# AN ANALYSIS OF THE EFFECTIVENESS INNOVATION PROGRAM ON THE PRODUCTION PROCESS IN WATER FILTERS INDUSTRY IN SURABAYA

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**ABSTRACT**

*The purpose of this research is to analyze whether there is a difference in effectiveness production process between automated method and manual method in terms of productivity, adaptability of work, job satisfaction, ability profitable, and resource search in Aquatic Water Filter Surabaya. The population of this research is Aquatic Water Filter's employees who have already worked for at least 6 months, as many as 18 peoples. Furthermore, in this study, samples are taken using census method. Moreover, data are collected using a questionnaire that is measured by the Likert scale. Additionally, this study employs Multivariate Analysis of Variance (MANOVA) which is supported by the SPSS program version 20.*

*Results have shown that there is difference in effectiveness production process between automated method and manual method in terms of productivity, adaptability of work, job satisfaction, ability profitable, and resource search in Aquatic Water Filter Surabaya.*

**Keywords:** effectiveness, automated method, manual method.

## INTRODUCTION

People in Surabaya use water from PDAM Surabaya, who supplies almost 96% people in Surabaya (Perum Jasa Tirta; Ecoton, 2012). Thus, the need for people to be lack of clean water is crucial.

Along with the rapid economic and population growth in the city of Surabaya, Surabaya river water quality has decreased in the classification, from class C to class D (Amalia, 2014). This makes the Surabaya river water should not be used as a source of water for daily activities of people in Surabaya, such as washing, cooking, bathing, and even drinking. Thus, Aquatic Water Filter came to fill this demand of the clean water.

Until the first quarter period of 2014, Aquatic Water Filter has two methods of production of activated carbon, which is a form of innovation of the company. The first method is a manual method. This method starts from the washing process of charcoal as a raw material. This is done with the purpose of raw materials such as coconut shell charcoal is clean. The parameters of this process is the absence of waste (wood chips, paper, pebbles) in the coconut shell charcoal. The next process is the combustion process manually. Coconut shell charcoal collected up weighing

100 kg, then burned with coal. The parameters of the combustion process, burning of charcoal should be thoroughly and evenly. Not only the lower part, but also the top. After baking, coconut shell charcoal, activated dried. The purpose of this is done, so that the coconut shell charcoal becomes dry and hot again when it is held. Furthermore, coconut shell charcoal is sifted to produce some size, ie 8-30 mesh, 6-12 mesh and 4-8 mesh. The latter process is packing, and activated carbon products ready to be distributed to customers. The second method is a method using a machine. This method is similar to the first method, but the difference is in the combustion process. In this method, coconut shell charcoal collected until weighing 50 kg, then burned in a combustion furnace 5000 watt electric power for 4 hours, parameters of the combustion process by using this machine is, to reach a temperature of 1000 degrees Celsius in coconut shell charcoal. For this reason Aquatic Water Filters should conduct research on production methods which are more effective, if the first method with manual method or the second method, using an electric furnace.

**Problem Identification**

Based on the background, here is the problem identification:

1. Is there difference of production process effectiveness between the automated method and the manual method in terms of productivity?
2. Is there difference of production process effectiveness between the automated method and the manual method in terms of adaptability of work?
3. Is there difference of production process effectiveness between the automated method and the manual method in terms of job satisfaction?
4. Is there difference of production process effectiveness between the automated method and the manual method in terms of ability profitable?
5. Is there difference of production process effectiveness between the automated method and the manual method in terms of resource search?

**Research Purposes**

The purpose of this study are as follows:

1. To test whether there is difference of production process effectiveness between the automated method and the manual method in terms of productivity?
2. To test whether there is difference of production process effectiveness between the automated method and the manual method in terms of adaptability of work?
3. To test whether there is difference of production process effectiveness between the automated method and the manual method in terms of job satisfaction?
4. To test whether there is difference of production process effectiveness between the automated method and the manual method in terms of ability profitable?
5. To test whether there is difference of production process effectiveness between the automated method and the manual method in terms of resource search?

## LITERATURE REVIEW

### Measures of Effectiveness

The criteria to measure the effectiveness of an organization there are three approaches that can be used, as proposed by the Martani (2010: 55), namely: 1. Approach Resources (resource approach) that measure the effectiveness of input. Approach prioritizes the success of the organization to acquire resources, both physical and nonphysical in accordance with the needs of the organization; 2. Approach the process (process approach) is to see how effective implementation of all activities of internal processes or mechanisms of the organization; 3. Approach the target (goals approach) where the center of attention at the output, measure the success of the organization to achieve results (output) in accordance with the plan.

Furthermore strees in Tangkilisan (2012: 141) suggests five (5) criteria in the measurement of effectiveness, namely: 1. Productivity; 2. The ability to adapt the workplace; 3. Job satisfaction; 4. Ability gainful; 5. Resources.

