

Study on Quality Control and Quality Assurance Measures in Environmental Monitoring Laboratory Analysis

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Abstract

According to the practical experience of environmental monitoring, this paper expounds the relevant measures of quality control and quality assurance in laboratory analysis, and focuses on various quality control methods in the laboratory, hoping to improve the calculation accuracy and representativeness of monitoring data, so as to promote the quality control technology in the monitoring work.

Keywords

Environmental monitoring; Laboratory analysis; Quality control; Quality assurance.

1. Introduction

Environmental monitoring laboratory analysis is an important part to ensure the quality of monitoring, which is mainly contained in the process of data sampling, data analysis and data processing. It is necessary to minimize the impact of errors on quality in this process, and formulate a series of standard operating procedures and standardized operation methods. The monitoring data are mainly obtained by the laboratory, Therefore, laboratory analysis is the key to the quality control. It can control the monitoring data within the reasonable error range, ensure the accuracy and accuracy of the monitoring data, make the data obtained from the monitoring analysis in a reasonable confidence interval, and lay a solid scientific and technological foundation for the relevant data analysis.

2. Quality Control of Environmental Monitoring Laboratory Analysis

The quality control of environmental monitoring laboratory analysis is mainly reflected in the quality stability of analysis data. It is necessary to eliminate the influence of accidental error and take targeted corrective measures in time. The main purpose of quality work is to monitor the time error caused by human factors, and to control the error within a reasonable limit to ensure the monitoring data, Analysis results in the given confidence interval to meet the requirements of the corresponding quality standards, to ensure that the test data can achieve the corresponding accuracy of effective methods, the following describes the main work of quality control technology.

2.1. Automatic Quality Control Technology

2.1.1. Blank Test Value

The data represented by the blank test value can fully reflect the overall operation status of the experimental instruments in the environmental detection work, and reflect the specific operating conditions of the environmental laboratory and the quality of the environmental data monitoring and analysis personnel. The blank test value can not completely offset the interference caused by the sample, and can not obtain the sample with ideal purity, The random error in the process of environmental experiment analysis does not have the same elements, so the error of blank test value sample determination is relatively large. If the data of blank test value in the sample is higher, the fluctuation of the data covered may be too large. If the concentration of the object to be detected is low in the monitoring, the measured value of the sample and the blank test value may be negative, This represents the failure of the monitoring work, and unreasonable procedures appear in the analysis of samples.

2.1.2. Parallel Double Analysis

Parallel double sample analysis is a reasonable method to eliminate errors. The same sample needs to be divided into multiple parts and tested under the same experimental conditions. Generally, the double parallel method is used in the detection process. The double parallel sample analysis mainly reflects the accuracy error of the test results, and can check the stability of the sample components.

In the process of daily environmental monitoring data analysis, the number of samples can be reasonably determined according to the complexity of the data and the precision of the instruments used. If conditions permit, double parallel inspection and analysis should be carried out. At the same time, 10% to 20% of the samples of the same batch should be sampled for determination at any time. If the number of the same batch of samples is small, the number of samples should be determined at any time, It can increase the overall detection rate of sample analysis.

In parallel sample determination, the selected results should meet the requirements of indoor error, and the error should be judged according to reasonable and scientific methods. If the error standards do not meet the requirements, it is necessary to find out the reasons and re analyze the samples. Parallel double analysis is the minimum inspection standard, which is mainly used to detect accidental errors, The inspection results should meet the corresponding quality inspection index control standards.

2.1.3. Recovery Rate of Standard Addition

The recovery rate of standard addition refers to adding reference materials to the data samples in the process of laboratory determination of data samples, and deducting the detection value of reference materials in the determination results, which can determine the overall recovery rate and reflect the actual accuracy of the experimental monitoring results. The overall principle for determining the recovery rate includes the following contents.

Firstly, the form of the added standard substance needs to be basically the same as that of the measured substance; secondly, the overall concentration of the added reference material needs to reach a reasonable range, and the precision should be basically similar to that of the measured substance, and the quantity should be controlled within a reasonable lower concentration range; if the concentration of the substance to be measured is relatively high, the concentration of the added standard substance should be controlled at about $1/2$ of the concentration of the substance to be measured, However, it can not be higher than 80% of the upper limit concentration; the standard addition concentration generally does not exceed about twice the concentration of the sample to be tested; third, the substance to be tested will not change significantly after adding the reference material. If there is a change, this factor should be considered in the calculation of recovery rate.

In the process of adding reference materials, the external conditions and analytical conditions are exactly the same as the samples to be tested, so the external interference may have an impact on the monitoring results, which is relatively similar. Therefore, the experiment of recovery rate measured by adding reference materials often fails to obtain satisfactory results, which affects the overall correctness of environmental data monitoring results.

