

**Low-Cost Steam Sauna Development with Local Materials
and Natural Aromatherapy**

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Abstract

The objective of this study is to design and construct an affordable and accessible steam sauna for the general public. The sauna design employs locally sourced and cost-effective materials, including PVC pipes, plastic heaters, and fabric cabinets. The sauna is heated by an electric water heater, while the aromatherapy is derived from Indonesian spices, including cinnamon, vanilla, and cloves. The dimensions of the sauna are 75 cm x 75 cm x 120 cm, with a water capacity of 2 L and a duration of use per session of 15 to 20 minutes. The findings of the study indicate that the design of the steam sauna is cost-effective, with an estimated cost of approximately Rp350,000. This figure is considerably lower than the estimated cost of constructing a conventional sauna, which typically ranges from Rp2,000,000.00 to Rp35,000,000.00. In conclusion, the findings of this study indicate that the concept of a cost-effective and easily constructible sauna design is a viable proposition.

Keywords: Sauna, Low-Cost, Local Materials, Aromatherapy, Innovation

A. Introduction

There is a growing interest among the general public in pursuing a healthy lifestyle through relaxation techniques. One common form of relaxation is sauna. Sauna, a long-standing thermal therapy method, offers a plethora of health benefits, ranging from muscle relaxation to enhanced immune system functioning. A sauna is a heated and dry room designed to facilitate the release of sweat and the burning of more calories. During a sauna bath, the temperature is typically maintained between 80 and 100 degrees Celsius, with humidity levels kept at a minimum of 10 to 20 percent, which is significantly lower than the humidity levels in a typical guest room, which range from 45 to 65 percent (Olsson, B., 2018).

Home Spa: Creating Your Own SPA Experience with Aromatherapy The Rain Coast region is notable for its unique characteristics. The sauna process involves a series of brief sessions (5-20 minutes) in a heated room, interspersed with cooling procedures involving cold water (Judith White, 2007). The temperature in a steam sauna is typically between 70 and 90 degrees Celsius, with a relative humidity of 25 to 39 percent, achieved through the use of a heat source connected to an electrical supply. Steam and herbal saunas are more suitable for a broader range of individuals due to their lower temperatures, which range from 45 to 65 degrees Celsius (Pawłowski, J., 2015).

Nevertheless, the lack of access to modern, high-end sauna facilities represents a significant obstacle for a considerable proportion of the population. Furthermore, the use of chemical substances in commercial sauna products has been identified as a concern due to the potential adverse effects on the environment and human health.

In light of the discrepancy between the public's need for affordable sauna facilities and the limited availability of such amenities, this study aims to develop a more cost-effective and environmentally sustainable model of steam sauna. The proposed design for a simple sauna is intended to utilize readily available materials and employ a straightforward yet effective operational system, while maintaining the desired level of benefit.

The present study will be limited to the development of a small-scale prototype sauna for individual or community use. The research scope encompasses material selection, design planning, prototype fabrication, performance testing, and assessments of user comfort and safety. The present study does not include an in-depth analysis of the economic and social impacts of the development of low-cost sauna units.

The development of low-cost steam saunas using locally sourced materials and natural aromatherapy is an attempt to address the challenges of accessibility and sustainability in the healthcare and wellness industry. It is the objective of this study to develop a cost-effective sauna model that offers an authentic and beneficial sauna experience. Consequently, the general public will be able to more readily enjoy the benefits of sauna without having to bear a significant financial burden. Moreover, it is hoped that this research will encourage the utilisation of local resources and reduce reliance on imported products, thereby contributing to sustainable development.

B. Literature Review And Hypothesis Development

A sauna is a room utilized for the purpose of steaming the body with a high temperature and low humidity. The temperature of a sauna is typically within the range of 70–100° Celsius. The benefits of sauna use include relaxation, detoxification, and improved blood circulation. Moreover, research indicates that sauna use may facilitate the alleviation of muscle pain, enhance immune system function, and reduce blood pressure. Previous research on sauna therapy was conducted by Cendekia Airedeta Mulianda et al. (2017). The prevention of obesity or overweight can be achieved through therapeutic or medical interventions. The human sauna treatment is conducted at a temperature of 82°C, which is twice the normal human body temperature of 37°C. This temperature is therefore optimal

for the human body. Sauna for relaxation is recommended one to two times per two weeks, while sauna therapy for obesity is recommended one to two times per week. The recommended temperature for the sauna is 180°F (82°C), with a treatment duration of approximately 15 to 20 minutes per session.

