

DESIGN AND CONSTRUCTION OF A MOBILE CLAY DRYER

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Abstract

The design and construction of mobile clay dryer is very important and is one of the most dynamic matrix in clay preparation that vintage the most desired ceramic wares that are aesthetically commendable. As such, every potter is expected to understand the clay drying process either through mechanical or local means. Most alluring ceramics works have been prone to the challenges of having cracks and warping, and one of the greatest way to douse this problem and ascertain expected outcome during the production of ceramics wares can only be gotten through a proper knowledge of using clay dryer and it drying techniques without minding the polygonal and difficult processes we have recently realised that mobile clay drier contributes largely to reduce the delay in the production of ceramic wares. To this end, this paper therefore posit that the mobile clay dryer helps the clay dry fast and is very important and should be owned by every institution, individual, or corporate affairs running ceramics studio to facilitate production of alluring wares. To encourage the effectiveness of this study, we also looked at the importance of plaster of Paris (POP) in the process of fabricating clay drier. The study employed the Design theory as theoretical framework. The participant observation capacity was assumed for methodology. While to encourage effective documentation, the library, prints and electronic media were consulted. For conclusion the study concludes that the mobile clay drier is very important. It gives the artist

leverage to move the clay from one position to the other to ascertain fast dry when drying is required.

Keywords: Mobile, Clay Dryer, Ceramics, Production.

Introduction

Generally, the basic raw material we know, needed for making of ceramic wares; is clay. Clay is a natural product of the earth which can be molded, pounded, rolled, flattened, coiled, cut or extruded. In ceramics clay dominates. As such, it is the domineering function of the clay substance that inspired the exploration of more materials and tools for its preparation to enhance the effective production of ceramics wares. One of these media explored in this study to enhance the effective production, in the area of ceramics is the mobile clay dryer. As a matter of fact, scarcity of prepared clay which result from delay in the preparation (usually wet clay sieving) is one of the major challenge facing almost all the ceramic studios in Nigeria. However, it is a thing of interest to note that dewatering clay slip to the needed viscosity carries the heist percentage of the period of clay preparation and as well takes a very long time to be achieved. Hence this study therefore tends to explore the production of mobile clay drier that will help douse the challenges of clay drying process, as well help; also to facilitate the clay drying process.

Theoretical Framework

The theoretical framework that guided the documentation are the Design theory and Gestalt theory respectively.

Theories in art are assumptions, accepted principles of procedure based on limited knowledge to predict and explain the nature and forms of art works under scrutiny, (Oluoba, 2013:7). It is pertinent to note that art as a beautiful practice is dynamic and multi-layered and therefore can be seen from variety of perspectives (Petty, 2006:86). It is within the framework of these viewpoints that its analysis can acquire validity. Though no single theory can provide a comprehensive inquiry of the classification and nature of the work, a suitable theoretical framework is nonetheless not only necessary but imperative.

