

THE IMPLEMENTATION OF RECTIFIER TECHNOLOGY FOR SMALL SCALE INDUSTRIES PRODUCING EXHAUST PIPE IN PURBALINGGA

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Purbalingga Regency Government policy to include exhaust pipe as one of the region's leading commodities is considered as one finest step. Various types of motor vehicle are produced and as a result small industry engaged in motor vehicle spare parts are emerging, including exhaust parts. The choice of technology with the metal industry, especially the exhaust in Purbalingga aims to improve the competitiveness of regional superior competency-based industries, namely revitalizing the industrial sector in order to exist and be able to develop, and be able to transfer technology about improving exhaust quality which has an impact on increasing the exhaust industry's income. The exhaust products from SMEs have exclusivity in the tip of exhaust pipe that is coated with metal, thus improve the appearance and quality of the exhaust. But the exhaust product with a variety of metal coated parts turned out to be incompatible with industry standards, which consequently the quality of the results of the dull metal coating process, easy to peel and rusty. For this reason, Semarang State Polytechnic implements rectifier equipment for metal coating. The methods used were the founding of an Institution Forum for the Purbalingga Exhaust Cluster Association, metal coating technique training for workers, operating tests, operational procedures and operational assistance. The results obtained are rectifiers for metal coating with current outputs of 10 A, 20 A, 30 A, 40 A, 50 A.

Keywords : rectifier, metal coating, exhaust.

1. INTRODUCTION

Purbalingga Regency has a set of three superior commodity areas to develop, namely exhaust, batik, and artificial hair. The policy of this regency to include exhaust as one leading commodity is considered as one of its finest movement.

Various types of motor vehicle products are produced so that small industries engaged in motor vehicle spare parts, including exhaust parts, are emerging. The choice of technology with the metal industry, especially exhaust in Purbalingga aims to improve the competitiveness of regional superior competency-based industries, namely revitalizing the industrial sector in order to exist and be able to develop, and be able to transfer technology on improving exhaust quality which has an impact on increasing exhaust industry's income. Besides that, small exhaust industry cluster in Purbalingga has become industrial partner of Semarang State Polytechnic in collaboration with Purbalingga Government in terms of technology in the process of nickel plating, chrome plating, hand plating, anodizing, metal welding, electroplating waste treatment. Small and medium industries which are one of the mainstay industries and mostly in industrial centers in the villages of Purbalingga Lor, Kembaran Kulon and Kalimanah, Mrebet, Wirasana, Bojongsari and Padamara are small metal industries, especially exhausts which have an exclusive design on the exhaust gas pipe end casings. The number of business units is 148 business units with employment of 658 people and total production of 67,719 pieces / month and

production value of Rp.3,344,751,000 / month. The distribution area of the small industrial exhaust Purbalingga Lor has 87 business units, Kembaran Kulon 32 business units and the Kalimanah, Mrebet, Wirasana, Bojongsari and Padamara regions as many as 29 business units. In Purbalingga district there are 2 (two) SMEs (Small and Medium Enterprises) exhaust which have the potential to move in the field of electroplating and anodizing and the manufacture of exhaust caps, namely UKM Dwi Karya Mandiri and UKM Nirwana Knalpot. The exhaust products from SMEs have the exclusivity of the electroplating or colored anodizing process, which adds to the appearance and quality of the exhaust [1] [2]. But the exhaust product with variations in the electroplating and anodizing parts turned out to be incompatible with the industry standard SNI.09-0425-1999, which consequently the quality of the dull electroplating process, easy to peel and the color of the end pipe exhaust exhaust gas easily wear off. Besides that, the quality of the exhaust cap is bumpy, not symmetry, because it is done only using a hammer not using dies and mattresses [3] [4]. For the marketing aspect, it is still done traditionally by waiting for orders from various automotive industries which require exhaust as one of the vital automotive components.

Purbalingga Regency is divided into 18 Subdistricts with an area of 77,764,122 ha which has the potential of small and medium industries in 2010 as many as 21,891 business units consisting of various types of businesses and can absorb as many as 75,259 people. However, this business has not shown encouraging results, as evidenced by this sector, which until 2010 was only able to contribute 8.04% to the GRDP of Purbalingga Regency at constant prices. (BPS, 2014)

The pattern of working relationships among prospective partners is that each SME has several differences that lie in the type of product, the type of marketing agent, and the consumer segment. In terms of product, UKM Karya Karya dominantly produces exhaust from various materials with rainbow color designs and motifs, while UKM Nirwana Knalpot produces exhaust for two-wheeled motorcycles with chrome plating. In general, the pattern of employment relations between SMEs is very good, this is seen, for example, among SMEs, often borrowing from various materials and equipment. For example, when the UKM Dwi Karya Mandiri lacked material, the UKM Nirwana Knalpot would supply and vice versa or other materials. Likewise in terms of equipment and design among SMEs, they will complement each other, especially the exhaust of two-wheeled vehicles, because to make one type of exhaust equipped with rainbow colors requires electroplating equipment, usually requiring precision cutting machines.

