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DESIGN AND DEVELOPMENT OF POTTERY MAKING MACHINE

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Abstract

There is a growing concern that the pottery making is in the path of extinction one of the main project is to revive this dying industry.The project work begins with survey justifying the need for the product. It is identified that a pottery making machine which has the capacity to produce the pot.To bring needed attention to the subject of product design and enable researchers to better investigate design issues, the author introduces a conceptual model and several propositions that describe how the form of product relates to consumer responses.With literature survey and field visits, different pottery techniques and process involved in pottery making techniques is understand. With the knowledge acquired, basic requirement list that the product must prepare. Different concept is made and evaluate The main aim of this project is to focus on the customer requirements, detailed design of the product by using software pro/E and analysis ANSYS
Index terms- pottery, machine, ansys, pro/e

I. INTRODUCTION

Pottery Background: Pottery is made by forming a clay body into objects of a required shape and heating them to high temperatures in a kiln which removes all water from the clay, which include reactions that lead to permanent changes including increasing their strength and hardening and setting their shape. A clay body can be decorated before or after firing. Prior to some shaping process, clay must be prepared. Kneading helps to ensure even moisture content throughout the body. Air trapped within the clay body needs to be removed. This is called de-airing and can be accomplished by a machine called a vacuum pug or manually by wedging. Wedging can also help produce even moisture content. Once a clay body has been kneaded and de-aired or wedged, it is shaped by a variety of techniques. After shaping it is dried and then fired.

Potters struggle to earn sustainable incomes and left their families from low standards of living.

Through they wish that their children will carry forward the craft, they recognize that the young generation is disengaged. Youth are looking elsewhere for what they consider to be more profitable and respected careers. Many have already left the craft to join the construction industry.

Artisans are also challenged by changing ecology and environmental policies. Pottery has traditionally been a locally and environmentally sustainable craft; the sources of all the natural resources needed to turn earth into pottery are local. Local clay local white clay, water, thorns and black stone have not only been found in potter's villages for centuries but are also free of cost.

Today changing ecology and environmental policies are inhibiting artisans' access to these resources. As any town develops, industries and residences are being built on sources of quality clay. Water scarcity poses a significant challenge as artisans are forced to buy water not only for household purposes, but also for their craft. As local resources are depleted, artisans must travel great distances to access the materials which were once a part of the local landscape.

The market for the pottery and earthenware has changed dramatically in the last few decades. Plastic and metal continue to replace handcrafted pottery. As the market decreases, potters are increasingly dependent on traders who hold the power to determine costing and production. Artisans must look to new markets and develop new products and designs to competitively meet these market's demands. Potters also struggle with a lack of infrastructure needed to bring their goods to market. Workshops are inadequate and transportation is inefficient resulting in unnecessary breakage and waste.

NEED ANALYSIS AND VALIDATION:

Pottery in village – designed for extinction.

Different cases were studied in order to identify the problems faced by the potters.

1.2.1 Case 1: Vishnu, Nagalapuram village, Kurnool

Figure (1): A man preparing pot

Pottery was once a thriving industry, but not anymore, according to Vishnu a potter in his mid

thirties who lives with his wife, children, unmarried brothers and sisters. As this is the only trade Vishnu has inherited from his father, he has no option but to carry on pottery despite the low return.

Vishnu says "pottery is no longer a lucrative business as market demands for pots is fast diminishing……..In the past people stored drinking water in pots, which helped to cool it, but refrigerator water bottles have replaced pots. Tea is no longer served in pots on trains, having been replaced by disposable plastic cups. Even clay flowerpots are slowly being replaced by much lighter and unbreakable plastic ones. The demand for pottery today is seasonal; for example, for festivals like diwali, the festival of lights that takes place in October November, when clay lamps are used to light houses. Most of the members of this community are opting out of pottery for other trades as it has become extremely difficult for them to survive on their meager earning of about Rs 4000/- per month".

The ancient art of hand-made pottery is still practiced by a few men of the oldest living generation. The younger villagers have opted for more modern, 'prestigious' occupations, thus this art in this place seems destined to become a historical memory.

