



## **SUNDIAL DEVELOPMENTS IN SURROUNDING COMMUNITIES: STUDY AT QOWIYUDDIN JAGIR MOSQUE AND PENELEH MOSQUE, SURABAYA**

**Adam Firmansyah Ahmad<sup>1</sup>**

<sup>1</sup>*Sunan Ampel State Islamic University Surabaya* ([c96219036@student.uinsby.ac.id](mailto:c96219036@student.uinsby.ac.id))

**Abstract:** The use of traditional tools at the present time is considered less attractive to do and has resulted in gradually being abandoned. Especially in the field of Astronomy there are technological developments that have supported the use of more practical tools or instruments. One of them on *Sundial* or a sundial which is a simple instrument that can tell time using the concept of the sun's shadow. The use of this tool is very rare. Researchers conducted a search and managed to find related to this traditional tool, namely at some of the oldest mosques in Surabaya, namely the Qowiyuddin Jagir Mosque and the Jami' Peneleh Mosque in Surabaya. The two mosques still use the classical device to determine the start of their prayer times, namely by using the Sundial. Both the Qowiyuddin Jagir Mosque and the Jami' Peneleh Mosque in Surabaya have their own mention of the Sundial they use. For example, the Qowiyuddin Mosque calls it Pandem, while the Jami' Peneleh Mosque calls it Bencet. Based on that, the researcher wants to dig deeper into how the development of the use of Sundial or Pandem or Bencet in the surrounding community, especially at the Qowiyuddin Jagir Mosque and the Jami' Peneleh Mosque in Surabaya. With this research it is hoped that it can become a source of knowledge related to the development of the use of Sundial itself.

**Keywords:** Sundial; *Pandem*; Mosque.

### **1. INTRODUCTION**

*Sundial* or sundial is one of the many astronomical instruments used as a timepiece or clock based on the position of the sun. The working principle of the Sundial instrument is to utilize the apparent motion of the Sun which causes the position of the Sun to observers on Earth to move in an apparent way throughout the day. Over time, the position of the sun gradually changes, causing the time indicated by the shadow of the sun to change. The sundial itself basically functions as a timer, especially to determine the start of the prayer time.

Along with the passage of time, the existence of the sundial or sundial as a medium for determining time is gradually being abandoned and replaced. This is inseparable from the increasingly advanced science and technology that exists at this time. With this progress, new tools, instruments or devices that are much more sophisticated and practical can be used to determine time easily and quickly. Examples include digital clocks, wall clocks, watches, or even clocks on cellphones, and many others.

In its development, people used to be more familiar with the term Sundial with another name, namely Bencet. These bruises are often found in front of ancient mosques such as the Great Solo Mosque, the Demak Mosque and the Menara Kudus Mosque. Even though there are many and easy to find, in fact there are many Bencet that are only for display at this time, such as Bencet in Sunan Ampel Surabaya and Bahrul Ulum Islamic Boarding School in Sidoarjo. However, there are also several mosques that are still actively using the instrument today, as in the Al-Mahfudz Seblak Diwek Islamic Boarding School, Jombang and also the Tegalsari Laweyan Mosque, Surakarta.

Some of the Bencet in these mosques are thought to have been made since the 1900s, some of which are even hundreds of years old. However, there are also a number of bencets that have recently been made, for example the one at the Al-Mahfudz Seblak Diwek Islamic Boarding School, Jombang.

As for the places that the researchers found from the searches carried out, namely in the area around the Qowiyuddin Jagir Mosque, the people call Sundial as Pandem. Meanwhile at the Jami' Peneleh Mosque in Surabaya, he knew Sundial by the name Bencet. All of these instruments



were used by the previous pious scholars to determine the start of the prayer time at each of these mosques. Where the use of Pandem and Bencet over time has become a culture and habit that has been passed down from generation to generation by the people around the Qowiyuddin Jagir Mosque and the Jami' Peneleh Mosque in Surabaya. Even though at this time a variety of sophisticated and practical tools are available and easily found everywhere, but it is not impossible that there are still those who still use and utilize the Sundial or Sundial or Pandem or Bencet to determine the time, especially regarding prayer times, for example at the Qowiyuddin Jagir Mosque and the Jami' Peneleh Mosque in Surabaya. Therefore, researchers want to examine the ins and outs and how far the development of the use of Sundial / Bencet / Pandem in the surrounding community, especially at the Qowiyuddin Jagir Mosque and the Jami' Peneleh Mosque in Surabaya.

