencies etc.

Saving energy means being resourceful to take actions like insulating and weather-stripping your home around draughty doors and windows. Purchase energy saving products which are Energy Star certified like high efficiency domestic appliances such as washing machines and refrigerators. There are many other ways to promote energy efficiency and save energy in your home. Present issue points out that conserving and saving energy is the need of the hour because the sources that provide energy for the generation of electricity are being depleted faster than they are being regenerated. It reports the comparative test results of energy efficient bore-well pumps useful to lift the ground water. This energy analysis will help consumer to choose option for energy conservation and energy cost reduction.

Saving Energy: A need of the Hour



Energy is one of the most vital aspects in the human life cycle. We need energy for almost everything in our life like from energy we cook, use electrical appliance so all in all it is energy that keeps our life running. Save energy involves both conservation and efficiency.

Efficiency and Conservation

Energy is more than numbers on a utility bill; it is the foundation of every thing we do. All of us use energy every day—for transportation, cooking, heating and cooling rooms, manufacturing, lighting, water-use, and entertainment.

Efficient energy use make our lives comfortable, productive, and enjoyable. Sustaining this quality of life requires the careful management of resources includes reducing total energy use and using energy more efficiently. The choices we make about how we use energy—turning machines off when not in use or choosing to buy energy efficient appliances—will have increasing impacts on the quality of our environment and lives. There are many activities where we can use less energy and use it more wisely. These things involve energy conservation and energy efficiency.

Many people use these terms interchangeably, however, they have different meanings. Energy conservation includes any behavior that results in the use of less energy. Energy efficiency involves the use of technology that requires less energy to perform the same function. A compact fluorescent lightbulb that uses less energy to produce the same amount of light as an incandescent light bulb is an example of energy efficiency. The decision to replace an incandescent light bulb with a compact fluorescent is an example of energy conservation.

As individuals, our energy choices and actions can result in a significant reduction in the amount of energy used in each sector of the economy. Energy efficiency and conservation are most economical solution to energy shortages.

Energy efficiency and Climate change

Energy efficiency is a critical tool for meeting our energy needs cheaply and fighting climate change. It is good for the economy, good for the environment and good for consumers' wallets.

Energy efficiency gained ground in 2015, demonstrating that there is a strong support for



smarter energy use that spurs innovation, creates jobs, lowers utility bills and cuts pollution.

The Special Report on Energy and Climate Change, part of the World Energy Outlook series published by the International Energy Agency (IEA) in 2015, found that while global energy-related emissions slow as a result of the climate pledges, they still increase. To compensate, governments need to ramp up efforts, review their pledges regularly, set realistic and attainable longer-term goals and track their progress. The report presented detailed energy and climate analysis for the sector and recommended four key pillars- Peak in emissions, Five-year revision, Lock in the vision and Track the transition for securing the legacy of climate change.

UN Environment has also a wide portfolio of energy efficiency activities covering transport, building, lighting, district energy and the appliance sectors. It also integrates energy efficiency into its sustainable production and consumption activities. With its partners, UN Environment continues to strengthen the business case for energy efficiency in developing and emerging economies, enabling them to reap economic and environmental benefits, including the alleviation of poverty. UN Environment also works with the Sustainable Energy for All Initiative's (Sef or ALL) Global Energy Efficiency Accelerator Platform.

United Nations Development Programme (UNDP) with support from the Green Climate Fund is also

encouraging market demand for public and private investment in energy efficiency through a combination of policy, financial de-risking and direct incentives.

An Op-EdEnergy efficiency slows climate change, saves money appeared in "USA Today" on January 27, 2020 where writer Forest Bradley-Wright opines that the choices we make in the next decade will either lock us into a future of fossil fuel dependence or transition us toward a clean energy future. Energy efficiency has the power to replace dirty fossil fuels and decarbonize the energy sector.

To cut energy costs, there is a need to made changes around our home such as switching to light-emitting diode light bulbs, adding insulation, or replacing outdated appliances or heating systems. If so, we have already participated in energy efficiency, which simply means reducing waste.

Energy- efficiency and conserving technologies does not only provide environmental benefits, it also provides jobs and economic growth while helping to alleviate nation's dependence on energy.

