CHALLENGES FACED IN WATER TREATMENT AND ITS DELIVERANCE FOR GRAVITY AND LIFT TYPE SCHEMES

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INTRODUCTION

Water is the universal solvent and the liquid that makes life on Earth possible. As water cycles from the air to the land to the sea and back again, water shapes our planet – and nearly every aspect of our lives. No matter how isolated it is from sources of contamination, it will always have some chemicals. Gases or minerals in the air, soil, or rock are dissolved by the water. Some dissolved materials give water its characteristic taste, and "pure water" is generally considered to be flat and tasteless.

DRINKING WATER TREATMENT PLANT (DWTP)

Drinking Water Treatment plant is a series of structures built to treat raw water to desired water quality standards for safe consumption and health protection. Treatment of drinking water can be achieved by using in-line or contact filtration (coagulation followed by filtration), direct filtration (coagulation, flocculation, and filtration), or conventional treatment (coagulation, flocculation, sedimentation, and filtration). Each Drinking WTP is unique, and the selection and design of the treatment processes depend upon the source water characteristics, level of contamination, local site characteristics, and the desired quality of the treated water.

GRAVITY TYPE WATER TREATMENT PLANT

In this type of Treatment plant, raw water source or starting point of the transmission is at a higher elevation and flow in the raw water main pipeline occurs from higher potential head to lower potential head.

LIFT TYPE WATER TREATMENT PLANT

In this type of Water Supply Treatment plant, raw water water is transmitted to a higher elevation and starting point of transmission is at a lower elevation, energy/head to the flow has to be provided by an external source. Such a system for transmission of water is termed as Pumping Main.

CHALLENGES FACED IN GRAVITY/ LIFT TYPE WATER TREATMENT PLANT

QUANTITY OF RAW WATER SOURCE

The problem will mainly relate to change in Discharge of Raw water due to natural causes viz Variability in rainfall and seasonal changes that has a direct impact on the source water levels thereby affecting the reliability of the lift/gravity scheme. Although the lift type water treatment plants thereafter depend wholly & solely on the raw water lifting from that source.

QUALITY OF RAW WATER SOURCE

In case of Gravity Type Water Treatment Plants Raw Water intakes generally off takes from higher contours where there is less human habitations which further keeps raw water away from pollutants While as in case of lift type Water Treatment Plants the surface water sources are generally tapped at lower contours where there exists rapid urbanization which has lead to habitat destruction thereby altering the natural flow and increasing pollution loads which further envisages high cost on account of chemical treatment for maintaining the quality of water. keeping these things into account, in case of gravity type schemes the open raw water channels/canals may be replaced to piped conduits so as to minimize the contamination & cost of treatment.

ENERGY CONSUMPTION & POWER RELIABILITY

a) The gravity type Water Treatment plant uses natural grade for conveyance of raw water to Filtration Plant While as in case of Lift Type Treatment Plant Pumping water to higher elevations requires significant energy, leading to high operational costs .

b) The Lift Type Water Treatment Plant has a high Dependence on a reliable power supply that can be problematic, especially in areas with frequent power outages or limited access to electricity which is not the case with Gravity Type Treatment Plants. As the operation of DG sets in case of High head HT pumps is very expensive.

Technical Challenges

a) **Variable Water Demand:-** In case of Gravity type Water Treatment Plant the influx of raw water quantity can be adjusted as per fluctuations in water demand While as the Lift type schemes the discharge of pumps are fixed that require flexible and responsive management to be adjusted as per the demand.

b) **Mode of Operation:-** As in lift type Water Treatment Plant the inflow & outflow of water for catering the peak demand needs close and expert supervision 24x7 as the same depends on efficient working of pumps whereas in case of Gravity type Water Treatment Plant the natural grade plays its role and needs no expertise for maintaining the discharge of raw water.

Technical Challenges

c) Pump Maintenance and Replacement: Pumps and associated equipment require regular maintenance and eventual replacement due to wear and tear, which can be costly and logistically challenging for efficient lift water supply schemes the extra standby machinery shall be kept available & functional.

d) Pipeline Integrity: Pipelines must be designed to provide efficient transmission and to withstand high pressures as any leaks or bursts can lead to significant water loss and damage.

Economic and Financial Considerations

a) **Capital Investment:** The initial cost of setting up a lift type water Treatment Plant, including pumps, pipelines, and related infrastructure, is very high as the major bulk of water needs to be lifted uninterrupted for Mega Schemes.

b) **Operating Costs:** On-going costs for energy, maintenance, and personnel can be substantial and may require sustainable funding models.

