

WARM WATER POOL SYSTEM SIMULATION: DESIGN AND MANUFACTURE

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Abstract. Human development and national competitiveness is one of the flagship programs from The Indonesian Government. Bali as one of the best tourist destination in the world is required to have an international standard tourism infrastructure. A swimming pool in a tourism accommodation is a standard facility in a tourist infrastructure. There are several types of swimming pools i.e. public swimming pools and private pools. During its development and demand, private pools develop into swimming pools with additional facilities such as warm water, which is often called a jacuzzi. Another additional facility is added pressure to the water in completing massage, fragrance and foam. The swimming pool is one of facility designed to hold water to allow swimming or other recreational activities. Pools can be built in the ground or on the ground as a free construction or as a part of structure and also with a common feature or a free style design. In-ground pools are the most common pools made and constructed from materials such as concrete, natural stone, metal, plastic, or fiberglass. To support comfort and satisfaction when using the swimming pool, the adequate water level in the swimming pool will be maintained by system with several supporting devices such as pumps, dirt filters and maintained at a certain level. Other things that support water quality include temperature, water turbidity, color, odor, pH, chlorine content etc.

Keywords : design, swimming pool simulation, warm water

1. INTRODUCTION

Bali as one of the best tourist destination in the world which visited by many local and foreign tourists. In order to welcoming tourists, the facilities provided must be standard such and accommodation e.g. villas, hotels, spa, etc. where in these facilities will provide a standard facilities as well. One of these facilities is a swimming pool. The pool may consist of a large swimming pool for all hotel guests and small swimming pool for guests in more private villa. Today, there is also a swimming pool that uses warm water, so hotel guests can choose either regular pool or warm water. A swimming pool, wading pool, paddle pool, pond, or simply swimming pool is a structure designed to hold water to allow swimming or other recreational activities. Swimming pool can be built in-ground or on ground as a free construction or as a part of structure and also with a common feature or a free style design [1]. In-ground pools are most commonly constructed from materials such as concrete, natural stone, metal, plastic, or fiberglass and can be a special size and shape or built as a standard sizes while the largest being an Olympic-sized swimming pool.

To support the comfort and satisfaction of guests at the hotel, the hotel will design a safe and appropriate swimming pool for hotel guests according to a comfort location, environment and maintain the quality and quantity of the pool water. The water quality referred to water turbidity, color, odor, Ph, chlorine content and so on [2]. While the water quantity is the amount of water in the swimming pool at the level it should be, so there is no pool leakage or in the pool water circulation system which causes the water level to drop or completely run out.

To get the desired results, it needs knowledge and materials to maintain quality and quantity of pool water. These knowledge here is in the form of how the requirements for pool water standards, like how the actual pool water circulation and what kind of equipment needed to support the pool water circulation system and of course, different from the requirements for drinking water standards. And then, what materials are needed to maintain the quality of water and not to harmed the health of people who swim e.g. cause irritation to the skin or eyes. These knowledge must owned by a person who in charge of handling water treatment and water circulation systems and from that problem, the writer raised the title "Design and Build Simulation of Warm Water Swimming Pool".

2. METHODS

Research methods is explaining the operational definition of variables along with data measurement tools or how to collect data and data analysis methods. If the data measurement tool uses a questionnaire, it is necessary to include the results of the validity and reliability of the research instrument.

This research will be conduct with a simulation design of a warm water swimming pool system. The author carries out a simulation design of a warm water swimming pool system. This design discusses the components will be used for the warm water swimming pool circulation system and their function - each component of the warm water swimming pool circulation, manufacture and how to maintain the swimming pool.

The circulation system that will be used is skimmer system which is a simple swimming pool system for large and small swimming pool and suitable as a tool / simulation. This system is assisted by a skimmer, main drain, jet holes as an inlet, a heater as a water heater and a sand filter that helps to maintain water quality. Figure 1. shows how the system will be made.

