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Basic Electrical Welding Training at the Markaz Hadist Bilal Bin Rabah Islamic Boarding School Tangerang

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A B S T R A C T

A welding machine is a tool for welding thin and thick plates which can be used to make house fences, shelves, tables, chairs and so on. The community service, which is packaged in such a way and carried out at the Tahfiz Markaz Hadits Bilal bin Rabah Aliyah Legok Islamic Boarding School, aims to provide welding training using electric welding to the students so that when they enter society, they become productive humans. Additionally, they can work independently. This community service activity made all participants who participated in PkM activities feel enthusiastic about participating from start to finish. They also tried to practice welding themselves under the guidance of lecturers and students.

INTRODUCTION

Training is a teaching and learning process using methods and techniques to improve knowledge, skills, attitudes, and the behaviour of individuals or groups in a field (Sukirno,2008),(Gustiana et al., 2022) . The primary purpose of training is to provide better understanding, develop new skills, improve performance, and achieve desired results in the context of education, work, or personal development. In this case, training can be conducted through various methods, such as formal training, on-the-job or in-school training, online training, or self-learning(Syafrida, 2023). Training conducted for individuals or groups of people is a means to realize empowerment for individuals or groups in a community. Empowerment can be carried out through activities such as providing skills, developing knowledge, strengthening abilities, and others aimed at creating positive change, increasing independence, and having the ability to build and advance themselves to strengthen the position of individuals or groups in society towards a better direction overall sustainable (Kartika Sekarsari et al., 2020), (Endah, 2020) .

The Markaz Hadist Bilal Bin Rabah, Islamic Boarding School, is a Tahfiz Islamic boarding school that provides teaching to children aged 13-18 years or equivalent to the general high school level, with a boarding system or living in a dormitory/cottage. Apart from only accepting male students, the students who live in the Tahfiz Markaz Hadits Bilal bin Rabah cottage come from Java and outside Java. This Islamic boarding school also does not charge any fees to its students from the time they enter until they graduate (full scholarship). They are educated and prepared to become preachers who will later serve the community in their home area or meet the needs of other places in need. However, of course, students must also be prepared to have different skills. This is an empowerment effort for the students so that when they have graduated from their education at the Islamic boarding school, the students can become entrepreneurs independently. Empowering students can be done by providing various educational training, for example, welding training with electric welding.

Collaboration between the Mechanical Engineering Study Program and the Electrical Engineering Study Program at Pamulang University on Community Service (PkM) activities at the Markaz Hadist Bilal Bin Rabah Islamic Boarding School, Tangerang Regency is one form of manifestation of the Tri Dharma of Higher Education. Meanwhile, the objectives of this PkM activity include forming/developing a group of students who are economically and socially independent, improving thinking skills, improving soft skills and hard skills, as well as providing an understanding of the importance of skills for productive young students in the primary electric welding training program.

Basics of Electric Welding

Welding is a process that involves the use of a welding machine that produces an electric arc between an electrode and a work material, such as a piece of metal or plate, which causes a high temperature to occur around the welding point (Siswanto,2011),(Singh, 2022). Welding utilizes a heat source from electrical energy in an electric welding machine. When connected to

electricity, the energy is received by the welding machine and converted into heat energy(Hisey, 2014). This heat is used to melt the metal parts that you want to connect. During the welding process, a metal rod called an electrode is used. The electrode is a filler metal rod that passes electricity from the welding machine. When electricity flows through the electrodes, it causes the surrounding metal parts to become very hot and melt. When the metal electrode melts, it can finally join two pieces of metal. Moreover, after the metal electrode cools, a strong connection will form between the two pieces of metal. The welding procedure seems very simple, but some problems must be overcome where the solution requires a variety of knowledge; therefore, in welding, knowledge must accompany the practice (Zulfikar et al., 2019). Figure 1 shows the operating principle of SMAW welding.