Design theory

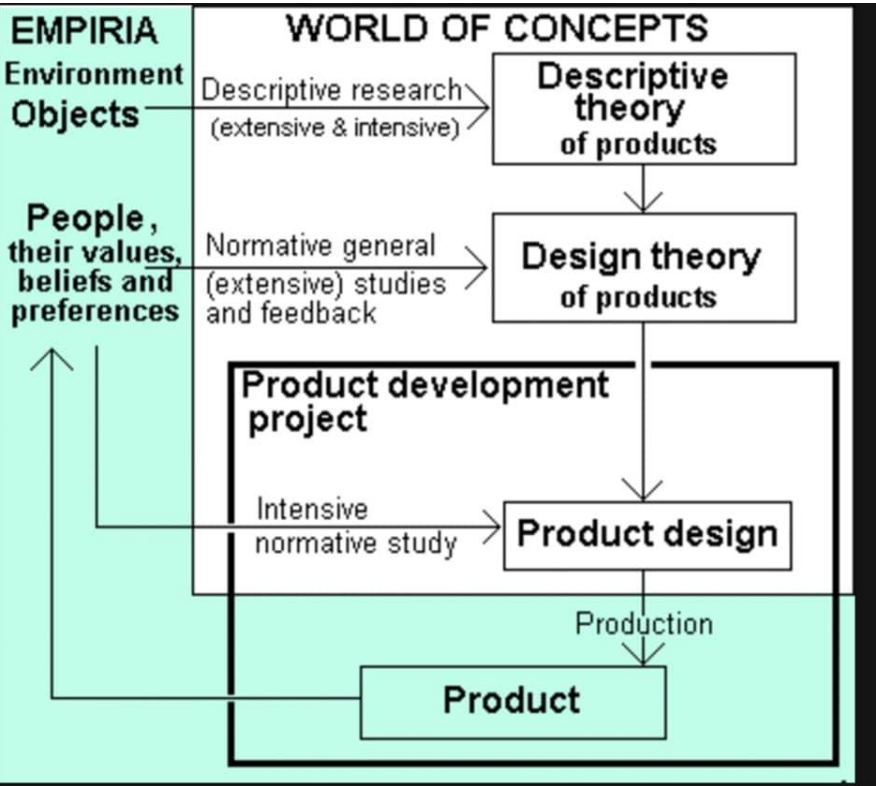


Fig. 1. Model of Design theory

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Design theory by Robert H. McKim in the 1950's involves the fundamentals and principles of creating visual communication and all types of art. It deals with how we see and perceive visual information, and separate ideas of style, taste and trend from the universal principles of aesthetics that are common to every person. It is foundational to the pursuit of design and construction, photography, illustration and visual arts in general. This common visual language connects designers and image makers from history to current day and continent to continent (Heldman, 1996:90).

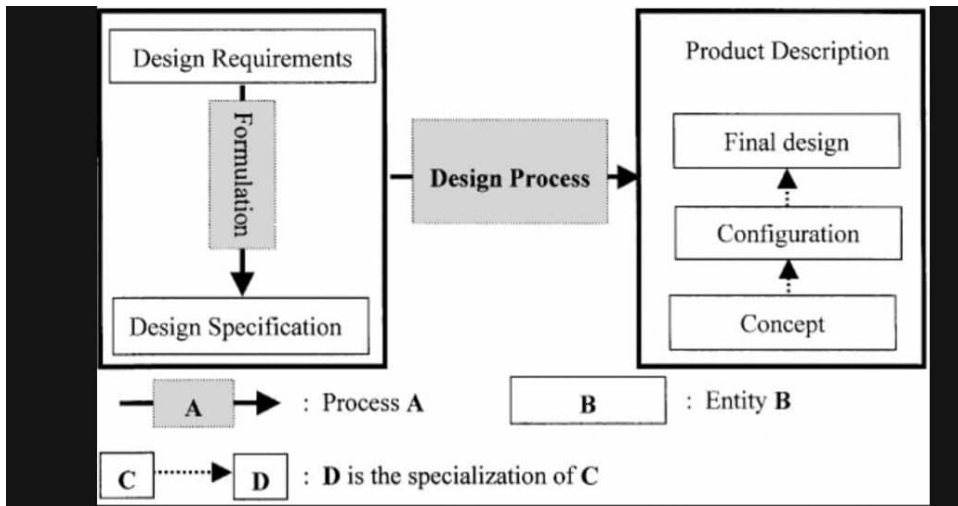


Fig. 2. Model of Design theory

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Design theory involves an understanding of the tangible elements including form, space, proportion, colour, scale, texture, structure (grid), composition, line, shape and volume and how to arrange them to achieve balance, rhythm, pattern, hierarchy, emphasis, and unity. Design theory, blended with a purpose or problem to solve, results in effective design solutions (Heldman, 1996:92). Markus (2002) take a more practical view of design theories, using these theories to explain the means– ends relationship as a practical, prescriptively causal mechanism to justify design components. The value of designers to their clients is the thinking and the ability to combine *form* (design principles) and *function* (the purpose of the design) to achieve an effective and pleasing result. Form and function as universally applied design concepts were first defined and formalized at the [Bauhaus](#), and have been the basis for good design ever since. Software has changed the design process and the way we work with design elements, but it has not changed the elements themselves (Wiley, 2002:18). The reason behind learning design theory is to make one become a Ceramic *designer* and not simply a Ceramic *technician*. When you understand the principles of balance, order, hierarchy, composition, structures, and the elements, colour, value, shape, space, scale, texture, etc. one will have the foundation to create effective, appropriate and appealing design, and be far more valuable to the arts than a “wrist” could ever be. Design theory suits this research work in that it is an engineering work where a dryer will be designed to cover a gap of time wasting drying

clay under the sun in ceramic production. It will solve the problem of space. Since it will be built outside, there will be enough utility ground for students to work on. In the designing of the work, scales shall be taken for proportion and balance. At the end, the dryer will be tiled for aesthetics and protection. The functionality of it covers effectiveness as it will meet its purpose of production. Though, the theory suits the work, it is not comprehensive enough to cover the research.

