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Training on Repairing the Winding Coil of a 1-Phase Electric Water Pump Motor

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Abstract

Training skills and how the steps are learned as a learning activity for trainees, as well as starting from the theory about electric motors and practicing sequentially. Understanding each material given in the module is also needed to identify the coil winding of a 1 phase electric motor, especially a water pump. Learning activities are equipped with exercises or evaluations that become a benchmark for the training participants' mastery level. Trainees are expected to understand the explanation from the teaching team so that they can understand well the material that is the basis of repair planning, installing winding sleeves at Cern, winding copper email wire windings to mall boards, attaching windings to the grooves of water pump motors, connecting the main and auxiliary winding coils, tying the windings with nylon thread After finishing winding the wire coil, close the water pump motor that is ready to be rolled again and then test the motor that has been completed in rolling again. After participating in all learning activities in this training, participants are expected to follow the procedures from the planning stages of rolling, installing coil windings, and reinstallation for the quality of winding coils, with good quality and neatness.

A. Introduction

Amidst the optimism that has emerged in welcoming 2024 due to the improvement in the national economy which grew above 5 percent throughout 2022, Indonesia is still faced with a fundamental problem, namely the stagnant improvement in the quality of Indonesia's Human Resources in recent years. The economy is sometimes only judged by statistical figures and physical development, but neglects the problems of human resources, starting from the low quality of education and the economy of the community. Current conditions related to the need for competent human resources and meanwhile due to the rapid population growth and the development of population income as well as developments outside the skills sector and causing the need for human resource skills are needed. Can Indonesia compete with other countries, if the condition of the quality of human resources is still relatively low, the need for the government to promote various programs such as vocational training, competency-based apprenticeships in companies, to certify competencies for productive people (Mardiana & Saleh, 2022).

Indonesia is a country that has the fourth largest population in the world after China, India, and the United States with around 237,641,326 million people according to statistics in 2015 (Indraswari & Yuhan, 2017). According to IMF (International Monetary Fund) data, it was recorded that in 2018, the population in Indonesia reached 264.16 million people and it is predicted that by 2024, Indonesia will experience population growth to reach 281.64 million people. where around 60% of them are of productive age

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between the ages of 15 to 55 years. Until now, the quality of human resources in Indonesia is still relatively low. BPS data shows that the workforce in Indonesia is still dominated by elementary school graduates and below, which is 39.10 percent (February 2022). According to the Central Bureau of Statistics, from the number of productive ages, the unemployment rate reaches 68.7% with various types of unemployment, or there are around 5.28% 5 unemployed people out of 100 labor force in Indonesia who are included in open unemployment (6.82 million people), namely people who voluntarily do not work or work but the results of their work are not sufficient for their living expenses.

The skills of Indonesia's human resources rank fourth among countries in Southeast Asia. This is based on one of the assessment pillars in the Global Competitiveness Index (GCI) released by the World Economy Forum (WEF) in 2018. "No less important is also to collaborate with other credible institutions that can bring Human Resources to be even more qualified in the future," because the potential of the Regency capital is located in Lubuk Pakam District. Based on data from the Deli Serdang Central Bureau of Statistics 2021, the population of this regency amounted to 1,931,441 people (2020), and is the largest population by regency in North Sumatra Province. Deli Serdang Regency is known as one of the 33 districts/cities in North Sumatra Province. The regency has a large diversity of natural resources so that it is an area that has quite good investment opportunities. Deli Serdang Regency consists of 22 sub-districts, 14 urban villages, and 380 villages with an area of 2,241.68 km² and a population of around 1,931,441 (inhabitants) according to statistics, with a population density of 800 inhabitants / km² must really be produced in the future to make a major contribution to the welfare of its citizens so that their economic income level can continue to increase (BPS).

As it is now, Deli Serdang Regency is one of the areas that has enjoyed the construction of toll roads, railways, including various other major developments. Of course, this requires polish and a touch that is later expected to develop. Skills working capital is necessary to produce quality products such as skills to repair the coil winding of a 1-phase Electric Water Pump Motor and various other skills, so that it can continue to increase.

The vision of Deli Serdang Regency for 2019-2024, which was presented by the Regent, is "Deli Serdang which is advanced and prosperous with a religious and harmonious society in diversity" (Pemerintah Kabupaten Deli Serdang, 2019). An advanced and prosperous Deli Serdang is a Regency that has quality human resources, the availability of good infrastructure, and the fulfillment of community needs through accelerated development in all fields that are equitable and environmentally sound, while a religious and harmonious society in diversity is to make Deli Serdang Regency whose people have a level of faith and devotion to God Almighty, uphold the values and norms of harmony between religious communities, ethnic cultures and human rights.

