

ENERGY EFFICIENCY ARCHITECTURE OF WATER PACKAGING INDUSTRY DEVELOPMENT ON PT SWABINA GATRA DISTRICT GRESIK

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Article Info

Article history:

Received Jul 12th, 2017

Revised Aug 20th, 2017

Accepted Oct 26th, 2017

Keyword:

The Source Of Nature
Drinking Water In The
Packaging
Energy Efficiency In
Architecture

ABSTRACT

In Surah Az-Zumar 21 explained that God had given a lot of resources on earth for the welfare of the creatures. God provides humans to take advantages of all the blessing things that exist properly and not forget to be grateful for it. Everything has been available on the earth for human life. The source of natures is very abundant such as water. Conservation and consumption of the water can be used in the form of treatment of drinking water in the packaging. Application of drinking water in daily life is good for people's health, whereas groundwater sources have been contaminated by waste and drinking water consumption have impacts on human life. One of the cities that implement the processing of drinking water is Gresik city in the company of PT Gresik "Swabina Gatra". PT Swabina Gatra was 26 years old, has been managing drinking water which is capable of producing drinking water of seventy thousand units per month in the form of cups, bottles, and gallon. The production will be increased to 150 thousand units per month. The big concern of public for consuming drinking water alter increasing of production capacity. Thus, PT Swabina Gatra will develop the drinking water industry. The drinking water industry development is applying the theme of energy efficiency in architecture because it involves consideration of the location, cost, machinery and labor and energy efficient building design. Energy efficiency in architecture is trying to minimize energy usage without limiting the user's needs and activities. Thus the building will reduce expenses in drinking water industry development and provide positive impacts to the environment around.

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INTRODUCTION

Water resources are vital needs that must be conserved for the survival of the people, even by all living things. According to the 1945 Constitution article 33 paragraph 3, which contains that "Earth and water and natural wealth contained in it controlled by the state and used for the greatest prosperity of the people." Therefore, water resources should be appropriately utilized and processed correctly. The wise use of water takes into consideration of the interests and needs of water will have some impacts on future generations. Here, Surah Az-Zumar verse 21 describes the benefits of water:

Have you not seen that Allah has sent down water from the heavens, he shall set it into the waters of the earth, and shall grow it with the waters, the plants of varying colors, then it becomes dry, and then you see it yellowish, then made Him crumble. Verily in that is a lesson for those who have a mind. (39:21)

From the above verse of the Qur'an, we can genuinely understand and well know the benefits of the water source which Allah has given so much. Only the need for proper regulation of water resources, so that the virtues of water resources can be brought to life and to move the lives of all beings on earth.

Currently, water is needed for the industry, household, and domestic. The need of water for industrial, home and, local needs are experienced by Gresik city. That consumption of drinking water in

Indonesia throughout 2014 was recorded at 23.1 billion liters. The record grew 11.3% of demand in 2013 by 20.48 billion liters.

The explanation above lead to the swift drinking water market, which leads to investment in this industry increase massively. One of the drinking water industry located in Gresik is PT. Swabina Gatra. PT. Swabina Gatra is a national private company incorporated in Semen Gresik Group with the dedication of quality product improvement in all business field activities to meet the needs and desires of the growing consumer. According to one online news port news, PT. Swabina Gatra was 26-year-old has been managing AMDKs and capable of producing dinking waters of 70,000 units per month that are packed up in glasses, bottles, and gallons. Production will be increased to 150 thousand units per-month, and will also be supported with new equipment. It implies the fact in the development of drinking water Industry in PT. Swabina Gatra Kabupaten Gresik. Certain located of drinking water management in Gresik based on that calculation resulted in more efficient for plant development.

METHOD

The design method used in this study begins with the description of the object of design and its problems on the issue of drinking water plant. The point is developed through qualitative research supported by primary data from documentation and records and secondary data from the literature to obtain a solution in the form of a design.

DISCUSSION

Concept Design

The design results used in the design of the development of Drinking Water Industry in Packaging with the theme of Energy Efficiency in Architecture takes the concept of efficiency. The idea of this design is a combination of energy efficiency and architectural efficiency.

