

POWER PROFILE IMPROVEMENT FOR AGRICULTURE SECTOR

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Abstract

With the drop by voltage level, the reactive power demand rises. If the reactive power demand isn't met, then it leads to an extra decline in bus voltage resulting in the cascading effect on neighboring regions. Hence to maintain the power profile within permissible limits becomes essential. India is presented with an upscale and vast diversity of natural resources and water is one among them. It plays an important part in agriculture production. The pumping of groundwater to irrigate crops consumes about 50% of the groundwater resources and around 35% of the electricity generated in the country. To satisfy the expansion target for power availability, its entire requirement cannot come solely from generation augments. A major contribution will need to come from savings through better demand-side management and improvement within the end-use efficiency. As the agriculture sector is one of the unorganized sectors and inefficient power users in India, it's going to provide immense opportunity to save lots of energy through better demand-side management methods. The paper is generally focused on the importance of agricultural demand-side management and different businesses models for energy efficiency improvement in this sector. Demand-side management is recognized together of the important area within the agriculture sector insight of the increasing energy consumption pattern and wishes to be considered as key strategies capable of proposing unique opportunities to implement energy efficiency actions. Energy efficiency through agriculture demand-side management promises massive opportunities and benefits. The Agriculture

demand-side management program of the Bureau of Energy Efficiency could offer a unique way to influence plus change the equipment buying habits of end-use consumers so that they prefer to adopt efficient technologies.

KeyWords: Agricultural Demand Side Management, Natural Resources.

1. INTRODUCTION:

The Indian agriculture sector along with its associated sectors is indisputably the largest livelihood provider in the country. It positions second worldwide in farm output. The GDP of the agriculture sector and its allied sectors in India reached US\$ 151 billion in FY 2012. It is the dominant region of the Indian economy which agrees the growth and sustainability in the nation. In the earlier few years, the Indian agriculture sector has done extraordinarily well in terms of output growth. The 11th Five Year Plan (2007-2012) witnessed an average annual growth of 3.6% in the GDP from agriculture and its allied sectors. The growth target for the agriculture sector in the 12th Five Year Plan is estimated to be around 4 %. The Indian agriculture sector is benefitting hugely from the rising external demand and sector-wide participation in the global economy. The future growth of this sector needs to be more rapid and also the different areas need to be addressed keeping in view the lesser contribution of the land area under agricultural production and the increasing overall population in the country. To order to boost this agriculture sector from a different perspective, the Government of India has already initiated different schemes all over the country. Demand-side management is recognized as one of the important areas in the agriculture sector given because of the

increasing energy consumption pattern and needs to be considered as a key strategy capable of offering unique opportunities to implement energy efficiency measures. The studies undertaken by Bureau reveal that the current efficiency level of pump sets is in the range of 20-25% and efficiency improvements can reach up to 40-50% for existing pump sets as well as for new pump sets which would be installed. Overall, Pump set efficiency up-gradation is one of the key aspects of DSM measures in the agriculture sector. The replacement of existing inefficient pump sets with energy-efficient star-rated pump sets would unlock the market for investments of a very large scale and ultimately will help the agriculture sectors in achieving their sustainable growth. Electricity is the major source of energy in the Indian agriculture pumping region. The Indian agriculture sector is the third maximum consumer of electrical energy with a entire consumption of 92 billion kWh in 2007-08. It accounts for 19% of the overall electricity consumption level of 9 the total electricity supplied in the country. The total operating pumps in the country is something around 18 million and also every year addition of 0.5 million new pump sets is realized in the agriculture sector. The pump sets which are now being operated are very short efficient pumps sets (20-35%) and are available in the bazaar at a low price of less than Rs 15,000. Many pilot trainings were undertaken by World Bank (2001), WENEXA (2007) have also witnessed the poor level of efficiency of these agriculture pump sets. The latest study by NPC estimates a total saving potential of 28 billion Kwh in the Indian agricultural pumping division. Twenty-five years ago electricity sales to irrigation pump set consumers were less than 10% and today it is something around 20%. Therefore, managing this agricultural load now is a key challenge to all-electric utilities in India. DSM is a concept in which the power utility plans, implements, and monitors the different activities which have been designed to encourage the customers to improvements in their electricity consumption patterns, both concerning timing and level of electricity demand to help the customers to use electricity more efficiently According to the Central Electricity Authority (CEA), there are around 27

million electrified pump sets installed in the agriculture sector. Further, due to the increasing demand for water to meet agricultural needs, about 0.25 to 0.5 million fresh pump sets are being added yearly. Typically, the pump sets used for agricultural purposes are useless in terms of overall energy performance. While the average efficiency of these standard installed pumps sets ranges between 25% and 30%, the energy-efficient pump sets, as per Bureau of Energy Efficiency (BEE) star labeling, have energy efficiency levels as extraordinary as 50 to 60%. So, there is an estimated saving potential of about 25% to 30% by simple replacement of the present inefficient pump sets with BEE star-labeled efficient pump sets. In addition to this, going for education in the specific energy consumption (kW/liter per second of water) could also provide an additional 5-10% energy savings. Similarly, this may also reduce the maintenance as well as repair costs experienced by the farmers as the breakdown frequency drops drastically provided a minimum preventive maintenance practice is adopted and good power quality is ensured.