What is Clay

Clay is soft and earthy and often looks and feels like playing with mud. Unlike mud, which is largely soil and water, clay is a mineral substance made up of feldspar. Feldspar is a name given to a group of naturally occurring minerals containing varying amounts of potassium, sodium, calcium and/or lithium. It is the most abundant group of minerals in the earth's crust making up about 50% of all rocks (Moses, 2019).

The clay must be prepared to veer from any trace of sand, stones, metal scraps, plant materials, and all other impurities before using it during the production of any ceramic ware. Greg (2020) stated that clay is a natural material composed of clay minerals and sediments which, with the addition of a certain amount of moisture, becomes mouldable. This characteristic is called plasticity. The plasticity developed when clays are mixed with water is the result of the attraction forces on electrically charged lamellar particles of the clay mineral and the lubricating action of water between these particles. For Blend 2009, the clay is then mixed with water and thoroughly pounded to remove air bubbles thereby making it smooth and more plastic, because when plastic, clay will be easy to mould. The sand and air bubbles are removed to prevent the molded articles from cracking during the period of heating. After this, the freshly prepared clay is then used to mold different wares such as pots, cups, flower vase etc.

Justice (2015) noted plasticity develops when the clay-water system has enough water to cover the surface of the clay minerals with a film of oriented water molecules and several layers of non-oriented water molecules which acts as a lubricating medium, helping the sliding of the lamellar particles on top of each other when a tangential tension is applied. This means that water acts not only as an inert medium to separate the clay minerals particles, changing the attraction-repulsion forces among them,

but also causes plasticity to take place, guiding the lamellar particles towards the flow. As the oriented water molecules are attached to the surface of the clay minerals by hydrogen bridges, they also bond the clay mineral particles together in the wet (green) form of the clay body, giving rise to the various forms of the mechanical resistance of the green clay body. however, it is a thing of interest to note that this art and skill of using clay to mould articles is known as Pottery. The need to breakdown this process in this study stem from the fact that the study deals with the production of clay drier to enhance effectively; the production of ceramics wares that will no doubt project the producer's high creative prowess.

Clay Drier and Drying Process

The clay dryer is mainly used for the drying of various types of clay mud such as bentonite, kaolin, aluminium, and iron clay, and solves some problems of sticking, crushing, and drying. Dingli Group successfully launched the bentonite dryer according to this development direction. The bentonite dryer can adapt to various fuels such as coal, oil, gas, etc. At present, the fluidized boiler is favoured by users due to its convenient operation, energy saving, environmental protection, and easy purchase of raw materials. Some manufacturers also choose natural gas or coal gas generators for conversion, and the gas is burned for a second time to achieve the drying effect. It conforms to the country's policy of creating an environment-friendly and resource-saving society and is an environmentally friendly and energy-saving product that replaces traditional drying equipment (Scott 20121).

The drying system is mainly composed of a hot air stove, belt feeder, drum dryer, belt discharger, induced draft fan, cyclone dust collector, bag dust collector (or wet dust collector), and operation control system. The equipment adopts a downstream drying process, and its working principle is as follows: After the wet material enters the drying drum, it is divided into the following working areas: One is the guide area, where the mineral slag enters this area and contacts with the high-temperature hot air to quickly evaporate water, and the material is at a large lead angle When the material guide plate is moved, it is led to the next working area; the second is the plate cutting area, where the mineral slag is picked up by the plate to form a material curtain. At this time, the material is in full contact with the hot air, and the slag in the mineral slag The water evaporates and strips

into water vapour, and the water vapour is drawn away by the induced draft fan, so as to achieve the purpose of drying the mineral slag; the mineral slag is dried into a loose state with moisture less than 5% (or lower) in this area. After the heat exchange, the material reaches the required moisture state and enters the final discharging area; the third is the discharging area, where the drum is not equipped with a copy plate, and the material rolls and slides to the discharge port in this area to complete the entire drying process (Donatus, 2021). Haven explained the concept of clay, clay drier and its drying process in this study, we believe, the need for the production of clay drier has been ascertained.

