
Application of Basic Welding Techniques Shield Metal Arc Welding (SMAW) to Improve the Capability of Forced Village Communities

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Abstract

Most of the area of this village is an area of rice fields and fields. In the agricultural sector, some villagers have used mechanical, agricultural equipment that requires maintenance and repair by welding. In addition, welding is also often used in the livestock sector and for other purposes. Among the many types of welding, SMAW welding is the most popular and widely used both on a home and industrial scale. The welding process requires understanding the correct procedures, appropriate tools, personal protective equipment, and K3. Therefore, training guidance was held for the Force Village community to improve welding skills. The method used is providing material about welding, K3 and practice. The results of this training guidance activity show an increase in the skills and knowledge of the trainees, which can be seen from the results of the tests before and after the training.

Keywords: Training; SMAW welding; Force Village; Welding Procedure

1. Introduction

The development of science and technology from year to year is increasing rapidly. In Indonesia, the development of science and technology is very significant, marked by progress in various important sectors, which cannot be separated from human intervention in survival. Advances in science provide convenience for all human beings.

The development of the manufacturing industry, especially the machinery, base metal, and automotive industries, has experienced significant developments from year to year. Considering that the manufacturing industry is a sector that employs many workers, the role of welding science and technology in developing the manufacturing industry is very important throughout the world. Most of the manufacturing and machinery industries use welding techniques.

Metal welding is a metal joining process by melting metal widely used in many manufacturing industries. Apart from the automotive sector, welding is also commonly used in piping, bridges, offshore buildings, and shipping. The use of this welding is very wide compared to other joining techniques. The advantage of welding is that it can be done with the help of robots, like in the manufacturing industry in Indonesia.

Currently, industries are required to innovate in order to compete at the national and international levels. The industry requires substantial funds to create maximum added value, especially for development and research. Therefore the role of welding science and technology is very important in developing strategic industries in Indonesia. This forces many people to prepare everything to face a more advanced future. Technological advances will accelerate. Therefore, humans are required to have good abilities in order to compete.

Serangan Village is located in the Kangean Islands, Arjasa District, East Java Province, and has an area of 1.9980 km². Most of the area of this village is an area of rice fields and fields. Force Village is a village that has a buffalo race field. In the Forces Village community's agricultural sector, some villagers have used mechanical agricultural equipment that requires maintenance and repair using welding. Not only that but welding is also used in the livestock sector and other purposes. Among the many types of welding, SMAW welding is the most popular type of welding and is widely used for home and industrial scale needs. The welding process cannot be done arbitrarily; it requires an understanding of the correct welding procedures, appropriate tools, personal protective equipment, and an understanding of K3.

In this activity, training or teaching guidance will be carried out to the Force Village community to improve welding skills. In addition to guiding welding, the trainees were also given material on occupational safety and health and materials that could support activities and guidelines during or when this guidance was completed. The trainees were given the material on theory, not only a theory but the trainees were also provided with practical knowledge.

Considering the problems, appropriate action is needed by training the Force Village community regarding welding and occupational health safety. Therefore, the existence of this training for the Forces Village community can improve their abilities and increase confidence in work to produce good output. This is by the functions and objectives of this training.

2. Materials and Methods

Among the many types of welding, SMAW welding is the most popular type of welding and is widely used for home and industrial scale needs. Welding is a method of joining metals by heating the metal until it melts using heat energy either from the heat of electricity or from the heat of a fire originating from burning gas.



Figure 1. Welding Process

Welding is a process of joining two or more metals using heat energy so that the metal to be welded melts and fuses, by applying pressure or not. WeldingShield Metal Arc Welding (SMAW) or often called wrapped electrode welding, is a welding process that uses heat energy so that the base metal can melt. Heat energy is obtained from the jump of electric ions between the cathode and anode. The heat energy obtained from this electric ion jump usually reaches 4000°C to 4500°C. SMAW welding generates two kinds of voltage sources: alternating current (AC) and direct current (DC).

The welding process occurs due to a connection between the metal material and the electrode tip resulting in a short circuit. When a short circuit occurs, the welder must pull the electrode so that an electric current forms. The heat energy generated will melt the metal and the electrode so that the two liquids combine to form a welding blob (*weld metal*).

2.1 Working principle of SMAW welding

a) In the SMAW welding process, the heat energy generated comes from an electric arc between

the electrode tip and the base metal.

- b) This heat energy causes the electrode tip and the parent material to melt.
- c) When the ends of the two parent materials melt, they will mix with the molten metal from the welding wire, forming a molten crater, which will then cause the weld metal to solidify.

There are two types of current used in SMAW welding, namely:

- 1. AC or often called a welding machine with alternating current
- 2. DC or often called a welding machine with direct current

In the current type of welding machine with direct current (DC), there are two polarities, namely:

- 1. Direct Current Electrode Negative (DCEN)
- 2. Direct Current Electrode Positive (DCEP)

2.2 Welding Position

The welding position is one of the success factors in welding, so the welding position has various difficulties that must be faced. In general, character welding is divided into two categories, namely welding one layer or single pass or also known as fillet welding, which has the symbol F, and the second category of welding for several layers or multi-pass or also known as Groove Welding, which has the symbol G.

At each welding position, the numbering rules for fillet weld joints are as follows:

- 1F = Flat position welding
- 2F = Horizontal position welding
- 3F = Welding vertical position
- 4F = Overhead position welding

At each welding position, the numbering rules for Groove welding joints are as follows:

- 1G = Flat position welding
- 2G = Welding in a horizontal position
- 3G = Welding in vertical position
- 4G = Welding in the overhead position

Several stages need to be considered in the welding training activities at the Forces Village this time, which will be explained below.

