

**A STUDY OF THE PROBLEMS ENCOUNTERED
IN RURAL WATER SUPPLY**

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ABSTRACT

This study is to look at the problems faced in rural water supply systems especially to homes in order to meet community use for a reasonable number of years in future. There is a necessity for this work as water is the most essential commodity for the continuation of life, a cleaning agent, a basic requirement for domestic use and even various types of industries. It extends water use to public use, flushing of sewer, street sprinkling, parks and ground, fire fighting e. t. c. Since it is known that about between 70% to 80% of our population is rural dweller and only about 10% to 20% of them can avoid pipe water supply, it means portable water has to be provided. The problem of covering whole of rural population within a reasonable time with portable water is a big national problem.

Key: water supply, pumping, water treatment, storage and distribution

INTRODUCTION

Water is the most essential commodity for the substance of life. Water makes everything grows. Water for human consumption ought to be pure and wholesome. It plays an important role in making human life not only survive but comfortable and luxurious. Water is used for drinking, cooking, bathing, air-conditioning (desert coolers etc), flushing of sewers, fire fighting, entertainment (water sports), industrial processes, power generation e .t .c [1].

Water supply system is the complete layout of getting water from the source, treating of for removing impurities and then, distributing it to the public for various uses. A well organized water supply system is essential by the engineer to meet the domestic, commercial and public use , and water from the source of supply which can provide adequate supply to meet the demand of the city [2].

The importance of water in broad term are agriculture (irrigation), industrial purpose, domestic use, recreation, commercial, hydroelectric power, sewer flushing, public supply e.t.c. The water consumption is the amount of water consumed a specified area. Consumption in area with comparable condition is often used as a guide for making estimation for new district. Water supply systems are designed to meet community used for a reasonable number of years in future. Rate of consumption is normally expressed as mean annual use in gallon per capital daily. There are variations in hourly, daily and season demand [3]

In water supply system there is always need for a storage tank. A storage tank operates usually under no pressure, distinguishing it from pressure

tanks or vessels. The design of the supporting structures and foundations of liquid storage tanks normally requires the determination of total weight and in the process, the tank capacity and the volume of the construction materials needed to be calculated and then multiplied by the density of the respective liquid and tank construction materials to obtain total weight [4].

Hence, [5] stated that the source of water among others for rural areas is generally ground water and this may necessitate the removal of harmful elements like fluorides, iron, and salinity. Which means the proposals for rural water supply should consider the feasibility of covering groups of villages in a regional scheme and this will facilitate the use of dependable source of raw water or treated water. Other sources of water may be spring, well, canal, lake, river, etc.

Thus , there is need to consider in this study a well or portable hand drilling bore for individual or a motorized bore in case of groups of people or a whole village having in mind that villages can be located quite far from each other or if villages are located quite near to each other.

- a. If villages are located quite far off from each other, it is always good to adopt individual source for each villages which can at best be a well or a portable hand drilling bore hole
- b. If several villages are located quite far off from each other, it is always a central water treatment plant may be installed and water distribution to all the villages. In this wise a lake, or river, or wells, or a portable motorized bole hole may be the source.

The essential thing is that selected source should satisfy the following needs, Quality of water should be best requiring no or very little

treatment and Quantity of water available from the source should be adequate to meet the requirements in all the seasons.

DESCRIPTION OF TECHNICALITIES IN RURAL WATER SUPPLY SYSTEM

GROUNDWATER are aquifers that is found in wells, springs, infiltration galleries etc. There are two sources of ground water: Rainfall which infiltrates, percolate or permeates into the ground through the force or cracks in the rock formation and finally reaches the underground water table. The other is the water from stream, in the likes of rivers, lakes and reservoirs which seeps or permeated though the soil to the underground water table.

SURFACE WATER is exposed to contamination and so it must be treatment before use. It may contain both organic and inorganic impurities gases and micro organisms. It is generally used for drinking purpose when the ground water supply is inadequate in quantity. There is rain water which is generally and stored in cisterns for domestic consumption. It may also be collected in reservoir. Rain water is soft and suitable for laundry purpose, it also corrosive when in equilibrant unit atmosphere geese. The river water is rainfall that does not percolate into the ground, taken in by plants or evaporates. It flows on the ground surface as rivers, streams and into the sea. Deep lakes and ponds having sufficiently large surface areas can be used for principal water supply.

WATER INTAKES : An intakes is a structure required to withdraw water from a river, lakes or reservoir. The primary functions of an intake is to supply highest quantity of water from the sources and to protect piping and

pumps from damage or clogging as a result of floating and submerged debris.

PUMPS AND PUMPING STATIONS

Simply put, a pump is a device for lifting water from a lower level. Sometimes a pump can be used to increase the flow pressure of water, oil, or gas. Normally most water sources are in lower levels compared to delivery points, for the water to get to the treatment works and then delivered to consumers, there is the need for the delivered to consumer, there is the need for the use of pumps to carry or pump the water to its destination.

Pumping facilities have to be provided to pump water for water supply if economical gravity systems cannot be constructed. Most large pumping stations abstract water from surface sources such as rivers, canals, lakes, etc. where ground water abstraction is usually provided by smaller (usually submerged) pumping units.