2.1.4. The Comparative Analysis Method of Reference Materials is Adopted

Reference materials have the function of value transfer, and can achieve the purpose of traceability in the process of transmission. Therefore, it is often used as the main reference standard for comparative analysis, and it can also test the accuracy of the instrument and evaluate the overall professional quality of the analyst, This method is also a controversial method. In the environmental monitoring laboratory, the standard content of substances should be set synchronously with the samples to be tested. At the same time, the measured results are compared with the theoretical values, so as to evaluate the accuracy of the experimental results, It can be inferred whether there are corresponding system errors or abnormal experimental results in the whole experimental process.

2.1.5. Comparison of Overall Experimental Methods

If the same sample is determined by different methods, the results can be compared. However, due to the different reagents used in the sample test method and the surrounding environment, if the test result data obtained are basically consistent, it can show that the data results obtained from the environmental experiment analysis work are correct and reliable.

In the comparison of experimental methods, the experimental method of standard addition recovery is relatively simple, so it is often used to judge the accuracy. However, in the process of adding reference materials, the operation is basically similar, so it may affect the same error, resulting in the final error offsetting each other, thus affecting the overall accuracy of the experiment. Due to the different experimental analysis methods, it is difficult to eliminate the error, The data value measured by standard addition recovery test method will be more accurate.

2.1.6. Quality Control Chart Method

Quality control chart is an operation method based on the establishment of statistics. This operation method mainly takes the normal distribution as the basis of drawing lines, and tests the quality of the data obtained. In the quality control of laboratory analysis work, this method of quality control coating is often used to reasonably determine the experimental accuracy.

2.2. Quality Control Measures of Other Control

2.2.1. Cryptanalysis Method

The password adding quality control method is mainly used by special quality control organizations. This method requires the simultaneous determination of standard samples and conventional samples. The actual detection values of known samples are unknown samples for analysis. If the actual detection values of known samples are correct after verification, the detection value standards should be correct and reliable.

The code sampling analysis method needs to add reference materials into the samples randomly, and send them to the professional quality analysts for analysis, and add the standard addition recovery rate to the analysis results, so as to reflect the accuracy and accuracy of the data obtained from the environmental monitoring experiment.

2.2.2. Comparative Analysis of Cipher Samples

In the comparative analysis of cipher samples, the internal components of standard samples are sufficiently uniform, and the characteristic values are relatively obvious, and the characteristic values have corresponding certainty in reasonable confidence intervals. If in the ideal environment, the basic concentrations and basic components are similar, they should

basically belong to the same detection standards as the samples with detection, The password sample is inserted into the standard sample to be analyzed and tested. If the detection value is finally obtained and conforms to the error range of the corresponding standard sample, the analysis result data of this batch of samples can be obtained, which is true and reliable.

2.2.3. Mutual Inspection in Laboratory

The mutual inspection of laboratory results needs to be carried out among different analysts. The experimental results obtained can be self-control inspection or other controlled inspection. However, due to the different subject personnel in the actual operation, they are faced with different experimental environment and conditions, Therefore, this method of mutual inspection in the laboratory can effectively avoid the overall impact of habitual errors and systematic operation on the experimental data. If the experimental results obtained by different analysts in the laboratory are basically consistent, the quality of the experimental data results can be considered to be acceptable. If the experimental data results are inconsistent, the quality of the experimental data is acceptable, The reason should be found separately, and the experimental samples should be re analyzed.

2.2.4. Mutual Inspection Between Laboratories

Mutual inspection between laboratories is also known as external inspection. External inspection is to deliver the same sample to different laboratories for analysis of experimental data. Because the experimental equipment and the analysis method of experimental data used by different laboratories are different, if the data results obtained by different laboratories are consistent with the determination results, if the data results obtained by different laboratories are consistent with the determination results, if the data results obtained by different laboratories are consistent with each other, Basically, it can be determined that the determination results are true and effective, and can be accepted as experimental data. If the results of data determination between the two are inconsistent, then we should find out the reason for the error in the experiment, and analyze and test the sample again.

3. Conclusion

With the development of modern environmental monitoring technology, all walks of life in environmental monitoring are more closely linked, so the accuracy requirements for the results of data quality are put forward. Because the concentration of samples to be tested is not actually measured, and the overall sources and types of samples to be tested are not the same, This brings more difficulties to the quality control methods and technologies used in the actual environmental laboratory analysis, and its overall complexity is high. Any single quality control method and technology can not completely eliminate the impact of the overall error, and at the same time, it has certain technical limitations, Combined with the actual situation of the samples to be tested, several representative quality control methods should be selected reasonably, so as to effectively guarantee the accuracy of the data quality results. In the actual measurement process, it is necessary to use the method of correlation analysis to determine the actual accuracy of the samples to be tested. Through various quality control methods in the process of laboratory analysis, In the actual work, the quality assurance measures and systems are implemented in the whole process of environmental monitoring data to improve the accuracy of environmental monitoring experimental data analysis.

Reference

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