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Sustainable Water Management in Coal Handling Plants through Utilization of Purified Tube Settler and Lagoon Water

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Abstract: ***Water management is a critical component of sustainable industrial operations, particularly in bulk material handling facilities such as Coal Handling Plants (CHP). Coal yard activities such as road sprinkling, wheel washing, coal heap dust suppression, and conveyor cleaning require substantial quantities of water, which traditionally depend on fresh service water sources. This study presents the implementation of a water recycling and harvesting system utilizing purified water from a Tube Settler and Lagoon reservoir for coal yard operations. The project involved installing a mechanized pumping system and a distribution pipeline network to reuse treated wastewater for various operational activities. The initiative enabled the recycling of wastewater and reduced fresh water consumption by approximately 34,875 m³ annually, resulting in significant financial savings and improved environmental sustainability. The system demonstrates an effective approach to industrial water conservation and aligns with modern sustainability practices in bulk material handling facilities.***
Keywords: Water Harvesting, Coal Handling Plant, Tube Settler, Wastewater Recycling, Sustainability, Coal Yard Operations.

I. INTRODUCTION

Water conservation has become a key priority for industries due to increasing environmental concerns and the need for sustainable resource management. In large-scale industrial facilities such as power plants and metallurgical industries, Coal Handling Plants (CHP) consume considerable amounts of water for operational and housekeeping activities.

Typical coal yard operations such as road sprinkling, coal heap dust suppression, wheel washing of vehicles, and conveyor system cleaning require continuous water supply. Traditionally, these activities rely on fresh service water, which increases operational costs and places pressure on water resources.

However, CHP operations also generate wastewater through various processes. This wastewater is treated in systems such as Tube Settlers and Settling Ponds, producing relatively clean water that can potentially be reused. In many plants, due to lack of proper recirculation infrastructure, this treated water is discharged back to reservoirs or lagoons instead of being reused.

This paper presents a water harvesting initiative implemented in the Coal Yard, where purified water from a Tube Settler and Lagoon was successfully reused for coal yard activities through a mechanized pumping and distribution system.

II. EXISTING SYSTEM AND CHALLENGES

In the existing Coal Handling Plant system, approximately **120 m³ of fresh service water** was used regularly for coal yard activities, including:

- Road sprinkling in the coal yard area
- Truck wheel washing
- Coal heap sprinkling for dust suppression
- Water washing of conveyor systems

At the same time, wastewater generated from these activities was treated through a Tube Settler system and discharged into the Coal Settling Pond and Lagoon (Reservoir).

Despite the availability of treated water, reuse was not possible due to the absence of a mechanized pumping and distribution system. As a result:

- Treated water remained underutilized
- Fresh water consumption remained high
- Operational water management was inefficient

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These challenges highlighted the need for a system that could recirculate treated water for operational use.

III. SYSTEM IMPLEMENTATION

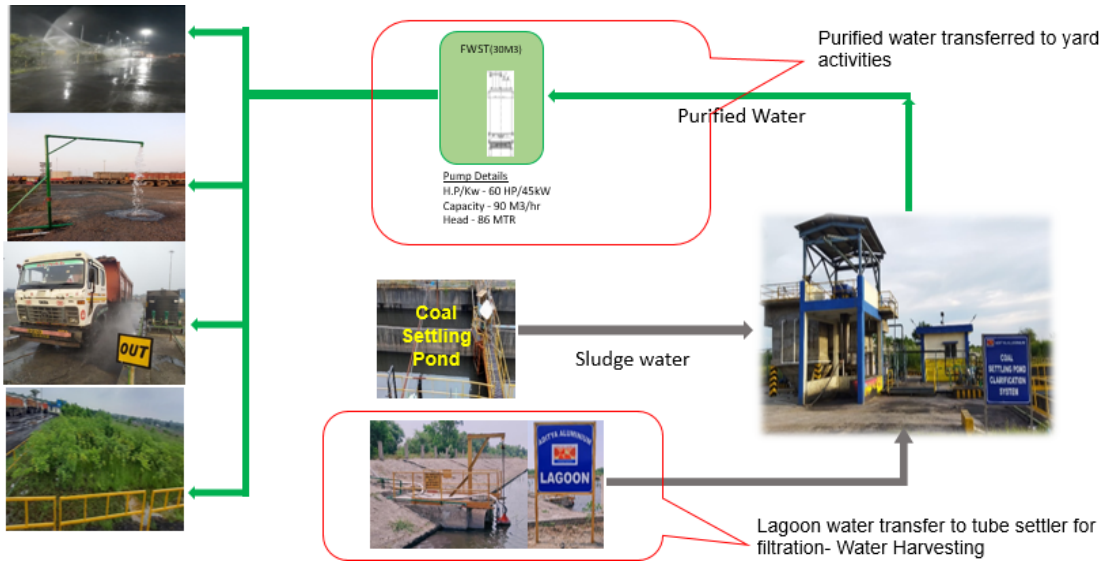
To address the issue of treated water underutilization, a water recycling system was designed and implemented in the coal yard area.

A. Pumping System Installation

A heavy-duty submersible pump was installed in the filtered water storage tank of the Tube Settler and Lagoon reservoir.
Key specifications include:

- Pump capacity: 50 m³/hr
- Motor rating: 60 HP
- Location: Filtered water storage tank

This pumping system enabled the extraction of treated water for reuse.



B. Pipeline Network

A 100 NB pipeline network was installed to distribute the treated water across various coal yard operational points.
Key features:

- Approximate pipeline length: 500 meters
- Connection points across coal yard utility locations
- Integration with electrical power supply for pump operation

This pipeline network allowed treated water to be supplied to different coal yard activities efficiently.