Source: <https://www.need.org/Files/curriculum/infobook/EfficiencyS.pdf> [https://webstore.iea.org/download/summary/538? fileName=French-WEO-Climate-2015-ES.pdf](https://webstore.iea.org/download/summary/538?fileName=French-WEO-Climate-2015-ES.pdf) <http://www.indiaenvironmentportal.org.in/files/file/WEO2015SpecialReportonEnergyandClimateChange.pdf>, <https://www.eesi.org/topics/climate-change/description>

Energy Saving Borewell Pumps: A comparative Study

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India is one of the fastest growing economies of the world. A critical input for growth and development is energy production and consumption. At the same time this has adverse impacts on the environment through CO₂ emissions and waste generation which is a global issue.

For the enhancement of energy efficiency in the country as a whole, there has to be a simultaneous increase in the production and consumption of energy efficient products

Our country is balancing the development strategies by limiting the environmental deterioration with appropriate technology and developing legal and regulatory framework to enable carbon capture and sequestration.

To promote energy efficiency in India, Government has supported Promotion of energy efficient products and Adoption of energy efficient technologies.

Bureau of Energy Efficiency (BEE) is an agency of the Government of India, under the Ministry of Power created in March 2002 under the provisions of the nation's 2001 Energy conservation Act. The function of the agency is to develop programmes which will increase the conservation and efficient use of energy in India. BEE initiated the standards and labelling programme for equipment and appliances in 2006 to provide the informed choice to consumers about the energy saving. The energy efficiency labelling programmes under BEE are intended to reduce the energy consumption of electrical appliances.

Energy labelling aims to shift markets for energy using products and appliances towards greater energy efficiency. It helps consumers to understand which products are most efficient and influence to choose more energy efficient products.

The veracity of the labels can be verified by BEE and also by consumers through consumer organisations or any manufacturer or any person can challenge the

star rating label. If the manufacturer fails to comply with the directions of BEE, then the use of the label for that model is prohibited.

ISI mark on product denotes that the product is safe for use and quality and performance of product is as per relevant BIS standards.

Energy Star labelling on product is a hallmark for energy efficient products which comparatively consume less amount of energy resulting in less energy cost.

Borewell submersible pump-sets is one of the products covered under voluntary labelling scheme of BEE.

About the Borewell Pump-sets

Borewell submersible pump-sets are made of two units. Pump portion with stage casings in series, provided with impellers at every stage, coupled to unit and electric motor suitable for operation under water. Thus it is a device which has a hermetically sealed motor coupled to the pump. The whole assembly is submerged in the well and suspended with discharge piping. Motor is connected to power supply with cable supported on discharge pipe.



Borewell pump-sets are useful to lift the ground water from larger depths at economical cost.

The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between pump and the water surface. They are very much effective for pushing the water to surface.

Operating principle of Borewell pump-sets

Borewell pump-sets are installed in water and operated on electricity. Electrical supply is given to

the motor coupled with pump. Impellers inside the pump start rotating and this high rotational speed of impellers produce great amount of centrifugal forces. Due to this rotary energy is converted into the kinetic energy which lifts the water upwards. When this water passes through impellers, rotating impellers pushes the water through the diffuser where kinetic energy is converted into the pressure energy.

Thus energy conversion in two cycles helps to lift the underground water to the surface.

Need of Borewell Pump-sets

Consumers purchase the submersible pump to get rid of water problems. They need good water flow at sufficient water pressure for household chores and farmers need water throughout the year for irrigation and cultivation.

A domestic single phase borewell pump-set can typically raise water from depths of 30 feet to hundreds of feet and at water delivery rates of 15 lpm to 95 lpm depending on its capacity.

Single phase borewell pump-sets are available in horsepower ratings like 0.5 hp, 0.75 hp, 1 hp 1.5hp and 2.0 hp. These are widely used for domestic purpose (Bunglows and Tenements).

Three phase borewell pump-sets are available in horse power ratings like 3 hp, 4 hp, 5 hp, 6 hp, 7.5 hp, 10 hp, 12.5 hp, 15 hp & 20 hp. These are widely used in very big bunglows, big houses (2 to 3 storied) multi-storeyed flats, agricultural purpose, in commercial buildings and for industrial purpose.

Test findings

Ahmedabad-based Consumer Education and Research Centre (CERC) has undertaken a comparative testing project on submersible pump-sets to spread the awareness on benefits of purchasing energy efficient products. The Ministry of Consumer affairs, Food and Public distribution, Government of India funded for purchasing of the samples of pump-sets.

CERC tested 9 models of submersible pump-sets of 5 hp (3.7 kW) rating.

ISI mark and star labelling are not compulsory for submersible pump-sets. Only ISI marked borewell pump-sets are eligible for energyStar labelling.

Borewell pump-set marked with single star label denotes that the efficiency of pump-set is about 5% better than the minimum efficiency required by BIS for passing criteria (related to Head and Discharge declared by the manufacturer).

