

# Increased Productivity Engineering in the Environmentally Friendly Batik Home Industry

*by* Jaka Purwanta

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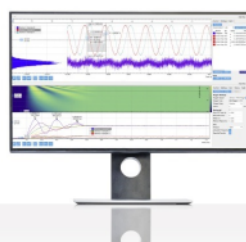


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**Abstract.** The aim of this study is to engineer an increase in productivity in the Batik Home Industry. a batik home industry, which is administratively one of the villages within the Munggon area/village. Munggon village is included in Sendangtirto Village, Berbah District, Sleman Regency, Special Region of Yogyakarta. The background of this research is the atmosphere in the work environment that is less comfortable. This is due to the temperature of the work area which is higher than normal so that the air feels hotter. Lack of green open space (RTH) in the work area and roof of the work area made of galvalume so that the temperature in the work environment becomes hotter. Dinda Hayu Batik is a home industry in batik making, which was founded and led by Ms. Riyo Ety. A large number of orders for these batik products makes Dinda Hayu Batik have to do even more challenging work. This of course, must be supported by the performance of the leadership and employees. To create better performance a comfortable working environment should be created. A work area uses a residence so that every part of the house becomes full of work equipment and goods. This condition makes the circulation of fresh air not smooth the air temperature in the work area becomes rather hot. This condition is coupled with the roof of the work area at the front made of galvalume, so this condition makes the workers feel the heat and reduce comfort in working. To increase employee productivity a study is needed to find the cause of the decline in employee productivity. Based on the study, it was found several ways to improve the work productivity of employees, namely by providing counseling to the public, especially leaders and employees of Dinda Hayu Batik, about the importance of environmental management. One legal basis is RI Law Number 32 of 2009 concerning Protection dan Management of Life Environmental that working environment conditions must be made comfortable so that they can support the performance of Dinda Hayu Batik employees in order to be able to produce optimally.

**Keywords:** production, air circulation, comfort, performance

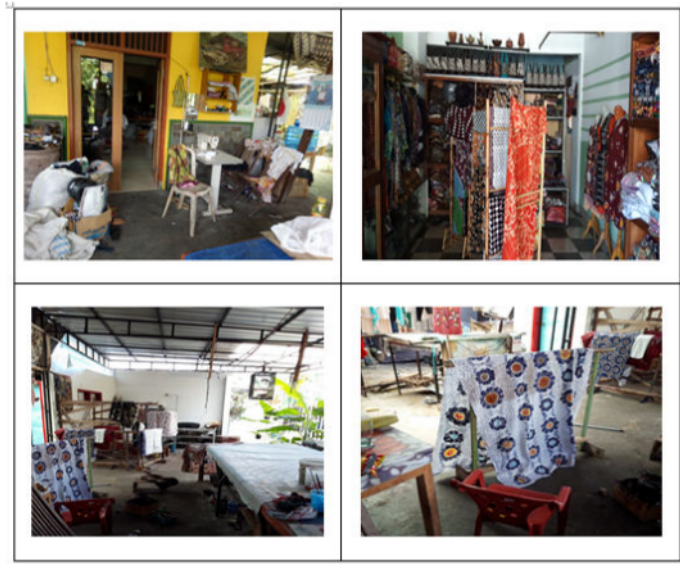
## INTRODUCTION

The economic conditions in our country, which are generally sluggish due to the coronavirus, have not made the home industry sink. The demand to meet the household needs of their employees makes them survive. Likewise, what happened in Dinda Hayu Batik, which is located in Munggon Village RW 20 RT 02, Sendangtirto Village, Kalasan, Sleman, DIY. Dinda Hayu Batik is a home industry in batik making, which was founded and led by Mrs. Riyo Ety. To respond to this condition the leadership has a policy that, on the one hand, the health protocol must be met; on the other hand, work productivity must always be maintained. Health protocols include wearing a mask, always washing your hands with clean water and soap, and keeping your distance.