According to Vishnu Shekar "in the morning, the women go into the fields to collect special stones used in the preparation of clay. These stones are pounded into powder, which is then mixed with water and then heaped into piles whose size depends on the final product. The men, using manual pottery wheels, spin the clay with dexterity to create pots and lids of various sizes which are kept in the sun for drying. In the final step, the pottery is covered with hay and mud and baked overnight over low fire. Once ready, the pots are taken to markets around Kurnool. The younger generation, craving a more modern lifestyle, has opted for more education and office jobs in neighboring cities. Through the pay is less, they find the prestige awarded them by society more appealing then the occupation of their fathers. Pottery-making in this village seems destined for extinction".

II. BACKGROUND INFORMATION

Potential users: There can be various possible users for our portable water purifier, through our primary target is younger generation in various pottery making villages. A single machine would give employment to them. The product made out of this pottery making machine can be used in rural, semi urban and urban areas also. The product can also be used by those people in urban areas who are facing shortage of electrical.

Pottery basics: Pottery is formed clay hardened by the application of heat, it includes a range of materials like bricks and tile, earthen-ware, stoneware, terra cotta, bone china and porcelain. The otter needs clay and water to mix and form, and some sources of heat to bake the formed clay.

Clay body is formed into objects of a required shape and heated to high temperatures in a kiln to induce reactions that leads to permanent changes, including increasing their strength and hardening and setting their shape.

There are wide regional variations in the properties of clays used by potters and this often helps to produce wares that are unique in character to a locality. It is common for clays and other minerals to be mixed to produce clay bodies suited to specific purposes.

Types of pottery:

Clay can be shaped or formed processed by any of the following processes:-

a. Modelling
b. Throwing
c. Molding
d. Jollying
e. Extruding
f. Pressing
g. Turning

a. In modeling, which is undoubtedly, the most ancient and simplest of the above processes, shapes are formed entirely by hand using only the potter's fingers and a few rudimentary tools like scrappers and knives. Large pots are even made today by coiling up ropes of clay and smoothing the surface on the inside and outside as the shape builds up.

b. Throwing is the best known of all the shaping processes. The potter imparts his creativeness on a lump of plastic clay spinning on a turntable, using his thumbs, fingers and palms.

c. In molding clay is pressed onto a mould having the negative form of the desired shape. The pre Columbian Americans, lacking the mastery of the throwing wheel, used molding as their main pottery-making technique.

d. The jolly consists of a plaster of Paris mould on a rotating turntable and a profile tool attached to a lever. Clay is placed in or on the rotating mould and on lowering of the profile tool the clay is forced to take the shape of the mould.

e. In extruding, plastic clay paste is forced through a dye or a mouthpiece with the required profile.

f. Clay is pressed in between two dies whose inside had been formed to the required profile of the article, in the pressing process.

g. Clay turning is similar to metal turning on a lathe but the clay has to be air-dried to be hard enough to with-stand the turning.

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DRAFTING OF THE POTERY MAKING MACHINE

