



5. CONCLUSION AND SUGGESTION

Physical Properties. It is found that the water supply from the Water Treatment Plant is free of turbidity, clear and colorless. The standard of drinking water is that the turbidity should not exceed 10 ppm. of silica scale, and color not exceed 220 ppm. of platinum cobalt scale. Odors and tastes are qualitative. If there is any odor in the water it can be detected at once. This may be removed by aeration, or by super chlorination.

Chemical Properties. In chemical tests the substances are divided into two sets with their limiting values. The first set is called imperative requirements. If these are exceeded the water is condemned to be unfit for drinking. The other one is called desirable requirements.

First set substances and their limiting values:-

1. Arsenic	0.2 ppm.
2. Barium	1.0 "
3. Cadmium	0.01 "
4. Hexavalent chromium	0.05 "
5. Cyanide	0.01 "
6. Lead	0.05 "
7. Selenium	0.01 "
8. Silver	0.05 "

These are very minute amounts which are the limits of detectability in water, using known analytical procedure.⁽⁴⁾ These substances were detected by the procedure using spectrophotometer.

None of these substances are present in both raw water and treated water. But tests are required to be made regularly once or twice a year. It is unfortunate that there is no spectrophotometer in the laboratory yet. The tests for these substances are very important, and there are chances of pollution by these substances into the raw water along both sides of the intake canal. Some of the industrial wastes may find their ways into rivers or canals. Inspections of factories, which are situated along the River, have to be made in order to know about wastes disposed from these factories.

The other set with limiting values:-

Total solids or total salinity, that is, the amount of material remaining after a sample is evaporated: The limiting value is 500 ppm. but should not exceed 1,000 ppm. The report of the water analyses at the Bangkok Water Works shows that the total solids of both raw and filtered water are in this limit.

Iron: the limiting value is 0.3 ppm. The quantity of iron present in raw water is sometimes found to be more than the limiting value. After the processes in the Treatment Plant, the filtered water is found to contain not more than 0.3 ppm. High iron content will cause stains in plumbing fixtures. Certain bacteria, called iron bacteria, are usually found in the water containing iron. They live on iron and attach themselves to the walls of pipes, thus causing the latter to corrode with a bulky and hard incrustation. Water that flows through the corroded pipes

causes red water, turbidity and odor. Problems are usually found in those districts still using old pipes. Most old pipes are corroded during periods of inadequate water supply when water from a number of deep wells is drawn up and pumped into the distribution system. Most ground water from deep wells in the area of Bangkok and Thonburi is high in iron content. Sometimes it is up to 5.0 ppm., so it causes tuberculosis in pipe lines. Later there was a project of extension and improvement of the Bangkok Water Works. Most of the mains have now been laid and the quality of water flowing through the distribution mains is better. And it will be even better if the consumers have changed the pipes in their houses. They will get the water supply which is good in quality.

Copper and Zinc: Copper and Zinc are both metallic poisons, so we try to avoid their presence. The limit for copper is 1.0 ppm. and that of Zinc is 15 ppm. In the water analysis at the Bangkok Water Works no copper and Zinc is detected.

Sulfates and Chlorides: are negative radicals which form incrustations in boilers and containers, so we try to limit their amounts in water not to exceed 125 and 250 ppm. respectively. In the Bangkok water supply there are only small amounts of both sulfates and chlorides.

Sulfates in combination with sodium and magnesium will act as a purgative so that drinking water with more than 500 to 1,000 ppm. will probably lead to diarrheal disorder.⁽⁴⁾ The amounts of magnesium and sulfates are traced in water supply.

Bacteriological Properties. Bacteriological standards are that one coliform organism per 100 milliliters of water. In order to apply the figure the method of the dilution tube is used in the laboratory of the Bangkok Water Works. In the dilution technique a sample comprises five portions of 10 ml. each, so five tubes constitute one sample. To arrive at one coliform per 100 ml. each, the first requirement of the standards is that the number of positive tubes shall not exceed 10 percent of all the portions examined per month. ⁽⁴⁾ In the determination of bacteriological properties of water supply at the Bangkok Water Works, the number of positive tubes is 1% of all the portions examined per month.

The number of samples examined per month is proportional to the population as indicated in the Standard Methods for the Examinations of Water, Sewage and Industrial Waste by the American Water Works Association, 10th Edition. For a population of nearly 2,000,000 the minimum number of samples per month is 300. It is to be hoped that the Water Analysis Laboratory of Bangkok Water Works will be improved to run bacteriological tests on 300 samples a month.

All of the methods of the physical, chemical and bacteriological analyses are indicated as in the Standard Method for the Examination of Water, Sewage and Industrial Waste, 10th Edition by The American Water Works Association. Within the last few years a newer method of estimating the coliform group of organisms has been worked out; this is the member filter technique.

In this method by the sample of water is directly filtered and determined by the number of bacterial that are filtered out. The membrane filter is a special material made of organic cellulose acetate having a fairly uniform porosity. It looks like an ordinary fine filter paper but is actually a synthetic material that can be dissolved in acetone. In using the membrane filter technique, a suction pump is applied to a suction flask, on top of which the membrane filter assembly has been placed. The water sample passes through the filter, leaving the bacteria on the membrane. The membrane is then transferred to a supporting pad which has been saturated with the appropriate medium, using sterile techniques to make sure that contamination has not been introduced. The medium is selective. It will encourage the growth and multiplication only of the coliform organisms, producing typical colonies which can be identified by their metallic purple sheen.⁽⁴⁾ The advantages of this method are that the bacteria are counted directly and the process takes only one or two days, whereas the old process takes five days.

The most important thing that we have to think about is the determination of radioactive substances in water. In the last few years, the Institute of Radioactivity for Peace has provided a reactor. Whose purpose is to produce radioactive substances and use them for agricultural and medical purposes. These substances will be well known and very popular in the near future. To make sure that there are none of those radioactive

substances contaminating the water supply, tests will be made regularly. Most dangerous are the two products: Radium-226 and Strontium-90. The allowable limits are 3 micro-microcuries per liter for Radium-226 and 10 micro-microcuries per liter for Strontium-90. The gross beta activity should not exceed 1.000 micro-microcuries per liter of water, provided the limits for Ra-226 and Sr-90 are not exceeded.⁽⁴⁾
