

An Introduction to Water Quality Analysis

Abstract :

Water is perhaps the most precious natural resource after air. Though the surface of the earth is mostly consists of water, only a small part of it is usable, which makes this resource very limited. This precious and limited resource, therefore, must be used with prudence. As water is required for different purposes, the suitability of it must be checked before use. Also, sources of water must be monitored regularly to determine whether they are in sound health or not. Poor condition of water bodies are not only the indictor of environmental degradation, it is also a threat to the ecosystem. In industries, improper quality of water may cause hazards and severe economic loss. Thus, the quality of water is very important in both environmental and economic aspects. Thus, water quality analysis is essential for using it in any purpose. After years of research, water quality analysis is now consists of some standard protocols. There are guidelines for sampling, preservation and analysis of the samples. Here the standard chain of action is discussed briefly so that it may be useful to the analysts and researchers.

INTRODUCTION :

What is Water Quality?

Water Quality can be defined as the chemical, physical and biological characteristics of water, usually in respect to its suitability for a designated use. Water can be used for recreation, drinking, fisheries, agriculture or industry. Each of these designated uses has different defined chemical, physical and biological standards necessary to fulfil the respective purpose. For example, there are stringent standards for water to be used for drinking or swimming compared to that used in agriculture or industry

What is Water Quality Analysis?

After many years of research, water quality standards are put in place to ensure the suitability of efficient use of water for a designated purpose. Water quality analysis is to measure the required parameters of water, following standard methods, to check whether they are in accordance with the standard.

Why Water Quality Analysis is required?

Water quality analysis is required mainly for monitoring purpose. Some importance of such assessment includes:

- (i) To check whether the water quality is in compliance with the standards, and hence, suitable or not for the designated use.
- (ii) To monitor the efficiency of a system, working for water quality maintenance
- (iii) To check whether upgradation / change of an existing system is required and to decide what changes should take place
- (iv) To monitor whether water quality is in compliance with rules and regulations.

PROCEDURES OF WATER QUALITY ANALYSIS :

The steps for water quality analysis in general is mentioned in Figure-1.

Selection of Parameters:

The parameters of water quality are selected entirely according to the need for a specific use of that water. Some examples are

Drinking : As per WHO/CPCB Standards

Irrigation :