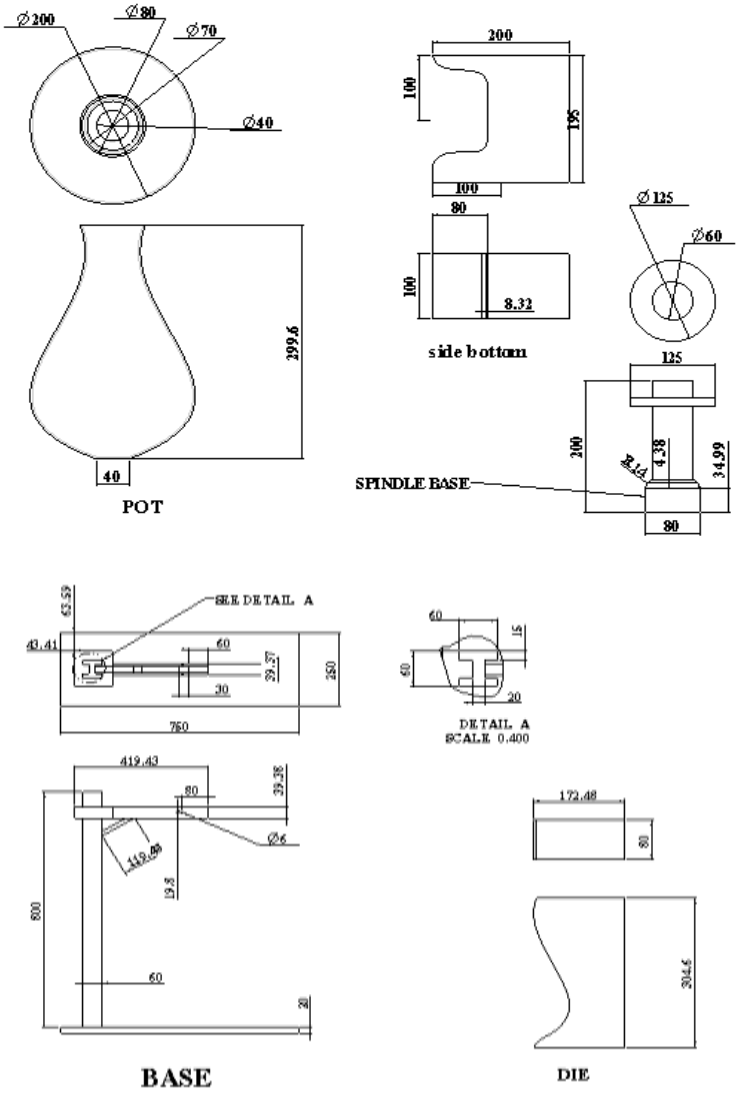

Figure (15): drafting of the pottery making machine

III. MAIN RESULT

Design calculation has been carried and find out the stress and observed design is safe for all materials.

The designs of pottery making machine has been carried out through ansys software, in order to find the reaction forces at the end effecter of the mechanism. It is done so that one could find whether the amount of force the potter has to apply to lift the mechanism is well within the limits of the force the human hand can apply while sitting

The modeling of device is carried in Pro-E and analyzed in ansys.From the obtained results the maximum stress developed at the critical points is nearly 2.75 Mpa and it is less than the permissible stress of 15.5 Mpa. Therefore the device is suggested to safe

MATERIAL	VONMISES STREESS (N/mm^2)
clay	2.75
wood	2.66

From the obtain results the design is safe for pottery making machine

IV. IMPLEMENTATION DETAILS OF THE PROPOSED METHOD

Material properties:

MATERIAL	CAST IRON	CLAY	TEAK WOOD
Young's Modulus Mpa	170000	10-20	10500-15600
Density (ρ) kg/m^3	6800-7800	1746	630-720
Poisson Ratio	0.21-0.26	0.2-0.3	0.2-0.3
Yield Strength N/mm^2	320	15.5	48-95

Table (4): Mechanical Properties for Different Materials

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Structural analysis of pottery making machine