BEE label with two stars denotes that the pump-set efficiency is about 5% to 10% more than the minimum BIS efficiency.

Label with three Stars denotes that the pump-set efficiency is about 10% to 15% more than the minimum BIS efficiency.

Label with four stars denotes that the pump-set efficiency is about 15% to 20% more than the minimum BIS efficiency.

Label with five stars denotes that the efficiency of pump-set is more than 20% of the minimum BIS efficiency.

All nine models tested by CERC were marked with ISI mark and license number except one.

Three brands marked with five star labelling were found to be conforming to requirements as per BEE.

Borewell pump-sets which give better efficiency while consuming less power are best.

Samples marked with ISI mark and five star labelling were found to be best performers and energy efficient due to their overall quality of construction. Hence we recommend to purchase samples with ISI mark and five star labelling

Guarantee/Warranty

Normally manufacturers of pump-sets provide a warranty of one year from the date of purchase.

Out of nine models tested, seven were provided with warranty and only one was provided with a Guarantee against defect in material and workmanship for a period of 18 months (1½ year) from the date of dealer's invoice. While remaining one brand has neither given any guarantee nor a warranty.

CERC recommends to always collect invoice, warranty/guarantee card and information on authorised service centre from the dealer with his endorsement to get rid of future hassles regarding repairing and maintenance.

Feedback from Manufacturers:

After completion of testing CERC has sent test reports to manufacturers of each model separately with test results of their own brand/model.

All test reports were sent by registered AD and CERC has received acknowledgment receipts from all. CERC also asked manufactures about their concern for environmental safety.

Manufacturers have agreed with the test results and conveyed CERC to test their other models also. Most of the manufacturers also conveyed that they are providing instructions on disposal/recycling of products and packaging material in their operating instruction manual for environmental protection.

Important tips for selecting the Right Borewell pump-sets

Selecting the best pump as per need of a purchaser (amount of water required and product usage pattern) will save substantial time and money. It is very much important to decide the amount of water needed and purpose of buying the pump-set (exact usage pattern of pump). 'Decision on need of borewell pump' is very much important whether it is for tenement or bungalow, for irrigating a garden or small farm because purchasing a big capacity pump than the need will be a wastage of money and energy.

It is most important to know about the water level of the area where the pump will be installed. Depending upon the area, the sizing and rating of pump-set will be given by dealer/shopkeeper to get better water flow. Pump with more number of impellers help to get the desired pressure of water so pump stages will be suggested by dealer accordingly (Number of stages will be equal to number of impellers).

Motors with copper winding are most cost effective and environment friendly choice over the long run because conductivity of copper is better than Aluminium. Copper coil is most energy efficient and less subject to coolant leaks and easier to maintain and repair.

Borewell pump-sets are available with two varieties of impellers: Radial flow impellers and mixed flow impellers.



Submersible Pump
Radial flow Impeller
and Submersible motor

Submersible
Pump with Mixed
Flow Impellers

Pump-set with mixed flow impellers are used where more amount of water flow is required from deep ground. These are known as high discharge pump-sets. In this design, fluid is discharged at an angle less than 90° from the eye of the impeller. Borewell submersible pump-sets with mixed flow impellers

are most suitable for multi-storeyed and commercial buildings, agricultural and industrial purpose.

Pump-sets with radial flow impellers are useful where adequate water flow is required from deep ground. These are known as low discharge, high head (Pressure) pump-set. In this design of impellers, fluid is discharged at 90° angle from the eye of the impeller. Borewell submersible pump-sets with radial flow impellers and oil cooled type are most suitable for residential purpose. These are also used for vegetable farming and small farms.



Cost of single phase Borewell pump-sets varies from Rs. 3000/- to Rs. 20,000/- and more. Cost of three phase Borewell pump-sets varies from Rs. 10,000/- to Rs. 30,000/- and more.

Cost of pump-sets is depending upon the size, material used and design of pump and motor with technical specifications to meet with safety, quality and energy efficiency requirements of BIS & BEE standards.

Hence pump-sets with ISI mark and five star labelling cost higher.

These are also available online with discounts.

Important Guidelines for safe use

It is always useful to file the copies of bill, guarantee/warranty card and manual /leaflets supplied by dealer at the time of purchasing the models. These will be useful for future reference during maintenance and repairing because it covers the guidelines to overcome the trouble shooting.



After purchasing the pump-set, it is very much important to properly follow the instructions given in the manual for proper installation of pump-set.