### 3. DISCUSSION

#### 3.1 Sundials

Etymologically, Sundial comes from the English word "sun" which means sun and "dial" which means plate.(Qulub, 2017, p. 129)Meanwhile, in Sundial Arabic it is better known as Mizwalla or as-Sa'ah ash-Syamsiyah.(Atabik and Ahmad Zuhdi Muhdlor, 2004, p. 1036)The sundial, also known as the sundial, was first discovered by archaeologists in Egypt and Babylon. Archaeologists also estimate that the obelisk-shaped Sundial (monument) existed around 3500 BC and also a shadow clock around 1500 BC.(Qulub, 2017)It was also in Egypt around the 15th century BC that the oldest sundial was found during the time of Thutmosis III, where the sundial consisted of two pieces on a stone that served as a needle and a clock line. The Sundial is also equipped with a pendulum which functions as a tool to measure the flatness of the Sundial itself.

Meanwhile, in Indonesia the Sundial is known as the Bencet, which is a simple device made of cement, wooden sticks or the like modified in such a way and placed in an open place to be exposed to or get sunlight.(Khazin, 2005, p. 12)The Bencet in Indonesia is usually used to find prayer times, true solar time, Syamsiyah date, and pranotomongso so that the dial has the angle of the sun, the north-south line, the sign of the sun's position (season), the analemma, and the asr timeline.

*Sundial* or what is also called a sundial is a device that is used as a local apparent time indicator that uses the sun to produce the shadows of the gnomons. The most important components of a Sundial instrument are the gnomon and the dial area. Gnomon is a tool component that functions as a sun shadow on the dial to indicate time. The gnomon can be set based on the dial surface, which is either parallel to the dial surface, perpendicular to the dial surface, or pointing to the celestial pole depending on the type of sundial.(Azhari, 2008, p. 105)While the area of the dial is where the sun's shadow falls, this component is in the form of a disc or plain on which the hour numbers are written.(Jannah & Rohmah, 2019, p. 135)Later the gnomon's shadow will point or point to the hour number.

In its development Sundial is divided into 3 types, among others; a) Equatorial Sundial, b) Vertical Sundial, c) Horizontal Sundial.(Riza, 2018, pp. 9-14)The various Sundials have different types, characters, and concepts but are still related to each other. Apart from that, there is also a Bencet which is a modification of the three Sundial models. Even so, it should be noted that the majority of Bencet have a shape that almost follows the Sundial Horizontal because the dial is horizontal. However, the difference between the Bencet and the Sundial Horizontal lies in the gnomon, where the gnomon Bencet does not tilt and forms a latitude angle like the Sundial Horizontal in general. So that this modification is more similar to the Sundial analemma.(Qulub, 2017)Besides that, there is also a Bencet which is made with gnomon placed on top of the dome of the mosque, namely in the form of a hole in the roof or dome, where later the sunlight that falls on the inner floor of the mosque is likened to functioning as a dial which will indicate the time of prayer.(Qulub, 2017)Such a model or concept of Bencet can be found at the Sunan Ampel Mosque in Surabaya and the Tegalsari Laweyan Mosque in Surakarta.

