Vol. 7., No. 1, April 2023, pp. 7-11 ISSN 1978-0524 (print) | 2528-6374 (online)

The implementation of electroforming technology on home industry and souvenir center in Malang

Budiono [a,1,*], Suwarsono [a,2], Trihono Sewoyo [a,3]

[a] Study Program of Mechanical Engineering Universitas Muhammadiyah Malang, Jl. Raya Tlogomas No. 246 Malang
[1] budionoft@umm.ac.id*
* Corresponding Author

Received 28 February 2023; accepted 10 March 2023; published 29 April 2023

ABSTRACT

Souvenir industry is the supporting aspect of tourism industry. As the one of creative economy industries, souvenir shows the characteristics of a region or a tourism place. This industry needs expertise and creativity, but there is an issue in the development of product variations with high expenses and the improvement of skills to create a product. The method to conduct this program is by conducting empowerment with participative and bottom-up approach. The participants are given electroforming training for souvenir industry. From the implementation of this program, the souvenir industry is given assistance through the training of electroforming technology to improve their creativity and souvenir production.

KEYWORDS
Electroforming
Tourism
Souvenir

1. Introduction

The development of tourism industry in Malang is undeniably influencing the development of the economy of society and the social welfare. The three important tourism areas in Malang, which is well-known as the golden triangle gives benefits to fishery and tourism sectors [1], [2]. Those are Batu, Bromo, and the Southern area of Malang. The urban area has potency in tourism as well. It is the fascinating colonial buildings from the Dutch colonial era. These buildings stand gorgeously in Ijen Boulevard, the Monument Square, and in the area of Kayutangan. The relic is certainly grabbing the local tourists and those who are from overseas [3]. Another tourism potencies in Malang urban area are Kampung Tridi and Kampung Warna-Warni in Jodipan [4]. The tourism in Malang brings huge potency in jewelry and souvenir industries. Those become one of the milestones for industry in the field of creative economy [2]. It focuses on the expertise, ability, and the creativity of intellectual property. These are expected to handle the unemployment problem or the development of economic potency in an area.

The application of souvenir can be intended for award, commemoration, or memorial merchandises [5]. As the authentic local creation, it has different figure, function, and uniqueness [6]. The souvenir production has varied and developed [7]. The development of souvenir products occurs in design, color, and the material. The design is mostly created based on the local animals or ancient heroic animals. It is sometimes inspired by Wayang figures. The people expression applied in the masks is also another design ideas of the souvenirs [8]. The brownish, greenish, or reddish color are mostly used as the representative of the natural color. Metal and non-metal are commonly used to give luxury and elegance . Yet, in minimizing the production and the material expenses, the natural material has been widely utilized in this souvenir industry [9]. The natural material is abundant in nature. Therefore, it can decrease the raw production cost. Reversely, the use of natural materials in this industry can encourage the creativity in design, color, or function of the souvenir.

To this recent time, the production of souvenirs is conducted by giving interesting color paint or unique design but it demands more cost. Besides, it is important to increase the skills in creating the

ISSN 1978-0524 (print) | 2528-6374 (online) Vol. 7., No. 1, April 2023, pp. 7-11

product. Electroforming is the solution to this industry; it tends to give luxurious appearance of the products [10], [11]. The appearance of the products can look like it is made of stainless, cooper, or gold [12].

Electroforming is a coating technology of products that has been applied for decades [13], [14]. The utilization can result the modern products from a simple material. Therefore, the alternative technology is in a need to result more variance of the products. By the Partnership Program, the electroforming method in coating the product is proposed as the promising solution for increasing skills and varying the products. Training of electroforming method for the employees in Malang souvenir industry was conducted to increase their skills. Skills in this method focused on coating using copper and chrome on the souvenir products made of natural or other rustic material. The implementation of electroforming has the point of lower production costs [15], [16] and is easier to learn. The training for the souvenir producers is intentionally aimed to increase creativity and the ability to vary the products.

2. Method

The Partnership Program conducted by the executor focused on the society empowerment. This program was conducted by using participative and bottom-up approach. It gives training to the producer and the employees who produce the souvenir. Moreover, the tools and devices to coat the product as the application of electroforming method are given to the trainees that they can directly applied the theory. Implementation program as show in Fig. 1.