If instructions/leaflets are not found with models, following guidelines are useful during installation.

- The inside diameter of borewell should be more than maximum diameter of pump and motor.
- The borewell must be flushed well so that it is free from sand, slit, cuttings and other abrasive material because pumping of sandy water causes wear and tear. Do not use new pump-set for cleaning sand from the new borewell.
- Borewell should be closed suitably to avoid the contamination of water.
- All electrical work must be performed with the help of technically qualified and experienced personnel.
- It is essential to provide good quality of earthing with appropriate size of copper conductor to avoid risk of electric shock during operation of pump-set. Proper earthing should be provided from screws on upper housing of motor to the earthing screws in the capacitor box/electrical panel used for starting the pump-set.
- Water cooled type submersible pump-sets have water lubricated bushes and therefore these must not run dry. Pump-set should not be 'Switched ON' without filling the motor with drinking water.

- Also, pump-set should not be operated with 'close position' of discharge valve.
- Installation of Borewell pump-set should be done with panel containing MCBS, safety switches, single phasing preventer with overload relays and water level floating switches.
- Pump-set should not be switched ON/OFF frequently. It may cause damage to the motor.
- Repairing work should be carried out at authorised service stations and where replacement of parts/components is necessary, original spare parts should be used for better performance and less maintenance.

Feedback of CERC to Bureau of Indian Standards

CERC has sent its comments to BIS on IS 8034-2018 for consideration

- Test method for hydrostatic pressure test
(Simple test method was suggested considering the product usage pattern of consumers. Existing method given in standard was difficult to adopt practically)
- Formula for calculation of temperature rise of winding.
(Formula with more clarity on sump temperature and ambient temperature was suggested)
- Determination of permissible residual unbalance
(IS 11723 -1 is superseded by IS/ISO 1940 hence suggested to include the latest version of standard for test method)
- Permissible limit of maximum current in the operating head range
(Particular values were derived through calculations for checking conformity with standard and sent to BIS for inclusion in standard)

Above comments/suggestions are taken under consideration by MED-20 committee of BIS.

Resolve to Save Energy

Many households find their energy bills as an additional burden to their monthly budget. An average home creates more pollution compared to an average car. This is because the energy used to power all the electrical appliances come from burning of coals and fossil fuels. This creates a lot of environmental pollution like smog, acid rain and global warming. Energy efficient appliances are designed to utilize minimum energy to complete the required task. Others use renewable sources of energy such as solar energy and water. These appliances are capable of maximizing small amount of energy into the required one to complete a task.

There are many reasons why homeowners should consider energy efficiency, from the clear environmental and financial benefits of cutting energy use to potential improvements in mental and physical health. In fact, energy efficiency has become one of the common features that prospective homeowners look for when purchasing a home.

Reduces Utility Bills:

About one-fifth of the total energy consumption in any average household is due to the usage of electrical appliances. This energy cost makes up a significant portion of the monthly expenses. Using energy-efficient appliances can help us all cut down on our energy consumption significantly without compromising with the quality. The use of energy-efficient appliances leads to lesser consumption of energy, which automatically translates to savings on electricity bills. For example: by replacing the fluorescent bulbs with energy-saving alternatives, and use energy-efficient appliances such as



refrigerators , washing machines, air conditioners, etc.

Money Savings:

Energy efficient purchases should not be viewed as an expense, but as an investment with utility savings that add up over the service life of the product. Though the initial price on the energy efficient appliances are more, it offers a significant return in comparison to conventional, non-efficient alternatives in the long run.



Boost the Resale Value:

In the real estate market, energy efficient homes and private residences with green certifications frequently sell for a higher price than standard homes with comparable features. Coming with expectations of reduced utility bills and fewer repair bills, energy efficiency is an attractive feature in any home.

Protects the Environment:

Energy or electricity that is used to run the electrical appliances is generated in the power plants which run on fossil fuel. Hence, the more the energy consumed more the depletion of fossil fuels. An energy efficient appliance also consumes less water. Hence, to protect our environment it becomes a necessary step to use energy efficient appliances.



Reduces Carbon Footprint:

Carbon footprint is defined as the total amount of carbon dioxide and other greenhouse gases released



into the atmosphere in a year, directly or indirectly, by an individual. Since energy-efficient appliances have lower emissions of these harmful gases into the environment, they can play a significant role in reducing your carbon footprint, making you more environment-friendly.