The functions of Sundial include:

- As a timepiece
- As a prayer time indicator



- As a medium for determining the Qibla direction
- As a sign of the season

### **3.2 Overview of the Qowiyuddin Jagir Mosque and the Jami' Peneleh Mosque in Surabaya**

The Qowiyuddin Mosque is the oldest mosque in the South Surabaya area, where this mosque was built in 1786. The Qowiyuddin Mosque has an area of 13 square meters with a size of 117 meters x 9 meters. (The History of the Qowiyuddin Mosque in Jagir Wonokromo Surabaya Founded by the Descendants of Sunan Gunung Jati - Surya Travel, nd) The mosque is located at Jalan Jagir, Kec. Wonokromo, Surabaya was founded by Mbah Qowiyuddin who is the 7th (seventh) descendant of Sunan Gunung Jati. Similar to Sunan Gunung Jati, Mbah Qowiyuddin is also a prominent scholar in the Cirebon area. Apart from being a prominent scholar, Mbah Qowiyuddin was also famous for his intelligence in formulating war strategies. For his intelligence and ability, Mbah Qowiyuddin became one of the scholars who the Dutch greatly feared during the Dutch colonial period in Indonesia. Because being a fugitive from the Dutch required Mbah Qowiyuddin to flee from Cirebon, he did this by drifting the wood into the sea where the wood finally stopped at the Brantas River (Rolag) in Surabaya. After successfully escaping from the pursuit of the Dutch, finally Mbah Qowiyuddin continued his preaching by building a mosque right where the wood he had washed away stopped. At first, the Qowiyuddin Mosque was built right at the floodgates of the Brantas River (Rolag) in Surabaya. However, during the Dutch occupation, the mosque had to be moved to Jalan Jagir permanently, due to the construction of irrigation canals by the Dutch government. It is said that the transfer of the mosque was carried out by Mbah Qowiyuddin himself by lifting it up, with Allah's permission the mosque was finally lifted. during the Dutch occupation the mosque had to be moved to Jalan Jagir permanently, due to the construction of irrigation canals by the Dutch government. It is said that the transfer of the mosque was carried out by Mbah Qowiyuddin himself by lifting it up, with Allah's permission the mosque was finally lifted. during the Dutch occupation the mosque had to be moved to Jalan Jagir permanently, due to the construction of irrigation canals by the Dutch government. It is said that the transfer of the mosque was carried out by Mbah Qowiyuddin himself by lifting it up, with Allah's permission the mosque was finally lifted. (Hamza, n.d.) Since its inception, the Qowiyuddin Mosque has renovated or changed it three times. Even so, the original part of the Qowiyuddin Mosque (to be precise on the inside of the mosque) has been maintained and has not changed. (Hamza, n.d.) As for the wood that was washed away by Mbah Qowiyuddin and stopped at the Brantas river in Surabaya, it was used as the pillars of the 8 meter long mosque which has maintained its authenticity to this day. (Looking at the Qowiyuddin Mosque, the Relics of Sunan Gunung Jati's Grandson - Indrajatim.Com, nd)

The Jami Peneleh Mosque is the 3rd oldest mosque in Surabaya. (Prayodya, 2019) The mosque is located at Jalan Achmad Djais Gang Peneleh V No. 41, RT. 06 / RW.03, Peneleh Village, Genteng District, Surabaya. It is estimated that it was built around the 1400s. The history of the Peneleh Mosque began when Sunan Ampel stopped by the Peneleh area via the Kalimas River (at that time it was the largest water transportation route). The Peneleh area is a stopover for Sunan Ampel because this area is the area closest to the water transportation route, having previously made a short stop at the Kembang Kuning area. The arrival of Sunan Ampel in the Peneleh area was also to spread the teachings of Islam, one of which was by establishing the Jami' Peneleh Mosque and establishing a boarding school located right next to the mosque. It is said that before establishing the mosque, (Peneleh As Surabaya Old Village 3\_The Meaning of Village Names and Existence of the Sunan Ampel Heritage Mosque. Radar Surabaya. 13 May 2019. Pg. 3. Chrisyandi. Lib - Library, nd) Initially, the Jami' Peneleh Mosque could still be seen from across the Kalimas River, but over time the Jami' Mosque area was increasingly covered by the new buildings around it, causing the mosque area to become a densely packed environment. (Prayodya, 2019) In its development, the Jami' Peneleh Mosque has renovated and expanded the building 3 times, namely in 1800, 1945 and 1970's.

