



Measures for the Management of Large Instruments and Equipment in Experimental Teaching

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Abstract: Large instruments and equipment as an important asset of the relevant experimental institutions, in relation to their maintenance and management, as well as the relevant operating norms on the importance is also self-evident. Therefore, from the relevant installation and commissioning, personnel maintenance and management training, as well as the daily use of operating norms should be meticulous, to ensure that the relevant large instruments and equipment are in good operating condition.

Keywords: experimental teaching, equipment management, management measures

1. Introduction

Large-scale instruments and equipment are the important material basis for experimental teaching and research experiments in higher education institutions. It is the hard power of a school's teaching level and research level. Therefore, how to improve the management efficiency of large instruments and equipment in daily maintenance work, and how to maximize the efficiency ratio of large instruments, is the main task of the relevant laboratory management.

2. The current situation of management and maintenance of large instruments and equipment in universities

Firstly, since the reform and opening up and the popularisation of education to today's China's academic society has undergone radical changes. However, the real problem is that there are too few professionals engaged in the maintenance of professional equipment, and there is an uneven development between vocational and technical

schools and academic undergraduate institutions, which guarantee the output of relevant technical personnel. As a result, the quality of education and the skills of the personnel working in the equipment management departments and their organisations are not fully professional. The difference in the level of technical quality between the different positions of technical staff means that the efficiency of the various departments can be limited by the synergy between them. From the point of view of equipment management and maintenance, the quality and technical level of grassroots personnel have a definite impact on the effectiveness of equipment maintenance. It is therefore important for current large instrument management and maintenance staff to adhere strictly to maintenance regulations and to invest a great deal of effort in the management of relevant systems in order to maintain the quality of large instrumentation to the greatest extent possible(Qiu et al., 2014).

Second, the management and operation of large instruments and equipment awareness are weak. In many universities or experimental units, rough management or negligent management and

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maintenance of the situation often occurs, from one side, the relevant personnel's safety awareness and responsibility are not enough, for the management of equipment, and operational awareness is weak. Not checking the operation of the equipment before use, results in the operation of equipment with disease or overload the situation occurs. For example, operators do not understand the principles of maintenance. The usual routine maintenance of the instruments and equipment make serious damage or is not in timely repair.

Thirdly, the poor level of maintenance of the equipment should first ensure that the operators of large instruments and equipment are familiar with the operation of the equipment and the strain in special environments. And have simple troubleshooting and routine maintenance skills. The phenomenon of unlicensed, untrained and inexperienced equipment maintenance managers should be eliminated. In many school units, due to the low cost of equipment management, there are some staff with less experience and relevant skills to operate or manage these large instruments and equipment. And from a day-to-day management point of view, there is no proper inspection and safety checks are neglected. For the scientific nature, the interplay between the various types of equipment is not appropriate, easily resulting in the waste of resources(Tong et al., 2003).

Fourth, in the management of large instruments and equipment in many universities, there are still many maintenance management is not serious, and the ideological attitude is not correct. Few managers, can systematically and timely learn the advanced and applicable management of basic concepts way and basic content. This leads to the installation and maintenance of some large instruments and equipment still using more backward management and maintenance methods, therefore, it will not be able to do the daily use of operating norms should be meticulous, to ensure that the relevant large instruments and equipment in good running condition.

3. On the management measures of large instruments and equipment in experimental teaching

3.1 Strengthen the demonstration work before the purchase of large instruments and equipment

Do a good job about the demonstration of large instruments and equipment, on the one hand, to avoid blind procurement, and waste of funds, on the other hand, to ensure that it can effectively ensure that it meets the needs of the current institutions on daily teaching and related scientific research tasks. This will improve the efficiency of the use of the equipment. The review system for the purchase of equipment should be constantly improved and strengthened. It is required to gradually establish its set of more stringent approval systems. First, the relevant demand department or the intended use department submits a validation report and an application form, and then the relevant equipment operation management department organises relevant experts to review and validate the application, and finally, the president of the relevant institution is responsible for signing and approving the application. Due to the relatively high cost of construction and procurement of large instruments and equipment, as well as the fact that some of them are national precision instruments and equipment, they are very important to the relevant research institutes. Therefore, it is very important and necessary to establish a set of the review system and pre-procurement validation work with scientific methods, rigorous argumentation and democratic decision-making(Wang et al., 2009).

