Introduction to Water Supply Management with Urban Planning and Grid System in Smart Cities

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Abstract

Water supply and consumption is always a field of concern for any country. In the recent times, there was water scarcity in many places around the globe. Population expansion with time is booming. Water is a basic need to survive. Water is required for drinking, washing, household and industrial activities, etc. Hence, it is essential to conserve water at every stages of development. There has been exploitation of portable water all around the globe at all scales, starting from houses to large industries. Irregularity of rainfall has resulted in reduction of portable water and water supply. Increased discharge of effluent to the existing water treatment plants has caused over-working of machines and over energy consumption. With increase in population and urbanization, water supply has to be sufficient as well as satisfy the sustainability parameters. Hence, regular monitoring and regulating is needed to satisfy the present water demand as well as conserve efficiently for the future. Thus, smart cities are the future!

Keywords: Water supply, monitoring, conserve, energy consumption, sustainability, etc.

1. INTRODUCTION

Water resource engineering is always keen to develop new frameworks and regulations that help to conserve water and also supply water in satisfactory amount. Keeping in record of the fresh water sources, water supply, water scarcity and waste-water generation, there has been a constant development with time [1]. Construction of dam, canal, and catchment area may not be always a solution. Construction of a structure has many impacts on the environment. An EIA (Environmental Impact Assessment) is mandatory to build any of these structures [2]. Also, mass concreting may result to increase in surrounding

temperature. Then how to deal with management of water, from stock to supply? This will surely be answered in this paper through an analytical approach.

2. METHODOLOGY

2.1 Need of Smart Cities

The architecture of urban planning includes practice of designs that accommodate commercial, residential, industrial, eco-friendly environment and energy sufficient factors. With increasing demand in water, more and more amount of water is to be drawn from the ground water or from water reservoirs. Also, more water supplies will lead to more waste water. Hence, the overall system puts tremendous pressure on constant energy supply.

People are switching to cities for employment and better living. Hence, the weight of the cities is going to increase by 68%, as predicted by statistics [3]. Smart cities are the only option to facilitate the present and upcoming issues. However, any developmental activity puts immense load on energy supply.

Smart cities facilitate clean and renewable energies and the operation of sustainable distributed systems that can be widely discussed. A smart city has extensive use of IT services, efficient flow of products, intelligent governance system and cloud based real-time data monitoring system [4]. This allows a smart city to keep an eye on the services, energy consumption in each sector and track the standards of existing infrastructures with future standard.

2.2 Grid Technology

Application of Grid approach to differentiate the whole area into parts is an efficient scientific approach to understand the root causes of the problems and develop solutions that will benefit the area as whole. Smartgrid technology is being implemented in smart cities to me it more efficient and monitor the load on energy supply and distribution. With the help of smart grid technology, information is available to both the consumer and producer. It can facilitate real-time data of energy produced, stored and consumed. A small part can be monitored to improve the efficiency of the whole part. DER (Distributed Energy Resources) like Solar, wind, etc can be designed using this technology to optimize the area usage [5][6].

3. APPROACH

Taking an example, let there is a smart city with few houses, industries, facades, etc. The whole area is divided into small parts, considering each part has sufficient area to accommodate the facility. The water supply line connects all the household needs, industrial needs and facade maintenance needs. A separate line is constructed to guide the sewage water to treatment plant. Installation of water flow meter at each small part (squares) is done to monitor the water consumption by the entity [7]. The real time data is also

available to the waterworks body. If the entity consumes more water than designed value, then an alert will be sent to the entity to control the consumption of water. Also, water level detectors in sewage tunnels will help in monitoring discharge of sewage water in the treatment plant. Regular monitoring of water supply and treatment will help conserve water and reduce pressure on the mechanical equipment [8]. Hence, it proves to be energy efficient process to sustain a good quality of life. In smart cities, this system can be easily implemented as there are various inter-connected communication links and flow of data. Through IoT, data can be stored in cloud and accessed from anywhere and at anytime [9].