The indicators used to gauge the effectiveness of each is as follows:

1. Productivity
a. Quantity, related to the amount of finished product produced Aquatic Water Filter.
b. Velocity, with regard to the time required to produce activated carbon products in Aquatic Water Filter.
c. The rest of the material, how much residue resulting from the production process of activated carbon products in Aquatic Water Filter.
2. Adaptation Capabilities Work
a. Adaptation Time, with regard to the time required respondents to learn how to operate the method of production in Aquatic Water Filter.
b. Preparation Time, with regard to the time required the respondent to prepare production methods in Aquatic Water Filter.
3. Job Satisfaction
a. Safety, how often respondents had an accident while operating methods of production in the Aquatic Water Filter.
b. Healthy, how often respondents had health problems when operating the method of production in Aquatic Water Filter.
c. Satisfaction, related to job satisfaction felt by respondents when working producing activated carbon products in Aquatic Water Filter.
4. Ability gainful
a. Production Cost, related to the cost of production on the production method in the Aquatic Water Filter.
b. Treatment Cost, related to the cost of care in production methods in the Aquatic Water Filter.
5. Search Resources
a. Quantity of Employee, relates to the number of employees needed in a production method in the Aquatic Water Filter.
b. Special Requirements for Employee, relating to the qualifications or special skills of employees to run the production method in the Aquatic Water Filter.

**Hypothesis**

The hypothesis that will be generated from this study are:

a. H1: There is a difference between the effectiveness of the production process automated method with manual method in terms of productivity.
b. H2: There is a difference between the effectiveness of the production process automated method with manual method in terms of adaptability of work.
c. H3: There is a difference between the effectiveness of the production process automated method with manual method in terms of job satisfaction.
d. H4: There is a difference between the effectiveness of the production process automated method with manual method in terms of the ability of gainful.
e. H5: There is a difference between the effectiveness of the production process automated method with manual method in terms of search resources.

**RESEARCH METHODS**

The approach used in this research is quantitative approach, with descriptive. Descriptive study is the kind of research that is used to solve the problems faced today. (Winarno, 2013: 140). It is

based on the conditions and the context of the issues that were examined in this study, namely regarding the effectiveness of activated carbon product production process.

**Sampling method**

The sampling method used for this study was a non-probability sampling, in which all members of the population known not to have the same probability to be in the sample. Members of the population in this study were all employees of Aquatic Water Filter, which amounted to 18 people.

The sampling technique of this study is saturated samples, in which all members of the population used as a sample. The sampling technique is determined based on a limited number of samples. Samples taken in this study were all members of the population, it's based on the number of small population, in addition, all members of this population one hundred percent has been working for the last six months in the Aquatic Water Filter, so it can be concluded that they must be competent and understand the production process of activated carbon products Aquatic Water Filter.

**Method Of Collecting Data**

The type of data in this study is the ratio data. Ratio data is data obtained by means of measurement, in which the distance of two points on the scale already known, and have the absolute zero point. This study used a questionnaire as a research instrument. Questionnaires are a number of written questions that are used to obtain information from respondents in terms of reporting on the personal, or the things that he knew.

The data used in this study are primary data that data collected or obtained directly. In addition, this study also uses secondary data, ie data derived from the company. This data comes from the Aquatic Water Filter, in the form of calculations in producing activated carbon products. In this study, the data source used is the internal and external data sources, where these data are derived from calculations at the company Aquatic Water Filter, as well as obtained from the respondent, through questionnaires.

This study used a questionnaire as a data collection technique, which is done by giving a paper containing questions posed to respondents. Interval measurement data used in this study is the scale interval.

The scale of measurement that will be used in this research is Likert Scale, which is a scale used to measure attitudes, opinions and perceptions of a person or group of events or social phenomena. By using a Likert scale, the dimensions are translated into a variable and then the variable again translated into indicators that can be measured. Finally measurable indicators that can be used as a starting point to create an item instrument in the form of questions or statements that need to be answered by the respondent. This is a form of semi-enclosed questionnaire that is partly in the form of closed questions whose answers should be selected respondents based on the options provided. The scale used to measure the effectiveness of the activated carbon production process belongs Aquatic Water Filter this form of data according to Likert scoring method in the form of an ordinal scale, involving a scale of 0 to 4, namely:

a. Strongly disagree (STS) = 0
b. Disagree (TS) = 1
c. Neutral (N) = 2
d. Agree (S) = 3
e. Strongly Agree (SS) = 4

**Data Analysis**

This study using inferential analysis, which uses several statistical tests to process data as follows:

**Validity Test**

Validity test is done to determine the extent of the measuring device (questionnaire) to measure what is desired. The validity of the instruments can be tested by correlating between the scores obtained on each of the questions with a total score obtained from the sum of all scores of questions. If the correlation between the total score with the score of each significant question (shown with significance level <0.05), it can be said that the measuring device is valid.