A large number of orders for batik products made Dinda Hayu Batik have to work hard to fulfill these orders. This, of course, must be supported by the excellent performance of the leadership and employees. The background of this research is the atmosphere in the work environment that is less comfortable. This is due to the temperature of the work area which is higher than normal so that the air feels hotter. Lack of green open space (RTH) in the work area and roof of the work area made of galvalume so that the temperature in the work environment becomes hotter. To create a good performance a comfortable working environment must be created. A work area uses a residence so that every part of the house becomes full of work equipment and goods. This condition makes the circulation of fresh air not smooth so that the

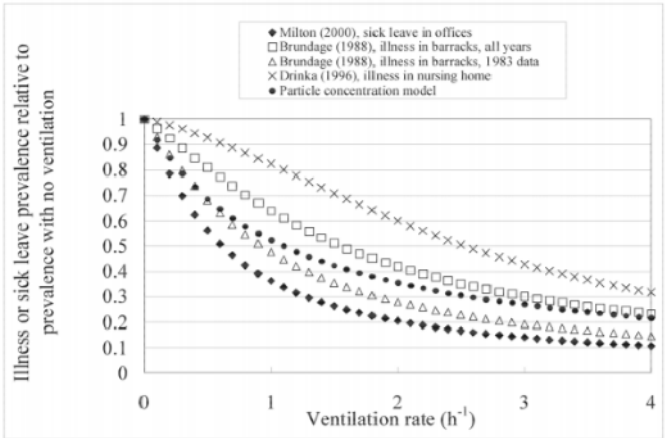


air temperature in the work area becomes a bit hot. This condition is coupled with the roof of the work area at the front made of galvalume. So that this condition makes the workers feel that the workspace air temperature is getting warmer and reduces comfort in working. This condition can be seen in the documentation in Figure 1.

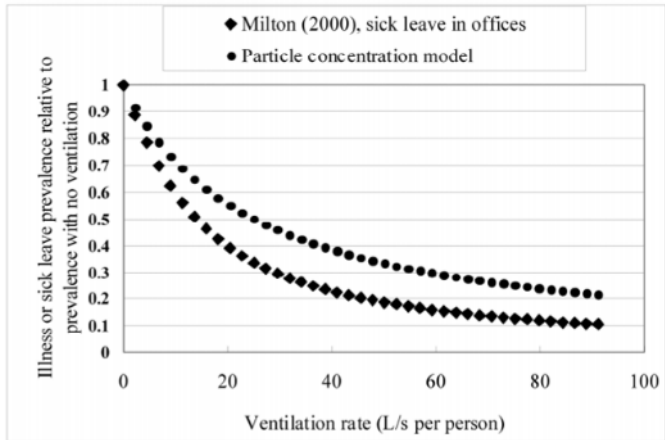


**FIGURE 1.** The working atmosphere at Dinda Hayu Batik  
(Source: Primary data, 2020)

According to Chang [1], people are tired of seeing natural scenery. However, when shown the view from the window and the plants placed in the house, this will make people interested in enjoying it. This has an impact on reducing high blood pressure and anxiety. Wyon [2] explained that after carrying out research for 5 hours a day with a clean air supply of 3-30 L/s/p and a workroom temperature of 22°C, it was concluded that especially for the tropics that productivity is related to life cycle costs and efficiency energy use. Minimal indoor air quality can change office work comfort by about 6-9%. There is a linear relationship between the percentage of discomfort and indoor air quality (20-70%) and a measurable reduction in appearance/comfort. According to Seppanen and Fisk [3], low indoor environmental quality (IEQ) or low environmental quality in the house will trigger sick body syndrome, respiratory abnormalities, illness, and loss of productivity. Calculations show that the costs of low environmental quality can be higher than the costs of conditioning distance and ventilation. Many measures can be taken to demonstrate that indoor IEQ will be highly cost-effective relative to the resulting productivity. For a cost-benefit analysis in the application of IEQ, health, and productivity, it is not enough to provide statistical information between the IEQ condition and health or appearance, but how much impact or effect is needed quantitative estimate. That low indoor environmental quality (IEQ) or the quality of the environment in the house that is not good enough will lead to symptoms of body sickness syndrome, respiratory abnormalities, illness, and loss of productivity. Calculations show that the costs of low environmental quality can be higher than the costs of conditioning distance and ventilation. Many measures can be taken to demonstrate that indoor IEQ will be highly cost-effective relative to the resulting productivity. For a cost-benefit analysis in the application of IEQ, health, and productivity, it is not enough to provide statistical information between the IEQ condition and health or appearance, but how much impact or effect is needed quantitative estimate. That low indoor environmental quality (IEQ) or the quality of the environment in the house that is not good enough will lead to symptoms of body sickness syndrome, respiratory abnormalities, illness, and loss of productivity. Calculations show that the costs of low environmental quality can be higher than the costs of conditioning distance and ventilation. Many measures can be taken to demonstrate that indoor IEQ will be highly cost-effective relative to the resulting productivity. For a cost-benefit analysis in the application of IEQ, health, and productivity, it is not enough to provide statistical information between the IEQ condition and health or appearance, but how much impact or effect is needed quantitative estimate.