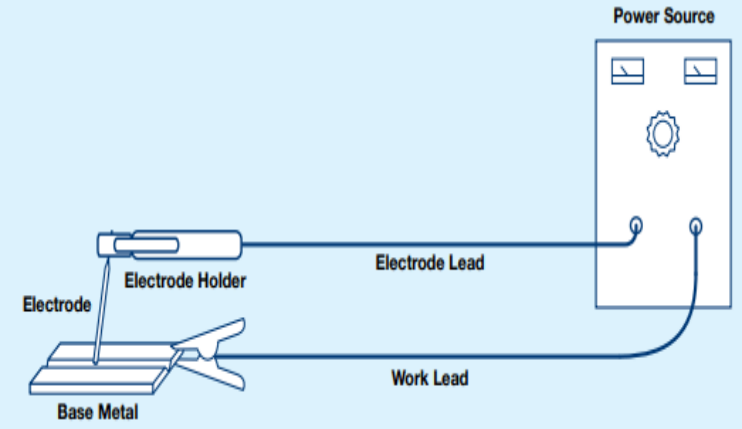

Figure 1. SMAW operating principle
(source: www.allpro.co.id/pengelasan/smaw)

Welding with electric welding has various types, such as Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), Flux-Cored Arc Welding (FCAW), and others. Each type of welding has different advantages and applications depending on the project's specific needs. In the PkM activity, basic electric welding training at the Markaz Hadist Bilal Bin Rabbah Islamic Boarding School, Tangerang Regency, used a Shielded Metal Arc Welding (SMAW) welding machine. In this case, SMAW welding is called Electric Arc Welding, a welding process that uses heat to melt the base material or base metal and electrodes (filler material). The heat is generated by electric ion jumps between the cathode and anode (the tip of the electrode and the surface of the plate to be welded have the best distance of 1.5 x the electrode diameter used (Surono, B., et al., 2023).

Electric welding is widely used in construction, manufacturing, repair, and various other fields to make or repair various metal structures and can also be used to make house fences, shelves, tables, chairs and so on.

IMPLEMENTATION AND METHODS

Basic electrical welding training, a PkM activity, was carried out at the Markaz Hadits Bilal bin Rabah Islamic Boarding School, Cirarab Village, Legok

District, Tangerang Regency, Banten Province. This activity, which ± 11 participants attended, occurred in December 2023. The implementation methods for basic electrical welding training include:

a. Teaching

At this stage, the participants were given material about the basics of electric welding, including a definition of the welding process, an introduction to types of welding equipment, types of electrodes, welding parameters, their effect on the final welding result, and an introduction to material about K3 including an introduction to PPE. The equipment used in basic electric welding training activities is shown in Table 1.

Table-1. Name list of basic electric welding equipment

No	Equipment Name
1	Welding machine
2	Electroda
3	Hand Glove
4	Welding Goggles
5	Welding Apron
6	Hammer
7	Steel Brush
8	Hand Grinding Machine
9	Metal Pieces

b. Training

Welding is a challenging job because it involves the use of heat energy, which is quite dangerous, so the process should not be carried out carelessly because, apart from endangering yourself, it can also damage the results of the welding work being carried out. Therefore, at this stage, participants are taught and trained on how to carry out welding correctly and safely before starting practice.

c. Welding Practice

At this stage, students must first pay attention to welding practices exemplified by a committee of students whom competent lecturers accompany. After the students had understood enough about welding procedures, they were asked to try and practice welding themselves using electric welding equipment and, of course, accompanied by a committee of students and supervisors. Each student carries out this welding practice alternately. This aims to ensure that all training participants can follow and experience how to carry out welding.

d. Evaluation

At this stage, an evaluation of the PkM Basic Electric Welding Training activities is carried out, including technical skills, safety, understanding of theoretical concepts, and participant feedback.

RESULTS AND DISCUSSION

Community service activities (PkM) Basic Electrical Welding Training, which was carried out at the Markaz Hadist Bilal bin Rabah Islamic Boarding School, Cirarab Village, Cirarab Village, Tangerang Regency, can be seen in the following photo of the activity:

Figure 2. Photo of basic electrical welding education activities

Figure 3. Photo of basic electric welding practical activities

As can be seen in Figure 2, the enthusiasm of the participating students to take part in basic electrical welding counselling and training can be seen. Counselling and training are packaged in such a way by a committee of lecturers and students in the form of presentations and questions and answers, making the atmosphere of counselling lively and exciting. This is proven by the many questions asked by participants to the resource persons. In this basic electrical welding counselling and training, participants were also introduced to the equipment used for welding, including personal protective equipment (PPE) and how to use it.

Figure 3 shows the participants taking part in practice in a series of PkM activities for basic electric welding training. As seen in the photo, before the participating students try to use the electric welding equipment prepared by the committee, the participants must first pay attention and understand the safe welding procedures as demonstrated by the committee. Furthermore, after participants understand the welding procedures demonstrated by the committee, participants are given the opportunity to try using welding equipment under the supervision of the PkM committee of lecturers and students. Enthusiasm was visible when the participants were given the opportunity to try using welding equipment in this basic electric welding training activity. Almost everyone wanted to try using welding equipment and practice it themselves. However, because the amount of welding equipment and PPE brought by the committee was limited, the opportunity to use the equipment was carried out alternately but still under the supervision of the lecturer and student PkM committee.

