



iPUMPNET

Smart Pumping, Smarter Operations

AI & IIoT-Based Precision
Pumping Station Monitoring Solution



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Pump Academy Private Limited was established with a clear mission to cultivate innovation and harness digital technologies with the goal of enhancing the efficiency of Pumping Station operation and maintenance. It is estimated that Pumping Systems account for approximately 20% of the global electricity demand, and in some of the specific applications pumping sets often are the largest consumers of electricity.

Pump Academy Private Limited is committed to fostering innovation and utilizing digital technologies to enhance the overall efficiency of Pumping Stations. Through cutting-edge solutions, the company strives to optimize operations, improve efficiency, prolong equipment lifespan, and minimize energy consumption and carbon emissions.

With Mr. Anil Sethi leading the way, Pump Academy is poised to make a substantial contribution in optimization of Pumping Station operation and overall management, drawing upon the expertise of its leadership team gained from overseeing and implementing numerous infrastructure projects involving Pumping Stations.



Life Cycle Cost of Pumping Sets

15%
Purchase and installation

40%
Energy consumption

25%
Pump Maintenance

10%
Pump Operation

2%
Documentation
& training cost

3%
Down time

5%
Environmental cost

The initial cost to set up a Pumping Station is about 10-15% of its total Life Cycle Cost (LCC). The rest of the LCC, which is around 85-90%, is mainly made up of energy charges (up to 40% of the LCC) and operational and maintenance charges (up to 45% of the LCC).

Unfortunately, these operational and maintenance costs are often overlooked and don't get the attention they deserve. This lack of focus can be attributed to the absence of precise, real-time data and historical information, which are crucial for effectively managing and optimizing these charges.

The Vicious Cycle of Poor Pumping Set Performance

The lack of monitoring and data analysis hinders the identification of inefficiencies and improvement opportunities in pumping systems. Which leads to inefficient pumping systems operation resulting in various negative consequences, such as



Excessive energy consumption and accelerated equipment wear and tear, leading to frequent breakdowns and reduced equipment lifespan. This, in turn, results in higher operation and maintenance expenditure for the Pumping Station.



Inadequate water supply, potentially causing shortages



A larger carbon footprint, negatively impacting the environment



Customer dissatisfaction



Compromise in water quality and safety



Decreased revenue for the Pumping Station



Consumption of significant resources on maintenance and repairs

Symptoms of an **Inefficient Pumping System**

1. Inconsistent water pressure or flow rate
2. Excessive energy consumption
3. Unreliable or unpredictable water supply
4. Elevated noise levels or vibrations
5. Inadequate system capacity
6. Pressure drops or fluctuations
7. Leakage or loss of water
8. Frequent equipment malfunctions or failures
9. Poor system performance or efficiency
10. Water quality issues
11. Inadequate maintenance or servicing
12. Inadequate flow regulation mechanism
13. Cavitation or recirculation noise anywhere in the system
14. A pumping system operating with a deviation in design parameters
15. Poor system planning & configuration
16. Inaccuracy or scarcity of measuring instruments



The adoption of cutting-edge technology

is transforming Pumping Station operations, equipping them with intelligent products, machines, and services. It is crucial to prioritize the adoption and utilization of innovative solutions, placing technology at the forefront of Pumping Station management.

By embracing advanced technology, Pumping Stations can achieve unparalleled levels of efficiency, performance, and sustainability, ensuring trouble-free operations and meeting the evolving demands of the industry.





iPUMPNET

Smart Pumping, Smarter Operations

A Novel Pumping Station Optimization Solution

Pump Academy Private Limited presents **iPUMPNET**, a groundbreaking solution that redefines the management of Pumping Stations. This advanced IIoT technology is tailored to improve operations, increase energy efficiency, and transform pumping sets into smart and adaptable systems.

iPUMPNET is an advanced web-enabled analytics platform that employs Digital Twins, Artificial Intelligence, and state-of-the-art Machine Learning technologies to evaluate operational parameters, thereby providing users a comprehensive understanding of the performance and general health of Pumping Stations.