Seeing the above conditions, Medan Aviation Polytechnic in terms of Lecturers in collaboration with the Research and Community Service Unit, is moved to help government programs as stated in PP. No. 60 year 1999 chapter II article 2 paragraph 1b, namely "Developing and disseminating science, technology and seeking its use to improve the standard of living of the community by planning activities". Training to repair the coil winding of a 1-phase Electric Water Pump Motor for productive communities in Klambir Lima Garden Village. To achieve the vision and mission of the development of Deli Serdang Regency, namely increasing quality human resources, and competitiveness that is able to utilize science and technology, improving welfare and independence in establishing a solid economic structure based on competitive finance, therefore, it is necessary to prepare the right steps so that the human capital index can increase so that children can be more productive later. One of them is by boosting superior and competent Human Resources (HR).

B. Research Method

Community service activities are carried out for 3 (three) days in the second week of August. The target of the activity is 10 people of productive age in Klambir Lima Kebun Deli Serdang Village. The activities carried out include training by providing basic skills and knowledge about repairing single-phase electric water pump motor coil windings based on electric motor theory and practical implementation in rewinding water pump motor coil components and workpieces with the steps, namely:

a. Object image reading,
b. Object observation,
c. Draw the steps of how to roll,
d. Disassembly of water pump motor components,

e. Calculating the number of main turns,
f. Calculating the number of auxiliary turns,
g. Measure the diameter of copper enamel wire,
h. Winding the coil winding onto the mall board,
i. Winding connection,
j. Installing the winding sleeve,
k. Attach the winding to the groove of the water pump motor,
l. Tie the twist with woll yarn,
m. Winding and reclosing the motor
n. The finished rolled water pump,
o. Then assembly of the water pump motor.

After carrying out the work of reinstalling the 1 phase electric water pump motor in the implementation of winding the coil winding ready for use and testing the water pump motor that has been completed and is ready for testing or use.

Training activities begin with coordination licensing of partners, making a training cooperation agreement with the Village Head.

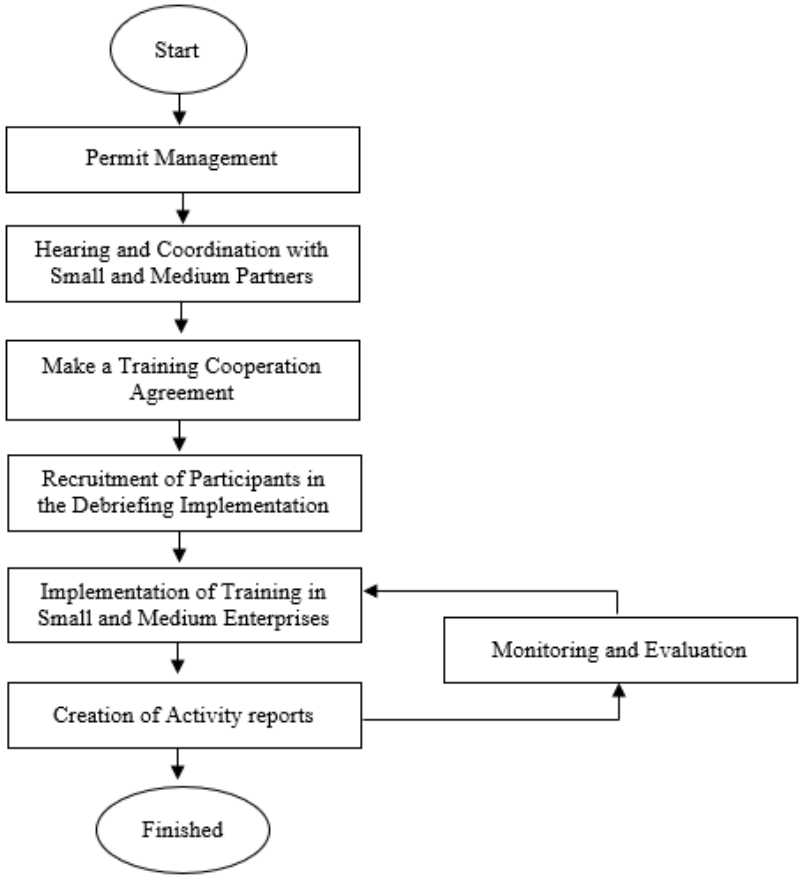

Figure 1. Flow Chart of the Training Activity Process

From the flow chart, the design and mechanism of the training activities can be explained as follows:

a. Permit processing, in the form of activities to propose permits from implementing institutions through submitting activity proposals;
b. Hearings and Coordination with partner institutions, this activity is an effort to select partner institutions that are deemed suitable as a place for entrepreneurship training activities, as well as coordinating to plan the training program to be implemented;
c. Carry out a cooperation agreement in a training activity between the head of the activity organizer and partners in order to obtain mutual agreement on the training activities to be carried out;