Pumping installation may also be needed to pump sewage or storm sewer flows from low level networks to high level screening/treatment plants. Also booster pumps may be needed in water supply network to boost pressure heads. Reversible pump turbine units are utilized in pumped storage hydroelectric schemes. In all these cases different types of pumps with appropriate sump and intake arrangement of the abstraction point are used to transfer the liquid from low to high levels.

Finally pumps are hydraulic machines which convert mechanical energy (imparted by rotation) into water energy used in lifting (pumping) water/sewage to higher elevations. The mechanical energy is provided by

electrical power (motor) or a diesel or gas or stream prime moves using either vertical or horizontal spindles[6]

KINETIC ENERGY PUMPS

The principal sub-classification of kinetic-energy pumps is centrifugal, which in turn, is dividable further into three groups: Radial-flow pumps, mixed-flow pumps and Axial-flow pumps. Thus, the fluid is displaced radically in a radial-flow pump, axially in an axial-flow pump the principal components of kinetic-energy pumps are: The rotating element called the impeller that imparts energy to the liquid being pumped. The shaft on which the impeller is mounted. The pump casing that includes the inlet and outlet passages for leading the liquid being pumped into and out of the pump, and the recuperating section which receives the liquid discharged from the impeller and directs it to the outlet passage. The function of the recuperating section is to convert a portion of the kinetic energy of the fluid into pressure energy. Typically this is accomplished by means of volute or a set of diffusion vanes. In a volute casing, the size of the channel surrounding the impeller increases gradually to the size of the pump discharge nozzle, and most of the conversion of velocity to pressure occurs within the vane passages. The frame which supports the pump casing. Because rags and trash in wastewater (even though screened) would quickly clog the small passage in typical Clearwater radial-flow pumps, the pumps used for untreated wastewater are usually the single-end section volute type, fitted with nonclog impellers. Nonclog pumps have open passage and a minimum number of vanes (not exceeding two in the smaller sizes and limited to three, or at the most four, in the larger sizes). Wastewater pumps must be able to pass solids that enter the collection

system. Because a 70mm diameter solid can pass through most domestic toilets, it is common practice to require that pumps be able to discharge a 75mm solid. Most 100mm pumps i.e pumps with a 100mm discharge opening normally should be able to pass 75mm diameter solids, and 200mm pumps should be able to pass 100mm diameter solids, and 200mm pumps should be able to pass 100mm diameter solids, etc. Non clog pumps smaller than 100mm should not be used in municipal pumping stations for handling untreated wastewater.

POSITIVE-DISPLACEMENT PUMPS

Position-displacement pumps are usually divided into two major categories, reciprocating (piston or diaphragm) pumps and rotary pumps. Pneumatic ejectors and the Archimedean screw pumps are also include under this category. Piston-type reciprocating pumps utilize a reciprocating piston or plunger in a cylinder to draw a fluid in on the suction side and to discharge it under pressure on the discharge side. In a diaphragm pump, the reciprocating element is a flexible diaphragm. In both of these check valves are used to control the pumps suction and discharge. In rotary positive-displacement pumps, the essential working element is a rotor that may have form of an impeller, vane, lobe, or any other suitable configuration. The principal types of rotary positive-displacement pumps are Eccentric rotor screw (progressive cavity), Gear, Lobe, Peristaltic, Piston, Screw , Vane and Flexible vane.

Pneumatic ejectors are often used for raising wastewater from building sumps. The ejector consists of an airtight tank into which wastewater flows by gravity and out of which the wastewater is forced automatically

whenever sufficient wastewater has accumulated to raise a float and open the compressed air-inlet valve. The screw pumps is based on the Archimedean screw principle in which a revolving shaft fitted with one, two or three helical blades rotates in an inclined trough and pushes the wastewater up the trough (see fig). Screw are commonly used in waste water-treatment plants to pump untreated wastewater and return waste activated sludge.

DESIRABLE WATER STANDARD

Portable or drinking water can be defined as the water delivered to the consumer that can be safely used for drinking, cooking and washing. The public health aspects are of such importance that the health authority having jurisdiction in the community now reviews, inspects, samples, monitors and evaluates on the a continuous basis the water supply to the community , using constantly updated drinking water standards.

METHOD OF WATER ANALYSIS

Water quality control analysis are based on analytical principles. This quantitative analysis may be carried out gravimetric, volumetric or colorimetric methods. Water can be stored to equalize pumping rates in the short term, to equalize supply and demand in the long term, and to furnish water during emergencies such as fines and loss of pumping capacity. Elevated storage may be provided by earthen, steel or concrete reservoirs located on high ground or farms desired above the ground surface. Water is pumping at a more or less uniform rate, with flow in excess of consumption being stored in elevated storage tanks distributed throughout the system. During the periods of high demands, the stored water

augments the pumped flow, thus helping to equalize the pumping rate and to maintain uniform pressure in the system. It may be economical to pump during off peak hours[7].

CONCLUSION

This work shows that it is necessary to look into the rural water supply system especially most homes now live on steams , rain water or public water and the quality of the water should be considered requiring very little or no treatment, in the same way the quantity of water available from the source be adequate to meet the requirement of all seasons. This knowledge is useful in the determination of appropriate rural water supply system to choose and if pumping is involve, it make case for the type of pump to choose and the storage system to adopt. This is true in [2] and [8].

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