With its secure and centralized platform, **iPUMPNET** utilizes a patented system to monitor Pumping Station activities in real-time. It offers intuitive dashboard interfaces on the internet and mobile applications, providing users with valuable insights, analyzing root-cause and recommending for efficient Pumping Station operation.

iPUMPNET is the ultimate solution for accelerating the transition from conventional to smart and digitally integrated pump monitoring systems.

Benefits & Utility of iPUMPNET

iPUMPNET offers several significant benefits for Pumping Station Operation and Maintenance. Here are some key benefits it provides:

Up to
35%*

improvement in Pumping Station **operational efficiency**

Up to
25%*

reduction in **energy costs**

Up to
50%*

extension in the **lifespan** of Pumping Systems

Up to
45%*

decrease in the **life cycle cost (LCC)** of Pumping Station



Virtually eliminates unscheduled breakdowns and reduces maintenance requirements



Enhances environmental sustainability by reducing carbon emission

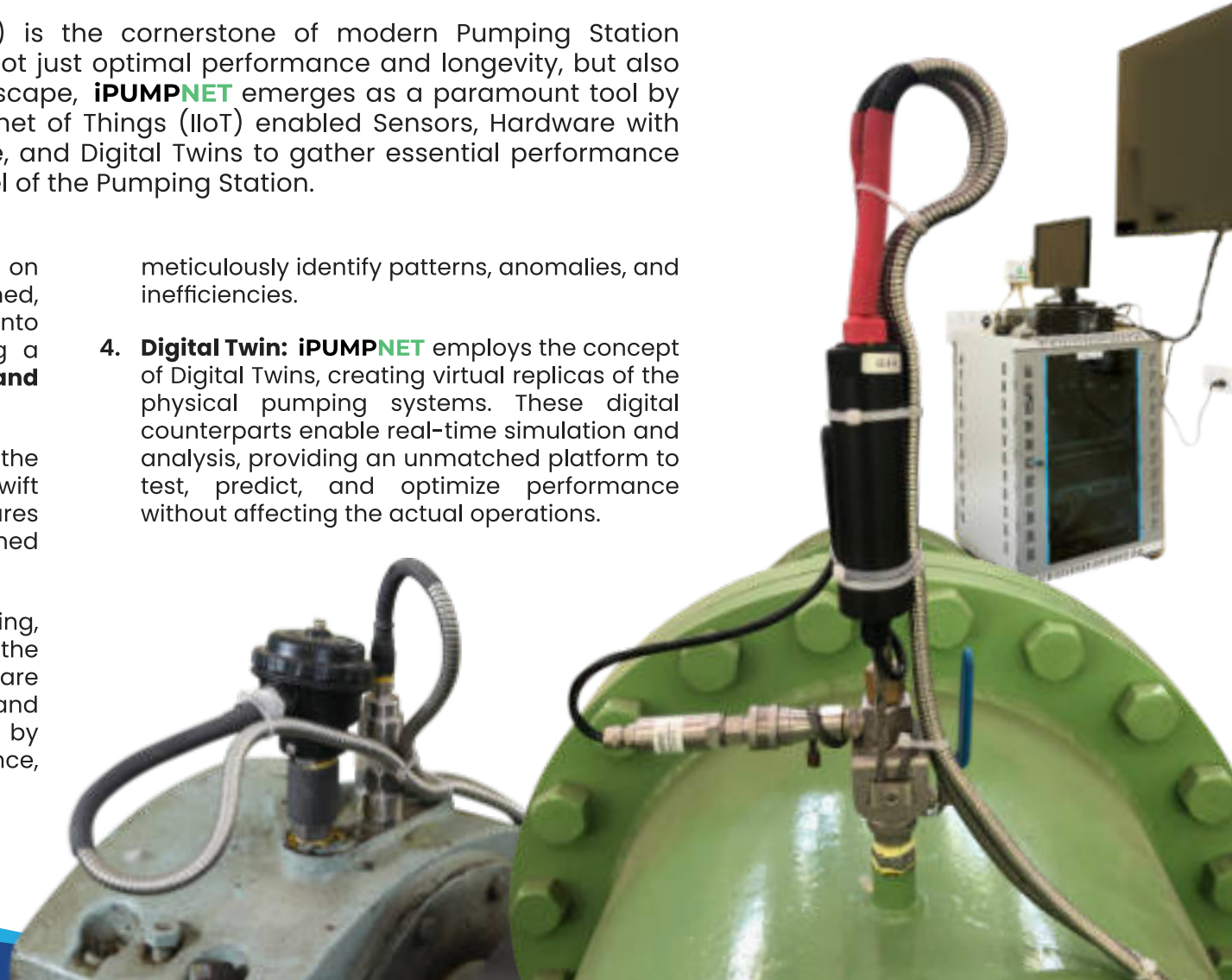


* Subject to following our recommendations for Operations & Maintenance

Continuous Condition Monitoring with iPUMPNET

Continuous Condition Monitoring (CCM) is the cornerstone of modern Pumping Station operation and management. It ensures not just optimal performance and longevity, but also unrivaled efficiency. In this evolving landscape, **iPUMPNET** emerges as a paramount tool by leveraging high-precision Industrial Internet of Things (IIoT) enabled Sensors, Hardware with Embedded Analytics, Artificial Intelligence, and Digital Twins to gather essential performance data and generate a mathematical model of the Pumping Station.

- 1. Data Gathering:** At its core, CCM thrives on data. **iPUMPNET**, meticulously designed, integrates IIoT sensors to delve deep into various operational parameters, creating a rich data tapestry crucial for **insightful and holistic monitoring**.