Plaster of Paris and its Dynamic Role for The Production of Clay Drier

Scott (20121) noted that in pottery, plaster refers to a material commonly used for various purposes, including creating molds, drying pottery, and controlling moisture during the ceramic process. Plaster plays a crucial role in shaping and refining pottery objects. Here are two primary applications of plaster in pottery:

Mold Making: Plaster is extensively utilized in the creation of molds for pottery. It is poured into a mold frame that contains the desired shape or pattern. The plaster absorbs water from the clay, causing it to harden and solidify. Once the plaster mold is fully dry, the clay can be pressed or poured into the mold, allowing it to take the shape of the mold and facilitating the reproduction of identical pottery pieces.

Drying and Absorption: Plaster bats or plaster slabs are frequently employed in pottery to assist in the drying process. These are flat, porous surfaces made of plaster that absorb moisture from freshly formed clay objects. By placing the pottery on a plaster bat, excess moisture is drawn out from the clay, allowing it to dry evenly and gradually. Plaster also helps prevent warping or cracking during the drying phase (Scott 20121).

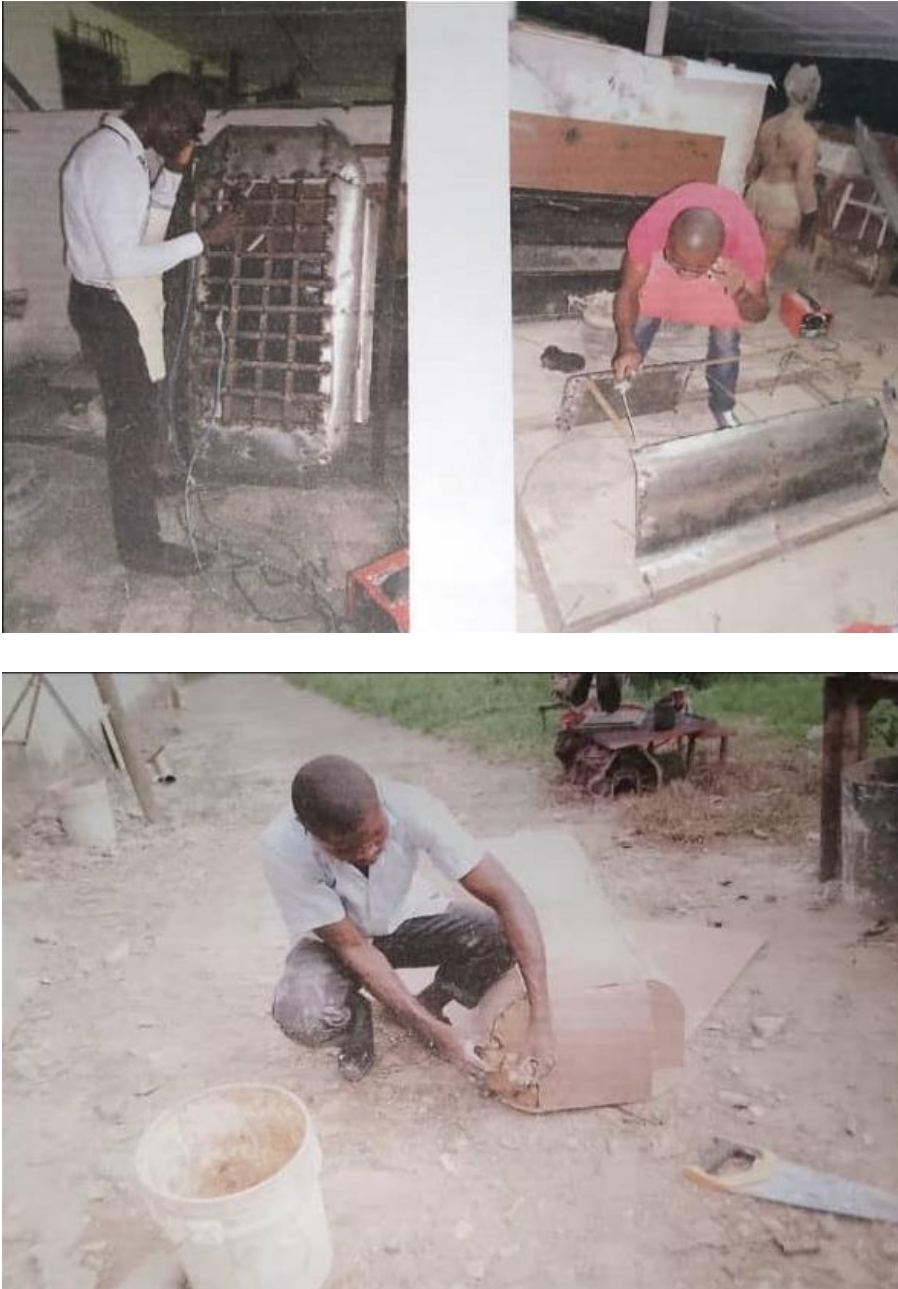
Moreover, plaster is utilized in other pottery techniques such as slip casting, where liquid clay (slip) is poured into plaster molds to create hollow forms. The plaster absorbs water from the slip, resulting in a layer of solidified clay on the mold's interior, which is then removed to create the final pottery piece.

