The Role of Teachers in The Utilization of Industrial Automation Learning Media Using Portable Boiler Machines in The Engineering Department of SMK Jayabeka 02 Karawang

Mohamad Jajuli[1], Rahmat Hidayat[2], Adit Kurniawan[3], Enjang Ahmad Juanda[4]
{mohamad.jajuli@unsika.ac.id}

Universitas Singaperbangsa Karawang[12], Institut Teknologi Bandung[3], Universitas Pendidikan Bandung[4]

Abstract. The problem for students of the Mechanical Engineering Department of Jayabeka Vocational High School 02 Karawang is they find it difficult to learn the boiler system material. The research uses the method with the following stages: Testing the power supply or regulator; Power Supply Circuit Test; Focus group discussion. From these results, measurements are made three times with no load and with load to ensure that the rated power and rated current on the power supply are in normal and good condition. In testing the power supply circuit, it is done by measuring the output voltage generated at the power supply. Measurements are made three times to ensure that the power supply circuit is in normal and good condition. Based on the results of focus group discussion, the introduction of industrial automation learning media using portable boiler machines can applied and be very helpful for students.

Keywords: Education; Teacher; portable boiler

1 Introduction

The development of science is increasingly encouraging innovations in the use of technology products in the teaching and learning process. Teachers are required to be able to use the tools provided by the school or to develop some skills in creating learning media if there is no available media. The problem for students of the Mechanical Engineering Department of Jayabeka Vocational High School (SMK) 02 Karawang is they find it difficult to learn the boiler system material.

The school cannot afford a boiler machine because it is too expensive. Thus, in teaching and learning process, teachers still use lecturing method without direct practice. Lecturing method make students easily bored, so students do not have motivation to study. If this problem continues, the learning process will not be optimal which will ultimately affect students learning outcomes.

The use of portable boiler machine learning model is one of the efforts to improve learning outcomes during the learning process, so as to foster students' substantial curiosity and they can better understand the material related to the boiler system. The teacher's role in industrial automation learning is very important in achieving successful learning in the classroom.

ICES 2021, November 17-18, Jakarta, Indonesia

DOI 10.4108/eai.17-11-2021.2318655

Teachers are required to always follow the technology of the times, especially in the industrial 4.0 era.

2 Research Methods

The research uses the method with the following stages: 1) Testing the power supply or regulator, 2) Power Supply Circuit Test, (3) Focus group discussion.

3 Results and Discussion

Testing the power supply or regulator

The results of the measurement of the measured power and the measured current at the output of the power supply on the industrial automation learning media using a portable boiler machine are shown in the table below.

Table 1. Power and Current Measurement

Voltage & Frequency	Rated Power	Rated Current	Explanation
220V/ 50 Hz	4,9 W	0,06 A	No Load
220V/ 50 Hz	4,9 W	0,06 A	With Load

In table 1. above, the power and current testing is carried out by measuring the measured power and measured current generated in the power supply of industrial automation learning media using a portable boiler machine. Measurements are made three times with no load and with load to ensure that the rated power and rated current on the power supply are in normal and good condition and are effective. In addition, a measured power measurement was carried out with a voltage and frequency of 220V/50 Hz and the results of the measured power measurement were 4.9 Watt and a Measured Current of 0.06 Ampere.

Furthermore, leakage current testing was also carried out, the results of measuring leakage current on industrial automation learning media using portable boiler machines are shown in the table below.

Table 2. Leakage Current Measurement

Tested Part	Measurement Results	Max Limit	Decision
Top	59,6 µA	0,6 mA	Pass
Side	57,1 µA	0,6 mA	Pass
Power Button	52,5 µA	0,6 mA	Pass

In table 2. above, the leakage current test is carried out by measuring the leakage current in the upper box made of iron which is produced with a measurement result of 59.6 A and is declared passed or safe. Furthermore, the leakage current was measured on the side iron which was produced with a measurement result of 57.1 A and was declared passed or safe. In addition, the leakage current was measured on the resulting power button with a measurement result of 52.5 A and was declared passed or safe.

In addition, electrical strength testing was also carried out, the results of measuring electrical strength on industrial automation learning media using portable boiler machines are shown in the table below.

Table 3. Electrical Strength Measurement

Tested Part	Insulation Type	Voltage	Translucent (Yes/No)
Skrup	Dasar	1500 Volt	No
Plastik Bagian Atas	Diperkuat	3500 Volt	No

In table 3. above, the electrical strength test is carried out by measuring the type of basic insulation on the part being tested, namely the screw part on the industrial automation learning media using a portable boiler machine which produces a voltage measurement of 1500 Volt and is declared impermeable or safe. Furthermore, the electrical strength test was carried out by measuring the type of reinforced insulation on the part that was tested, namely the top box made of plastic on industrial automation learning media using a portable boiler machine which resulted in a voltage measurement of 3500 Volts and was declared impermeable or safe.