**FIGURE 2.** Predicted trends in the illness of sick leave versus ventilation rate  
(Source: Fisk et al, 2003)



**FIGURE 3.** Predicted trends in the illness of sick leave versus ventilation rate per person  
(Source: Fisk et al, 2003)

FIGURE 2 and 3 above show that there is a tendency that when the ventilation rate is greater, the amount of pain that is caused without ventilation will be smaller. Based on the description above, the work area should have adequate ventilation so that the air temperature will be expected, and employees will feel comfortable working. Based on the Regulation of the Sleman Regent No. 1 the year 2016 about Protection dan Management of Life Environmental, Regarding 107 Green Open Space, that every area of land to be built is a building, the landowner should provide a Green Open Space (RTH) of at least 20% of the land area.

**METHOD**

**Study Sites**

The research location is in Munggon, Sendangtirto Village, Kalasan District, Sleman Regency, DIY.

Material and Equipment

This study uses materials and equipment in the form of documentation tools, maps, and calculators.

Doing the Work Process

Conduct field observations at the research location and identify the research location, including the area of land, garden area, and temperature of the work area. Then calculate the proper garden requirements and determine the number of fans/blowers with fog and fans required.

Data Analysis

Based on the data obtained from the observations, then the area of green space or pressure that should exist is calculated and the type and number of room temperature conditioners needed.

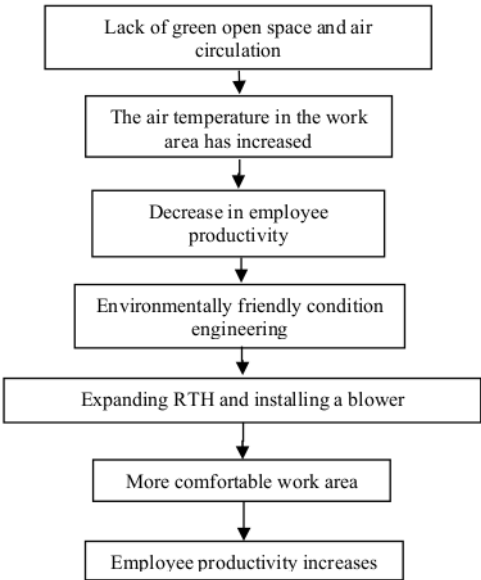


FIGURE 4. Reserach Flowchart

RESULTS AND DISCUSSION

Based on the results of field observations, the following data will be obtained:

- a. The land area used as Dinda Hayu Batik's house and work area is 380 m<sup>2</sup>, while the existing Green Open Space (RTH) or garden is 45 m<sup>2</sup>.
- b. The temperature of the work area during the day, in a house with a tile roof, is 33.2 °C, while in a house with a roof tile, it is 36.3 °C.

