Frontiers in Community Service and Empowerment
Multidisciplinary : Rapid Review : Open Access Journal **e-ISSN: 2827-8747**

COMMUNITY SERVICE ARTICLE **OPEN ACCESS**

Manuscript received December 31, 2021; revised January 10, 2022; accepted January 13, 2022; date of publication March 20, 2022;
Digital Object Identifier (DOI): https://doi.org/10.35882/ficse.v1i1.x

Internal Calibration For Centifuge Using A Digital Tachometer as a Synergistic Collaboration Between the Health Polytechnic of the Ministry of Health Surabaya and the Turi Lamongan Health Center

Her Gumiwang Ariswati[1], I Dewa Hari Wisana[1], Sumber[1], and Levana Forra Wakidi[1]
[1] Department of Electromedical Engineering, Poltekkes Kemenkes Surabaya, Jl. Pucang Jajar Timur No. 10, Surabaya, Indonesia
Corresponding author: Her Gumiwang Arisawati (e-mail: hergum@poltekkesdepkes-sby.ac.id).

ABSTRACT Centrifuge is a laboratory tool used for the process of separating particles of a solution between the filtrate and the substrate through a high-speed centripetal process. The increasing use of Centrifuges at the Turi Lamongan Health Center causes the equipment to be vulnerable to damage. In addition, the lack of handling of these tools is due to limited medical analysts and the absence of electromedical personnel as well as insufficient funds, so that the impact on the health service system at the puskesmas is disrupted. Therefore, it is very important to create a community service program that is carried out in the form of a synergistic collaboration between the Health Polytechnic of the Ministry of Health Surabaya and the Turi Lamongan Health Center which is oriented towards community independence through counseling and assistance, especially in the maintenance of the Centrifuge laboratory. The purpose of this activity is maintenance by testing and calibrating/verifying the motor speed and time on the centrifuge in accordance with the working guidelines. The methodological concept in this activity is to carry out counseling and assistance activities in the maintenance and verification of centrifuge laboratory equipment using a digital tachometer. This activity is an application of previous research on centrifuges and tachometers. The tools used are digital tachometer, savety electrical analyzer, avometer, thermohygrometer, stopwatch and tool set. The materials used are several spare parts, compressors, cleaning tools and cleaning fluids as well as antiseptic fluids. The results obtained from these activities are: 1). The technical specifications of the 4 centrifuge devices are recorded; 2). Identification of damaged centrifuges and those requiring maintenance, namely 2 heavily damaged centrifuges and 2 centrifuges that are still suitable for use; 3). Maintenance of 4 centrifuges; 4). Verification/calibration of 2 centrifuges, namely centrifugal 1 with a relative error of 2.73% in the selection of a motor rotation speed of 2500 rpm is still within the allowable limits (≤10%); for testing the time of 300 seconds, the relative error of 20.57% exceeds the allowable limit, while in centrifuge 2 the results of the relative error in 4 selections of motor rotation speed (rpm) are below 10%, namely 5.92%, respectively 3.82. %, 3.65%, 3.47%. As for the time test, the result of 5.56% is still below the maximum allowable error of 10%. From these results, centrifuge 2 is still in good condition; 5) Implementation of mentoring and counseling for 1 (one) medical laboratory technician (analyst) in performing centrifuge equipment maintenance. The results of this activity can facilitate services at the Turi Public Health Center.

INDEX TERMS Internal calibration, revolution per minute, centriguge, digital tachometer

I. INTRODUCTION

Community Service Poltekkes Kemenkes Surabaya with the Partner Village Development Program (PVDP) scheme aims to empower the community in realizing community independence and welfare based on optimizing community potential so that they are able to utilize and optimize the potential of existing resources.