IV. SYSTEM OPERATION

The implemented system operates by pumping treated water from the Tube Settler and Lagoon storage tanks through the pipeline network to designated coal yard usage points.
The recycled water is now utilized for:

- Coal yard road sprinkling
- Truck wheel washing
- Coal heap dust suppression
- Conveyor system washing
- Gardening and general housekeeping

This system ensures **continuous reuse of treated wastewater**, reducing dependence on fresh service water.
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V. RESULTS AND OPERATIONAL BENEFITS

The implementation of the water harvesting system resulted in significant operational and environmental benefits.

1) Fresh Water Conservation

Approximately 67,690 m³ of fresh water consumption was avoided annually through the recycling of treated wastewater.

2) Financial Benefit

Based on the cost of fresh water at ₹15 per cubic meter, the annual financial saving achieved is approximately:₹10.15 lakh per year

3) Operational Improvements

Additional benefits observed include:

- Effective reuse of wastewater generated from CHP operations
- Reduced dependency on fresh service water
- Improved water management practices
- Enhanced environmental sustainability in plant operations

The project demonstrates how simple engineering modifications can significantly improve resource utilization.

VI. SUSTAINABILITY IMPACT

Water recycling initiatives such as this play an important role in achieving **industrial sustainability goals**. By utilizing treated wastewater for operational purposes, the system contributes to:

- Conservation of freshwater resources
- Reduction in environmental impact
- Efficient utilization of existing water treatment infrastructure

The initiative aligns with the **long-term sustainability and environmental policies of the Aditya Birla Group**.

VII. CONCLUSION

The implementation of a mechanized water recycling system using Tube Settler and Lagoon purified water has successfully transformed previously unused treated water into a valuable operational resource for coal yard activities.

By installing a submersible pumping system and distribution pipeline network, the project significantly reduced freshwater consumption while improving operational efficiency and sustainability.

The initiative demonstrates that water harvesting and recycling in industrial operations can provide both environmental and economic benefits, making it an essential component of modern industrial resource management.

Author Profile

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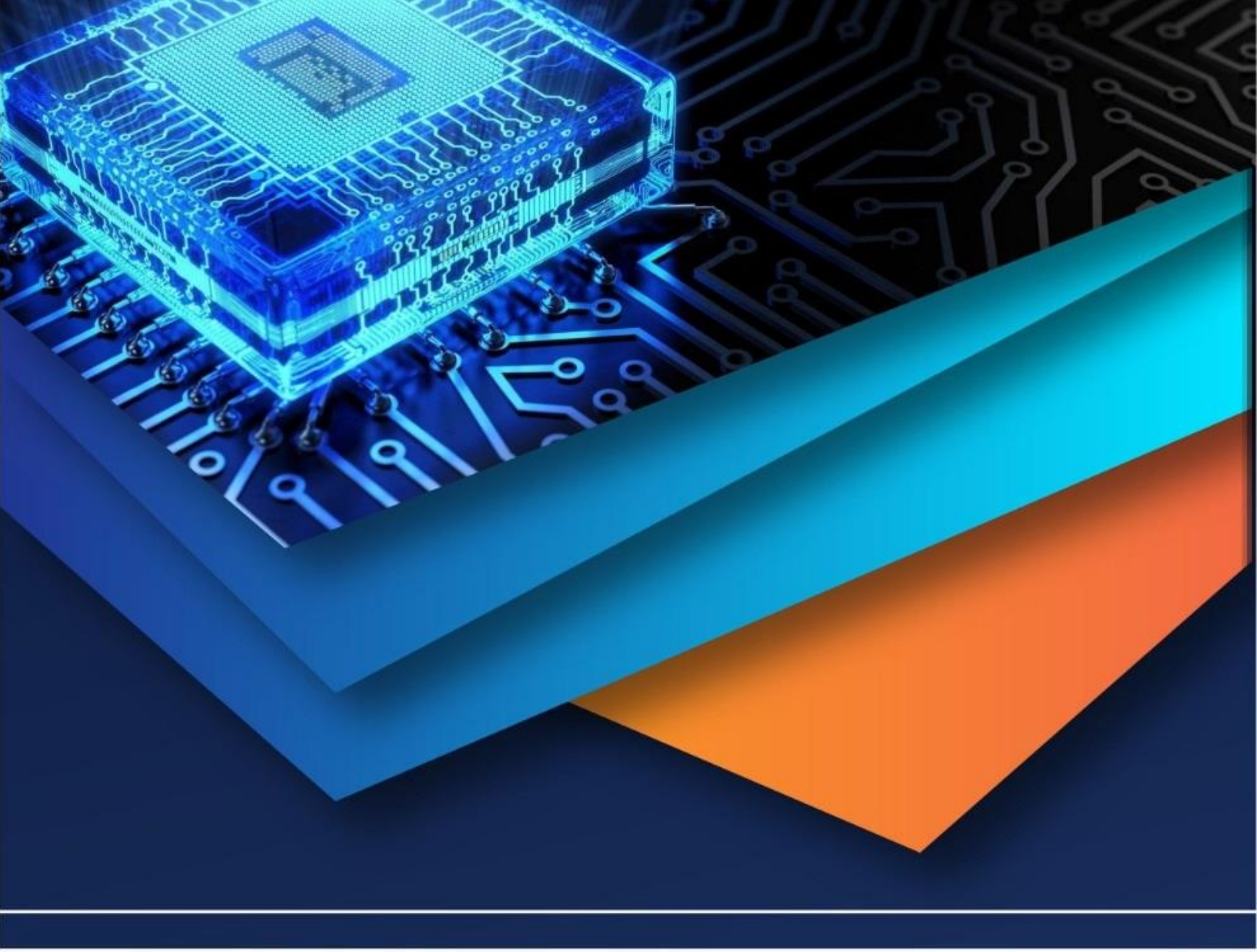

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