Stage 1

Discussions with the field team and the mentors who will provide during training. Guidance regarding the material to be provided and the equipment needed during the training. It aims to make the right method to achieve the training objectives. The method used must provide an overall picture because the right method can be a benchmark to evaluate the progress of the training process. The discussion process can be seen in Figure 2 below.



Figure 2. Discussion with the field team and mentor

Stage 2

They provide tests prior to being given material and practical welding training to the training guidance participants so that they can find out the participants' abilities and understanding.

Stage 3

Submission of material before the training is carried out, providing material regarding the basic theory of welding Shield Metal Arc Welding (SMAW) covers SMAW welding techniques, SMAW welding positions, SMAW welding parameters and also regarding occupational health safety so that trainees can better understand the basics of welding and also the importance of occupational health safety at work.



Figure 3. Welding Training Preparation

Thus the training participants can follow and understand the training flow later. In addition, the delivery of material can also help reduce the anxiety of the trainees when learning new things so that the participants can focus during the training session.

Stage 4

At this stage, namely the implementation of SMAW welding training or practice (Shield Metal Arc Welding) to the training participants, this aims to apply the material the welding training mentors delivered. During the welding practice, the participants were assisted in understanding the welding process better. The assistance during the training is to increase the understanding and skills of the trainees regarding SMAW welding (Shield Metal Arc Welding).



Figure 4. Welding Practice 1

Stage 5

To find out the development and progress of the training participants, then further tests were carried out to measure the progress of the training participants.

3. Results

Results of Basic SMAW Welding Training (Shield Metal Arc Welding) to improve the skills of the people of Serangan Village, in theory, can be seen from the ability of the training guidance participants to gain knowledge about SMAW basic welding (Shield Metal Arc Welding) and also about occupational safety and health. The training results can be seen from the test results before welding, which has increased after being given material and practical training to the trainees.

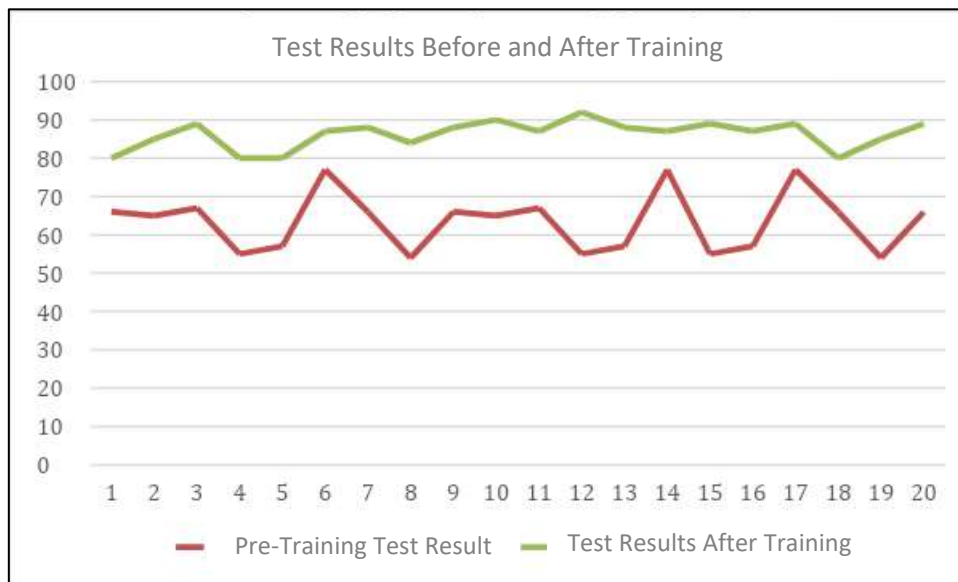


Figure 7. Test results before and after training

The training results for the training participants in the Force Village, regarding the basics of SMAW welding (Shield Metal Arc Welding) have provided much basic welding knowledge and increased knowledge for the trainees. The participants used welding equipment very well; in addition to gaining welding knowledge, the participants also gained new knowledge about occupational health safety (K3), which had been delivered by the mentors or trainers in this welding training.

4. Discussion

From the discussion above, it can be analyzed that the basic SMAW welding training (Shield Metal Arc Welding) carried out in the Force Village, aims to improve the skills of the local community. The results of this training showed an increase in the ability of the participants to gain knowledge about basic SMAW welding and occupational health safety. This can be seen from the results of the tests before and after the training, which showed an increase in the participants' abilities.

The results of this training it has provided many benefits for the participants. They gain basic welding knowledge and increase their knowledge about occupational health safety (K3). This is very important because welding is a job that requires good skills and knowledge to do it safely and efficiently.

In addition, this training also provides an opportunity for participants to use welding equipment properly. This shows they have understood and can apply the material in practice. Thus, this training has succeeded in increasing the skills of the Dayak Village community in SMAW welding.

However, remember that this training is only the first step in improving the skills of the TNI in welding. Continuous practice and learning are required to reach a higher level of expertise. Therefore, similar training can continue to be carried out in the future to increase the ability of the Forces Village community in welding.

5. Conclusions

From the results of SMAW welding basic training (Shield Metal Arc Welding) carried out in the Force Village, it can be concluded that this training has succeeded in increasing the skills of the local community in welding. The training participants showed an increased ability to learn about basic SMAW welding and occupational health safety. They can also use welding equipment well, showing that they have understood the material presented and can apply it in practice. However, to reach a

higher level of expertise requires continuous practice and learning. Therefore, similar training can continue to be carried out in the future to increase the ability of the Forces Village community in welding.

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