

Analysis of on-site work and quality control methods of occupational health testing

Qiang Li

Taiyuan Fuxing Shun Technology Co., Ltd, Taiyuan, 030000, Shanxi, China

Keywords: occupational health testing; Inspect field work; Quality control method

Abstract: In order to further improve the effect of occupational health testing, this paper discusses the implementation of on-the-spot work of occupational health testing and the application of quality control methods. Through the overview of the current occupational health testing field work, the existing problems are analyzed, and effective quality control methods are proposed, in order to improve the accuracy and reliability of occupational health testing and ensure the health and safety of staff.

1. Introduction

Occupational health testing is an important link to protect the health and safety of workers, and its accuracy and reliability are directly related to the effect of occupational health testing and prevention. However, due to the influence of various factors, there are often some problems in the actual field work of occupational health testing, which affect the accuracy and reliability of the test results. Therefore, it is of great significance to conduct in-depth analysis on the on-site work and quality control methods of occupational health testing.

2. Overview of on-site work and quality control methods of occupational health testing

2.1 On-site work of occupational health testing

The on-site work of occupational health testing covers the whole process from sample collection to result report, in which sample collection, processing, transportation and preservation are the key to ensure the accuracy and reliability of test results. The quality control of these links involves not only technical operation, but also management, personnel and environment. First of all, sample collection is the first step and one of the most critical links of occupational health testing [1]. The samples collected must be representative and truly reflect the health condition of the environment or object being tested. Sampling personnel need to follow strict sampling specifications and operating procedures to ensure the integrity and authenticity of samples. Secondly, sample handling, transportation and preservation are also the links that cannot be ignored in occupational health testing. In the process of processing, it is necessary to select appropriate treatment methods and technologies to eliminate or reduce interfering factors and improve the accuracy of detection results. Necessary measures should be taken during transportation to prevent deterioration, damage or loss of samples during transportation. During the storage process, the storage conditions and time need to be strictly controlled to ensure that the sample does not change during storage.

2.2 Overview of quality control methods

Quality control method plays a vital role in occupational health inspection. Internal quality control is the quality control activities carried out by the laboratory itself, mainly including laboratory management, personnel training, instrument and equipment calibration, reagents and standard material management. By strengthening laboratory management and establishing a sound quality management system and rules and regulations, we can ensure the standardization and standardization of laboratory work. Personnel training is an important means to improve the technical level and sense of responsibility of testing personnel, through regular training and

assessment, to ensure that testing personnel have the ability and quality of occupational health testing. Instrument calibration and reagent management are important measures to ensure the accuracy and reliability of testing equipment and reagents. External quality control is the quality supervision and evaluation activities carried out by external institutions on laboratories, mainly including inter-laboratory comparison, capability verification and accreditation. By participating in activities such as inter-laboratory comparison and capability verification, the testing capacity and level of the laboratory can be evaluated, existing problems and deficiencies can be found, and improvement measures can be taken to improve the quality of testing.

3. Problems existing in the field work and quality control of occupational health testing

3.1 Sample collection is not standard

In the process of occupational health testing, sample collection is the starting point of the whole testing work, and it is also the key link to determine the accuracy and reliability of the test results. However, in practice, due to the influence of various factors, the sample collection is not standardized, which directly affects the accuracy of the test results. First of all, some sampling personnel may lack the necessary professional knowledge and skill training, and have insufficient understanding of sampling principles, methods and precautions, resulting in strict operation in accordance with the norms during the sampling process. For example, there may be problems in the selection of sampling location, the use of sampling containers, and the determination of sampling volume, which may affect the representativeness and authenticity of samples [2]. Second, some sampling equipment may be unstable or unable to meet sampling requirements due to aging, damage, or lack of necessary maintenance and calibration. For example, the accuracy, stability, sealing and other performance indicators of the sampler may not meet the standards, thus affecting the quality and quantity of sample collection. Finally, the site environment and working conditions may also have an impact on the standardization of sample collection. For example, there may be cross-contamination, interfering substances and other influencing factors on the site, which, if not controlled and treated, may lead to contamination or deterioration of the sample. For example, in the sampling process of a chemical factory, the sampling personnel continuously collected samples from different areas without changing the gloves, resulting in the subsequent samples mixed with chemical substances from the previous sampling point, resulting in cross-contamination of the samples, affecting the final detection.

