Safety Hazards and Management Strategies of Welding Laboratories

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Abstract: Welding laboratory is a very important place in the experiment course, subject research and graduation project of material processing specialty in colleges and universities. The safety management of the welding laboratory plays a key role in the smooth progress of the welding experiment and the personal safety of the experimental personnel. This paper is to analyze the potential safety hazards and related management strategies in the welding laboratory.

1. Introduction

In the application process of welding laboratory, the existence of some Safety Hazards will not only affect the effect of welding experiment, but also pose a serious threat to the safety of teachers and students. Therefore, we must fully understand these hidden dangers and strengthen the safety management of welding laboratory through effective strategies.

2. Analysis of Safety Hazards in Welding Laboratories

2.1 Electrical Safety Hazards

Firstly, the power consumption of welding laboratory belongs to three-phase five wire, including three live wires, one neutral conductor and one earth wire. In the process of experiment, no matter which live wire is touched, there will be a serious risk of electric shock.

Table 1 Voltage Of Three Live Wires in Welding Laboratory

Live Wire	Voltage
Live Wire 1	380V
Live Wire 2	380V
Live Wire 3	380V

Secondly, in the welding power supply, large current and small voltage are its main characteristics. Generally, in the process of welding experiment, the limit voltage should be 80 V or less, but the current in the process of arc welding can be as high as 500 amp, while in the process of pressure welding, the current can even be as high as tens of thousands amp [1]. In this case, the input voltage of the power supply is 380V, 380V and 200V respectively. If there is leakage and other faults in the use process, it will cause serious electric shock hazard.

2.2 Welding Safety Hazards

Firstly, in the brazing process, the material plays a decisive role in the temperature. Generally, the brazing temperature should be50℃higher than the melting temperature of the material, and the brazing temperature is usually between 200℃and 1000℃, so when taking out the work-piece, it is easy to have scald accident. Meanwhile, in the process of heating, an important way is high-frequency induction heating. Once the high-frequency electromagnetic field is heated, serious leakage problem will occur, which will lead to the autonomic nervous disorders of the test personnel[2]. In addition, some poisonous and harmful gases and volatile metals are easy to be produced in the process of brazing, which are also harmful to the body of the tester.

Secondly, in the process of arc welding, there will be a violent gas discharge phenomenon, that is, arc. In the case of improper protection of the experimenter, arc light will cause burns to his skin and eyes, which is very dangerous. The high temperature welding spatter is also easy to burn the body

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of the experimental personnel, and even cause fire accidents in serious cases. At the same time, the small dust and smoke generated in the welding process will cause harm to the lungs of the experimental personnel, and even lead to poisoning of the experimental personnel in serious cases.

Finally, in the process of pressure welding, if the parameters are not selected properly, splashing will occur, which will cause harm to the skin and eyes of the experimental personnel. At the same time, in the process of pressure welding, if the operation is improper, the fingers or other parts of the experimenter may also be crushed by the electrode. In addition, the radiation produced in the application of laser welding machine will also have a great degree of adverse effects on the eyes and body of the experimental personnel.

2.3 Safety Hazards in Machinery and Gas

First of all, in the application process of welding machine, the robots will carry out welding work according to the set parameters and tracks, and follow the set procedures to automatically carry out corresponding actions. At this time, if the experimenter is in the range of motion of the robot mechanical arm, it is likely to be hit by the mechanical arm, which is very dangerous.

Secondly, in the welding laboratory, there are many risks in the transportation and use of gas. In the process of transportation, if there is an accident of dumping, people around are easily injured. Meanwhile, if there is a large amount of leakage of these gases in the process of transportation and use, it is easy to have an explosion accident in the case of open fire.

3. Safety Management Strategy Analysis of Welding Laboratory

3.1 Strengthen the Management System

First of all, the corresponding system should be established and improved in an all-round way, and the rights and responsibilities of management should be clarified. In the process of using the laboratory and corresponding equipment, the responsibilities of relevant management personnel must be clearly divided to ensure that each equipment is in the charge of a special person, and strictly implement the responsibilities of management.

Secondly, in the safety management of the welding laboratory, the management personnel should also establish the relevant information base, record the information of various instruments and equipment in the laboratory in detail, especially the instructions for the use of relevant instruments and precautions in the use process.

Meanwhile, in the welding laboratory, the access system should also be established, and a set of safety training manual should be prepared according to the specific characteristics of the laboratory and the actual situation of the equipment. In each semester, the safety training should be carried out for the students, and the results of the training should be assessed. Only the students who have passed the assessment can enter the welding laboratory.

Finally, the management personnel should do a good job in the dangerous goods management of the welding laboratory, guarantee the sanitary conditions of the laboratory, and formulate a complete set of safe operation specifications of the welding laboratory. In view of fire and other safety accidents, managers should also work out scientific and reasonable emergency plans. In this way, the safety of the welding laboratory can be effectively guaranteed, and the safety accidents can be prevented from causing serious harm to the experimental personnel.

3.2 Safety Inspection of Welding Laboratory

In the process of safety management of welding laboratory, managers must do a good job in safety inspection. In the process of inspection, we should focus on the electrical facilities in the laboratory, ensure that the circuit in the laboratory is not damaged, and mark the naught wire, live wire and earth wire, so that the experimenter can recognize them at a glance. At the same time, the wire at the input end of welding equipment should also be strictly checked to ensure the integrity of the circuit. Only in this way can we effectively avoid the occurrence of electric shock accidents.

In the process of safety inspection, the management personnel should also strictly check the

laboratory personnel, and only when the laboratory personnel wear protective clothing and take all protective measures can they be allowed to enter the laboratory, and ensure that the laboratory personnel start and close all kinds of equipment in order in strict accordance with the requirements. In order to avoid potential safety hazards caused by welding spatter, managers must allow the experimenter to leave the welding laboratory after the spatter is cooled.

In addition, in the process of inspection, managers must check the safety of all equipment, and set up warning signs around the welding robot, so as to further ensure the safety of the welding laboratory.

3.3 Safety Education

In the process of safety management of welding laboratory, attention should also be paid to the safety education of students. Therefore, the manager can post the relevant safety regulations, safety system, safety operation precautions, etc. in the eye-catching position of the laboratory, and can also provide the safety consulting services for teachers and students of the welding laboratory. In order to further improve the safety management quality of the welding laboratory, the school should also carry out safety competition, safety education lectures, emergency evacuation drills and other activities in the relevant disciplines. Only in this way can good publicity and education effect be achieved and the safety of welding laboratory be further guaranteed.

4. Conclusion

To sum up, in the experimental operation process of the welding laboratory, if there are problems in equipment and facilities, or if the experimental personnel operates improperly, it will lead to a series of safety accidents, which will have a serious impact on the safety of the experimental personnel. Based on this situation, colleges and universities must strengthen the safety management of the welding laboratory, and further improve the safety management effect of the welding laboratory through the form of system management, laboratory safety inspection, publicity and education, so as to ensure the smooth progress of the welding experiment and the safety of the experimental personnel.

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