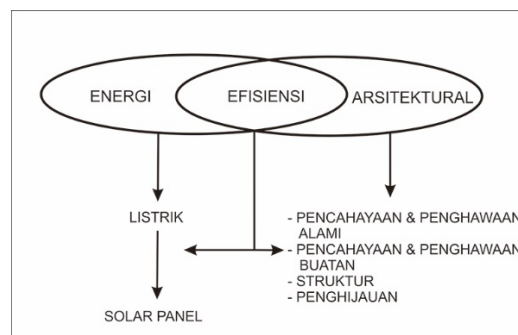


Figure 1, Basic Concepts

The results of the design in electric utilities imply that the primary source of electricity come from PLN and generator as the alternative when the power system get disruption and use the solar panel energy as the backup energy. The use of solar energy panels in the building is used during the night and when the power is shutting down. The existence of two alternative option between Genset and solar panel facilitate the user in processing activity, especially for the drinking water production process.

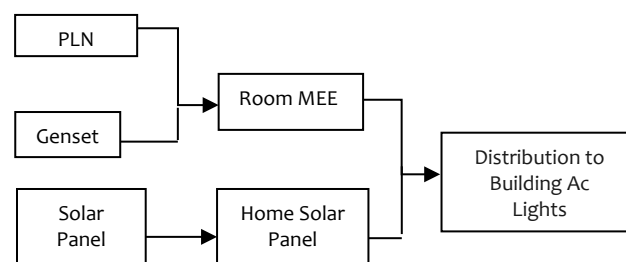


Figure 2, Electricity Scheme

Application of solar panels is intended for the needs of many plants using electrical energy where the factory operates for seventeen hours to provide convenience for users activities. Here is the calculation of solar panels were used for electricity in industrial buildings.

AC	= 14 x 820 x 17 = 195.160	
LED 11 watt	= 11 x 69 x 17 = 12.903	
Downlight 12 watt	= 12 x 18 x 17 = 3.672	
Downlight 18 watt	= 18 x 98 x 17 = 29.988	+
Total	= 241.723	

$$241.723 : 100 : 5 = 483$$

$$241.723 \times 2 = 483.446 : 12 = 40.287$$

$$40.287 : 100 = 403$$

Pump	= 3 x 100 x 17 = 5.100	
Filling machine & shealler cup		
8 line	= 1 x 15000 x 17 = 255.000	
Rotary filling machine	= 1 x 9500 x 17 = 161.500	
Ozone generator	= 1 x 1000 x 17 = 17.000	
Ultraviolet lights	= 3 x 40 x 17 = 2.040	
Blower	= 2 x 50 x 17 = 1.700	
Computer	= 1 x 500 x 17 = 8.500	+
Total	= 450.840	

$$450.840 + 241.723 = 692.563$$

$$\frac{241.723}{692.563} \times 100 \% = 34\%$$

Thus, from the calculation, the required solar panels are 483 solar panels. While Accu is needed 201 pieces, but 403 Accu have used. It means two times from general requirement. The use of 403 Accu is caused to anticipate if the next day no solar heating so that the production activity still run optimally. Further, to calculate how the efficiency of solar panels consumed, the total amount of lamp & Ac calculations are added to the tools/machines that require electricity. Then, the whole lamp & AC calculations are divided by the all total and multiplied by 100% that shown above estimates and resulted in the efficiency of 34%.

The Design

A. Building Mass Order

The pattern in the arrangement of the site on the object area is formed through the division of 5 zoning, namely: public, semi-public, semi-private, private and service. Plan for semi-private and individual is in the middle while public, semi-public and service surround the area. The zoning is intended to maintain the privacy of space, while for the public and facility close to the outside area to facilitate the user. The pattern of arrangement of the linear zonation form is supported by a footprint extending from north to south.

B. Building Design Results

1. Building Administration Office

The design results are based on the Energy Efficiency in Architecture Themes that focus on energy efficiency and architectural efficiency. The basic form of office administration building comes from the adjustment of the elongated shape of the site as well as the potential that is on the site. The way has changed in form with the reduction on north and east side of the building to enter the wind and deflect the wind. Also, the shape undergoes the type of the stage structure to make space inside can be more refreshing and curved roof shape to accommodate rainwater and efficient for wide-span buildings.

