

REDUCTION OF WATER CONSUMPTION BY MEANS OF PITOMETER SURVEY AND CONSTANT INSPECTION*

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IN 1897, the Buffalo common council decided it more advantageous to its citizens to install more pumps and give practically an unlimited supply of water than to control consumption by means of meters. It is hardly necessary to add that this decision was made contrary to sound engineering advice. Free water is a slogan that often appeals to the unthinking. It would be interesting to speculate on what that decision has cost the citizens of Buffalo in the past twenty-two years. Suffice it to say that, in 1903, the Bureau of Water had a bonded debt of \$3,699,382, while it was \$12,141,524 in 1917. From that date until 1917 it was a race between the unchecked waste, both in mains and in houses, and the pumps.

In 1903, there was one pumping station, with a daily capacity of 183,000,000 gallons. In 1917, there were two pumping stations with a combined daily capacity of 330,000,000 gallons. Coincident with the increased pumping capacity, large distributing mains were laid. During this period the per capita consumption had ranged between 302 and 339 gallons per day. Of this practically 100 gallons was for industrial use.

Commission Introduced Economies

In 1916, the city government was altered and a commission of five men elected to govern the city. Their platform was an economical and efficient city government, and one of the early efforts was an investigation as to means to reduce the city water consumption. As all water used must be pumped from Lake Erie, against a head of 140 to 204 feet, a reduction in pumpage would make an immense saving in coal used for fuel. Various methods were considered, and in the spring of 1917 it was decided to have a pitometer survey made of a small section of the city with the idea of covering the whole city later, should this section show satisfactory results. The question of metering was considered but rejected on various grounds, some of which were: Popular local prejudice against metering; length of time to completely meter city, there being over 76,000 unmetered and active services, while the pitometer method promised early results; extensive changes in plumbing required should meters be installed in many of the poorer types of dwellings; and heavy initial investment required for meters.

To facilitate the work and also that definite records could be obtained of water consumption in different points, the city was divided into ten sections, none of which were similar in character, and work was completed by sections.

City Divided Into Sections

Section 1 includes manufacturing use and poor, good and high grade residential districts.

Section 2 is an old residential section with most of the buildings ante-dating the modern sewer and water service. In this section the toilets are usually of the so-called anti-freezing type installed in a shed in the rear of the house. The waste in this section was tremendous.

Section 3 is a section of the city sub-divided in the 90's, when water mains, sewers and services were laid. This section is only now being developed. The residences built are of fair construction. In this section the rock lies close to the surface and in many streets water mains and house services are laid in the sewer trench. The value of the pitometer was proven in this section as ever-leaking unfinished supplies which were discharging into the sewers were discovered and stopped. Along Fillmore Ave., quarries had been opened years ago and water from a broken 16-inch main discharging into the face of the pit had for years

furnished excellent water for men and teams working in the quarry.

Section 4. Principally high class residential, such as the Delaware Park section. Western portion, however, heavy manufacturing use of water and poor class dwelling. 75% of this section is built on rock strata close to the surface.

Section 5. High class residential principally, with eastern portion of middle class dwellings. No manufacturing use of water.

Section 6. This section takes in the heart of the business section of the city. Northern portion is composed of middle class dwellings but 80% of water is used commercially.

Section 7. Poorer class dwellings and large manufacturing use of water. All the big packing houses and stockyards are included in this section.

Section 8. This section includes most of the water front of the city, with large manufacturing plants and commercial use of water. Poor class of dwellings and the oldest section of the city.

Sections 9, 10. Middle class dwellings with some large steel mills on the outskirts. Also railroad yards are large consumers in these sections.

Theory of Pitometer Survey

The theory of a pitometer survey is briefly described as follows: A certain section of the mains is isolated by closing all but one of the boundary valves. A special corporation cock is inserted on the main, feeding this district through the open valve. The main is traversed and the velocity of the water determined by the instrument inserted in the main, through the corporation cock. Gaugings are recorded on sensitive paper for 48 hours, and from the velocities shown, the flow computed. As all the water entering this section passes the instrument the amount measured must be the consumption of the district. The interesting or indicating feature of these records is the relation between the minimum night rate, which is usually found between 12 and 3 a.m., and the total 24-hour consumption. A high night rate, unless accounted for industrially, means leaky fixtures or breaks in mains.

As the isolation of a section is apt to leave some industries just within and without the district short on water pressure, causing complaints of low pressure, a map is kept in the office of the Superintendent of Maintenance, on which all valves closed are indicated by a red-headed pin. By this means one can, at a glance, determine if a complaint of lack of pressure is due to the pitometer work, or to some other cause. These pins for closed valves are corrected each morning.

Determining Consumption by Sub-divisions

After the total measure of a district is made, sub-division work is started. Sub-division is the determination of the consumption block by block, and is always done at night. The pitometer is set at the gauging point and the district shut off block by block, the time of each shut off being noted. By comparing the time with the consumption shown on the photo chart at the corresponding time, the rate for each block can be determined. This is a very important feature of the pitometer work, as by comparing the consumption for the different blocks one knows immediately where the inspection of fixtures will give the greatest result. It is an especially valuable feature for the control of the house waste after a survey has once been made. By means of the pitometer and proper sub-division, house to house inspections can give results twice as quickly as though no pitometer were used, as efforts will be confined to blocks where the sub-division indicates the greatest results are to be obtained.

Immediately after the sub-division work was completed, inspectors were placed in the district and house to house inspection made.

To make the survey, an engineer in charge and four assistants were employed. Three trucks with gangs of four were constantly engaged and one clerk assigned to this work, to keep the records. Twelve of the regular city inspectors made the house to house inspections. Later, as

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