

SESSION : S-2 : TUBEWELL IRRIGATION

Welcome Address

by

S. Chatterjee

In this technical session we are scheduled to discuss very important sector of human necessities—the production of more food from the soil. From the dawn of civilization, wells are playing a very important role. This has been specifically recorded in Rikh Veda, the oldest literature available to date, wherein it is mentioned

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Not only it is important as a source of drinking water but also irrigating fields for production crops. Rain falls on the surface of the earth and seeps down into it and becomes ground water. It is recovered from wells of various categories or collecting galleries. The Indo-Gangetic plain and other river valleys are the potential sources of underground water. Proper exploitation of the underground water can go a long way to alleviate and to irrigate the field to yield three to four crops a year if the water supply is ensured.

Occurrence of Underground Water

Underground water occurs in three principal forms.

- 1) In defunct river valleys and beds and ancient lakes. They are the most fertile tracts for cultivation.
- 2) In extensive sedimentary deposits where water may be held in porous rocks or stored under pervious strata and

- 3) In porous strata in which resistance to flow together with the rate of percolation from the surface are adequate to maintain a storage of ground water well above elevation of natural surface outlet.

Water occurs under the surface of earth in three zones.

- 1) Zone of soil moisture where water is temporarily held in pore spaces by capillarity and other soil conditions.
- 2) Zone of aeration or zone of percolation beneath the soil layer where both water and air are present in pore spaces.
- 3) Zone of saturation where all spaces are filled with water. The top saturated zone is called water table. It is not flat but has a variable depth beneath the surface, depending on surface topography, rainfall, direction of water movement, rock structure and porosity. Water in the zone of soil moisture may evaporate directly or through transpiration of plants or may trickle down into the zone of aeration and subsequently into the zone of saturation. Permeable rocks in zone of saturation yield water adequately but wells ending in the zone of aeration produce practically no water.

Ground water is not static but moves slowly

through pores or other openings in the rock formation. Thus water is continuously moving towards the point of discharge and replenished intermittently by rainfall in intake zones. The rates of water movements are controlled by hydraulic pressure and permeability of the soil. The yield of wells is controlled by the above factors and thickness of water bearing strata.

Wells are divided into two major categories—

Types of Wells and Methods of Construction

Based on the types of construction, they are (a) dug wells and (b) tubewells. Dug Wells are generally constructed by hand tools and usually of 3 to 4 ft. diameter. It may go upto 20-100 ft. deep.

Tubewells may be categorised on the method of sinking as driven or drilled wells. Driven wells are possible in consolidated sedimentary deposits, free from boulders but in which the granules of deposits permit a swift flow into the well when rapid and continuous removal of water by pumping is possible. Hand operated wells can be driven by 'Sludger method' with least tackle and equipment. After making a preliminary hole by up and down movements of the pipes with saw tooth cutter improvised the bottom of the socket at the lowest end of the pipe, the driving pipe is extracted. Thereafter the strainers with pipes are introduced. Strainers are landed in coarse sand where the water strata is met.

In Abyssinian type of well a solid cone at the bottom with the strainer connected with pieces of pipes are driven by hammering or by application of load. They are suitable for areas where water bearing strata is high and specially in bivouac. Sinking of drilled wells require special training, experience, tools and equipment. Among the current methods of

drilling wells include (1) standard method, (2) jetting or wash down process, (3) the core drill method and (4) the hydraulic rotary method.

Sometimes the life of the well can be enhanced by putting a casing pipe and maintaining casing even after sinking tubewell. Sometimes with holes longer than the diameter of the pipe, the annular space around the space of the pipe is filled with gravels and pebbles so that chokage of the strainer is least.

The yield of the well depends upon the underground condition. The characteristic and behaviour of the well are determined by test and prediction based mainly on mathematical formulae, partly rational and partly empirical producing approximately correct results. The location and spacing of the wells should be such that there is least interference between the adjacent wells. Here the technologists and agroengineers can do a lot for exploitation of the underground water for intensive agriculture.

Materials

Galvanised pipes were so long used as standard tubes for insertion into the bores with one or more strainers located in different aquifers. The strainers are usually choked with the deposition of chemicals as a result the life of the well is reduced. At present Hagutha or similar type of strainers are some used. They are relatively costly. With the rise of price of steel some substitute materials were considered necessary. Hard plastic materials (PVC pipes) are now in the field. They are inert to the chemical action with the dissolved salts in water. they are economical in the long run specially with the plastic strainers.

Prime Mover

Manually operated pumps are convenient

for operating small diameter tubewells. For larger diameter tubewells above 2", power operated pumps are in use. In such cases, tubewells are provided with top-enlargements to accommodate the pump impellers. Prime Movers for running the pumps are either gasoline driven or diesel driven engines. The rise in price of these fuels are telling upon our

agricultural advancement. The electric motor driven pumps are very suitable to pump water for which rural electrification is very essential.

We have discussed in the morning session about the rural electrification. I welcome you all to discuss more elaborately on the different aspects of tubewell irrigation and its various perspective.

Address by Chief Guest

By

M. M. Choudhury

I feel a bit awkward to deliver before you and to express a few words because in the field of Engineering my knowledge is zero. In this function, three of our eminent engineers and scholars have been awarded Karmavirottama. Amongst them, Shri Prasm Sen took the award on behalf of his father late Gopal Chandra Sen. Sir Jehangir J. Ghandy accepted the award but could not attend the seminar physically due to indisposition. And the third, Dr, K. N. Modak accepted the award on behalf of his father Late N. V. Modak but could not attend the function due to various preoccupation. The life sketch of the three Engineers and Scholars who have been awarded such title Karmavirottama have been given in the meantime. We are very sorry that we have missed the presence of those distinguished Engineers. I find in the life sketch of Dr. Sen that he passed the I. Sc Examination in the year 1929 from the Calcutta University. I am proud that I also passed the I. Sc. in the same year from the same university. This is one of the reasons that led me to participate in this Seminar.

India is a developing country. You have so many things to do. We are almost in slumber. In the British regime, Indians were not allowed to demonstrate their talents to the fullest extent. For many reasons, their talents were ignored and they were not given opportunity to carry on their works. But to day things have changed. Many things are in the mind of the people. People want to have all facilities and amenities of life.

Mahatma Gandhi built the Indian people and you, the engineers are to build the country. You should know, there are yet things to be done. Many things are yet to be done than we have achieved. I don't like to go in for a long speech. I want to say or simply emphasize on one or two points.

India is an agricultural country where 82% of the population depends on agriculture for their livelihood for many years to come and unless we develop our agricultural economy it will be foolish to think that prosperity has come to the nation. If we want prosperous India, we must build up our agriculture. Many developments have occurred in urban areas but