3.2 Do the relevant acceptance work of large instruments and equipment after the acquisition

Acceptance of large instruments and equipment is an important part of the relevant procurement and the use of large instruments and equipment, is the key to ensuring their quality, large instruments and equipment will generally be installed and commissioned by the manufacturer or distributor after the purchase. Therefore, to do a good job of its installation and commissioning after the acceptance of work. The acceptance work is divided into routine

acceptance, and technical acceptance, to ensure that the quality of use of the relevant instruments and equipment and the working condition is at a good level.

3.3 Grasp the regular development and maintenance of relevant large instruments and equipment upgrade work

For the large instruments and equipment in teaching experiments, regular development and maintenance and upgrading work are to ensure that it can effectively improve the use of equipment one of the necessary links. However, for universities and related experimental institutes, the following problems exist in the development and maintenance of large instruments and equipment.

Firstly, some of the instruments and equipment being used for teaching or research are old, and their functions, accuracy and operational efficiency have declined seriously, making it difficult for them to continue to meet the demands of daily teaching and research tasks(Qiao & Hong, 2017).

Secondly, the functions and performance of large instruments and equipment are seriously wasted, and high-grade is not used. The daily teaching and general scientific research of its related institutions are completely sufficient, but the acquisition of the so-called high precision, as well as high cost, which leads to the related acquisition costs being expensive, maintenance costs reduced and other problems. Most of the functions and efficiencies in these instruments and equipment are also completely unavailable for application and are therefore a waste.

Thirdly, the information on the relevant large instruments is not well researched, and the use of the equipment and operating procedures, etc. are not fully understood, thus leading to poor daily management and maintenance of the equipment(Yan, 2021).

Therefore, in view of the current situation of many universities regarding the maintenance of large instruments and equipment, we propose that it is necessary to make some standardised development and upgrading measures for existing large instruments and equipment. The main purpose is to

expand the function and utilisation of the instruments, to improve their efficiency in daily teaching and research experiments, and to increase the service life of the instruments. First of all, we should understand that the need for maintenance and upgrading of large instruments and equipment needs to be proven by a group of experts. This is based on the following criteria: technical life, economic life, and service life. For large instruments that have exceeded their useful life, there is no need to repair or upgrade them. They are in obsolescence and their performance indicators are outdated and do not meet the needs of the teaching experiment. Therefore, they should be scrapped and written off in a timely manner. For two or three cases, professionals should be hired for the use of the instrument part of the functional development and upgrading, so as to strengthen the utilization rate and use of equipment, thereby saving the cost of acquiring new equipment.

3.4 Improve the utilisation rate of large instruments and equipment

Firstly, large instruments and equipment that have been idle for a long time should be handed in and registered by the relevant equipment maintenance and management department of the university.

Secondly, for the conditioned laboratories to carry out open management, establish a perfect and detailed laboratory opening mechanism. The three main objectives of the laboratory are teaching, research and service to society. The university's teachers and postgraduate students are guaranteed reasonable access to the laboratories when they need it and are qualified to use large instruments and equipment. In the double break, open to the majority of students, students in the laboratory before using the relevant instruments and equipment, need to follow the standard training guidance, in the use of the norms should be in line with the norms, found in time to report problems(Li et al., 2019).

3.5 Improve the quality of installation of relevant large instruments and equipment

The installation quality of large instruments and equipment in the relevant experimental colleges is an

important part of the entire equipment management and maintenance, should be from the process of installing equipment, installation techniques, including the quality of the installer and other aspects and comprehensive consideration, for which a high probability of quality problems in the process of strict control. And set up a special technical and quality supervision group, timely correction and record of the problems found, to ensure the effective implementation of the installation quality, so as to effectively prevent the occurrence of installation errors. The installation of large mechanical and electrical equipment requires a certain period of time, so the coordination and control of the project schedule are also very important in the whole project. The project installation project management personnel are required to participate in the process of developing a plan for the installation construction and improve the tracking efficiency of the relevant project progress, and coordinate feedback in a timely manner once the situation of falling behind the task progress occurs.