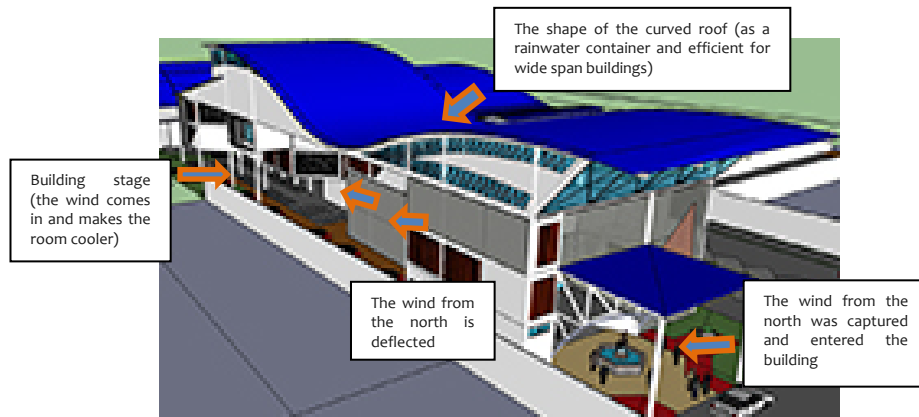
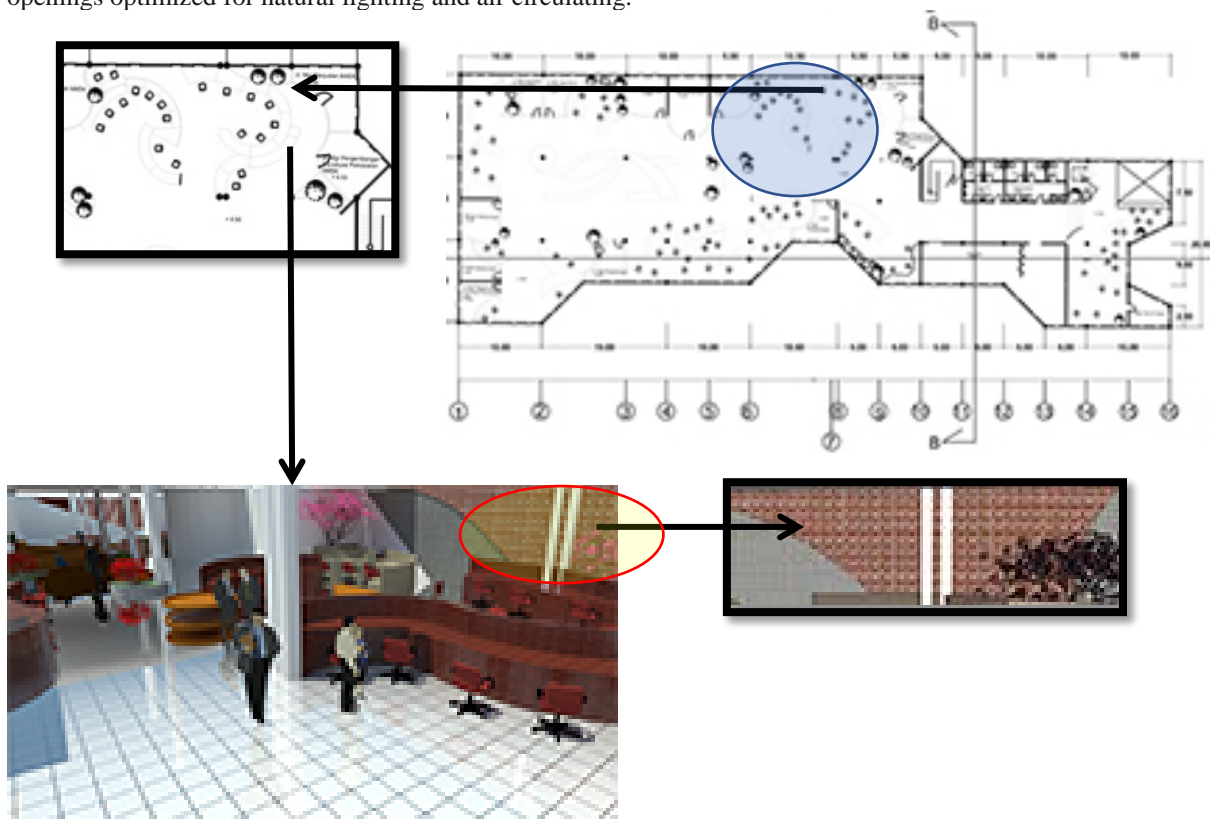


Figure 3, Building Form

Building 2nd floor is a private area because the area is an office staff area, made not insulated and in this area openings optimized for natural lighting and air circulating.