3.2 Improper handling, transportation and storage

In occupational health testing, sample handling, transportation and storage are also crucial, which directly affect the reliability of the final test results. However, in practice, due to a variety of reasons, these links are often prone to problems. First of all, the sample processing includes pre-treatment, analytical treatment and other steps, each step needs to be strictly in accordance with the specifications. However, due to the inadequate technical level of the operator, lack of experience or lack of thorough understanding of the specification, it may lead to errors in the process. For example, failure to effectively remove interfering substances during pre-processing, or the use of inappropriate reagents or methods during analytical processing, can lead to changes or losses in the composition of the sample, which can affect the accuracy of the test results. Secondly, the sample may be affected by a variety of factors such as vibration, temperature and humidity during transportation, which may lead to deterioration, pollution or loss of the sample if appropriate protection measures are not taken. For example, for some volatile or easily oxidized samples, if no protective measures such as sealing and refrigeration are taken, composition changes may occur during transportation, thus affecting the test results. Finally, the preservation of the sample requires strict control of environmental conditions, such as temperature, humidity, light, etc., to ensure that the sample does not change during storage. However, in actual operation, the deterioration or loss of the sample may be caused by the storage conditions not meeting the requirements or the storage time being too long [3]. For example, for some easily decomposed or easily deteriorated samples, if

stored in a high temperature and humidity environment or for too long, it may lead to changes in the composition of the sample or degradation, thus affecting the reliability of the test results.

3.3 Imperfect means of quality control

In the work of occupational health testing, quality control means is an important guarantee to ensure the accuracy and reliability of test results. However, at present, some occupational health testing institutions are still imperfect in terms of quality control means, which is mainly reflected in the lack of effective internal quality control measures and external quality supervision mechanisms, resulting in the accuracy and reliability of test results can not be fully guaranteed. First of all, internal quality control is the quality control activities carried out by occupational health testing institutions themselves, aiming to ensure the standardization and accuracy of testing work through a series of measures and methods. However, some organizations may not be able to effectively implement internal quality control measures due to poor management, inadequate staffing or limited technical level. For example, the lack of regular equipment calibration and maintenance, the management of reagents and standard substances is not standardized, and the verification and updating of test methods are not timely, which may lead to the deviation or distortion of test results. Secondly, external quality supervision is the supervision and evaluation of the testing work of occupational health testing institutions by relevant competent authorities or third-party institutions to ensure that they meet the requirements of relevant regulations and standards. However, at present, the external quality supervision mechanism in some areas may have problems such as insufficient supervision, insufficient supervision frequency or unscientific supervision methods, resulting in some occupational health testing institutions failing to detect and correct illegal operations or quality problems in the testing work.

4. Effective quality control methods for occupational health testing

4.1 Strengthen the training of sampling personnel

The low professional quality and skill level of the sampling personnel not only affect the final test result, but also bring risks to the sampling personnel themselves. For example, when collecting toxic gas samples in the air in a chemical plant, the sampling personnel chose a position near the ground, ignoring the gas density and possible concentration gradient, thus underestimating the actual exposure risk of workers, resulting in the collection of samples can not truly reflect the concentration of harmful substances in the workplace, and workers will face certain risks. In this regard, the training of sampling personnel should be strengthened. First of all, the training for sampling personnel should be comprehensive and systematic, covering sampling theory, practical operation, safety protection and emergency treatment. In the theoretical training, it is necessary to teach the sampling personnel relevant occupational health knowledge, sampling principles and methods, so that they can fully understand the importance and standardization of sampling. In the practical operation training, it is necessary to master the use of various samplers, the selection and determination of sampling points, the preservation and transportation of samples and other skills through simulated sampling and on-site practical operation. Secondly, the training process also needs to pay attention to enhance the responsibility of the sampling personnel. Sampling is a meticulous and rigorous work, and any negligence may lead to the distortion of the test results. Therefore, it is necessary to make sampling personnel fully realize the importance and responsibility of their own work through training, establish a rigorous and meticulous working attitude, and ensure the accuracy and reliability of sampling work [4]. Finally, establish a sound training and assessment mechanism. Through regular or irregular assessment of sampling personnel, assess their skill level and sense of responsibility, timely find and correct existing problems, and constantly improve the overall quality and skill level of sampling personnel. At the same time, the assessment results can also be linked to the performance of the sampling personnel to encourage them to participate in training and learning more actively to improve their professional quality.