d. Recruitment of participants, trained participants, was carried out using tracer studies in community groups in Klambir Lima Kebun Village. Implementation of debriefing, activities carried out at partner locations carried out by partners together with the team implementing community service activities;
e. The implementation of this training activity is the implementation of participant training for partners. The training activity refers to the provisions that have been jointly implemented in accordance with the training activity plan. Monitoring and evaluation of the training process at partners is carried out by supervisors from both partners and activity implementers;
f. Monitoring and Evaluation, implementation of monitoring and evaluation of programs carried out monitoring and evaluation activities directly by field supervisors and partners themselves.

C. Result and Discussion

This community service activity was carried out for 3 days which was attended by all 10 training participants who were productive age people in the village of Klambir Lima Kebun Deli Serdang, the implementation of which started at 08.00 to 16.30 WIB. The following is the implementation of training activities:

a. Learning Theory about 1 phase Electric water pump motor.

A water pump is a machine that can move a certain volume of water through the suction chamber to the discharge chamber using an impeller (wikikomponen) (Setiadi, 2018). The use of a 1-phase electric water pump motor has become an inevitable need at this time. One type of 1-phase electric water pump motor is an AC motor, most household appliances use a 1- phase AC motor (Irvawansyah & Rahmansyah, 2018). A 1-phase electric motor is used to drive the water pump (Sihombing, 2023).

Figure 2. Providing water pump motor theory

b. Identification of 1-phase electric water pump motor

Especially water pumps Electric motors are included in the category of dynamic electrical machines and are electromagnetic devices that convert electrical energy into mechanical energy (Hidayat, 2020; Tampubolon et al., 2021). An induction motor is an alternating current (AC) electric motor whose rotor rotation is not the same as the rotor rotation reverse (AC) whose rotor rotation is not the same as the rotation of the rotating field on the stator in other words motor rotation with rotation on the stator there is the difference in rotation called slip (Tampubolon et al., 2021). A single-phase induction motor is an induction motor that operates on a single-phase alternating current source (Fauzi & Irianto, 2021).

Figure 3. Providing theory about electric motors and Identification

c. Opening the water pump motor

Opening the water pump motor and then removing the stator from the stator housing removing the damaged coil winding from the kern so that the coil housing or removing the single-phase water pump components and cleaning the water pump components from the motor housing, drawing the winding step is removing the single-phase water pump components a (Usman et al., 2023). The stator is a stationary part as a frame to which the stator coil is attached. The stator consists of: stator core, stator coil, and stator groove (Fauzi et al., 2020).

Figure 4. Opening the water pump motor

d. Calculating the number of turns of the main coil

Draw the winding direction of the main coil and auxiliary coil, and first cut the main coil or auxiliary coil using cutting pliers. The first coil is called the main coil and the second coil is the auxiliary coil (Anthony, 2018). auxiliary coil and main coil where these two coils have different cross-sectional areas (Anthony & Erhaneli, 2020). These two coils are usually designed not to be equally large so that the motor can work better. For better motor performance, a capacitor is usually installed on one of the motor coils (Anthony & Erhaneli, 2018). If an electric motor uses both its coils when starting and when running, then this motor is referred to as a 1-phase capacitor-start and run induction motor (capasitor-start capasitor-run induction motor) (Anthony et al., 2019).

Figure 5. Making the coil winding of the water pump motor

e. Measuring wire diameter

Copper type email wire then calculate the weight of the wire or main coil and auxiliary coil. For the diameter of the wire used for the 0.45mm diameter coil, and for the auxiliary winding using a wire with a diameter of 0.35mm

Figure 6. Measuring the diameter of copper wire

f. Calculating the number of turns of the auxiliary coil

Calculate the number of turns and wire diameters of the main coil and auxiliary coil. In this exercise, the main coil has a wire diameter of 0.45 mm and the auxiliary coil has a wire diameter of 0.35 mm

Figure 7. Calculating the number of turns of the water pump motor wire

g. Installing the winding sleeve on the Cern

Here are the steps:

1) Prepare the materials for insulating the stator grooves as specified.
2) Work out the insulation to be used according to the size and number of stator grooves.
3) Clean the entire stator groove from dirt using a fine wire brush so that the groove where the coil wire is located is clean.
4) Reclean and confirm the cleanliness of the stator grooves and stator surfaces by washing them with gasoline!
5) Insert/cover the stator grooves with the prepared prespan insulation neatly and in the correct position.
6) Insert/cover the stator grooves with the prepared prespan insulation neatly and in the correct position.
7) Work on the isolations for the kern grooves, measure and form the isolations that match the original/according to the kern grooves.
8) Insert the insulation that has been done into the kern grooves, making sure that the insulation has been formed according to the kern grooves and is neatly arranged and in the correct position.