**Reliability Test**

Reliability testing can be understood through the basic idea of the concept is consistency. Researchers can evaluate the research instrument based perspectives and different techniques even though the same symptoms. Measurement using a numeric index is called the coefficient. Reliability test using Cronbach's Alpha Reability, where the instrument is considered reliable if it had Cronbach's Alpha Reability above 0.6 (Ghozali, 2001: 133). Calculation Chronbach's Alpha Reability is assisted by using SPSS 20.0 software.

**Assumptions Test**

Assuming that must be met in MANOVA is not happening multikolinieritas, no data outliers, and the data were normally distributed (Santoso, 2012: 220). For the following analysis.

Normality Test

Used to determine whether the distribution of the data follow a normal distribution approach. Will be used Kolmogorov-Smirnov test. Multivariate normality test is difficult to do at SPSS, for the test will be performed univariate with the logic that if individually each variable meet the assumptions of normality, then together (multivariate) variables can also be considered eligible for normality (Santoso , 2012: 43). If the sig. > 0.05 then the normal distribution of data. (Santoso, 2012: 45).

**Multivariate Analysis of Variance (MANOVA)**

Manova a multivariant techniques that interpret between two or more dependent variables and classification variables or factors (Kuncoro, 2009: 253). MANOVA used in testing hypotheses about the effectiveness of the production of activated carbon products Aquatic Water Filter.

The steps used in the test MANOVA are:

1. Significance Tests Multivariance
   Significance test of variables in a MANOVA test using test Wilk's Lambda, Pillai's Trace, Hotelling's Trace, and Roy's Larges Root. The significance test will be seen simultaneously in the MANOVA test. Rules different test (MANOVA) is where the significance <0.05, significant means (Ghozali, 2012: 80).
2. Significance Tests Univariance
   Univariance significance test is a test that is done by analyzing each variable of research results (Ghozali, 2012: 88). Significance in the multiple comparison test using Turkey HSD (Honesty Significant Differently), when the comparison result indicates the significant value> 0.05, or 5%, there were no significant differences (Ghozali, 2012: 82).

**1. The difference in the effectiveness of the production process between the automated method with manual method in terms of productivity (Y1)**

The study states that the difference in effectiveness between the production process automated method with manual method in terms of productivity. It is obtained from the test results MANOVA with sig. variable productivity amounted to 0,023, less than 0.05 which become the benchmark proven hypotheses exist. The big difference in the effectiveness of the

production process between the automated method with manual method is because, both the method is a method of combustion which is included in the activated carbon production process. The results are consistent with research conducted by Sutansyah (2009), entitled "Effectiveness of Liquid Waste Treatment System in PT Bristol-Myers Squibb Indonesia". Research results found no difference in the effectiveness of the production process when seen from a productivity of working methods. Because the methods of manual or automatic is one of the activated carbon manufacturing process. So that if the method is replaced, it will show the difference in the effectiveness in terms of productivity.

Respondents said that the automated method is more effective than manual methods. This is because the speed is very slow manual production method, which requires an average of eight hours to produce 100 kg of activated carbon. Besides the manual method can not produce activated carbon products in large quantities, because it requires a lot of manpower and still use coal that takes a long time to prepare for combustion.

**2. The difference between the effectiveness of the production process automated method with manual method in terms of adaptability of work (Y2)**

The study states that the difference in effectiveness between the production process automated method with manual method in terms of adaptability of work. It is obtained from the test results MANOVA with sig. variable adaptability of labor is equal to 0,037, less than 0.05 is a benchmark proven hypotheses exist. The big difference in the effectiveness of the production process between the automated method with manual method is because, both the method is a method of combustion which is included in the activated carbon production process. The results are consistent with research conducted by Sutansyah (2009), entitled "Effectiveness of Liquid Waste Treatment System in PT Bristol-Myers Squibb Indonesia". Research results found no difference in the effectiveness of the production process when seen from its adaptability.

On average respondents overall automated method is better than the manual method in terms of adaptability of work. This is because the time it takes employees to learn how to operate the manual method was considered quite a long time, in addition to the time required to prepare the manual method is also quite long, an employee had to clean the kiln, as well as iron containers to put charcoal in advance, then the employee must heating coal. These processes require a long time.

**3. The difference in effectiveness between methods of automated production processes with manual methods in terms of job satisfaction (Y3)**

The study states that the difference in effectiveness between the production process automated method with manual method in terms of job satisfaction. It is obtained from the test results MANOVA with sig. variable adaptability of labor is equal to 0.041, less than 0.05 is a benchmark proven hypotheses exist. The big difference in the effectiveness of the production process between the automated method with manual method is because, both the method is a method of combustion which is included in the activated carbon production process. The results are consistent with research conducted by Sutansyah (2009), entitled "Effectiveness of Liquid Waste Treatment System in PT Bristol-Myers Squibb Indonesia". Research results found no difference in the effectiveness of the production process when seen from work satisfaction.