The use of portable saunas with or without music for postpartum blues therapy in new mothers has been investigated by Titin Apriyani (2022). The findings suggest that combining portable saunas with music is more effective than using them separately in postpartum blues therapy, as indicated by a greater reduction in EPDS scores.

The study conducted by Azizha Mulhtazam Sudding and Fransisca Chondro (2024) revealed a correlation between the use of different types of saunas, the duration of sauna use, and the frequency of sauna use and the level of stress experienced by the pre-elderly and the elderly. (Nyang Vania A. H. et al., 2024) elucidated that three individuals, who were previously diagnosed with hypertension, exhibited a reduction in blood pressure after entering the sauna. However, six individuals exhibited elevated blood pressure following steam bathing. This is attributed to the fact that the body temperature at the outset of the steam bathing session is typically lower than that of the sauna environment. It is also important to note that the use of spices in saunas provides not only deeper relaxation but also a range of health benefits. The use of spice aromatherapy has been demonstrated to have a calming effect on the mind, a relaxing effect on the body, and a healing effect on the body.

In addition to its use as a therapeutic aroma and herbal beverage, rempah-rempah can also be utilized as a culinary spice and food processing ingredient. As demonstrated by Erfah Hikmatulloh et al. (2017), providing information regarding the benefits of spice knowledge in both preparation and processing is a valuable contribution to the field. Examples of food products that utilize spices include Indonesian salads, soups, and soups. Moreover, the development of herbal beverage productivity through granulation, equipped with ultraviolet pasteurization, has been conducted by Sutrisno et al. (2021) to enhance immune system function.

Furthermore, as outlined in the study by Bulkia Rahim et al. (2023), spices can be utilized as medicinal agents. Additionally, spices can be utilized as therapeutic aromatherapy and as herbal beverages that promote health and well-being, including ginger, lemongrass, turmeric, and other such preparations. This approach was previously employed by Lutfi Syauki Faznur et al. in their publication, wherein they utilized spices as ingredients in herbal

beverages, specifically the sipopon jamu. The sipopon jamu has been demonstrated to enhance immune system function. The spices utilized in the preparation of jamu sipopon include ginger, turmeric, galangal, lemongrass, and cinnamon. The benefits of spices include, for example, ginger, which can relieve muscle pain and improve blood circulation, and turmeric, which has anti-inflammatory and antioxidant properties beneficial for the skin. Furthermore, turmeric, ginger, and cinnamon can enhance the immune system due to their high antioxidant content, which helps to combat infection and maintain immune function.

As can be seen from the above explanation, there are a great many beneficial effects of spices on human health. The benefits of these spices when used in a sauna include relaxation and mental calm, improved respiration, increased blood circulation, improved skin health, and detoxification of the body.

One of the current issues is that the production of saunas is a costly process. Consequently, the objective of this study is to design an economically viable sauna. Given the numerous benefits of sauna use in terms of health, this study aims to develop an affordable, locally-sourced steam sauna with natural aromatherapy to make it accessible to a wider population.

C. Research Method

The present study was conducted at the Integrated Laboratory of the Nahdlatul Ulama Institute of Technology and Science in Lampung from June to July 2024. The objective was to devise a simple sauna apparatus utilising distinctive Indonesian spices as the primary components. The primary variable of interest in this study is the development of a simple sauna apparatus that can be utilized by the local community with readily accessible materials and technologies.

The research methodology employed entailed the initial preparation of the requisite tools and materials. The initial stage of the production process of the Indonesian sauna is the creation of a therapeutic steam aroma, which comprises cinnamon, vanilla, and lemongrass. The use of spices to create a therapeutic steam aromatherapy results in the relaxation of the user. Subsequently, the preparation of the heat transfer medium, namely the water heater, is undertaken. This will be the material used to transfer the heat generated by the Indonesian traditional spices. A water heater is a material that is capable of generating heat energy when subjected to alternating current.

Table 1. provides a detailed account of the costs associated
with the essential components of a simple sauna.

