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How to develop distribution control

CONCLUSIONS AND CONDITIONS

01. The RFR - a product of appropriate technology - restricts the flow-rate at the point of distribution. With the help of the RFR distribution periods can be increased without increasing the volume of supply. The results are lower peakfactors and an increase of the pressure level in the distribution network.

a. The RFR is a potential tool to develop and maintain a high degree of water supply equitability of (integrated) piped w.s. distribution systems, both urban and rural.

b. The RFR is a potential tool to develop and implement (integrated) piped w.s. distribution systems progressivily, that is in progression/in harmony and in pace with the development of the necessary allied activities to w.s. like drainage and income generation.

c. The RFR is a potential tool to exploit and develop piped w.s. self-reliantly.

If properly prepared and implemented - both technologically and socio-economically speaking - the developer can and should issue certain guarantees for self-reliance in operation, maintenance and repair (O/M/R).

d. The RFR is a potential tool to rehabilitate existing piped w.s. (distr.) systems. After leaks have been repaired proper distr. control can be enforced and a fair distribution of the (available) water established.

e. The RFR is a potential tool to lessen the need for private (household) storage and water-tanks as the need for intermittent supply ceases.

f. The RFR is a potential tool to decrease water losses that result from intermittent supply (high distr. factors and violent destructive flow conditions).

02. So, potential savings are at stake - both for the consumer and the Water Supply Undertaking (WSU) c.q. Government - as the result of proper distribution control and continuous supply. Besides that the quality of the water can be better guaranteed.

03. There are however, as always, a number of conditions that must be fulfilled in order to realise the above conclusions.

One is proper inspection.
Another is the recognition that every beneficiary should be in the position to pay for the services offered.

This means that income-generating activities have to be developed along with w.s. and sanitation.

04. New circumstances may require some research before applying the RFR on a large scale. Codes and guidelines may be needed.

INTRODUCTION

05. Water supply equitability is a notion used here to express appropriate service level of (piped) water supply. Appropriateness means adjusted/attuned to the real needs, to the safe (waste water) absorbtion capacity of the environment and to the ability of the beneficiaries to pay for the services rendered.

06. Appropriateness contemplates graduality in development
If the target group is used to a consumption of say 5 liters per capita per day (lpcd) it is bad to suddenly give much more than that without considering the ill-effects of the water that will return as waste,. Supply-rates have to be built up gradually and in tune with the development of drainage and/or the re-use of the waste waters. This is called progressive water supply.

07. Waste water can be used for many purposes. Particularly in arid and semi-arid regions where there is a tremendous need for mini-irrigation to water vegetable beds, seatlings and fire wood! Waste water in backward drought-prone areas offers a whole range of possibilities for income generation to individual families as well as to the subject community as a whole. Integrating such allied activities will make water supply more viable and meaningful. This is what is meant with integrated water supply.

08. If waste water /sullage and spill) is drained onto dirt-roads it becomes a nuisance and a danger to (public) health. Especially in drought-prone areas waste water becomes endemic and the abode of death as unhygienic conditions develop (new) deseases and epidemics. With the help of the RFR integrated piped w.s. can be developed progressively and economically. Particularly when the RFR is applied to render continuous w.s. service (rather than an intermittent supply), substantial savings can be expected.

DISTRIBUTION CONTROL of piped w.s. systems.

10. Distribution control is the key to w.s. equitability.

11. Under well-developed circumstamces proper distr. control is realised. The supply is continuous, quality assurance and reliablity are good and inspection services are effective. And, consumers pay their metered consumption (meter tariffs).

12. Under less-developed circumstances proper distr. control is a matter of appropriateness.

13. In many countries there are two types of distr. control (fig. 1):
- onset control and
- tail-end control.

14. When the distribution is controlled at the onset of a distr. network - or parts thereof - it is called "onset control". The flow may or may not be monitored.

15. When the distribution is controlled at the distr. points - the tail ends of the distr. network - it is named "tail-end control". The flow may be metered or restricted.

16. The main purpose of distr. control is to establish a fair distribution of the (available) water and to collect revenue. If both onset- and tail-end meters are applied water losses in the distr. system can be "measured" too.

17. Of the two, tail-end control is far the most effective. Without it the abuse of water will be abound and sufficient reason to apply intermittent supply after wich problems start to accumulate. Short distribution periods lead to high distribution factors, violent pressure fluctuations and violent flow conditions capable of damaging the mains. Taps are left open and many try to collect as much water as they can. Those who can effort it will invest in private water-tanks. Every time the supply is interrupted polluted water enters the mains through leaks, cracks and crevices. Water losses increases and hygienic conditions deteriorate.

18. So, keeping the mains under pressure must be strived after. That implies continuous supply and proper tail-end distr. control.
Under developing circumstances - e.q. lack of test benches and repair facilities - proper tail-end control is very difficult to achieve with watermeters. The RFR and the appr. technology that comes along with is more effective.

PROGRESSIVELY INTEGRATED W.S.

19. In many a rural environment piped w.s. is foreign and difficult to understand. It was brought upon the beneficiaries as a gift. But the community got stuck with it. Instead of improving the living conditions it was soon recognised as the Trojan horse that started to effect the precarious balances of rural life adversely. While subsidies for O/M are increasingly difficult to come by the commhnity will be further improverised.