Figure 8. Installing the winding sleeve on the Cern

h. Rolling the coil onto the mall board

Perform winding with the size and number that matches the original, using 0.35 mm wire and 0.45 mm wire (Gunawan, 2013).

Figure 9. Rolling the coil onto the mall board

i. Installing the winding into the Cern groove of the electric motor

In this case what is required when winding, is memory, as you will be counting the coil windings which are quite a lot. Coiling begins with coiling on the main coil. Use a mold to roll. The first winding we make is from the smallest which is 4 - 9 and so on. The number of turns is equalized with the original according to the notes obtained when unpacking. Finish rolling the smallest coil, then put it in the motor groove, then give a temporary cover so that the wire does not come loose. Then continue with the 2nd winding, then also enter the groove, after completion followed by the 3rd and 4th winding

Figure 10. Installing the winding into the Cern groove of the electric motor

j. Coil Winding Splicing Coder

The connection of the main winding connects the initial ends of the two smallest coil wires. After completing the connection then continue with winding the auxiliary coil. The method is the same, following the marks on the mold, then enter the kern and connect the two windings as in the main coil. After all the windings enter the groove then cover with a rather thick piece of mica about 0.25 mm, the size is 1 cm times the length of the groove plus 6 mm.

Figure 11. Splicing the coil winding with solder

k. Tying the twist with Nylon/Wool yarn and sealing the twist

Next, measure with an AVO meter to make sure there is no short circuit between the main coil and the auxiliary coil and kern. After you are sure then the coil is tied with thread while hitting the roll with a rubber hammer so that the winding becomes neat and dense. For the next, it is better for the coil to be given lacquer or sirlak, the goal is that the coil is unified and resistant to vibration, besides that if there is a wound on the email wire, the wound will be closed.

l. Reclose the motor that is ready to roll

Close the motor parts again After all the steps have been completed, the last stage is the closing stage of the electric motor to return to its original state. But please try it first before returning the complete electric motor parts to find out whether the previously repaired motor runs or

Figure 12. Re-covering the motor that is ready to roll

m. Completed motor testing

Perform testing by measuring the quantity using a multi meter. If the multimeter shows a number close to 0, under 10 ohms, then that means the temporary auxiliary coil we can say is still well connected. If the measurement or shows a very high resistance, it means that the coil has been damaged or broken. From the results of testing the water pump after rewinding the coil winding, the results are quite good and the rotation of the impeller is normal, then when compared to the capacity of the new condition pump is no different, and then the suction power of the water at normal impeller rotation, but the suction power of each pump engine is definitely different. if you feel that the water coming out of the pump is small, it is very possible that the pump engine that we repair is certainly the direction of the bias groove so that the rotation becomes slow and the suction power of the pump will be small.

Figure 13. Testing the pump motor that has finished rewinding the coil winding

Previously, a study was conducted by Usman et al entitled Training To Rewind The Electric Motor Coil Alternating Current 1 Phasa In Jati Makmur Kecamatan Kelurahan Binjai Utara with the results of research on the increase in the understanding of training participants related to rewinding the electric motor coil, namely from an average value of 45 (pre-test) to 90 (post-test) (Usman et al., 2023). Research by Khairuddin Tampubolon et al entitled Counselling on Knowing Water Pumping Machines and How to Maintain Them at Serikat Tolong Menolong Nurul Iman (STMNI) Timbang Deli Village, Medan Amplas District with the hope of providing knowledge to the community. so that the results are obtained in the form of: The community will save expenses, because with the correct use and maintenance of the water pump engine, the water pump engine will live long and save money. water pump engine will have a long life and save electricity; then it is expected that the community can overcome minor problems that occur in the water pump engine. water pump machine (Tampubolon et al., 2021).

D. Conclusion

Thus, from the test results, the implementation of repairing the re-wound coil of the water pump motor is feasible to be reused because the test results obtained are close to the specifications of the water pump motor that was wound initially. From the implementation of community service activities, it is one of the programs that must be carried out both by lecturers and by students, based on the principles of activities to

provide technical competence in the field of repairing the coil winding of the 1 phase Electric Water Pump Motor, Training activities contribute to increasing practical expertise to participants, activities then draw the winding steps, Disassemble electric motor components, Calculate the number of main windings, calculate the number of auxiliary windings and trainees increase their ability in technical skills in the field of skills to rewind electric motors, then have produced Human Resources in the field of motor coil winding construction, and provide an understanding of entrepreneurship.

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