- 2. Edge Processing:** **iPUMPNET** harnesses the prowess of edge computing, delivering swift localized data processing. This ensures instantaneous responsiveness and diminished data transmission delays.
- 3. Cloud Synergy:** Beyond edge processing, **iPUMPNET** seamlessly connects with the cloud. Here, colossal data repositories are continuously curated, processed, and analyzed. Advanced algorithms, bolstered by machine learning and artificial intelligence, meticulously identify patterns, anomalies, and inefficiencies.
- 4. Digital Twin:** **iPUMPNET** employs the concept of Digital Twins, creating virtual replicas of the physical pumping systems. These digital counterparts enable real-time simulation and analysis, providing an unmatched platform to test, predict, and optimize performance without affecting the actual operations.



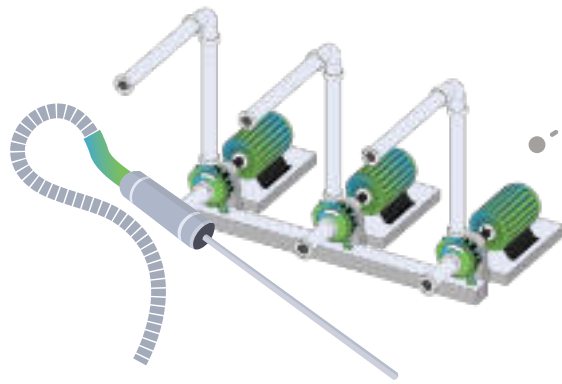
- 5. Instant Alerts:** Anomaly detected? iPUMPNET is on it. It dispatches immediate notifications via SMS, email, or app alerts, ensuring that relevant personnel are always in the loop, primed to act.
- 6. Predictive Intelligence:** Going beyond immediate concerns, iPUMPNET's integration with machine learning and AI empowers it to forecast potential component wear-outs, inefficiencies, or failures. This anticipatory insight spurs proactive intervention, ensuring continuity and efficiency.
- 7. Visual Insights:** With its elegant dashboards, iPUMPNET translates complex data into visually intuitive narratives. Be it equipment health, performance metrics, or any other vital indicators, a glance is all it takes to gauge.
- 8. Adaptive Monitoring:** Drawing from its extensive data streams and the invaluable insights of AI, iPUMPNET continually refines its monitoring paradigms. This adaptability translates to consistently improved operational efficiency.
- 9. Cost Efficiency and Operational Excellence:** By pinpointing inefficiencies and suggesting improvements, iPUMPNET curtails energy wastage and maximizes pump performance. This dual edge of operational excellence couples with tangible savings, ensuring both economic and environmental benefits.