pH

Conductivity

Sodium & Potassium

Nutrients

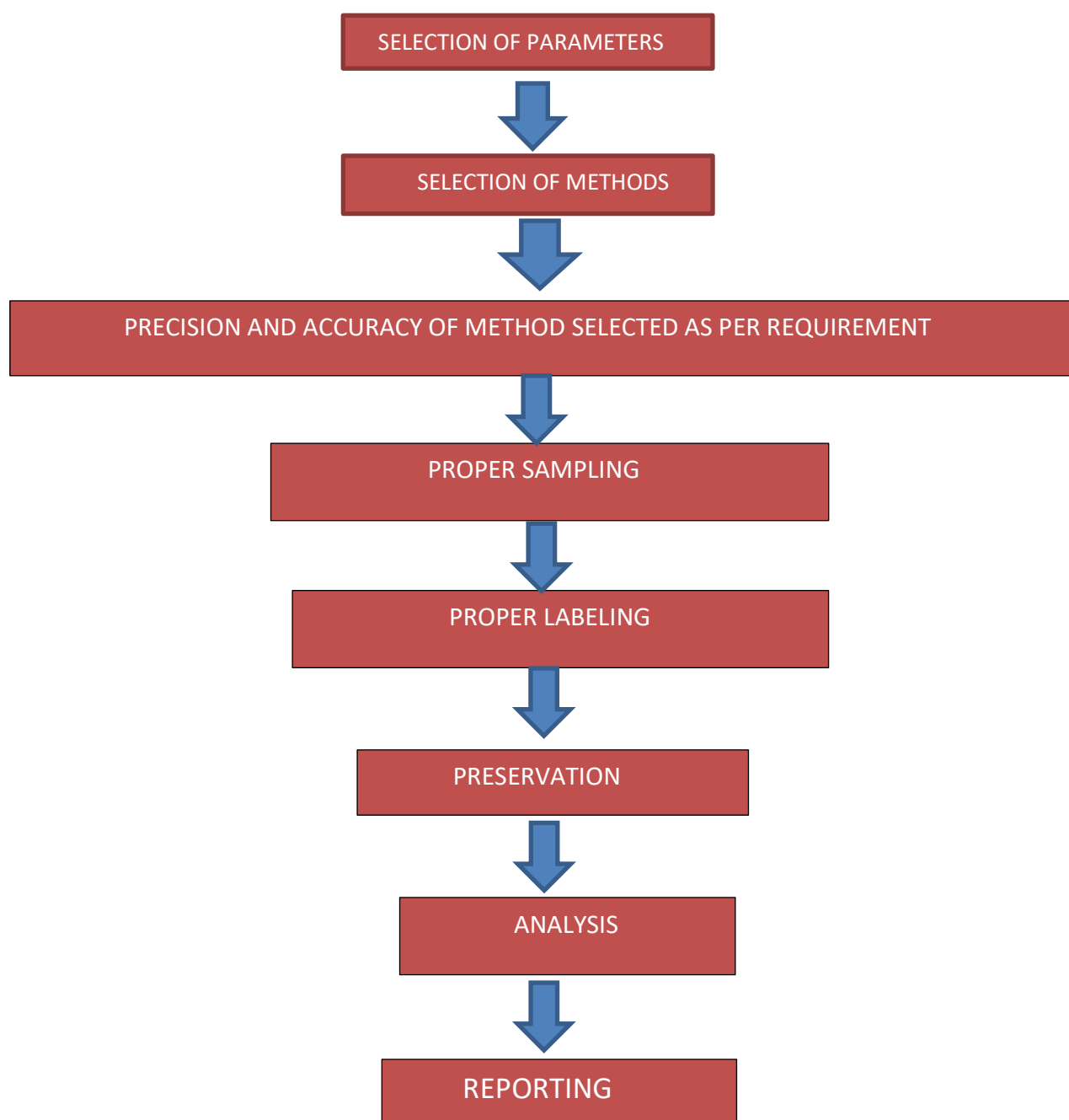
Specific compounds

Industries: As per specific requirement

Domestic Consumption: As per BIS Standards

Water Bodies: As per CPCB guidelines

Figure -1: Steps for Water Quality Analysis



Selection of Methods :

The methods of water quality analysis are selected according to the requirement. The factors playing key role for the selection of methods are

- (i) Volume and number of sample to be analyzed
- (ii) Cost of analysis
- (iii) Precision required
- (iv) Promptness of the analysis as required

Precision and Accuracy of Method Selected as per Requirement :

What precision and accuracy to be maintained against a particular method is decided according to the objective of the monitoring. The factors influencing this decision includes:

☐ Budget of Monitoring System

☐ Parameters to be Monitored

☐ Use of the Water

Proper Sampling :

Proper sampling is a vital condition for correct measurement of water quality parameters. Even if advanced techniques and sophisticated tools are used, the parameters can give an incorrect image of the actual scenario due to improper sampling.

Proper Labeling

Proper labeling :

prevents sample misidentification and ensures the responsibility and accountability of the collector. The sample container should be labeled properly, preferably by attaching an appropriately inscribed tag or label. Alternatively, the bottle can be labeled directly with a waterproof marker. Barcode labels are also available nowadays. Information on the sample container or the tag should include at least:

- (i) Sample code number (identifying location)
- (ii) Date and time of sampling
- (iii) Source and type of sample
- (iv) Pre-treatment or preservation carried out on the sample
- (v) Any special notes for the analyst
- (vi) Sampler's name

Preservation :

Usually a delay occurs between the collection and analysis of a sample. The characteristics of the sample can be changed during this period. Therefore proper preservation is required in the way to laboratory after collection, and in the laboratory upto when analysis starts.

Complete and unequivocal preservation of samples, whether domestic wastewater, industrial wastes, or natural waters, is a practical impossibility because complete stability for every constituent never can be achieved. At best, preservation techniques only retard chemical (especially, hydrolysis of constituents) and biological changes that inevitably continue after sample collection.

No single method of preservation is entirely satisfactory; the preservative is chosen with due regard to the determinations to be made. Preservation methods are limited to pH control, chemical addition, the use of amber and opaque bottles, refrigeration, filtration, and freezing.

Analysis :

The samples, after reaching laboratory, are analyzed, according to the requisite parameters, following standard methods and protocols.

Reporting :

The ultimate procedure of water analysis is to prepare a proper report against the submitted requisition. The report must be authenticated before handing over the authority. All data should be kept in the laboratory log and preferably in laboratory database.

An alternative way to present the overall quality of water is to express it in the form of Water Quality Index (WQI). WQI is a concise numerical representation of overall water quality of a water body, which is convenient to interpret and used widely. WQI expresses the overall quality of water with a single digit, instead of many digits for all the WQP. Thus, it is readily conceivable for common people.

PROBLEM STATEMENT :

Harmful germs and chemical can get in the water from may source ,including: fertilizers, pesticides or other chemicals that have been applied to land near the water . concentrated feeding operations manufacturing operations

Every year, more people will die from unsafe water that from all forms of violence, including war (Decade, water for life). The main reason behind water pollution is due to plastics , ship water and how those can affect human civilization.

CONCLUSION :

Assessment of water quality is essential to check the suitability of a water source for the designated use. Several water quality parameters are assessed and compared with their standard values to determine the acceptability of the water to be used. After prolonged research, the procedures for the assessment of the water have been standardized. In this article such guidelines are discussed concisely in one place for the convenience of the researchers and analysts. Thus, it may be helpful for them to get an overview of the water quality assessment standards and procedures.