PROCEEDING Al Ghazali Internasional Conference

Volume 1, Desember 2024

No.	Nama Alat dan Bahan	Harga Barang
1.	Pipa PVC Rucika 16 mm	Rp. 28.000
2.	Water Heater	Rp. 112.000
3.	A wardrobe for textiles	Rp. 170.000
4.	Rempah-rempah	Rp. 40.000

The subsequent phase is a sauna constructed from a fabric-covered wardrobe, a design element commonly observed in local residences. The material is employed as a steam bath or sauna. A thermometer is employed to regulate the temperature of the sauna. The use of polyethylene piping serves to facilitate the transfer of energy between the water heater, the sauna room, and the electrical power conduit. The operational principle of the apparatus is as follows: the heating element will heat the water to a temperature of 85°C and maintain it at 80°C, with the objective of ensuring that the water does not rapidly deplete, thereby producing the maximum quantity of hot steam. The heated steam generated by the heater is utilized to warm the sauna room. The process is continuous throughout the duration of sauna usage. The proposed design for the sauna apparatus is illustrated in Figure 1.

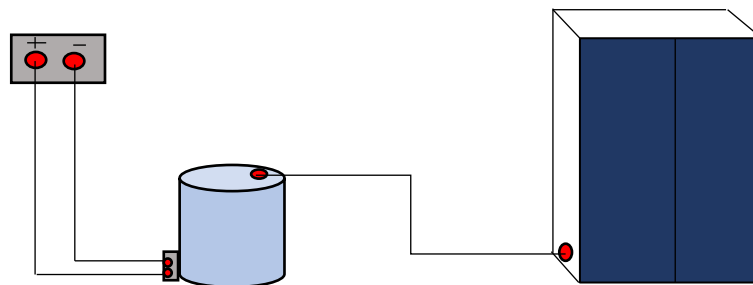


Figure 1. Proposed Schematic of a Simple Sauna Construction

The initial stage of the testing process entails the preparation of the essential oils that will be utilized as therapeutic aromas. The subsequent stage is the preparation of a water heater. Subsequently, the previously dried spices are introduced into the heating apparatus, accompanied by the requisite quantity of water. Once the water has reached its boiling point, the resulting vapor will flow into the sauna chamber. The final stage of the process is to conduct a trial with the practitioners. It is recommended that the practitioner enter the sauna chamber to undergo the process of steam bathing and inhale the aromatherapy steam that has been introduced into the water heating apparatus. The sauna bathing process involves the evaporation of water from the body for a period of 15 to 20 minutes within the sauna chamber.



Figure 2. The assembly of a basic steam sauna apparatus

D. Discussion

The objective of this study was to design and construct an affordable, effective prototype sauna. The utilisation of locally sourced materials, including plastic pipes, plastic water heaters and fabric wardrobes, has resulted in a notable reduction in production costs. The cost of the prototype sauna is approximately Rp350,000, which is considerably less than that of a conventional sauna.

The testing results demonstrated that the sauna apparatus was capable of generating an optimal temperature for sauna therapy, reaching approximately 80°C. The temperature is obtained through the regulation of the water heating temperature, which is integrated with the sauna room. Furthermore, the humidity of the air within the sauna room is maintained at an optimal level, thereby providing a comfortable sauna experience. The aromatherapy scents used are distributed evenly throughout the room, providing optimal relaxation. The use of natural aromatherapy ingredients in this sauna apparatus offers several advantages. Firstly, the therapeutic aromas derived from herbs provide a more natural and safer relaxation effect than synthetic chemical compounds. Secondly, the abundant availability of essential spices in Indonesia makes the production of this sauna apparatus more economically viable.

In comparison to previous research, this study has several advantages. Firstly, the utilisation of natural materials as a source of therapeutic aromas represents a novel approach that has not been widely explored in previous sauna research. Secondly, the more straightforward and readily reproducible design of the apparatus permits its mass

production at a more economical cost. However, the present study is not without limitations. One limitation of the device is the restricted capacity of the sauna, which allows for use by a single individual during a single session. Moreover, the long-term efficacy of this sauna apparatus has yet to be evaluated, both in terms of its impact on user health and the durability of its constituent materials.

In conclusion, the research demonstrates that low-cost steam saunas can be constructed using simple materials and accessible technology. Although further improvements are necessary, the prototype sauna has significant potential for further commercial development. Further research should concentrate on optimising the design, selecting superior materials, and developing more precise temperature control systems.

E. Conclusion

The objective of this study was to ascertain whether a simple Indonesian spice sauna could be a cost-effective alternative for those seeking to enjoy the benefits of sauna therapy. The findings indicate that this approach has the potential to be an appealing option for many individuals. The straightforward design and use of natural materials facilitate the production and maintenance of the apparatus. Nevertheless, further research is required to enhance the sauna room capacity and evaluate the long-term efficacy of the sauna apparatus.

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