With iPUMPNET, Pump Stations transcend traditional boundaries. Through the synergy of IIoT, AI, machine learning, and Digital Twins, they metamorphose into dynamic, self-optimizing entities, striking the perfect balance between peak performance and cost efficiency.



Components of iPUMPNET

iPUMPNET consists of **four** components



High-Precision IIoT Sensors

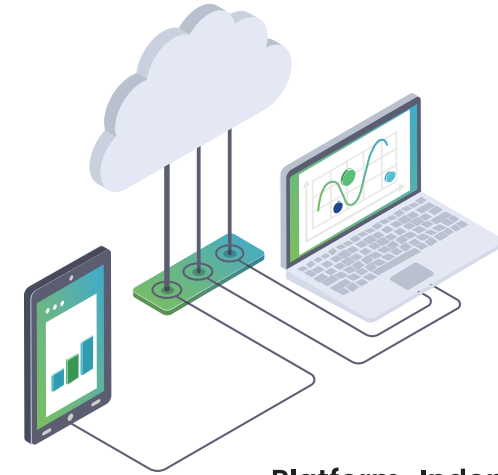
Specific precision sensors and Data Acquisition Hardware, 24V Battery, Surge Protection Devices, Field Instrument Cabinet

Hardware with Embedded Analytics

Auto Signal conditioner based 24-bit ADC ensuring almost zero signal delay



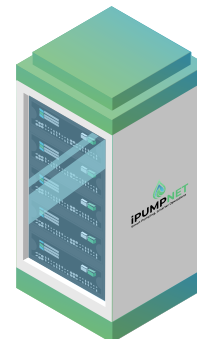
iPUMPNET



Platform-Independent Hybrid Cloud & Mobile App

Deep learning based Artificial Intelligence (AI) tools with digital twin and HMI in a cloud platform environment