3.6 Optimisation of installation management techniques and personnel quality

The management of the installation of large instruments and equipment focuses on the safety of the installation technology, and should first strengthen the personnel's own awareness of industry norms, as well as the relevant quality level, and strengthen the daily maintenance of the installed equipment and maintenance work. With regard to the training of personnel in the company, safety knowledge should be strengthened and assessed. The three systems should be strictly implemented, i.e. fixed machines, fixed personnel and fixed posts. The awareness of responsibility and the basic quality of grassroots management determine the quality of the daily management of large instruments and equipment. We must strengthen the daily assessment and related skills training work, and constantly improve the professionalism of the grassroots equipment management personnel, so that the timely detection of faulty equipment, the maintenance of good equipment in place, improve its service life, etc.

If you encounter problems that cannot be solved, you should respond to your superiors in a timely manner and keep a good record of your daily work and handover records. Establish a strict system of licensed work and constantly strengthen safety education so that they always pay attention to safety technology and safe maintenance. And establish a system of rewards and punishments, rewarding money for outstanding achievements to improve the treatment of positions, etc. Encourage upward examination of relevant technical documents and use this as a salary stratification criterion(Guan & Song, 2011).

3.7 Personnel supervision

In relation to the use of large instruments and equipment, as well as monitoring and equipment maintenance, professional safety management personnel and full-time equipment management and maintenance personnel should be allowed to carry out on-site supervision and inspection. Supervision is carried out by personnel from the supervision department. For the original data of on-site testing to do real-time follow-up, for the equipment and machinery that fails to pass the test or has safety risks, the testing agency should uphold the principle of objectivity and impartiality, the results will be truthfully informed to the person in charge of the relevant institutions, and make them not put into the teaching experiment. [8]

3.8 Improve the institutional construction of the management of large instruments and equipment

In order to prevent the occurrence of accidents related to the use of large instruments and equipment, reduce the loss of property and the operational efficiency of the relevant equipment users. The university's large instrument and equipment management department should standardise the system of operational specifications to ensure that technical standards are established and that previously missing technical issues can be addressed and improved. A special emergency department should be responsible for the handling of large instrumentation and equipment emergencies, and a review should be conducted afterwards to improve

the overall capability of the entire equipment management team. The responsibility will be put into practice, so as to strengthen the management level of relevant large instruments and equipment.

3.9 Improve the responsibility awareness of management personnel

The improvement of personnel professional quality is one of the important means to solve the current experimental teaching, improper management of large instruments and equipment and frequent failures. First of all, it is required that the management and maintenance team of relevant large instruments and equipment can even establish a set of strict induction qualification systems and relevant work experience audit systems. The standard of professional skills training for new employees must be raised and strictly assessed. The level of risk awareness and the ability to manage and maintain large instruments and equipment, as well as the ability to handle them safely, should be graded, with emphasis on ensuring that new staff are accompanied by someone with a higher level of ability to handle them when they start work. Establish a maintenance management responsibility system centred on the person responsible for the operation. The assessment of daily management and safety maintenance work is strengthened and directly linked to performance bonuses so that staff develop a sense of safety responsibility for the management and maintenance of large equipment and increase their motivation to deal with accidents and faults before they are detected. This will ensure the normal operation of the relevant large instruments and equipment.

4. Conclusion

It seems that the management and maintenance of large instruments and equipment are very important. Standard and strict management measures can not only extend the service life of the relevant instruments and equipment but also improve their utilisation. It is therefore important to develop a modern management awareness including a cost-effective mindset. Maximise the benefits of your

instruments and equipment. Emphasis on equipment management, so that the relevant maintenance management team has clear responsibility, strong awareness and professional quality characteristics. Set the post and work on the machine.

Conflict of Interest

The authors declare that they have no conflicts of interest to this work.

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