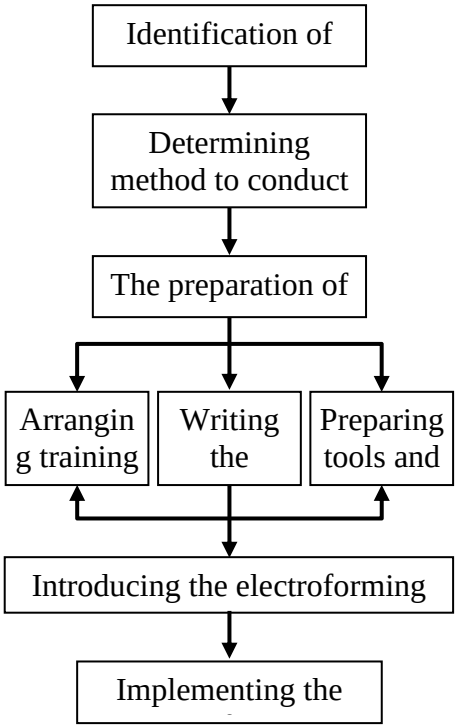

Fig. 1. The implementation of the Partnership Program for the Community Services

The material that will be given is divided into two main parts, namely the first part is theoretical about the procedure for selecting raw materials and making electrolyte solutions, safety procedures that must be adhered to during the process of making metal solutions and coatings, and electroforming coating procedures. While the second part is direct practice in the field starting from the practice of choosing and mixing the correct solution materials, the practice of preparing the raw materials for the product to be carried out by the electroforming process, the practice of operating the tool, followed by how to carry out the metal plating process.

3. Results and Discussion

From the implementation of Community Service activities, partners are helped in terms of skills and tools to create the resulting souvenir products. This alternative electroforming technology provides new

Vol. 7., No. 1, April 2023, pp. 7-11 ISSN 1978-0524 (print) | 2528-6374 (online)

insights for the Metal and Jewelry Industries in Malang. In their production, they are also trained to use materials from nature. The use of natural materials does provide an opportunity to reduce the cost of purchasing souvenir materials, such as shells and candles. Unlike decorative souvenirs made of teak wood with the same coating technique, the partner products of the Metal and Jewelry industries in Malang use leaves and dried flowers that function as jewelry souvenirs. Souvenir production equipment with electroforming technique is designed in a simple way with small current of electricity as an electrolyte solution, as shown in Fig. 2. And the material as show in Fig. 3.

Fig. 2. Tools and devices for electroforming

Fig. 3. The materials for electrolyte solution

The metal plating training activity on natural materials for Metal and Jewelry industries in Malang begins with the delivery of material on the introduction of tools and materials and how to make electrolyte solutions, Fig. 4. Participants are also introduced to safety procedures during the process of making metal solutions and coatings. Fig. 4 also shows the practice atmosphere of the SME group when producing souvenirs with a metal plating process.

Fig. 4. Electroforming Training

From the training given to the Metal and Jewelry industries in Malang, the training participants were able to make jewelry souvenirs with natural materials of dried leaves and flowers as shown in Fig. 5.

ISSN 1978-0524 (print) | 2528-6374 (online) Vol. 7., No. 1, April 2023, pp. 7-11

Although the souvenirs produced were not very smooth, the participants had shown an increase in their skills and creativity in manufacturing souvenir products.

Fig. 5. The products of electroforming method

Electroforming is a process of coating material with metal to reduce the risk of corrosion due to the influence of chemical or electrochemical changes [17]–[19]. Chromium and copper materials are widely used as coatings for metallic and non-metallic materials in electroforming method [20]. The results of metal plating can be measured from several parameters to determine the quality, stress and duration of the coating. Variations in current strength also affect the thickness of the coating in the electroforming process. The application of the electroforming method to souvenir products does provide additional variations in the resulting product. In addition to providing corrosion resistance to the product, metal plating can provide an attractive appearance even though it is only copper and silver in color.

4. Conclusion

This Community Service Program provides benefits to the Metal and Jewelry industries in Malang. Through this program, the producers have increased their skills to vary and create jewelry souvenir products. In addition, they also have insight into alternative technology for souvenir production, namely the electroforming method (metal coating). Souvenirs produced by the producers are more varied and unique. From this training program, the producers have plans for the development of their jewelry souvenir industry to increase industry income.

Acknowledgment

Thanks to DPPM Universitas Muhammadiyah Malang for the support to the implementation of this Community Service Program conducted in UKM Logam dan Perhiasan Sentra Malang.

References

[1] A. S. Widodo, S. Wijana, and A. M. Ahmad, "Development of an Integrated Agrotourism Area in South Malang Beach in Support of the Tourism Golden Triangle (Batu, Bromo, South Malang)," *J. Pengabdi. Kpd. Masy.*, vol. 23, no. 4, p. 403, Jan. 2018, doi: 10.24114/jpkm.v23i4.8581.

[2] A. Sopanah, S. Bahri, and M. Ghozali, "Community Empowerment in Batu Tourism City Through Local Wisdom-Based Creative Economics," in *Proceedings of the 1st International Conference on Social Science, Humanities, Education and Society Development, ICONS 2020, 30 November, Tegal, Indonesia*, Jan. 2021, pp. 1–6, doi: 10.4108/eai.30-11-2020.2303720.

[3] K. A. Muhrofi-G and R. R. Maria, "Best Practices of Heritage and Gastronomic Tourism in a Kampong," *E-Journal Tour.*, vol. 4, no. 2, p. 94, Aug. 2017, doi: 10.24922/eot.v4i2.36402.

[4] A. C. Ismoyo, "Arrangement of City Informal Settlements to Become a Tourist Destination Area Case Study: Tridi Village, Malang," *ALUR J. Arsit.*, vol. 4, no. 1, pp. 1–10, May 2021, doi: 10.54367/alur.v4i1.1091.