Community service is also carried out in various fields [1], one of which is Community Service program with the PVDP scheme is carried out in the form of a synergistic collaboration

between the Surabaya Ministry of Health Poltekkes and the Turi Lamongan Health Center which is oriented towards community independence through counseling and assistance, especially in the maintenance of Centrifuge laboratory equipment. Centrifuge is a technique that helps separate a particle by centrifugal force [2][3]. The centrifuge rotation speed is 1600-3000 RPM [4], Some centrifuges used in industrial processes produce high solids and low solids product streams from liquid/solid mixtures [5]. How to maintain the centrifuge to make it last longer and function better, the centrifuge load must be balanced, because to rotate the centrifuge the load must be balanced [6][7]. The increasing frequency of using laboratory equipment, especially the Centrifuge in the Turi Lamongan health center, causes the equipment to be vulnerable to damage. In addition, the lack of handling of these devices due to limited medical analysts and the absence of electromedical personnel and insufficient funds, thus impacting the health service system at the puskesmas is disrupted. Meanwhile, with a third party service contract, it will require substantial funds for puskesmas whose sources of funds are relatively small with the condition of the village area and its economy which is not yet developed and unproductive.

These problems were obtained from supporting data about the general description, the situation of health status, the situation of health resources, infrastructure, health service efforts and disease cases at the Turi Lamongan Health Center which were obtained from the Profile, Rentra of the Lamongan. Therefore, it is very important to create a community service program that is carried out in the form of a synergistic collaboration between the Health Polytechnic of the Ministry of Health Surabaya and the Turi Lamongan Health Center which is oriented towards community independence through counseling and assistance, especially in the maintenance of the Centrifuge laboratory.

District Health Office 2016-2021 so that it could be analyzed to determine solution to the problem. With the concept of methodology, a design / flow of counseling activities and assistance for the maintenance and verification of Centrifuge laboratory equipment using a Tachometer was made by a Team of 4 lecturers and students in accordance with their fields of expertise and participants from the Puskesmas, so that the Community Service activities that will be carried out are expected to help resolve problem. Faced by the Turi Health Center

II. MATERIALS AND METHODS

A. MATERIALS

Community service with the Partner Village Development Program scheme using equipment Digital Tachometer used for testing rpm. Savety Electrica Analyzerl- Fluke ESA 620 and Avometer are used for electrical safety testing. Thermohygrometer is used to measure room temperature and humidity. The stopwatch is used for time testing.

B. METHODS

The method used in this community service activity is assistance and counseling for operators and technicians in direct maintenance and calibration/ verification with tool demonstrations. The method is applied in the activity mechanism as outlined in the conceptual framework in the flow chart described in Figure 1.