20. In order to counter such sages in minor it is the developer's obligation to ensure that w.s. contributes to the sensuous balances of communal life. It is therefor important to identify for every village the necessary allied requirements and activities, such as

- drainage and sanitation
- preventive healthcare measures
- health education, community participation
- training of local operators
- effective inspection and O/M services and
- income generating activities

that have to be developed along with the w.s. in order to make it meaningful and self-reliant.

21. Depending upon the local circumstances the planner must determine the proper pace of the integrated developments. Also the proper sequence of activities is important.

22. This implies that integrated w.s. development has to be synchronised programmatically. With the help of the RFR (permissible) distribution-rates can be easily adjusted at the distribution points in the turn of an expert's hand (par. 27b). The owner can not increase the flow-rate. Yet, he can clean the RFR and use it as a valve (par. 27a).

23. In case of intermittent supply, the permissible distr.-rates can be increased/decreased by increasing/decreasing the distr. periods (par. 28).

24. As soon as the permissible distr.-rates cover the demand the need for flow restriction subsides. The WSU way than change the RFR's for water meters to save energy. This is a matter of costs as w.meters will require a hydraulic test bench and a repairshop.

APPLICATIONS OF THE RFR.

The RFR

25. The RFR is developed by WISA, Arnhem, the Netherlands(1). In Dec. '84 the company won the Eutraplas Price for it in Brussels. The properties of the RFR are determined by the capacitor assembly that controls the flow-rate. All cap. assemblies (25-1,000 l/hr) are colour coded and fit in the same housing. Within certain pressure limits the flow-rate is maintained at 15% accuracy. Below that pressure range the flow-rates drop.

26. The RFR consumes more energy than the water meter. The pressure drop over the device is substantial. Contrary to the water meter, the RFR dams the water up at the cost of the flow-rate. This benefits the pressure level in the distr. network.

27. a. While in operation the owner can (always) flush the RFR clean by turning the Splindle 180°, this reversing the flow in the cap. assembly. Turning it 90° it will stop the flow.
b. Only qualified operators should change the colour-coded cap. assembly. After changing the flow-rate the RFR is sealed again against tempering (inspection). Same for flushing the RFR.

c. Unique is the property to maintain a constant flow-rate independent of the pressure in the main as long as the hydraulic pressure difference over the device does not drop below a certain value. (fig. 2).

Progressive water supply (par. 19-24)

28. Example 1 (rural/drought-prone). A village (pop. 1,000) is to be supplied with progressively integrated piped w.s. The beneficiaries are used to consume less than 5 lpcd. There is no drainage nor sanitation facilities, no trees nor firewood nearby and thus no agriculture. Cattle, goats and camels form the lifeline.

a. The feasibility study by a socio-economic appr. technology unit (SEAT-unit) reveals that the beneficiaries need water all-right, but, not drinking water but mini-irrigation for vegetables, fodder and firewood is what they see as their first priority. For, dr. water thay can get grom far. Besides, irr. water can also be drunk!

b. A piped w.s. is designed for 30 years and 2,000 people. The SEAT-unit concludes that the implementation has to be integrated with
- a cattle watering programme
- a mini-irrigation programme
- preventive health care measures
- " " " education and
- a training programme for local operators, vegetable gardening, fodder-, firewood- and
- a production programme for gee and butter-milk.

The community will participate in the various activities. The SEAT-unit will guide the allied activities while the subject W.S.U. will implement construction work. Note: no need for sanitary facilities.

c. The implementation of the w.s. component (W.S.U.) distinguishes two phases
1. the first construction phase (75%)
2. the exploitation and progressive dev. phase (25%).

The first phase provides 75% of the hardware, sufficient to cover the first 15 years. As soon as the 75% is commissioned that part of the w.s. scheme will be exploited as follows (progressively):

1st year	10-15 lpcd	community to dev. cattle throughs, first veg. beds, gee and buttermilk for own consumption only	
2nd year	20-25	"	vegetables and seatlings for firewood. Drainage.
3rd year	30-35	"	irrigation of firewood
4- 5 year	40-45	"	fodder dev.
6-10 year	50-55	"	harvesting for own consumption and cash
11-15 year	75	"	stabilisation.

d. After 5 years the w.s. scheme must be self-reliant with all beneficiaries contributing to the cost for O/M. First 5 years no house connections.
Second 5 years max. 25% connections
Third 5 years max. 50% connections.

e. Public fountain (cont. supply/200 people). See for typical solutions fig. 5 and 6 resp. for permissible consumption ranges 10-50 lpcd and 50-150 lpcd. Fig. 5: solution for household water only. As soon as more than 30 lpcd is supplied water will be used at the public site for bathing, laundrying, cattle watering and -washing. These activities require appropriate facilities and the waste water should be used to develop watering of vegetable beds, seetlings and bush for firewood (mini irrigation). Household water is returned as sullage and should either be re-used or properly drained into e.g. private soak-pits.

f. House connections (fig. 7 and 8). For supply rates below 100 lpcd RFR's should be applied to serve at least 25 people (say 5 households). This situatation refers to A, fig. 7 and 8. In order to collect one's quota, that each house should install a 100 l. tank can be filled during the night (Sa). As soon as the supply is increased beyond 100 lpcd each house can be provided with it's own restrictor and situation B applies. Private storage, Sa, will be max. (600 l) for RFR's 75-100 l/hr. So, each house should install a standardised 500 l tank protected with a float-valve.