4.2 Optimize the sampling equipment and environment

In occupational health testing, the use of advanced sampling equipment and environmental control technology can effectively reduce the error and interference, improve the reliability of testing data. First, optimizing the sampling equipment is key. Advanced sampling equipment has higher accuracy, stability and reliability, and can collect representative samples more accurately. For example, in the occupational health testing project of an electronic manufacturing enterprise, in order to improve the sample quality and the accuracy of the test results, an advanced automatic sampler was introduced and a strict equipment calibration and maintenance system was established. Calibrate the sampler regularly to ensure that its performance indicators meet national standards; At the same time, regular maintenance and maintenance of the equipment, timely replacement of aging parts, extend the service life of the equipment. Second, environmental control is equally important. During the sampling process, environmental factors such as temperature, humidity, light, etc., may affect the sample. Therefore, it is necessary to adopt appropriate environmental control technology to maintain the stability and consistency of the sampling environment. For example, an electronic manufacturing company installed constant temperature and humidity equipment at the sampling site to ensure that the temperature and humidity in the sampling environment are kept in a stable range, thus eliminating the influence of temperature and humidity changes on the properties of the sample. In addition, for some light-sensitive samples, the sampling area is also equipped with a light mask, which effectively prevents the interference of light on the sample. Finally, corresponding measures should be taken in the process of sample handling, transportation and preservation [5]. Using proper containers and storage methods can prevent deterioration or loss of samples during transportation and storage. For example, samples that are volatile or easily oxidized can be stored in a well-sealed container and placed in a low temperature environment to extend the storage life.

4.3 Establish a sound quality control system

The quality control system should include internal quality control and external quality supervision. Through the development of detailed quality control plans and procedures, all aspects of the testing work are fully controlled. Internal quality control is the core part of the quality control system, which involves the management and calibration of personnel, equipment, reagents, etc. First of all, the management of personnel should include training, assessment and authorization. All personnel involved in the testing work shall receive relevant training, master the necessary testing skills and knowledge, and obtain the corresponding authorization through the assessment. This can ensure that personnel have the ability and quality to engage in detection work, and reduce the occurrence of human error. Secondly, the management of equipment is also an important part of internal quality control. A device file should be established to record the purchase, use, maintenance, and calibration of the device. Maintain and calibrate the equipment regularly to ensure that the performance and accuracy of the equipment meet the inspection requirements. At the same time, detailed operation instructions should be formulated for the operation of the equipment to standardize the operation process and reduce operation errors. In addition, the management of reagents is also a part that cannot be ignored. Reagent management system should be established to ensure that the procurement, acceptance, storage and use of reagents meet the relevant requirements. Periodically check and evaluate the effectiveness, purity and stability of the reagents to avoid the use of expired or deteriorated reagents to affect the test results.

External quality supervision is an important part of the quality control system, which can be achieved by participating in activities such as inter-laboratory comparison and capability verification. We should strengthen the construction and implementation of external quality supervision mechanisms, increase the frequency and coverage of supervision, adopt scientific and effective supervision methods and technical means, and promptly discover and correct the problems and violations existing in the testing work of occupational health testing institutions. In addition, in order to further improve the quality control effect, it is also possible to consider the introduction of advanced quality control technologies and methods, such as laboratory information systems, automated testing equipment, etc., to improve the efficiency and accuracy of testing. At the same

time, we should strengthen cooperation and exchanges with other relevant fields, learn from their successful quality control experience and practices, and constantly improve the quality control means and level of occupational health testing institutions.