Imported Model from Pro/Engineer

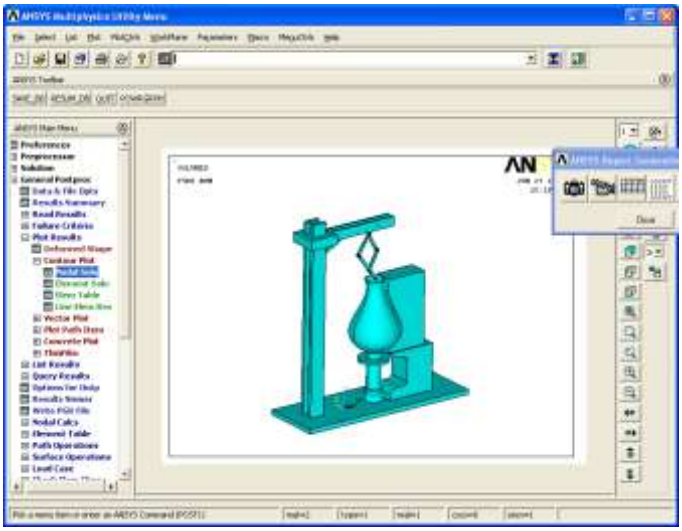

Figure (16): Imported model into Ansys

Element type : solid 20 nodes 95

Material properties of cast iron: Young's Modulus (EX) : 17000N/mm^2

Poisson Ratio (PRXY): 0.21 -0.26

Density : 6800 kg/m^3

Material properties teak wood: Young's Modulus (EX) : 10500N/mm^2

Poisson Ratio (PRXY): 0.2 -0.3

Density : 630 kg/m^3

Material properties of clay: Young's Modulus (EX) : 10 – 20 N/mm^2

Poisson Ratio (PRXY): 0.2 - 0.23

Density : 15.5 kg/m^3

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Mesh model:

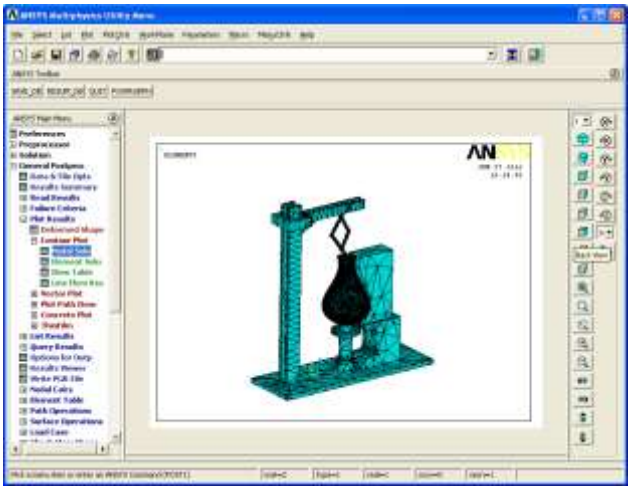

Figure (17): Meshing of the model

Solution

Solution – Solve – Current LS – ok

Post Processor

General Post Processor – Plot Results – Contour Plot - Nodal Solution – DOF Solution – Displacement Vector Sum

Pressure on the spindle = 14.715 N

Pressure on the pot = 10.406 N

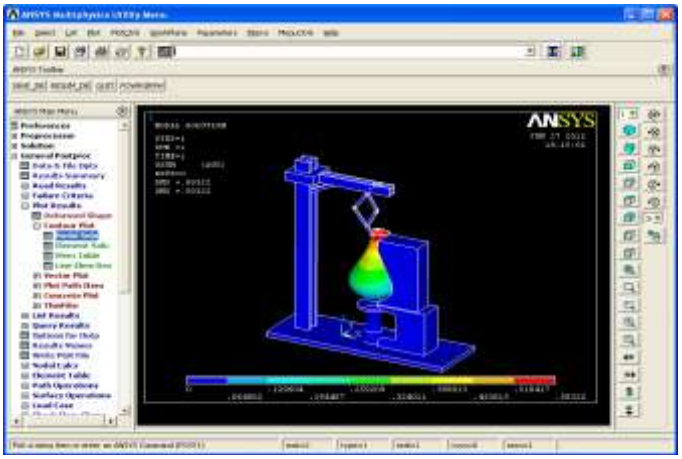

Figure (18): Displacement Values of Clay

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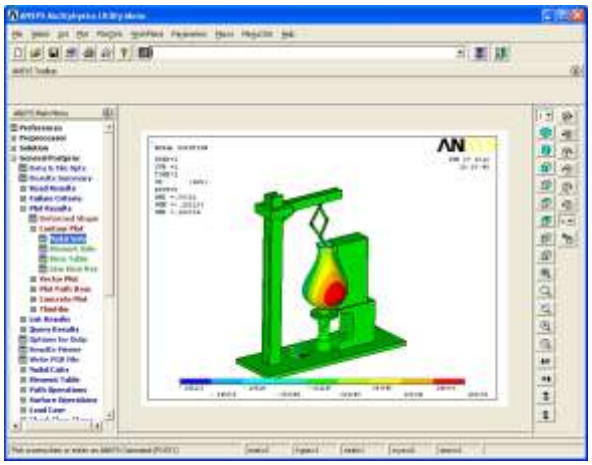

