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WATER, SANITATION, ENVIRONMENT and DEVELOPMENT

Emergency chlorination improvisation in Ondo

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Introduction

The implicit confidence the public has on the assured potability of water that comes from the taps make it imperative that supply from the waterworks must always be full disinfected. A cursory assessment of available water technology and services would reveal that the chlorination method of disinfection is most reliable, economical and banal in Africa. However, once the chlorinator systems break down, it is impossible to dose the gas and regrettably, this economical option is often lost. The use of powder form, High Test Hypochlorine with its 30% - 70% available chlorine becomes the next effective but more expensive alternative. Considering worst conditions, what happens when both options given above fail? The thought of averting this critical stage in water production led to the adoption of chlorination improvisation unit at Ondo State Water Corporation, Nigeria.

Situation report

Out of the 28 Water Supply Schemes being operated by Ondo State Water Corporation, 13 require full treatment the conventional way, while the rest are boreholes and mini schemes with partial treatment ie disinfection only. The biggest scheme, Ero, designed to produce 66 million litres of treated water per day operates at less half capacity. Almost all schemes are designed to rely on chlorination disinfection method. By the end of 1991, all the chlorinators in about 10 bigger schemes had broken down, leaving a large stock of 1850 cylinders of chlorine underutilised. The execution of a contract for the supply of chlorinator spares worth N2 million (£0.13 million) was unduly delayed. Only 170 drums of HTH were left. Even at N2,000 (£130) per HTH drum, the 200 drums per month consumption rate was uneconomical.

Assessment and options

With the above grim situation, the Corporation faced the risk of rationed pumping as undisinfected water cannot be pumped to consumers.

Analysed possible solutions to the problem at hand include the following:

(i) Repair all faulty chlorinators locally by January, 1992;

(ii) Purchase new chlorinators;

(iii) Employ other methods of disinfection;

(iv) Procure more HTH;

(v) Try ingenious means of dosing available chlorine.

The improvised unit

The Laboratory Division, an arm of the Operations Dept of the Corporation came out with an idea on how chlorine could be dosed from available cylinders and into water in the treatment process without a chlorinator. The efforts culminated in the testing of the T - Joint unit, a device with the characteristics of a pipeline undergoing a sudden decrease and enlargement. The chlorine gas from the drum flows through the PVC T-Joint. Carrier water tapped from a pressure line such as the upwash tank, is made to flush the chlorine from B to C to deliver the chlorine water into the dosing points. The point is preferably by the filtered water pipe entrance to the concrete water tank.

The carrier water pressure had P2 at A is greater than that of P3 and P4 by the sum of head losses at constriction and enlargement. The system works as long as the pressure of the gas does not fall too low for the flow of carrier water to surge in. Chlorine dissolution would obviously be less efficient than what obtains at a chlorinators injector vacuum.

The unit functions well in the Tropics because of readily available latent heat that aids rapid draw off of chlorine through the cylinder pipe.

Material sources, costing and assembly

Except for the clips, the materials used are all made of PVC. All materials are available in the local market. The cost then was between N700 to N1,000 (£50-£65) per unit while the assembling was done at the Central Laboratory. Where all items are supplied, it is possible to install a unit within 30 minutes.

Preliminary site tests/results

Preliminary site tests were carried out at Ado-Ekiti Water Supply Scheme and the Artisian Borehole at Ikere-Ekiti. The residual chlorine at the reservoirs range between 0.2 - 0.5 mg/l. Further sampling of supplies has always been satisfactory. The units were at various times

provided for Owena-Ondo, Owena-Igbaraoke, and Ala Water Supply Schemes when the chlorinators in these Schemes broke down.

The unit was installed at Ero Headworks in February 1992. It has been in service since then and is still giving somewhat satisfactory performance. The unit could not work well at Owena-Igbaraoke Scheme where the dosing point is on a higher level than the chlorinator room, obviously for the increased pressure head. At this scheme, water back flows into the system when pumping stops or when there is abrupt electric power failure.

At Owena-Ondo Scheme, the carrier water pressure was not high enough to effect dosage. The unit has no metering gauge to determine dosage rate. Since it was impossible to have 100% chlorine dissolution, dosing point is liable to corrosion effect, particularly leaching. Some measure of chlorine smell is noticeable but this does not normally get to danger level if the fittings are properly connected. In any case, an oxygen breathing apparatus should always be available for use of the operator.

Conclusion

It must be emphasized that at the stage of its development, the unit cannot replace the normal chlorinator system. It may only be relied upon to meet emergency needs in view of its short-comings. Some questions agitate the mind: Is the unit not best limited to effecting dosages not greater than 1 mg/litre especially for safety reasons? Will a simple automatic feeder provide proportional feed if incorporated to the unit? Could a check valve, if provided, solve the problem of back flow into the system?

Obviously, the concept of the improvised unit underlines the serious logistic problems at many Waterworks and the need to provide ad hoc solutions in times of emergency.