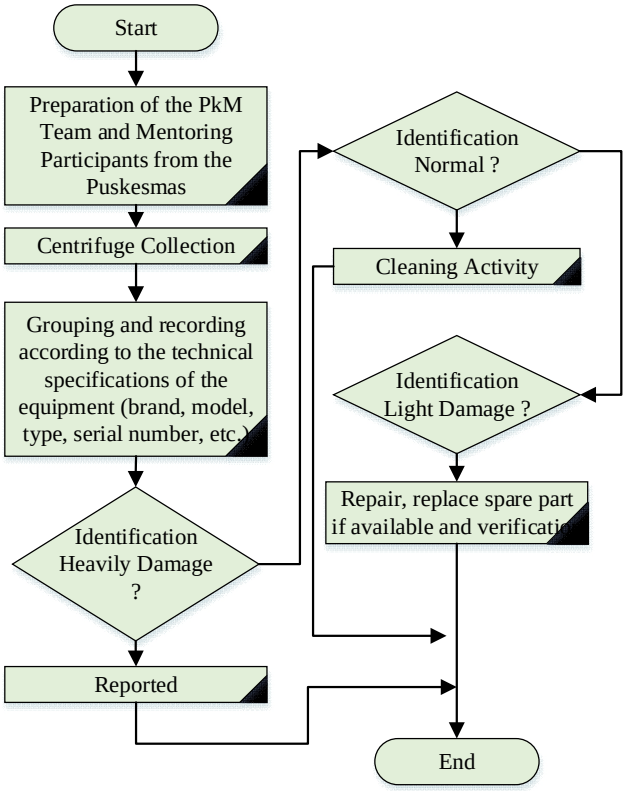

Fig. 1 The conceptual framework

Based on Figure 1, the flow of community service is explained, namely the Head of the community service Team of the Health Poltekkes, the Ministry of Health, Surabaya, asking the Head of the Puskesmas or his deputy to appoint 2 health workers/technical personnel to the community service team as participants who will be given counseling and assistance from the community service team of the health poltekkes of the ministry of health. surabaya.Tthe community service team asked the puskesmas to take an inventory of the equipment/collect the centrifuge equipment at the puskesmas to check the condition of the equipment. Then the community service team began to provide counseling and assistance to participants by means of direct demonstrations. Furthermore, the activity starts from recording the technical specifications of the tool (brand, model, type, serial number on the worksheet. Once recorded, then identified according to the level of damage or not. If the equipment is normal, the Team will carry out cleaning and maintenance of the centrifuge according to operational procedures with assistance to participants. Next, verify the rpm

(a) (b)

(c) (d)

Fig.2. (a) The team makes preparations for centrifuge maintenance by testing and verification (b) Perform centrifuge maintenance and check the working function of the centrifuge (c) Measuring the speed of rotation of the centrifuge motor using a digital tachometer by recording and processing data on worksheets (d) Report the results of maintenance activities and centrifuge verification in the form of a final report book.

measurement on the centrifuge in accordance with the tool settings with a tachometer then make a report/recording. If the tool is lightly damaged, and does not require replacement of spare parts, the community service Team can help repair it and then verify it with a tachometer. If the equipment is in a slightly damaged condition so that it requires replacement of spare parts and is available at the user's side (puskesmas), it is immediately repaired and if spare parts are not available immediately reported to the puskesmas and recorded / reported.

If the equipment is seriously damaged, either it does not require spare parts or requires replacement of spare parts, it is immediately reported to the puskesmas and recorded/reported. The community service activities at the Turi Health Center are described in Figure 2. In Figure 2 it is shown that the Surabaya Ministry of Health Poltekkes community service team performs maintenance, measures and calibrates the centrifuge using a tachometer calibrator.

III. RESULTS

The results of community service activities at the Turi Health Center resulted in the repair and maintenance of two centrifuges. The first centrifuge is the Digysistem Laboratory Instrument brand, type DSC200T Serial No: CT-2/16050612 with a speed of 0 to 2500 RPM. After repairs are made, Centrifugal calibration [8][9] is carried out using a tachometer, the calibrated parameters are motor speed and timeliness. The speed of time on the centrifuge was measured using a stop watch. The results of motor speed calibration and timing are described in Table 1 and Table 2.

Results from Table 1 it is known that at the 1000 RPM setting the error percentage is 50.27%, at the 1500 RPM setting the error percentage is -33.09%, while in the 2000 RPM setting the error percentage is -14.61%, then setting the RPM at 2500 the error percentage is 2.73%.

Table 1: The results of the verification of the speed of the Centrifuge motor

Setting time (second)	The result of the verification		
	Reading on the stopwatch	Error (second)	Relativr error (%)
300	316,67	-16,67	-5,56

Table 2. The results of the verification of the time.

Setting time (second)	The result of the verification		
	Reading on the stopwatch	Error (second)	Relativr error (%)
300	361,67	-61,67	-20,56

From Table 2, the results of the comparison of the timing of the centrifuge with a stopwatch are obtained with an error percentage of -20.56%.

Furthermore, repair and maintenance of the second centrifuge with the brand Germay Industrial Corp type PLC 05 serial number: 1612172 with a speed of 0 to 4000 RPM. After repairs are made, Centrifugal calibration [8][9] is carried out using a tachometer, the calibrated parameters are motor speed and timeliness. The speed of time on the centrifuge was measured using a stop watch. The results of motor speed calibration and timing are described in Table 3 and Table 4.

Table 3. The result of the verification of the speed of the centrifuge motor

Setting RPM	Calibration/verification results		
	Reading on the tachmeter	Error (rpm)	Relative error (%)
1250	1324,03	-74,03	-5,92
1500	1442,69	57,31	3,82
3200	3083,04	116,96	3,65
4000	4138,94	-138,94	-3,47

Table 4. The result of the verification of the time

Setting RPM	Calibration/verification results		
	Reading on the tachmeter	Error (rpm)	Relative error (%)
1000	1502,68	-502,62	50,27
1500	1996,30	-496,30	-33,09
2000	2292,27	-292,27	-14,61
2500	2568,16	-68,16	2,73

Results from Table 3 it is known that at the 1250 RPM setting the error percentage is -5,92%, at the 1500 RPM setting the error percentage is 3.82%, while in the 3200 RPM setting the error percentage is 3,65%, then setting the RPM at 4000 the error percentage is -3,47%. From Table 4, the results of the comparison of the timing of the centrifuge with a stopwatch are obtained with an error percentage of -5, 56%.