Respondents disagreed with the statement that the number of occupational accidents and health problems experienced by employees while running a manual method only slightly. This is because there is a lot of work accidents and health problems caused by the smoke of burning charcoal coal. Health problems commonly felt by employees include coughing, shortness of breath, and flu. Therefore, the automatic method is considered safer and better ensure employee satisfaction.

**4. The difference in effectiveness between methods of automated production processes with manual methods in terms of the ability of gainful (Y4)**

The study states that the difference in effectiveness between the production process automated method with manual method in terms of the ability of gainful. It is obtained from the test results MANOVA with sig. variable adaptability of labor is equal to 0.029, less than 0.05 is a benchmark proven hypotheses exist. The big difference in the effectiveness of the production process between the automated method with manual method is because, both the method is a method of combustion which is included in the activated carbon production process. The results are consistent with research conducted by Sutansyah (2009), entitled "Effectiveness of Liquid Waste Treatment System in PT Bristol-Myers Squibb Indonesia". Research results found no difference in the effectiveness of the production process when seen from the ability of gainful PT Bristol-Myers Squibb Indonesia.

On average respondents automated method is more effective than manual methods in terms of the ability profitable, where the mean for the automated method amounted to 3.12 and the mean is 3.03 for the manual method. In addition, respondents also answered agree on the cost of the care needed automated method is quite large, this is because the automatic method of each month the company had to replace an electric element that the price is quite high. Respondents did not agree on the cost of production of automated methods are quite large, this is because when compared with manual methods, automated methods still lighter cost of production, the company need only pay the cost of electricity, but the manual method, the company must buy coal in the amount of large enough.

**5. The difference in effectiveness between methods of automated production processes with manual methods in terms of search resources (Y5)**

The study states that the difference in effectiveness between the production process automated method with manual method in terms of search resources. It is obtained from the test results MANOVA with sig. variable adaptability of labor is equal to 0,048, less than 0.05 which become the benchmark proven hypotheses exist. The big difference in the effectiveness of the production process between the automated method with manual method is because, both the method is a method of combustion which is included in the activated carbon production process. The results are consistent with research conducted by Sutansyah (2009), entitled "Effectiveness of Liquid Waste Treatment System in PT Bristol-Myers Squibb Indonesia". Research results found no difference in the effectiveness of the production process in terms of sourcing PT Bristol-Myers Squibb Indonesia between two methods of wastewater treatment.

Respondents suggested that the number of staff required automatic method less than manual methods, but employees must have special qualifications such as a high school graduate (high school) to be able to run this method. This makes difficult the search of resources for automated methods.

## CONCLUSION

This study aims to examine whether there are differences in effectiveness between the production process automated method with manual method in terms of productivity, adaptability of work, job satisfaction, ability profitable, and search resources. The study was conducted by distributing questionnaires to 18 respondents who are employees of Aquatic Water Filters that have worked for at least 6 months. The analysis showed that:

1. There is difference in effectiveness between the production process automated method with manual method in terms of productivity (Y1).
2. There is difference in effectiveness between the production process automated method with manual method in terms of adaptability of work (Y2).

3. There is difference in effectiveness between the production process automated method with manual method in terms of job satisfaction (Y3).
4. There is difference in effectiveness between methods of automated production processes with manual methods in terms of the ability of gainful (Y4).
5. There is difference in effectiveness between the production process automated method with manual method in terms of search resources (Y5).

**SUGGESTION**

**Suggestions For Companies**

Results of this study suggest that there are significant differences in the effectiveness of the production process between the automated method with manual method in terms of productivity, adaptability of work, job satisfaction, ability profitable, and search resources. This proves innovation created by the author (automatic method) may be used by the company. Furthermore, through this study we can see that the automated method is better than the manual method in terms of the effectiveness of its production, therefore the company is expected to no longer use the manual method and turn to the automated method for the progress of the company. In addition, the company is expected to be made SOP (Standard Operating Procedure), punishment and reward system for employees. Managerial implications are discussed in Chapter 5 should be implemented and then be monitored to determine the effect of each action.

**Suggestions for Further Research**

This study only examine whether there are differences in effectiveness between the production process automated method with manual method on five variables, namely productivity, adaptability of work, job satisfaction, ability profitable, and search resources. Further research is recommended to investigate other variables that could also be used to measure whether there are differences in the effectiveness of the production process, such as product quality, environmental and psychological factors of employees. It also recommended further research to involve more number of samples, making it possible to obtain better research results.

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## THE IMPACT OF PRICE AND PRODUCT QUALITY