Enhances Quality of Life:

Using energy efficient appliances is more convenient, and hence, can make life easier for you. Also, it is a fact that, such appliances require lesser maintenance and replacement, as compared to their older counterparts. So, you may observe that an energy-efficient bulb lasts a lot longer than your ordinary fluorescent bulb. Also, the fact that energy efficiency has positive effects on the environment means that we get cleaner air to breathe, which would make us healthier and happier.



Earns You Energy Tax Credits:

In developed countries like America, Energy tax credit is a tax break given to homeowners who have

taken significant steps to save energy, such as switching to energy - efficient appliances, installing insulation, etc. According to the Federal Tax Credit laws for the year 2013, one can receive a tax credit of 10% on a total bill amount of up to \$500, or a specific amount from \$50 - \$300. These are applicable to only principle residents and not rentals or new constructions.



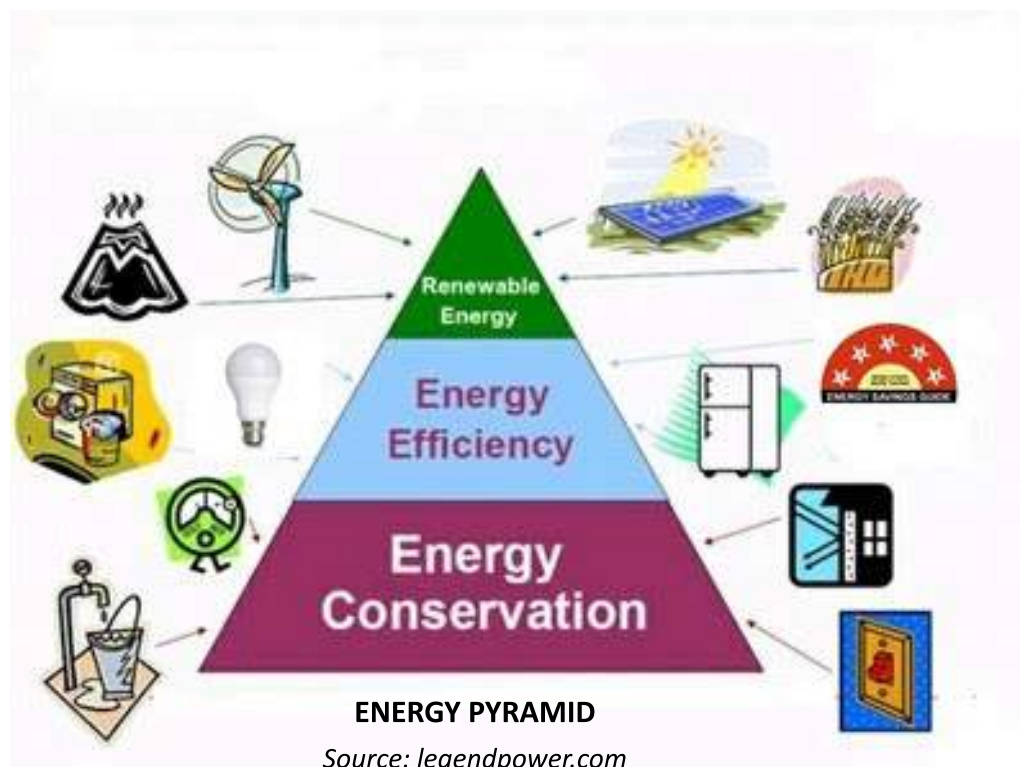
Sustainable Development:

Using energy-efficient appliances minimizes the exploitation of natural resources like natural gas, oil, coal, and water. Using energy efficiently helps the conservation of these resources, achieving sustainable development. These are a few of the great benefits you can gain from saving energy, whether you want to save money or save the planet. By simply using energy-efficient appliances, you're taking a small step towards living a more energy-conscious lifestyle and improve the world we live in.



Source: <https://helpsavenature.com/benefits-of-using-energy-efficient-appliances>
<https://www.energysage.com/energy-efficiency/why-conserve-energy/>





The Environmental Information System acronymed as ENVIS was implemented by the Ministry of Environment & Forests by end of 6th Five Year Plan as a Plan Scheme for environmental information collection, collation, storage, retrieval and dissemination to policy planners, decision makers, scientists and environmentalists, researchers, academicians and other stakeholders.

The Ministry of Environment and Forests has identified Consumer Education and Research Centre (CERC), Ahmedabad, as one of the Resource Partners to collect and disseminate information on "Environment Literacy - Eco-labelling and Eco-friendly Products". The main objective of this ENVIS Resource Partner is to disseminate information on Eco products, International, and National Eco labeling programmes.

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