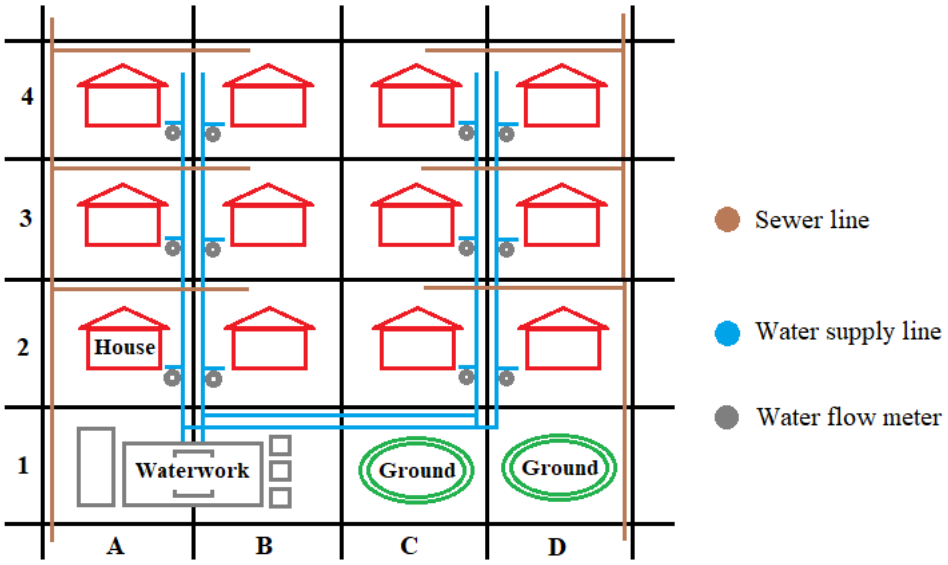

Figure 1 – Whole to part area division in smart cities

Figure 2 – Water flow meter

4. RESULTS AND DISCUSSIONS

As per provisions laid by IS: 1172-1957, it recommends water consumption in different sectors as listed below in Table 1:

Description	*Amount of water (lcpd)*
1. For communities with population upto 20,000	40 (min.)
(*a*) Water supply through stand post	
(*b*) Water supply through house service connection	70 to 100
2. For communities with population 20,000 to 100,000	100 to 150
3. For communities with population above 100,000	150 to 200

Table 1: Water consumption in different sectors

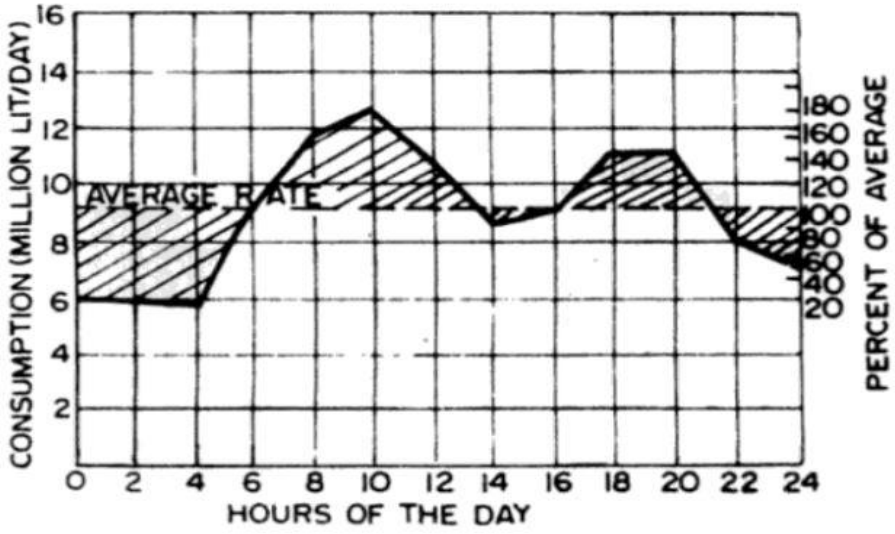

Figure 3: Water consumption variation in different hours of a day

The meter provides a low-cost alternative to existing solutions, with an estimated cost of 12% of the commercially available unit. The implementation of the Advanced Metering Infrastructure (AMI) widely regarded as one of the first steps in the digitization of the electrical grid control systems, generates new threats to the network, such as the fabrication

of reads energy meter, manipulation of energy costs, the sending false control signals and malicious code.

5. CONCLUSION

Smart cities form the basics of sustainable development in the modern world. Along with the expansion of population and urbanization, load on agriculture, water supply and electricity has increased tremendously. Today, one can hardly think of a day without electricity. Also, recent scenario on water scarcity has put scientists and researchers develop and form strategies to conserve water and monitor water supply and treatment. With the help of implementation of new inventions and processes, energy consumption can be optimized. There are various instruments available to monitor the energy consumption. Every process has a certain impact on the energy usage and environment. People must be concerned towards the use of natural resources. Every element of nature needs to be conserved and used with utmost responsibility.

6. REFERENCES

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