The main problem in the electroplating process is that the production process still uses conventional (traditional) equipment and the results is not in accordance with industry standards, so the quality of the products produced is still low and exhaust coating products are easy to peel off and dull

2. METHODS

This Science and Technology activity for Regional Leading was carried out between Semarang State Polytechnic Service Team and SMEs partner in 2018. The problem solving activities from Semarang State Polytechnic to partners were carried out in stages. The lecturer team involved was 4 lecturers in accordance with their expertise and 10 students who helped solving the SME problem. Details are shown in figure 1.

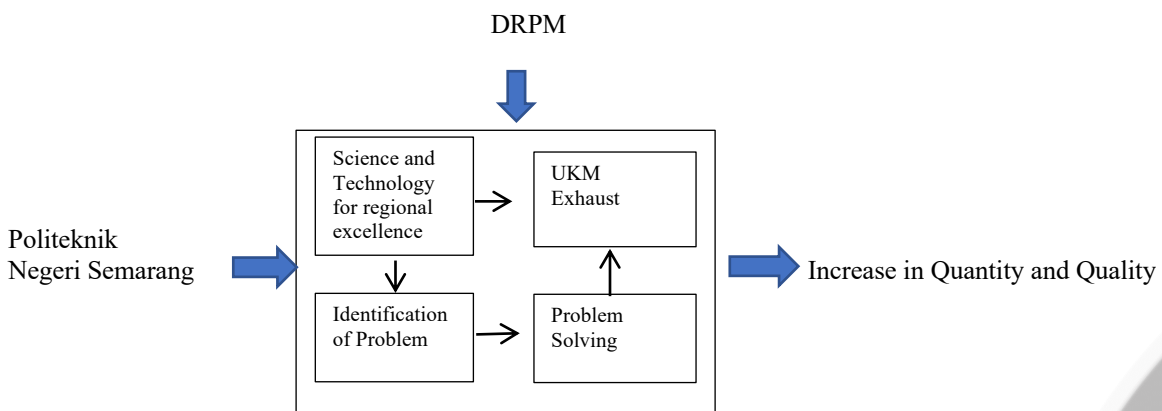


Figure 1 Scheme to solve problems in exhaust industry

Table 1 shows the patterns and methods of implementing science and technology for local superior products

Table 1 Patterns and Methods of Science and Technology Implementation for Local Superior Products

The Implementation of Science and Technplogy	Implementation Phase
<p>The making of this electroplating tool is to solve the problem of small exhaust industry that does not have this equipment unit whose production process is given to other industries or the small industrial exhaust time that receives electroplating services but its production equipment does not meet the electroplating copper, nickel, chrome and exhaust standards.</p>	<p>Tool planning Calculation of maximum capability in the power supply for copper, nickel and chrome coating can be adjusted by 10 A, 20 A, 30 A, 40 A, 50 A. Framework Planning and Calculation The electroplating frame is used to place the plating tub and electrode, place the control board and to put the power supply. The frame of this electroplating device is made of iron profile L with a size of 50 x 50 mm.</p>

Partner Participation in Program Implementation with Science and Technology Implementation Team for Local Superior Product:

- a. Establishment of the Institution Forum for the Purbalingga Exhaust Cluster Association or Joint Cluster Business Group
- b. Setting the layout (production flow) in total starting from cutting, forming, rolling, electroplating process to the packaging process.
- c. Participate in anodizing techniques
- d. Participate in training in metal coating techniques (electroplating)

Evaluation of Program Implementation and Program Continuity

Science and Technology Implementation Activities for Leading exhaust industry clusters will open opportunities to further enhance the effectiveness of cooperation with external partners, especially local governments so that external networks can be well developed. The results of the science and technology implementation activities for the superior area of the exhaust industry cluster can also be utilized for the sustainability of the community service program with the direction of developing the competencies of partners, industry and local governments, so that the sustainability of the program can run. Especially for the motor vehicle accessories industry, exhaust has begun in 2006 in collaboration with the Polines, especially in terms of welding, coating, material and energy use. Evaluation of program implementation is carried out annually by the Polines internal monitoring and evaluation team and the external DRPM team that evaluates the achievements and outcomes of the Regional Superior Science and Technology Implementation program per year.