Overall, plaster in pottery serves as a versatile material that aids in mold making, drying, and controlling moisture, enabling potters to achieve desired shapes, textures, and consistency in their ceramic creations.

The Need to Design and Construct a Mobile Clay Dryer.

The need to advise the design and construction of mobile clay drier was born out from the fact that; Over time, the clay drying process is very important and is one of the most dynamic matrix in clay preparation that vintage the most desired ceramic wares that are aesthetically commendable. Therefore, we feel that every potter is expected to understand the clay drying process either through mechanical electrical or local means but at least mobile by nature is very necessary. But most importantly, this study supports the usage of mobile clay drier to douse the delay in the clay drying process. Almost all the clay drier are not movable. They are kept one place in the studio and are worked upon without the climate or weather change which we feel that if the drier is moveable it could have been moved out of the sun believing that the heat from the sun will render a sharp and quick drying process. For example, a potter who wants to produce a ceramic ware in mass might need the help of sun light to summon it heat to the drier to facilitate quick drying. But if the drier is not movable, one has to wait until the drier dries and this may take a very long time; as such, a person who wishes to produce numerous works at a given time will end up being delayed. As a matter of fact, most alluring ceramics works have been prone to the challenges of having cracks and warping, as a result of not having enough patient to wait for the immovable drier to dry the clay. Therefor in this study we believe that if this mobile clay drier is been used,

It will serve a greater way to douse this problem and ascertain expected outcome during the production of ceramics wares. The images below shows the process and production of a mobile clay drier.



Conclusion

For conclusion, the clay material is the basic raw material, needed for making of ceramic wares. A proper preparation of the clay material yield, desired outcome as the appearances are best described as aesthetically commendable. And one of the best way the mobile clay drier is very

important. It gives the artist leverage to move the clay from one position to the other to ascertain fast dry when drying is required.

Recommendation

Here, we therefore recommend that ceramic artist should come to corroborate with science and technical institutions in Nigeria through the inspirations gotten from this study explore more on other dynamic means of clay drying process to enhance effective production of ceramics wares.

Contribution to Knowledge

We believe that this study will create new vaster for more media exploration in ceramics industries and also inspire innovative ideas on other areas of art.

Reference

- Densdale. A. (1953) Tr Brit.Cer.Soc 52, 614.
- Densdale. A. (1986). Pottery Science, Material, Processes and Products.
Ellis Wormwood, Britain.
- Glen N, (1971). Ceramics, University Of Minesota, Dulutti
- Greer, A. and Howell, W.H (1992) Mechanical Engineering Craft Bounty
Press. Nigeria.
- Henry, D. (1987) .The potters Alternative. Methuem, Australia.
- Moore, F (1959). The A.T.Green book, (1959, 2001, British Ceramics
Research Association
- Neal, F. (1972). Industrial Ceramics: Table Ware. Oxford University Press,
London.
- Ryan, W. (1978). Properties of Ceramic Raw Materials. Pergamum Press
England
- Savage, G. (1959) Pottery Through The Ages
- Umar, A. (2003) Ceramics; Were Geology Ends And Where Art Begins.
Ashakwu Journal of Ceramics Cer AN.
- Worral, W.E. (1988). And Ceramics raw-materials elseriver applied
science publishers, institute of ceramics