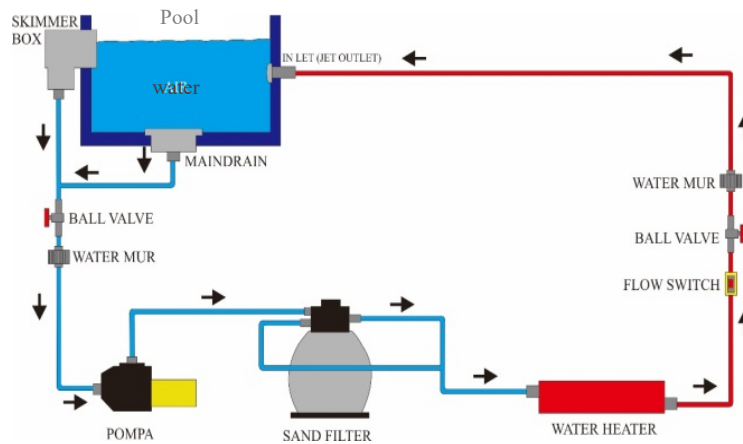


Figure 1. Design of the system

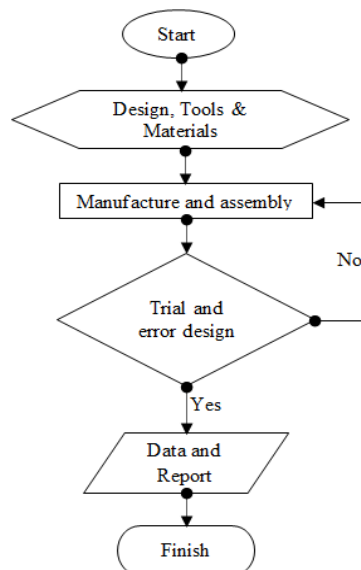


Figure 2. Research flow diagram

The way of this system works is that the water will be pumped by a circulation pump where the suction part is on the skimmer where the water impurities float on the surface of the water and will enter this channel. The heavy dirt under the pool will be sucked up by the main drain. And then the water will be entering the circulation pump and will be pumped into the sand filter to be cleaned by circulating it in the sand filter box. In this device, the water will circulate together with sand and the dirt will be tight in the sand. The water will flow to the water heater, heated and then go to the jet hole as inlet water, back into the pool and thus the water will continue to circulate. The water heater will be heated the water until 32-33°C. For more clearly to see how it works can be seen at figure 2.

3. RESULTS AND DISCUSSION

3.1 Results

The result of this design is a swimming pool simulation tool which later can be used as practical material for Mechanical Engineering students at Bali State Polytechnic as a provision before they do internships at hotels or any other accommodation who had a swimming pool. From the design carried out, after working less than 3 months, the results are:

Table 1. Design result

Tool's Name	Dimension (mm)	Function	Remark
Pool mounting	1250 x 1250 x 315	Mounting of the pool	
Pool's tool mounting	1130 x 1300 x 200	Mounting of the tool's pool	
Pool simulation	Ø 1080, H 360	Water tank	Vol: 1.280 Ltr
Circulation pump	¾ HP, 550 watt	Circulating pool water	Hayward
Sand Filter	Ø 355, H 726	Pool water filter	Emaux 350 ; sand 20 kg
Water heater	Ø 250, L 1000	Heating pool water	3600 watt
Main Drain	Ø 150	Outlet water	Emaux 2"
Skimmer Box	Ø 200	Outlet water	Emaux 1"
Jet Outlet	Ø 100	Inlet water	Emaux 1 ½"
Temperature gauge	Ø 100	Water Temperature	



Figure 3. Design Result

3.2 Discussion

After the design has been completed, it is continued to test the simulation pool system. At this stage the tool functions properly and is followed by data retrieval. Water content testing is carried out using a water tester as it is commonly used in pool water tests. From the initial test, it appears that the Ph level shows a value of 7.8 - 8.2 and the HCL level shows a value of 1.0 - 1.5, as shown below.



Figure 4. Data water initial

According to the Regulation of the Minister of Health of the Republic of Indonesia [1] which applies where the addition of chlorine in 1m^3 of pond is added as much as 2.5 grams. It means when pool volume is 1.28m^3 then it is added as much as 3.2gram and for 100m^3 is added 1 litre of HCL. From the data that has been collected for 10 days and taken at the same time (10.28 AM, 11.38 AM and 02.06 PM) tables and graphs can be made as below.

Table 2 Data of testing

Temperature	Ph	HCL
28.30	7.67	0.87
28.70	7.80	0.87
29.53	7.40	0.73
30.97	7.80	1.00
30.97	7.80	0.60
31.13	7.80	1.00
31.16	7.67	0.87
32.57	7.80	1.00
32.80	7.60	0.80
33.00	7.50	0.94
33.67	7.50	0.90

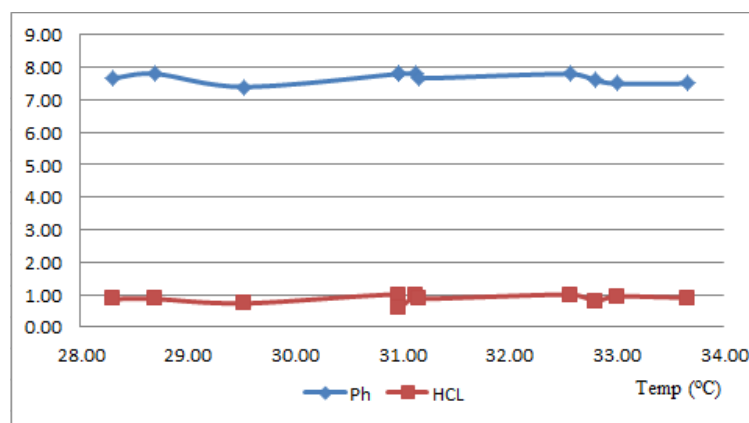


Figure 5. Data of testing

From the graph above, it can be said that the average Ph is 7.72 where the value is slightly above the normal limit. For chlorine levels it has not met the requirements too, where the average chlorine content for 7 days is 0.87, 0.3 point less than the ideal value that must be met.

According to the results of interviews we conducted with several people who had an experience in pool maintenance, the Ph and chlorine levels in the swimming pool are strongly influenced by the initial water conditions. Other things that affect are:

- a. The intensity of using the pool
- b. Number of pool users
- c. Pool layout
- d. Pool environment e.g. plants, wind, intensity of the sun
- e. Time for cleaning and administering pool drugs
- f. As well as the medicinal quality of the pool

4. CONCLUSION

From the results and discussion above, several conclusions can be drawn in the process of designing a heated swimming pool simulation, such as:

1. The process of designing a swimming pool is a lesson for students before his/her internship.
2. Increasing the number of pool drugs is a new knowledge / provision for students before doing his/her internship
3. Environmental temperature (intensity of the sun light) has a major effect on water conditions in the swimming pool.

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