Next, the final process stage of PkM activities is the evaluation of the participants. Activity evaluation was carried out to measure the extent of understanding of the participants in participating in the entire series of basic electric welding training PkM activities from the beginning to the end of the

event. Several points that can be evaluated include a) Technical skills, which include the participant's ability to carry out the electric welding process correctly. b) Safety, which includes compliance of participating students with safety procedures during the welding process with electric welding, including the use of personal protective equipment. c) Understanding theoretical concepts, which include understanding the basic concepts of electric welding, such as types of welding, types of electrodes, welding parameters, and their influence on the final result. d) Participant feedback, which includes participants' experiences during the training, including clarity of the material provided, sufficient time for practice, and availability of equipment facilities during the training. Figure 4 shows a diagram of the evaluation results of the PCM basic electric welding training activities carried out on participants.

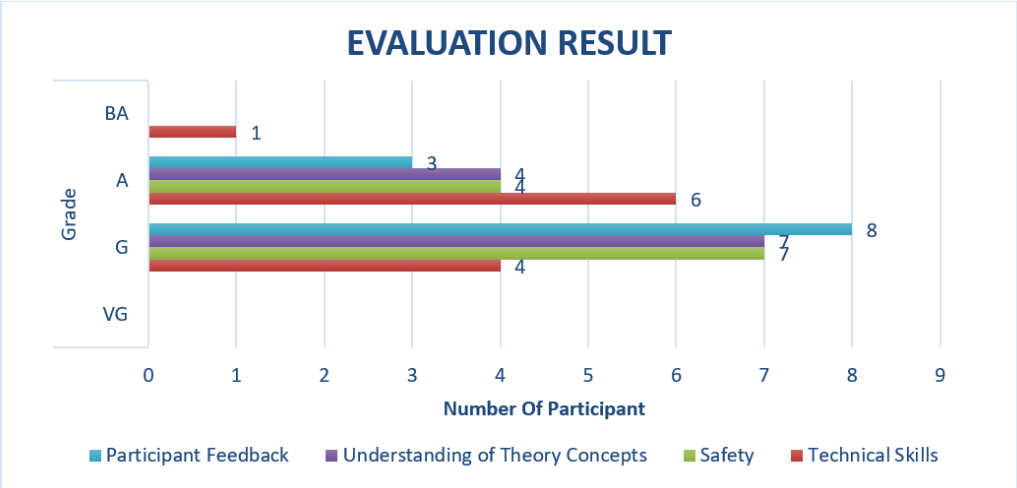

Figure 4 Diagram of the evaluation results of basic electric welding training for participants.

As can be seen in Figure 4, the participants' technical skills evaluation scores are quite good. For safety evaluation scores, almost all participants can use personal protective equipment when practising. For the evaluation score for understanding theoretical concepts, participants had a good average score because each participant was able to answer the questions given by the committee at the counselling stage. Moreover, for evaluation feedback from participants, on average, they gave good and positive marks for the categories of clarity of material presented, sufficient time for practice, and availability of facilities for basic electric welding training. The results of this evaluation are a reference that the participants are quite enthusiastic about taking part in basic electric welding training activities. They hope that this training can be carried out continuously so that they have better technical skills in welding, which can be used to help repair damaged metal equipment, which is in the Markaz Hadist Bilal bin Rabah Islamic Boarding School environment.

CONCLUSIONS AND RECOMMENDATIONS

The PkM activity for basic electrical welding training, which was carried out at the Markaz Hadist Bilal bin Rabah Islamic Boarding School, Cirarab

Village, Tangerang Regency, went well and was attended by 11 students. The basic electric welding training was packaged in such a way that the activity was enough to make participants interested in taking part in the activity from the start to the end of the event in an orderly manner. Their interest in this training is proven by the evaluation results achieved by the participants, both in terms of the technical skills they demonstrated when trying to practice welding under the guidance of lecturers and students, as well as their understanding of the basic theoretical concepts of welding, as well as the use of personal protective equipment (PPE) when carrying out the training. Welding practice. In this case, if training activities are carried out continuously, it will hone the participants' technical skills for the better.

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