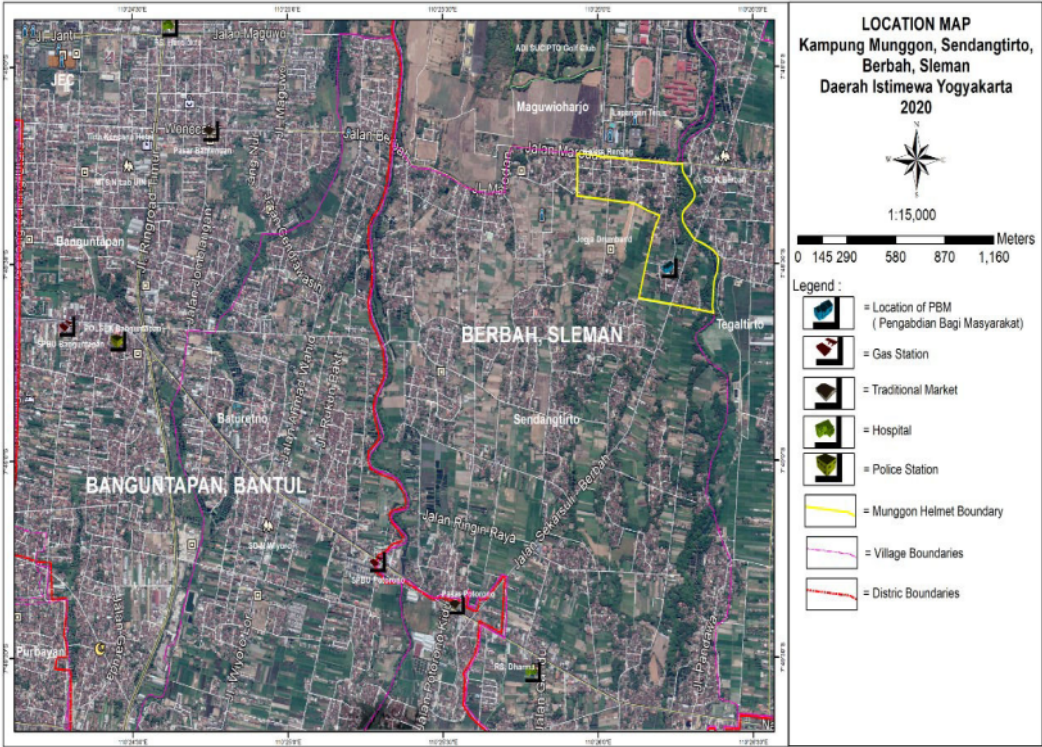


FIGURE 5. Map of the Munggon area, Village Sendangtirto  
(Source: Data processing constituent, 2020)

Calculating the Need for an Area of Green Open space or a Garden

Furthermore, the critical area of green open space or garden should be calculated. Based on the regulations that the parking area is at least 20% of the land area, namely:  
= 380 m<sup>2</sup> x 20% = 76 m<sup>2</sup>  
Based on the above calculations, it turns out that a minimum area of 76 m<sup>2</sup> is needed or RTH, even though the existing park area is 45 m<sup>2</sup>. It is necessary to add a minimum garden area of:  
= (76 - 45) m<sup>2</sup>= 31 m<sup>2</sup>.  
In general, increasing the area of the park can be done horizontally. However, if the land is minimal, the addition of the garden area can be done vertically. Flower plants are arranged in pots and arranged in a sloping/vertical place. The sloping span is calculated as an addition to the garden area. The addition of the parking area can be done at several location points in several corners of the work area so that it can fill the area of the park or green open space. The increase in the area of Green Open Space (RTH) in the work area of Dinda Hayu Batik will increase the amount of oxygen produced at that location so that the air temperature becomes cooler.

Determine the Type of Air Conditioner to the Right Working Room Temperature

The standard room temperature is 25 °C so that to condition the temperature of the workspace with a tile roof, using a fan mounted on the wall of the room and the number of fans is 1 per work area so that the room temperature can be conditioned to be cooler as it should be. Likewise, to condition the work area with a galvalume roof, use a fan with fog. The existence of blowing fog in a high temperature work area will make the humidity figure high because the water vapor content in the air is high or a lot. As a result, the temperature of the workspace drops and is more



relaxed. The air temperature in the work area is lower than before so that the work atmosphere becomes more comfortable, employees do not feel tired easily so that employee productivity increases.

**CONCLUSIONS**

The required green open space or garden area should be at least 76 m<sup>2</sup>. In comparison, the existing garden area is 45 m<sup>2</sup>, so it is necessary to increase the garden area at least 31 m<sup>2</sup>. For working room temperature conditioning, it is recommended that you use a type of fan in general and amount to 1 fan per work area. In contrast, for work areas with a galvalume roof, it is recommended to use a fan/blower that sprays fog and the number is 1 per work area. The existence of the total area of the park that meets the standards and the work area temperature conditioning equipment is equipped, the temperature of the work area becomes more controlled and more comfortable so that the productivity of the worker's increases.

**ACKNOWLEDGMENTS**

The recommendations of this study are beneficial for increasing the circulation of fresh air and conditioning the temperature of the work area so that the work atmosphere becomes more comfortable and the productivity of workers increases.

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