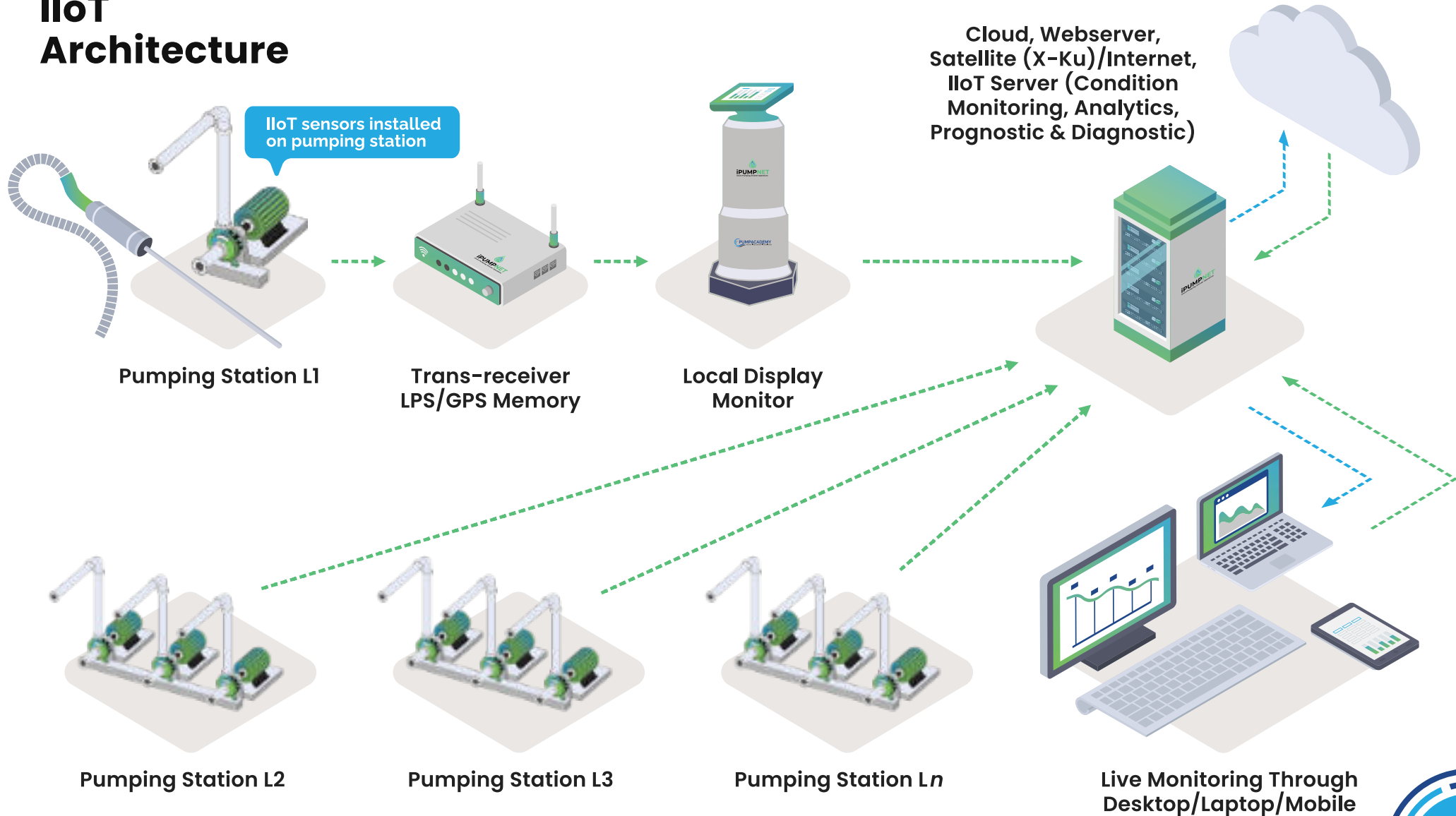
Visualize virtual pump and deviation with metrics



Secure Bi-directional Communication

Bi-directional communication between cloud and multi-SIM based IIoT gateway.

IIoT Architecture



Comprehensive Monitoring, Analysis & Reporting of Pumping Station Parameters on a Unified iPUMPNET Dashboard

Parameters Monitored

1. Pump

- a. Discharge
- b. Operating total head
- c. Hours of run
- d. Bearing temperature (max-min, average)(DE & NDE)
- e. Vibration mm/sec (max-min, average)(DE & NDE)
- f. Bearing lubricating oil moisture (DE & NDE)

2. Motor

- a. Bearing temperature (max-min, average)(DE & NDE)
- b. Winding temperature (Poles)
- c. Body temperature
- d. Vibration mm/sec (max-min, average)(DE & NDE)
- e. Speed

3. Pumping Station

- a. Number of pumping sets operating, standby and pumps under repair
- b. Hours of run of the Pumping Station with combination of pumps
- c. Total water discharge of Pumping Station
- d. Total head of pumping system
- e. Pressure in common discharge manifold / common pumping main
- f. Pump house noise level dBA (max-min, average)



Comprehensive Monitoring, Analysis & Reporting of Pumping Station Parameters on a Unified iPUMPNET Dashboard