2. Literature Review

2.1 Agricultural Sector Power Management

Agriculture may be a core sector of the worldwide economy. As countries mature and grow, it stimulates the establishment of regional developed and service sector spin-offs. The existence of the many industries depends on agricultural activity. As technological difficulty in agriculture progresses, this sector will transform into a more autonomous economic entity. It will be ready to control terms for the acquisition of products and services. It is likely and even probable that some developed processes will shift to agricultural sites, as on-site quality control solutions are developed. Even though the sector gives about 18% of the total electricity consumption of the country, in terms of revenue realization, the electricity sale to this 4sector hardly amounts to 5% -10% of the overall income of Electricity Distribution Companies. Agriculture Demand Side Management (DSM) helps in influencing the nature and behavior of the consumers and thereby modify their consumption pattern which is more beneficial to both the nation's

resources as well as Electricity Distribution Companies. Replacing old inefficient pump sets with new energy-efficient pumps sets not only helps in reducing the overall energy demand and specific energy consumption of the equipment, But it also gives a net economic gain both to the consumer (since pump lifetime will be longer and downtimes shorter) as well as the other stakeholders. Fitting pumps with timers, or other control mechanisms, helps control water consumption and prevent depletion of water resources. Over the last few years, various DISCOMs, under the guidance of BEE and support of Energy Efficiency Services Limited (EESL), have implemented various AgDSM pilot projects to identify a possible solution to this persistent problem. As a part of these struggles, the Ministry of Power had originated the AgDSM program of replacing the inefficient pump sets on the Public-Private 5P partnership (PPP) 11 mode over BEE during the XI plan era. In the program, about eleven DISCOMs were targeted which were located in eight agriculture intensive states namely Maharashtra, Haryana, Punjab, Rajasthan, Gujarat, Andhra Pradesh, Madhya Pradesh, besides Karnataka. This study covered around 20,000 pump sets through these states and eleven Detailed Project Reports (DPR) were organized. The major impact of these DPRs was that they identified an average energy saving potential of about 40% with a simple payback period ranging between 3 to 4 years. Subsidized tariff, contribution to peak demand, etc. As there is no incentive for agricultural consumers to improve the efficiency of the pumping system Even though the sector contributes about 18% of the total electricity consumption of the country, in terms of revenue realization, the electricity sale to these 4 sectors hardly amounts to 5% -10% of the overall income of Electricity Distribution Companies. In addition to this, it is clear to all that the underground water sources are reducing at an alarming rate, and various benefits in terms of free or low-cost electricity supply to this sector have aided this reduction process. The Livelihood of an outsized section of the population. Agriculture Demand Side Management (DSM) helps in influencing the nature and behavior of the consumers and thereby modify their consumption

pattern which is more beneficial to both the nation's resources as well as DISCOMs. Over the last few years, various DISCOMs, under the guidance of BEE and support of Energy Efficiency Services Limited (EESL), have implemented various AgDSM pilot projects to identify Eight DISCOMs.

2.2 Power Quality Issues

The world relies on agriculture to feed humanity. We simply cannot survive without food, and thus, without agriculture. Energy is a main component of agricultural creation. It fuels the equipment, irrigates the crops, fertilizes the soil, sustains the livestock, transports the food, and processes the food into its final forms. As the population stays to grow, more agricultural production is necessary to care the improved food demand. At a comparable time, energy and environmental constraints order that agricultural creation be accomplished effectively with minimal energy consumption. It is necessary to extend agricultural yields per unit area of land while preserving the soil integrity and environment. Efficient energy management practices will help achieve and maintain this slight balance. To intensify the challenge, a substantial quantity of arable land is lost annually to erosion, increased salinity, and waterlogging. Roughly one-third of the world's cropland was absent during 40-years between the mid-1900s and 1990s. This topic and therefore the articles contained within it provide descriptions of energy management opportunities within the agricultural sector. Definite attention is given to food creation by crop and livestock activities, and food processing energy necessities also are briefly addressed. Section 2 describes agricultural energy usage patterns in various countries of the planet and discusses the first energy-consuming segments. Section 3 summarizes energy-efficiency opportunities for every of those primary segments. This section also refers the reader to articles containing extra details of energy efficiency within the three top energy-consuming segments: pumping and irrigation systems, agricultural equipment, and fertilizer production and use. Section 4 describes