[5] Q. Zhu, R. Rahman, H. Alli, and R. A. A. R. A. Effendi, "Souvenirs Development Related to Cultural Heritage: A Thematic Review," *Sustainability*, vol. 15, no. 4, p. 2918, Feb. 2023, doi: 10.3390/su15042918.

[6] W. H. Kong and T.-Z. (Donald) Chang, "Souvenir Shopping, Tourist Motivation, and Travel Experience," *J. Qual. Assur. Hosp. Tour.*, vol. 17, no. 2, pp. 163–177, Apr. 2016, doi: 10.1080/1528008X.2015.1115242.

Vol. 7., No. 1, April 2023, pp. 7-11 ISSN 1978-0524 (print) | 2528-6374 (online)

[7] Q. Yang, "Research on Design Innovation for Reshaping Local Cultural Characteristics of the Tourist Souvenirs," *E3S Web Conf.*, vol. 179, p. 02087, Jul. 2020, doi: 10.1051/e3sconf/202017902087.

[8] P. F. Xie, T.-C. (Emily) Wu, and H.-W. Hsieh, "Tourists' Perception of Authenticity in Indigenous Souvenirs in Taiwan," *J. Travel Tour. Mark.*, vol. 29, no. 5, pp. 485–500, Jul. 2012, doi: 10.1080/10548408.2012.691400.

[9] S. N. A. Mohd-Salleh, N. S. Mohd-Zin, and N. Othman, "A Review of Wastewater Treatment using Natural Material and Its Potential as Aid and Composite Coagulant," *Sains Malaysiana*, vol. 48, no. 1, pp. 155–164, Jan. 2019, doi: 10.17576/jsm-2019-4801-18.

[10] C. P. Cutler, "Use of Metals in Our Society," in *Metal Allergy*, Cham: Springer International Publishing, 2018, pp. 3–16, doi: 10.1007/978-3-319-58503-1_1.

[11] W. Giurlani *et al.*, "Electroplating for Decorative Applications: Recent Trends in Research and Development," *Coatings*, vol. 8, no. 8, p. 260, Jul. 2018, doi: 10.3390/coatings8080260.

[12] B. Satpathy, S. Jena, S. Das, and K. Das, "A comprehensive review of various non-cyanide electroplating baths for the production of silver and gold coatings," *Int. Mater. Rev.*, pp. 1–37, Dec. 2022, doi: 10.1080/09506608.2022.2156723.

[13] S. Hayashi, S. Sugiyama, K. Shimura, G. Tobayama, and T. Togashi, "A Study of Deposition Coatings Formed by Electroformed Metallic Materials," *PLoS One*, vol. 11, no. 6, p. e0154257, Jun. 2016, doi: 10.1371/journal.pone.0154257.

[14] H. Zhang, N. Zhang, M. Gilchrist, and F. Fang, "Advances in precision micro/nano-electroforming: a state-of-the-art review," *J. Micromechanics Microengineering*, vol. 30, no. 10, p. 103002, Oct. 2020, doi: 10.1088/1361-6439/aba017.

[15] L. Zhao, S. Yu, X. Li, M. Wu, and L. Li, "High-performance flexible transparent conductive films based on copper nanowires with electroplating welded junctions," *Sol. Energy Mater. Sol. Cells*, vol. 201, p. 110067, Oct. 2019, doi: 10.1016/j.solmat.2019.110067.

[16] P. Hernández *et al.*, "Electroforming Applied to Manufacturing of Microcomponents," *Procedia Eng.*, vol. 132, pp. 655–662, Jan. 2015, doi: 10.1016/j.proeng.2015.12.544.

[17] B. Kwon *et al.*, "Janus behaviour of LiFSI- and LiPF 6 -based electrolytes for Li metal batteries: chemical corrosion versus galvanic corrosion," *J. Mater. Chem. A*, vol. 9, no. 44, pp. 24993–25003, Nov. 2021, doi: 10.1039/D1TA07860G.

[18] Y.-S. Kim and J.-G. Kim, "Electroplating of reduced-graphene oxide on austenitic stainless steel to prevent hydrogen embrittlement," *Int. J. Hydrogen Energy*, vol. 42, no. 44, pp. 27428–27437, Nov. 2017, doi: 10.1016/j.ijhydene.2017.09.033.

[19] H. Nazari, G. Barati Darband, and R. Arefinia, "A review on electroless Ni–P nanocomposite coatings: effect of hard, soft, and synergistic nanoparticles," *J. Mater. Sci.*, vol. 58, no. 10, pp. 4292–4358, Mar. 2023, doi: 10.1007/s10853-023-08281-1.

[20] O. S. I. Fayomi, I. G. Akande, and A. A. Sode, "Corrosion Prevention of Metals via Electroless Nickel Coating: A review," *J. Phys. Conf. Ser.*, vol. 1378, no. 2, p. 022063, Dec. 2019, doi: 10.1088/1742-6596/1378/2/022063.