Space that uses natural air circulation is staff office, space manager, and canteen. As for the meeting room, hall, and prayer hall using natural air conditioning in the form of space is more closed.

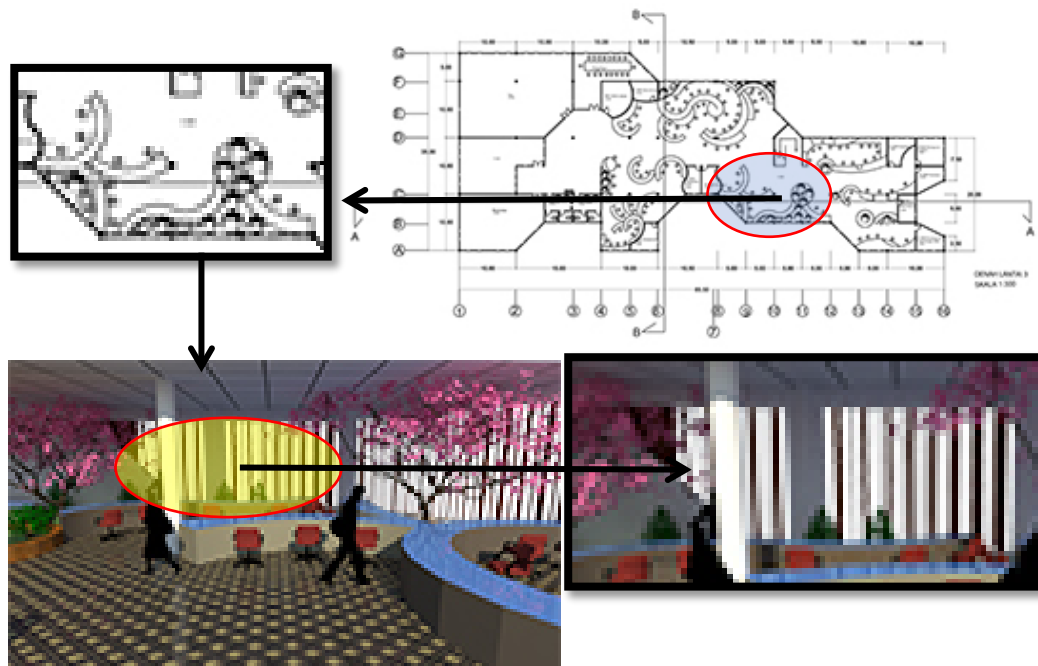


Figure 5, 3rd Floor Plan of Office Building

2. Building Factory AMDK Processing



Figure 6, AMDK Processing Factory Building Form

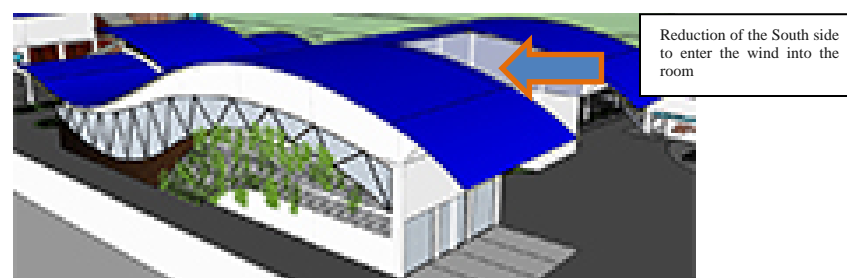


Figure 7, Building Form of AMDK's Processing Factory

The design results are based on the Energy Efficiency in Architecture Themes that focus on energy efficiency and architectural efficiency. The basic shape of the factory building comes from the adjustment of the elongated shape of the site as well as the potential that is on the site. The elongated shape is also due to the conformity with the circulation for the AMDK plant which must be linear. The Linear form will facilitate the process of production activities in the room. Then, in the southern part, there is a reduction of shape to entering the wind and the shape of the arch roof to accommodating rainwater and efficient for wide extent buildings.