IV. DISCUSSION

After carrying out the results of electrical and environmental testing and verification of the centrifuge, the results showed that the electrical safety conditions were in good condition because they were within the recommended limits and the results of the room temperature and humidity conditions were as recommended. Furthermore, for the results of the verification of the rotational speed of the centrifuge 1 motor, it shows that the allowable error at the motor rotation speed of 2500 rpm is 2.73%. So at the time of counseling it is recommended to the operator to use the motor rotation speed selection at 2500 rpm (maximum). This is because on the centrifuge control panel the rpm selection value is not clearly stated. As for the time test, the results obtained 20, 56% exceeding the maximum allowable error of 10%. Furthermore, it is recommended to the operator not to turn back the mechanical timer when they want to change the timing because it can cause damage. But they have to wait until the timer is finished. In centrifuge 2, the results of the relative error in 4 motor rotation speed selection (rpm) are below 10% [10] and the time test results are still within limits, so centrifuge 2 is feasible to use

V. CONCLUSION

In accordance with the objectives of the Community Service Poltekkes Kemenkes Surabaya with the Partner Village Development Program (PVDP) in socializing and assisting the maintenance and calibration/verification of centrifuge equipment at the Turi Lamongan Health Center, the results obtained include recording the technical specifications of the centrifuge equipment. Then, identification of the damaged centrifuges and those requiring maintenance were carried out, namely 2 heavily damaged centrifuges and 2 centrifuges that were still fit for use. Furthermore, maintenance of 4 centrifuges and verification/calibration of 2 centrifuges is carried out. From these results centrifuge 2 is still in good condition. The implementation of mentoring and counseling for 1 (one) medical laboratory technician (analyst) in performing the maintenance of centrifuge equipment.

REFERENCES

[1] S. A. Raskoff and R. A. Sundeen, “Community Service Programs in High Schools,” *Law Contemp. Probl.*, vol. 62, no. 4, p. 73, 1999, doi: 10.2307/1192268.

[2] Eppendorf, “Basics in Centrifugation,” *Basics in Centrifugation*, p. 2, 2020.

[3] Z. Xu, F. Kong, H. Zhang, K. Zhang, J. Wang, and N. Qiu, “Research on Visualization of Inducer Cavitation of High-Speed Centrifugal Pump in Low Flow Conditions,” 2021.

[4] R. Bobo, “Centrifuges,” pp. 475–488, doi: 10.1016/B978-0-12-821341-4.00021-X.

[5] J. J. W. A. van Loon, “Centrifuges,” *Gener. Appl. Extra-Terrestrial Environ. Earth*, pp. 109–122, 2015, doi: 10.1021/ed036pa269.

[6] Drucker Diagnostik, “Selection, Operation and Troubleshooting,” USA.

[7] S. Poirier, D. Wooldridge, G. Mayers, N. Sonleitner, and C. Coughlin, "Community Service Learning," *Encycl. Inf. Commun. Technol. Adult Educ. Integr.*, pp. 643–655, 2010, doi: 10.4018/978-1-61692-906-0.ch038.

[8] S. C. Laboratory, *STCL-SOP-049 JA3 Calibration of Fixed Speed Centrifuges.pdf*. 2015.

[9] Ascend, "Centrifuge calibration 2015.pdf," Redwood City, p. 94063, 2015.

[10] H. Asadina, T. Hamzah, D. Titisari, and B. Utomo, "A Centrifuge Calibrator Based on Personal Computer Equipped with Data Processor," *Indones. J. Electron. Electromed. Eng. Med. informatics*, vol. 1, no. 1, pp. 14–19, 2019, doi: 10.35882/ijeeemi.v1i1.3.