### **3.3 Sundial Development at the Qowiyuddin Jagir Mosque & the Jami' Peneleh Mosque**

Apart from being one of the oldest mosques in South Surabaya, the Qowiyuddin Mosque is also one of the mosques that has a culture of using Sundial or Bencet to determine the start of



the prayer time. The term Sundial is better known by the people around the Qowiyuddin Mosque as Pandem. The Pandem is also one of the legacies of Mbah Qowiyuddin which was passed on to his children and grandchildren and its citizens. Pandem, which is located right in front of the courtyard of the Qowiyuddin Mosque, is estimated to have existed hundreds of years ago more or less simultaneously with the establishment of the Qowiyuddin Mosque. The position or location of the Pandem is still the same and has not changed since it was first built until now. (Hamza, n.d.) Mbah Qowiyuddin taught the use of Pandem directly as a medium for determining the start of prayer times, especially the Dhuhr and Asr prayers. Where when entering the Dhuhr and Asr prayer times the mosque administrator will check the accuracy of the initial prayer times using Pandem. However, unfortunately the culture of using Sundial or what is better known to the people around the Qowiyuddin Mosque under the name Pandem to determine the start of this prayer time, for the last 3 years Pandem has rarely been used anymore. This happened after the person who had knowledge of using Pandem had died. Apart from that, it is also due to the lack of current Qowiyuddin Mosque administrators who are able to operate the Pandem consistently. (Hamza, n.d.) Even though it is rarely used anymore, the Pandem in the Qowiyuddin Mosque can still function and be well maintained by the mosque management.

Similar to the Qowiyuddin Mosque, the Jami' Peneleh Mosque also has Sundial heritage. The people around the Jami' Peneleh Mosque are more familiar with the term Sundial as Bencet. (Amiruddin, 2022) However, it is very unfortunate that the Bencet at the Jami' Mosque has never been used since the caretaker or person who controlled the Bencet died. In addition, the existence of buildings or buildings around the mosque makes Bencet which is located in front of the Jami' Mosque less exposed to sunlight because it is blocked by buildings or buildings, which greatly hinders the use of the Bencet itself. Now, the Bencet in front of the mosque area is stored in a special container that is permanently locked. According to the management of the mosque, the Bencet at the Jami' Peneleh Mosque is very rare and almost never reopened due to the lack of mosque administrators who are able to use the Bencet. Therefore, (Amiruddin, 2022)

#### 4. CONCLUSION

*Sundial* or sundial is a simple instrument that can tell time based on the shadow of the sun. Sundial on the development of the surrounding community, especially at the Qowiyuddin Jagir Mosque and the Jami' Peneleh Mosque in Surabaya, is more familiar with names such as Pandem and also Bencet. Even though they are known by different names, both Sundial, Pandem and Bencet are actually still related to each other, it's just that there are several modifications in their manufacture and use.

The development of the use of Sundial or better known by the local community as Pandem at the Qowiyuddin Mosque has become a habit that has existed since Mbah Qowiyuddin founded the mosque. Mbah Qowiyuddin taught the use of Pandem in determining the start of prayer times, especially Dhuhr and Asr, taught directly by Mbah Qowiyuddin to his children and grandchildren and his people and is still being used up to the last few years. However, it is very unfortunate that since the last 3 years the use of Pandem has begun to be rarely used. This is because people who have Pandem knowledge have died, and the lack of management of the Qowiyuddin Mosque who are proficient and consistent in using Pandem. Meanwhile, the use of Sundial or Bencet at the Jami' Peneleh Mosque has been taught by previous scholars. However, after the death of the caretaker, the use of Bencet in the Jami' Peneleh Mosque is increasingly disappearing. The administrators of the Jami' Mosque and local residents prefer to lock the Bencet permanently, and now the Bencet is only a display of the remains of the former pious scholars.

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