The factory area is different with the atmosphere of the office area, for the factory production area there is no opening side so that the factory area more emphasis on design airing and artificial lighting. The design is decorated to the needs of the factory with the use of bright and durable lamps, so use LED lights. Furthermore, the election of artificial air circulation uses split AC-friendly space because it does not cause dust, so the room remains sterile.

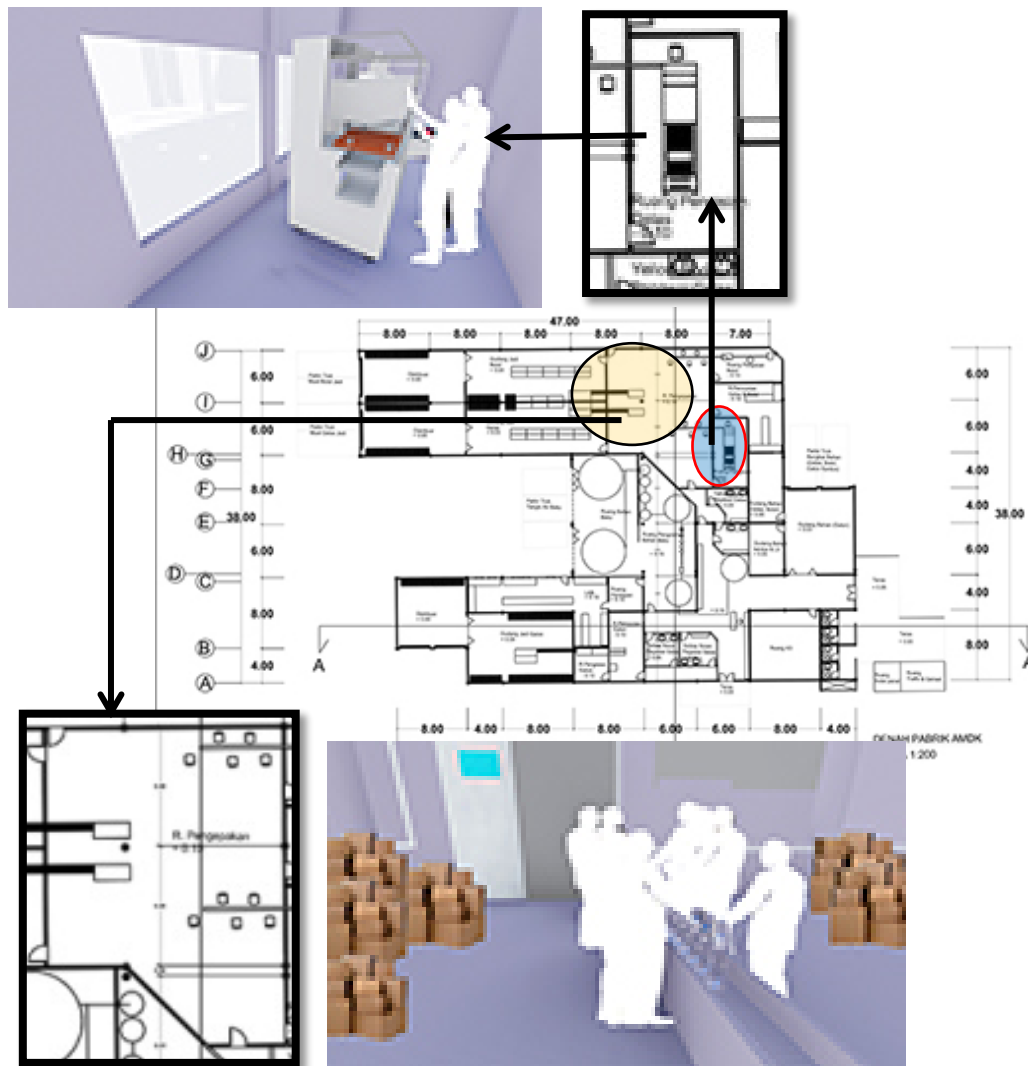


Figure 8, Artificial Lighting Filling Room Glass and Packaging

3. Greening

Vegetation is used as part of alignment and minimize negative impacts on the environment. Vegetation to be used on the site, classified in advance to determine the usefulness and benefits of each plant so that it can be arranged appropriate plant placement on the site. The following classification of plants used on the site.