an idea toward sustainable agriculture that's promoted by the United Nations. The method is termed "conservation agriculture." Energy is required for many aspects of the agriculture industry and the industries that support agriculture. Agriculture can be clear in numerous ways. In its most general sense, agriculture contains livestock, food crops, energy crops, fibers, ornamental plants, forestry activities, hunting, fishing, Mari culture. The table further matches data from 1987 with data from 1997. Of the countries listed, the agriculture sector of Jamaica has experienced the foremost significant rise.

2.2.1 Cost of Poor Power Quality

It can be described as an event related to the electrical network that ultimately results in a financial loss. Possible significances of poor Power Quality consist of surprising power supply failures (breakers tripping, fuses blowing).

- Equipment failure or malfunctioning
- Equipment overheating (transformers, motors,) leading to their lifespan reduction.
- Connection refusal of latest sites because the location would pollute the availability network to much.
- Impression of stability of visual sensation induced by a light stimulus whose luminance
- Spectral distribution varies with time (flicker) Health issues with and reduced efficiency of personnel.

3. Methodology

3.1 Methodology Work Flow:

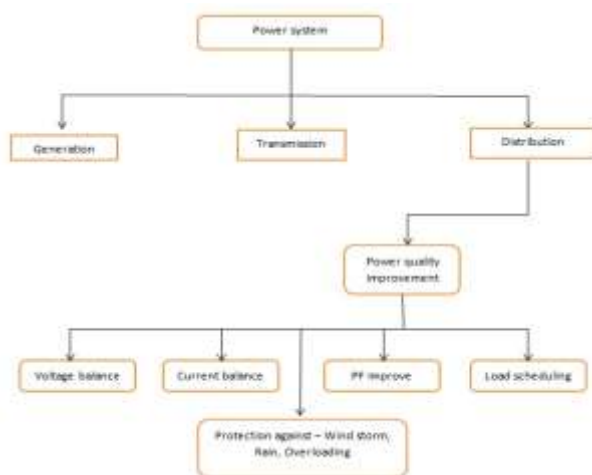


Fig.3.1.1 Block diagram of work flow

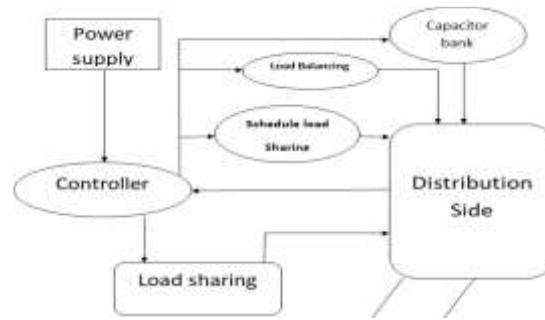


Fig.3.1.2 Block diagram of PPI

Working

1. Power supply

A switched-mode power source (switching-mode power source, switch-mode Power source, switched power source, SMPS, or switcher) is an electronic power supply that includes a switching regulator to convert electrical power efficiently. Like extra power supplies, an SMPS transfers power from a DC or AC source (often mains power) to DC loads, such as a private computer, while translating voltage and current characteristics. Unlike a linear power 15 sources, the pass transistor of a switching-mode source frequently switches among low-dissipation, full-on also full-off states, and spends little or no time within the high dissipation transitions, which minimizes wasted power. A hypothetical ideal switched-mode power source dissipates no power. Voltage regulation is achieved by fluctuating the ratio of on-to-off time (also referred to as duty cycles). In dissimilarity, a linear power source controls the output voltage via frequently dropping power in the pass transistor.

2. Controller

Arduino is an open-source electronics stage centered on easy-to-use hardware plus software. Arduino boards are expert to read inputs - light on a sensor, a finger on a switch, plus switch it into an output - opening a motor, varying on a LED, allotting almost combined. You can tell your panel what to undertake to try to do by sending a gaggle of instructions to the microcontroller on the panel. For processing, we are using Arduino based programming language (based on Wiring) and the software (IED). For many years Arduino has been the head of thousands of jobs, from regular stuffs to challenging scientific uses. Arduino was born at the Ivrea Collaboration Design Establishment as a

stress-free device for fast prototyping, designed to close students deprived of capability in electronics besides programming. As soon since it reached a wider community, the Arduino board started moving to familiarize to new necessities besides meetings, discriminating its offer from simple 8-bit boards to products for IoT applications, and wearable, 3D printing, besides surrounded situations. Now a day's users highly prefer this software and this software is open source that's why it becomes more popular worldwide.