CHALLENGES FACED IN DELIVERANCE OF TREATED WATER

OVERVIEW

The efficiency and effectiveness of deliverance/transmission of treated water supply depends on the operating stake holders knowledge of the variables that affect the continuity, reliability, and quantity of water supplied to consumers. The operational stake holders should be able to carry out changes in the hydraulic status of the system as required depending on those variables promptly and effectively. Routine operations shall be specified which are activities for adjusting the valves and operation of pumps to match the prevailing conditions (flows, pressures, levels and operation of pumps). Valve and pump operations will have to be controlled as per a schedule. The schedule shall contain procedures for operating the distribution system. It should contain procedures to obtain, process, and analyse the variables related to water flows, pressures and levels as well as the consequences of manipulating control devices, such as operation of valves and or pumps so that the hydraulic status of the system can match the demand for water.

1. Extension of Area of Distribution System:

Due to extension of service area without corresponding extension of distribution mains, the length of house connections will be too long leading to reduction in pressures. Also, in some of the places, an extension of distribution mains is not possible but a number of service connections are tapped at one location and extended for long distances which adds up misery to the supply system.

2. Inequitable Distribution:

This is one of the major problems in water supply distribution system. The consumers nearer to the ESRs receive more water with high pressure while it reduces as the distance from the ESR increases. If an area to which the SR is serving is uneven, the water will tend to flow towards downward gradient developing high pressure thereby consumer collects more water, on the other hand, the areas with higher elevation receives less water. This causes dissatisfaction in the consumers and, hence, to cater water to these consumers, the system has to be run for more time thus imparting more energy and cost consumption.

3. Intermittent Water Supply SyStem:

The distribution system is usually designed as a continuous system but often operated as an intermittent system. Intermittent supply creates doubts in the minds of the consumers about the reliability of water supply. This leads to limited use of the water supplied, which does not promote personal hygiene at times. During the supply period the water is stored in all sorts of vessels for use in non-supply hours, which might contaminate the water. Often, when the supply is resumed, the stored water is wasted and fresh water again stored. During non- supply hours polluted water may enter the supply mains through leaking joints and pollute the supplies. Further, this practice prompts the consumers to always keep open the taps of both public stand posts and house connections leading to wastage of water whenever the supply is resumed. Intermittent systems and systems which require frequent valve operations are likely to affect equitable distribution of water.

4. Cross/Inter Connections:

The distribution network of almost every water treatment plant in one city is interconnected with each other, which badly affects the water supply to tail enders owing to the fact that the release of supplies from all the plants doesn't take place in a synchronized manner which further accounts for Non-Revenue Water also.

5. Non-Availability of required Quantity of Water:

Failure of source or failure of power supply may cause reduced supplies. Normally, the distribution reservoirs are designed for filling in about 8 hours of pumping and whenever the power supply is affected the pumping hours are reduced and hence the distribution reservoirs are not filled up leading to reduced supply hours and hence reduced quantity of water.

6. Low pressure at tail end point.

Normally peak demand is considered ranging from 2 to 3, whereas the water supply is given only for a different duration, leading to large peak factors and hence affecting the pressures in the distribution system. This is a common with most water supply systems.

7. Urbanisation:

Expansion of pipeline networks to new settlements moves at a lower progression whereas the urbanisation and water demand both moves at different pace and high progressions. This creates a big gap. This gap appears to continue to go wider and deeper. In addition, damages to water distribution pipelines, chambers, marker posts (pipelines identification posts), etc., during road expansion programmes are becoming worrisome with displaced marker posts making line tracing a herculean task. Also, some of the undamaged pipelines often lie entirely under roads and make monitoring operations very difficult.

8. Leakages in pipelines:

Large quantity of water is wasted through leaking pipes, joints, valves and fittings of the distribution systems either due to bad quality of materials used, poor workmanship, corrosion, age of the installations or through vandalism. This leads to reduced supply, loss of pressure and deterioration in water quality

9. Unauthorized Connections:

Illegally connected users will contribute to the reduction in service level to authorised users/consumers and deterioration of quality of water. Sometimes, even legally connected users draw water by sucking through motors causing reduction in pressures. These illegal connections add to water loss thereby loss of revenue to water boards.

10. Age of the System:

With age there is considerable reduction in carrying capacity of the pipelines due to incrustation, particularly unlined CI, MS and GI pipes. In most of the places the consumer pipes get corroded and leaks occur resulting in loss of water and reduced pressure and pollution of supplies.

“Don't Let Life Slip Down The Drain”

Save Water, Save Lives

THANK YOU

Courtesy: Kashmir Jal Shakti (PHE) Department

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