Power Supply Circuit Test

In testing the power supply circuit, it is done by measuring the output voltage generated at the power supply. Measurements are made three times to ensure that the power supply circuit is in normal and good condition. The results of voltage measurements at the output of the power supply are shown in the table below.

Table 4. Measurement of voltage regulator 7805

No	Measurement	V Out (V)
1	I	4,96
2	II	4,96
3	III	4,96

Table 5. Measurement of voltage regulator 7812

No	Measurement	V Out (V)
1	I	12,15
2	II	12,15
3	III	12,15

From the measurement results, the average voltage = 36.45/3 = 12.15V. Presentation and data collection techniques carried out were by studying literature, designing and creating and testing technology. Industrial automation learning media using portable boiler machines based on digital monitoring systems and surveys at Vocational High Schools for mechanical, industrial electronics, and electrical expertise programs in Karawang Regency.

We conducted a survey, socialization and introduction and FGD of portable boiler machines as learning media for industrial automation at Vocational High Schools (SMK) in Karawang Regency. The way this machine works is based on a combination of machine hardware and

system monitoring technology based on orders from an Arduino microcontroller which controls the monitoring of boiler pressure and temperature. This monitoring tool has several features including a start-stop menu to set the boiler engine on and off. portable. In addition, when the portable boiler machine is working, the pressure and temperature on the portable boiler machine can be monitored based on the internet of things, and an LCD display and smartphone as display indicators.

The survey, focus group discussion (FGD) and socialization were carried out in several vocational schools in SMK Jayabeka 02 Karawang.

Fig.1. Introduction and FGD of Industrial Automation Learning Media Using Portable Boiler Machines at SMK Jayabeka 02 Karawang

Based on the results of the survey and Focus Group Discussion (FGD) the introduction of industrial automation learning media using portable boiler machines in several vocational schools in Karawang Regency, according to the teachers, when applied and implemented, it can be very helpful for students, especially in mechanical engineering vocational programs, electronics engineering, and Electricity as Learning Media of Industrial Automation Using Portable Boiler Machines, especially in the subjects of workshop engineering, industrial automation, basic electronics engineering, electronic circuits, control system engineering, digital simulation.

4 Conclusion

Measurements are made three times with no load and with load to ensure that the rated power and rated current on the power supply are in normal and good condition and are effective. In testing the power supply circuit, it is done by measuring the output voltage generated at the power supply. Measurements are made three times to ensure that the power supply circuit is in normal and good condition. Based on the results of the survey and Focus Group Discussion (FGD) the introduction of industrial automation learning media using portable boiler machines in several vocational schools in Karawang Regency, according to the teachers, when applied and implemented, it can be very helpful for students.

Acknowledgement

The researcher would like to thank the Ministry of Education, Culture, Research, and Technology for the grant funds provided in the 2021 Inter-University Cooperation (PKPT) scheme research.

References

[1] Cipta Azhar, Arsad.: Media Pembelajaran. PT Raja Grafindo Persada, Jakarta (2008)
[2] DCC, Deka.: Membangun Sistem Akuisis Data Berbasis Database dengan Delphi. Jakarta (2006)
[3] Heri Andrianto.: Pemrograman Mikrokontroller AT Mega 16 menggunakakan Code Vision AVR. Informatika, Bandung (2008)
[4] Karjono SA, MT. Ir.: Boiler Uap dan Sistem Tenaga Uap. Pusdiklat Migas (2002)
[5] Marcus Zakaria, Teddy.: Pemrograman Delphi untuk Pemula: IDE dan Struktur Pemrograman. Bandung (2003)
[6] M. Ary Heryanto & Wisnu Adi P.: Pemrograman Bahasa C untuk Mikrokontroler ATMega 8535. Andi, Yogyakarta (2008)
[7] Setiawan, Yudi dkk.: Thermocouple Type K. Universitas Kristen Maranatha Bandung, Bandung (2011)
[8] Share ITS.: Teknik Pengukuran dan Kalibrasi. ITS, Surabaya (2013)
[9] Sugiyono.: Metode Penelitian Kuantitatif Kualitatif dan R&D. Alfabeta, Bandung (2010)
[10] Widodo Budiharto & Gamayel Rizal.: 12 Proyek Mikrokontroler untuk Pemula. Elek Media Komputindo, Jakarta (2007)