4.4 Strengthen data review and report management

In the work of occupational health testing, data review and report management are important links to ensure the accuracy and reliability of test results. By strengthening the work in these two aspects, the quality control level of occupational health testing can be effectively improved. First, data review is a key step in the quality control process. In occupational health testing, a large number of test data will be generated, which directly reflects the nature and condition of the sample. Therefore, the data must be rigorously audited to ensure its accuracy and reliability. Specifically, data audit should include the following aspects: (1) Integrity audit: check whether the data is complete, whether there are omissions or missing cases. If the data is found to be incomplete, it should be supplemented or retested in time. (2) Accuracy audit: Check and verify the data to ensure that it conforms to the actual situation and expected results. For abnormal data or data that deviates from expectations, further analysis and confirmation should be carried out to eliminate the influence of error or interference factors.

Secondly, the test report is the final result of occupational health testing and the main basis for evaluating the test results. Therefore, it is necessary to strengthen the management and archiving of test reports. Specifically, the report management should include the following aspects: (1) Standardize the report format and content: develop a unified report format and content requirements to ensure that the report is clear, accurate and easy to understand. (2) Strict review of the report: Before the release of the report, the report should be strictly reviewed and approved. The auditor shall conduct a comprehensive review of the content, data and analysis of the report to ensure its accuracy and reliability. (3) Timely filing and preservation: Establish a sound report filing and preservation system to ensure the integrity and traceability of the report. When filing, it shall be classified and sorted in accordance with the prescribed order and manner, and relevant documents and materials shall be properly stored [6].

4.5 Continuous improvement and optimization of quality control methods

With the continuous progress of science and technology and the continuous update of occupational health standards, the traditional quality control methods may gradually expose their shortcomings and need to be adjusted and improved with The Times. First, more advanced sampling equipment, testing instruments and data management systems are introduced to improve the accuracy and efficiency of testing. At the same time, it is necessary to track changes in domestic and foreign occupational health regulations and standards in a timely manner to ensure that the quality control method is consistent with the latest requirements. Secondly, the existing quality control system should be comprehensively evaluated on a regular basis. This includes reviewing the implementation of the quality control plan, the accuracy and reliability of test data, the effectiveness of personnel training, and the status of equipment maintenance and management. Through evaluation, problems and weak links in the quality control system can be found, and clear directions and goals can be provided for subsequent improvement. Then, we should encourage testing personnel to actively participate in quality control work and put forward suggestions and suggestions for improvement. At the same time, it is necessary to strengthen exchanges and cooperation with other occupational health testing institutions or related fields, learn from their successful experience and practices, and jointly promote the improvement of the quality control level of occupational health testing. Finally, we should make a clear improvement plan and timetable, and clarify the responsible person and improvement measures. Regularly evaluate and summarize the improvement results, solidify the successful experience into the quality control system, and form a virtuous cycle of continuous improvement.

5. Conclusion

In summary, on-site work and quality control of occupational health testing are important links to ensure the health and safety of workers. The accuracy and reliability of occupational health testing can be further improved through in-depth analysis of the problems existing in the field work and quality control of current occupational health testing, and effective quality control methods are proposed. At the same time, the occupational health testing institutions should strengthen the attention and investment in quality control work, establish a sound quality control system and management system, and provide a strong guarantee for the health and safety of staff.

References

- [1] Chen Huixiang, Xing Liwei, LI Qianlong, RAO Baozhen, LI Minyan, SUN Qian, BO Yali. Development and application of digital information system for Occupational health detection and evaluation [J]. Occupational Health and Emergency Rescue, 2023, 41 (06): 757-761+790.
- [2] Li Yan. Quality control problems and solutions in occupational health field testing [J]. Chemical Engineering Management, 2021, (31): 40-41.
- [3] Ma Qingqing. Identification and preventive measures of PTA occupational health hazard factors [J]. Polyester Industry, 2021, 34 (02): 52-54.
- [4] Li Yan. Research status of quality control in occupational health field work [J]. Health of Urban and Rural Enterprises in China, 2019, 34 (09): 49-52.
- [5] Li Sheng. Study on occupational health field detection measures [J]. Health Road, 2018, 17 (10): 368-369.
- [6] Guo Dian. Quality control measures for on-site sampling in occupational health testing [J]. Petrochemical Technology, 2018, 25 (04): 215.