3. Capacitor bank

In general, power is that the capacity to try to do work. In the electrical territory, electric power is that the quantity of electricity which will be transmitted to another form (heat, light etc.) per unit of your time. Mathematically it's the produce of drop across the element plus current flowing through it. Considering first the DC circuits, having only DC voltage sources, the inductors and capacitors behave like short circuits and open circuits respectively in a steady form. The inductor stores electrical energy in the form of magnetic energy besides the capacitor stores electrical energy in the form of electrostatic energy. Neither of them dissolves it. Further, there's a phase shift between voltage and current. Hence once we consider the whole circuit consisting of a resistor, inductor, and capacitor, there exists some phase difference between the source voltage and current.

4. Distribution transformer

Distribution transformers are ordinarily located at a service drop, where wires run since a utility pole or underground power lines to a customer's confirmations. They are frequently used for the facility supply of abilities outside settlements, identical isolated houses, farmyards or pumping stations at voltages under 30 kV. Another application is that the power supply of the overhead wire of railways electrified with AC. In this case, single-phase distribution transformers exist used. [4]

Distribution transformers also are establish within the power collector systems of wind farms, where they intensify power from each turbine to attach to a substation which will be several miles (kilometres) distance.

5. Load Sharing

Load sharing is natural to the advancing procedure of a router to share the accelerating of traffic if the transmitting table has various paths to a target. If equal paths, the forwarding process will decide the way of forwarding and forward packets supported the load-sharing algorithm used. This still bears the likelihood of unbalanced forwarding. If unequal paths, the traffic is circulated inversely proportionally to the value of the paths. That is, paths with lower costs (metrics) are allocated more traffic, and paths with higher costs are allocated fewer traffic. Despite the thought of load balancing, it's not always true. Load sharing is technically more correct terminology, there in traffic is shared across multiple paths albeit in an unequal fashion. If you were to look at two relating traffic graphs, with load balancing the two graphs should be near-identical, but in actuality, with load sharing, they might be similar but the traffic flow pattern would be changed. So why the large deal in classifying the difference between the If the return traffic had to be balanced within the same manner, an equivalent configuration would be needed within the other way.

6. PVC Insulated Supporting Poles

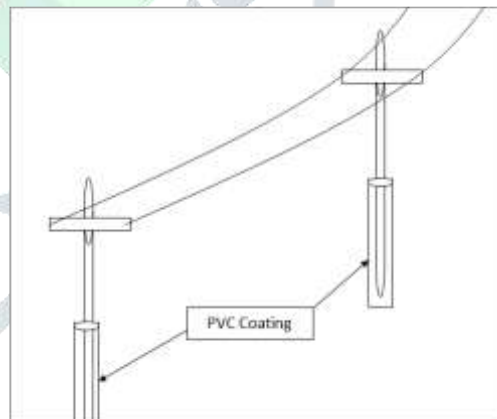


Fig.3.1.3 General Layout of PVC coated electricity poles

The distribution and transmission networks are two vital components of a reliable power grid. When considering these networks, many nations use wood for fabricating facility poles for the overhead power lines. The main disadvantage of using wooden poles is the foundation of pole top fires, which recruits catastrophic events such as bush-fires. This paper studies the leakage current distribution of a wooden pole that contains an inserted king bolt wont to

support the cross arm [5]. In this paper, these authors analyse technical substitutes to defend against secondary contact in light of the IEC standards. In order to elevate the extent of safety offered by Class II metal poles, the adoption of special circuitry and bonding connections to constantly monitor the double insulation of metal poles is planned. [4]

4. Advantages and Disadvantages

4.1 Advantages

- Power Quality Studies Detect Disturbances
- They Prevent Interruptions
- They save Money
- They Allow for New expansions
- They Increase Safety

4.2 Disadvantages:

- The cost of development and installation will be the only disadvantage of this system, but this cost can be recovered back in a very short lifespan.

4.3 Applications:

- Agricultural sector
- Smart grid solution

5. Result

- Solution of the unbalanced loading.
- Climate devices.
- This will benefit in terms of reduced damage to the power system due to short circuits. This will lead to reduced breakouts and improved reliabilities of the power will benefit both farmer and supply authority.
- Safety issues are also covered by PVC Coating of all the metallic parts which can be touched by any human being.
- Power factors are increases.
- Centralized power factor improvement methodology is a benefit in terms of reduced installation costs and also improved power factor has its advantages.
- Load shading schedules are properly managed through inbuilt timers of our controller so that no unauthorized person can change the flow systems.

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