Facilities available at Higher Education

The facilities for infrastructure or laboratory equipment and workshops related to the activities of the Science and Technology Implementation Program for Regional Leading owned by Semarang State Polytechnic are shown in figure 2:



Figure 2 *electroplating device*

3. RESULTS AND DISCUSSION

The solutions offered and the target outcomes are shown in table 2 below

Table 2. Output target

Business Aspect	Solution	Output
Production	<ul style="list-style-type: none"> ▪ Metal coating techniques, metal coloring techniques, metal coating tubs.[5]. ▪ Shiny, smooth, flat exhaust coating products, not easy to peel or shatter.[6] [7]. 	<ul style="list-style-type: none"> • The development of metal coating and metal refining techniques in accordance with industry regulations, not easy to peel, not shatter, shiny, flat, to make power supply [8].

The main rectifier circuit is a transformer, rectifier, load current regulator.[9] [10] [11] [12] [13]. Figure 3 below is a block diagram of a rectifier

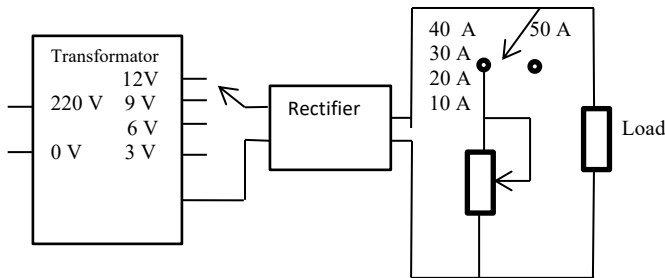


Figure 3 Block diagram rectifier

Figure 4 below is the transformer used for the rectifier

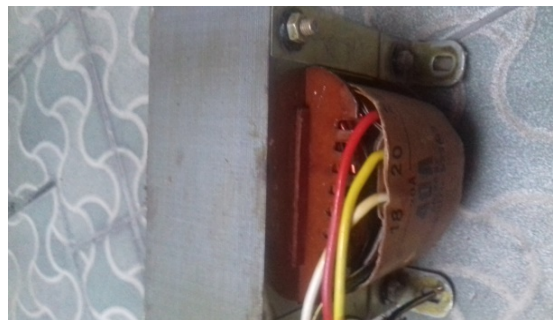


Figure 4. Transformer for rectifier

Figure 5 below is a rectifier circuit



Figure 5. Rectifier circuit

Figure 6 below is a rectifier in a laboratory

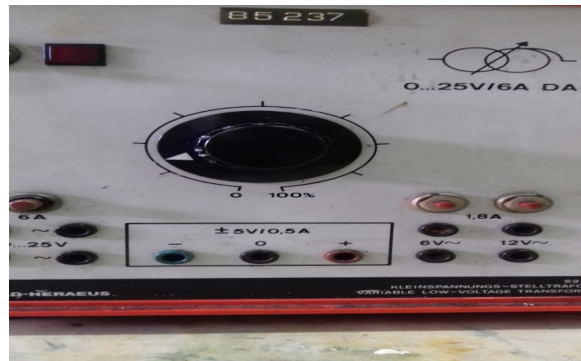


Figure 6 Rectifier in the laboratory

Figure 7 below is an electroplating tub that exists today



Figure 7 The current electroplating bath

Figure 8 below shows the electroplating bath that was made



Figure 8 Electroplating tubs made

Figure 9 below shows the finished exhaust



Figure 9 the finished exhaust

Figure 10 below shows the exhaust that will be sent



Figure 10 Exhaust to be sent

How to use a rectifier for electroplating:

1. The exhaust that will be carried out by the electroplating process is included in the electroplating bath.
2. The positive end (anode) of the rectifier is connected to the material for the coating, the negative end (cathode) is connected to the material to be coated.
3. Put the current position according to the needs.
4. For a current of 50 A, there is no setting, the switch is immediately placed in position 50 A.
5. For other currents after being placed in the appropriate position, it is necessary to adjust the obstacles so that the current flowing is as needed.
6. For the voltage placed the voltage position according to the needs.
7. This rectifier uses an input voltage of 220 V. after being connected to a socket, the switch is turned on.

Thus a brief review of how to operate a rectifier for electroplating. Understanding the operation of rectifiers is very important to keep the rectifiers used to work optimally. In addition to avoiding fatal damage due to a faulty procedure using the rectifier. Hopefully this brief explanation can be useful for rectifier users.

4. CONCLUSION

The results obtained are rectifier for electroplating, power capability of 600 W with input voltage 220 V, output voltage 3 V, 6 V, 9 V, 12V and current 10 A, 20 A, 30 A, 40 A, 50 A In order for the operation and use of the rectifier tool to have optimal results, it needs training for partner members as well as empowering the community to know about the operation of the recifier equipment.

5. ACKNOWLEDGEMENT

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