The vegetation in the site divided into three parts:

- Steering Vegetation
- Shade Vegetation
- Ornamental vegetation

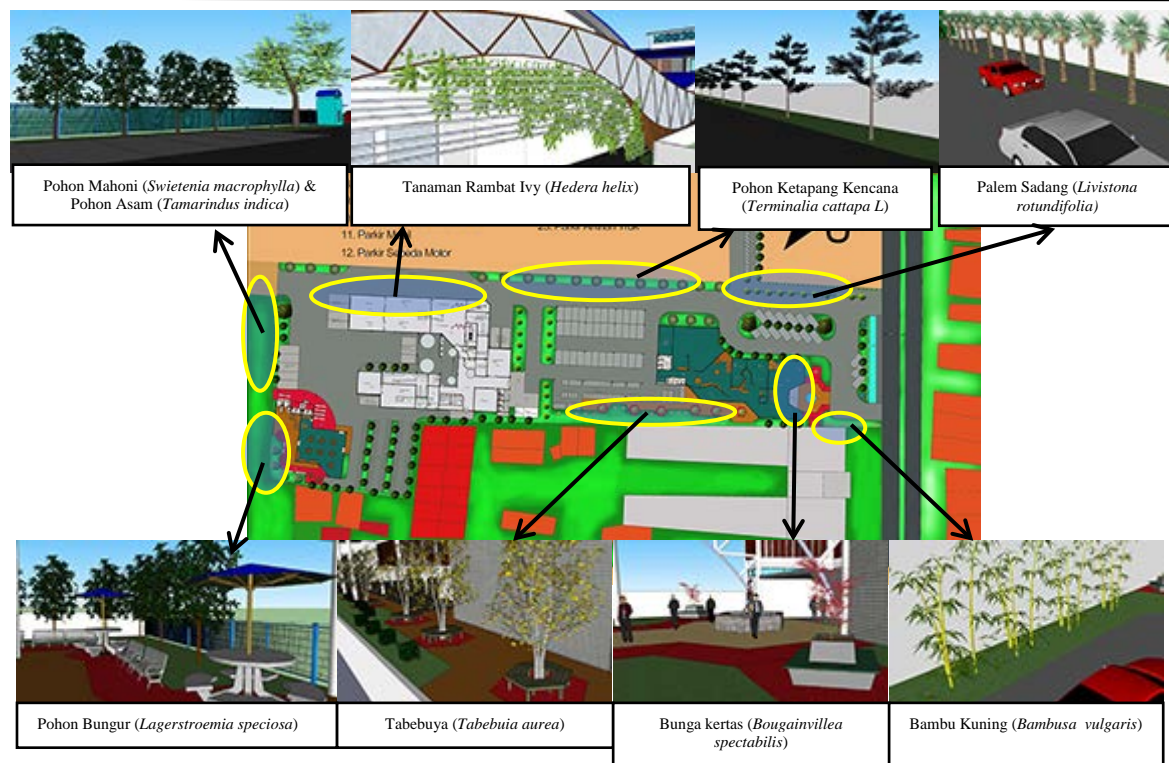


Figure 9, Region of Vegetation

Conclusion

Development of drinking water Industry in PT. Swabina has increased its production capacity, PT. Swabina Gatra needs to expand factory / industrial development of drinking water. Drinking Water Industrial Development uses the theme of Energy Efficiency in Architecture, with theme taking based on consideration of the function of factory building which is earn much of cost expenses so that the use of the theme will minimize the cost expenses. Furthermore, with the use of the theme Energy Efficiency in Architecture concern to the concept of efficiency.

The concept of this efficiency is a combination of energy efficiency and architectural efficiency. First, energy efficiency is covered because the plant uses a lot of electricity. The energy efficiency is applied by using solar panels. Solar panels are used to store solar heat as a backup of electrical energy. Furthermore, the effectiveness of solar panels is used including the total amount of lamp & Ac are added to the tools/machines that require electricity. Then, the entire lamp & AC calculations are divided by the total all amount then multiplied by 100% that is resulting in an efficiency of 34%. Secondly, the architectural capability is applied to natural lighting and air circulating, as well as artificial lighting and airing. The combination of both effects is expected can develop the drinking water industry so that can provide easiness, comfort, and smoothness for its users.

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