Figure (19): Displacement Values of Clay

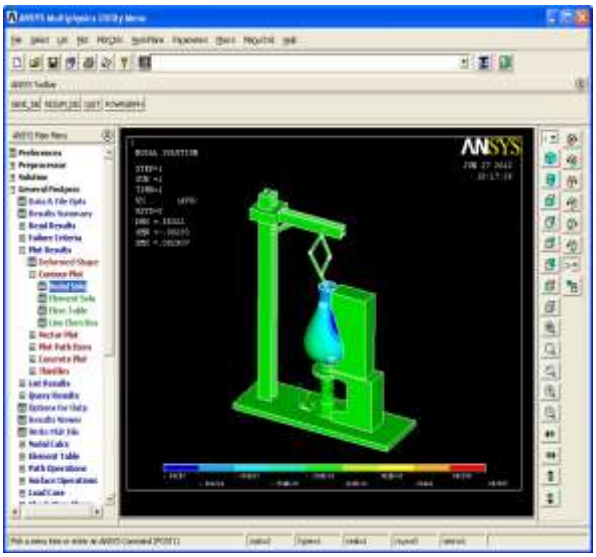

Figure (20): Displacement Values of Clay

Solution

Solution – Solve – Current LS – ok

Post Processor

General Post Processor – Plot Results – Contour Plot – Nodal Solution – Stress – Von Misses Stress

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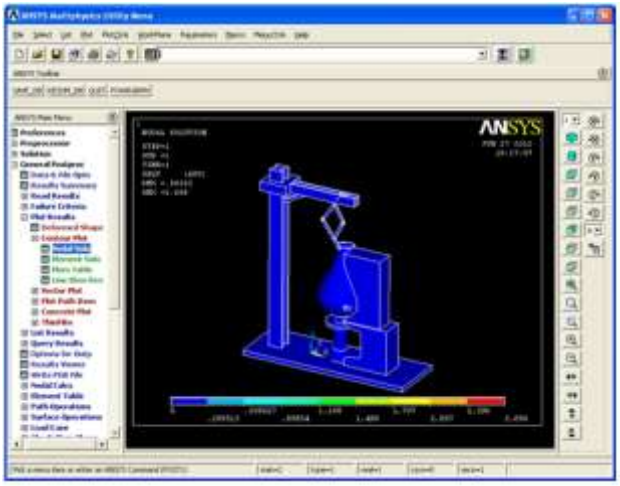

Figure(22): Stresses induced in wood

5.8 Stresses of the materials

Material	**Stresses** N/mm²	**Allowable Stresses** N/mm²
Clay	2.75 N/mm²	15.5 N/mm²
Wood	2.66 N/mm²	55 N/mm²

Table (5): stresses of material

V. RESULTS

Design calculation has been carried and find out the stress and observed design is safe for all materials

The designs of pottery making machine has been carried out through ansys software, in order to find the reaction forces at the end effecter of the mechanism. It is done so that one could find whether the amount of force the potter has to apply to lift the mechanism is well within the limits of the force the human hand can apply while sitting

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VI. CONCLUSION

In this project was really interesting to work in. We realized, as we were trying to establish the need during the initial stages of the project, that the pot making peoples really did need this product.

After doing research and observing the market demand for the pot makers, we believe that it is feasible to launch it into the market targeting not only for the pot makers but also those handy craft workers.

We have highlighted the growing number of pottery makers, which proved to be a potential market share in the future and even currently. We learnt a lot about the likes and interests of pottery making people and also challenging to detail out all the various parts and components of the product.
So finally this project explores the area of mobility for the pottery making peoples improving the aesthetics and usability of a clay pots and also identifying various ergonomic functional and usability issues. Then this product is also attracts the economically poor people and middle class people because cost is less when compared to existing products.

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