Parameters Monitored

4. Power

- a. Online power availability / power failures
- b. Voltage – R,Y,B
- c. Current – R,Y,B
- d. Frequency
- e. Power factor
- f. Total hours of power failure

5. Reservoir

- a. Water level of pump suction intake well / Pumping Station

6. Surge Tank

- a. Level in surge tank
- b. Pressure in surge tank



Comprehensive Monitoring, Analysis & Reporting of Pumping Station Parameters on a Unified iPUMPNET Dashboard

Analysis of Pumping Station Operation

- a. Pump efficiency
- b. Motor efficiency
- c. Combined efficiency of the pump and motor
- d. Combined efficiency of Pumping Station
- e. Power consumption pump wise and Pumping Station
- f. Pump sequencing & pump scheduling

Report Generation

1. Operation & Maintenance Report

- a. Details of alarms with time tag; with escalation protocol by SMS / WhatsApp and if possible, by e-mail
- b. Capture details - the timing when the abnormality attended and the person concerned
- c. Record spares and consumables inventory, date in / out, cost, alert if inventory below minimum level
- d. Record reason for non-operation of pumping set with period of non-operation
- e. Record action taken for rectification
- f. Maintain complete repair history pump wise of Pumping Stations



Comprehensive Monitoring, Analysis & Reporting of Pumping Station Parameters on a Unified iPUMPNET Dashboard

Report Generation

2. Basic Reporting

- a. Online comparison of pump parameters: actual vis a vis committed performance (as per the manufacturer Curve) like discharge, head, power consumption and efficiency
- b. Generate report of abnormality in machine behaviour
- c. Exploring dynamic saving opportunities by regularly optimizing pumping operations through pumping set operation sequencing based on demand, water level etc.
- d. Maintain automated electronic logbooks
- e. Monitoring, analysis and generating online the daily, weekly, and monthly MIS in prescribed format
- f. Conduct monthly assessment, audit, and review of energy, water, and asset performance, and generate online monthly reports



Comprehensive Monitoring, Analysis & Reporting of Pumping Station Parameters on a Unified iPUMPNET Dashboard

Report Generation

3. Commercial Report

- a. Calculate cost of energy per m^3 (fixed charges + energy charges) and compare it to other pumping stations on a daily, monthly, and yearly basis
- b. Capture O&M staff biodata, deployment information, and biometric attendance usage
- c. Calculate penalties for O&M contractor for deploying fewer staff members based on biometric attendance records
- d. Calculate penalties for operating below designed efficiency (higher power consumption) on a monthly, annual, and cumulative basis
- e. Calculate penalties for O&M contractor for failure to achieve desired power factor
- f. Calculate penalties for delays in attending to or rectifying defects / abnormalities
- g. Calculate penalties for various defaults based on predefined formulas



Unleash the Power of **iPUMPNET**: Embrace a Greener Future with Transformative Energy Efficiency

iPUMPNET is a revolutionary solution that aims to transform energy efficiency in pumping systems, leading the way towards a greener future. Pumping systems currently account for a staggering 20% of global energy consumption, with the water sector alone consuming 4% of the world's electricity. By implementing **iPUMPNET** across India's Pumping Stations, it is projected to achieve remarkable energy savings of nearly **5 GW**, setting a new benchmark for efficient operations. This would result in an approximate reduction of **3.06 million tonnes** of carbon emissions annually, contributing significantly to India's commitment to a sustainable tomorrow.

Each megawatt (MW) of energy saved through **iPUMPNET** is equivalent to planting **21,500 trees**, highlighting the immense potential for environmental benefits. Additionally, the energy savings attained through **iPUMPNET** implementation can be translated into **carbon credit certificates**, enabling international trading and unlocking financial opportunities while fostering sustainability. By embracing **iPUMPNET**, India aligns seamlessly with its commitment to achieve Net-Zero Emissions by 2070.



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