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DESIGN AND DEVELOPMENT OF PLASTIC RECYCLING MACHINE

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Abstract- The aim of our project is to design and fabricate cost effective plastic recycling machine for granule products for plastic industries. As these plastic industries were based on export and imports as well as they were having financial barriers to install highly sophisticated and advance recycling machine.

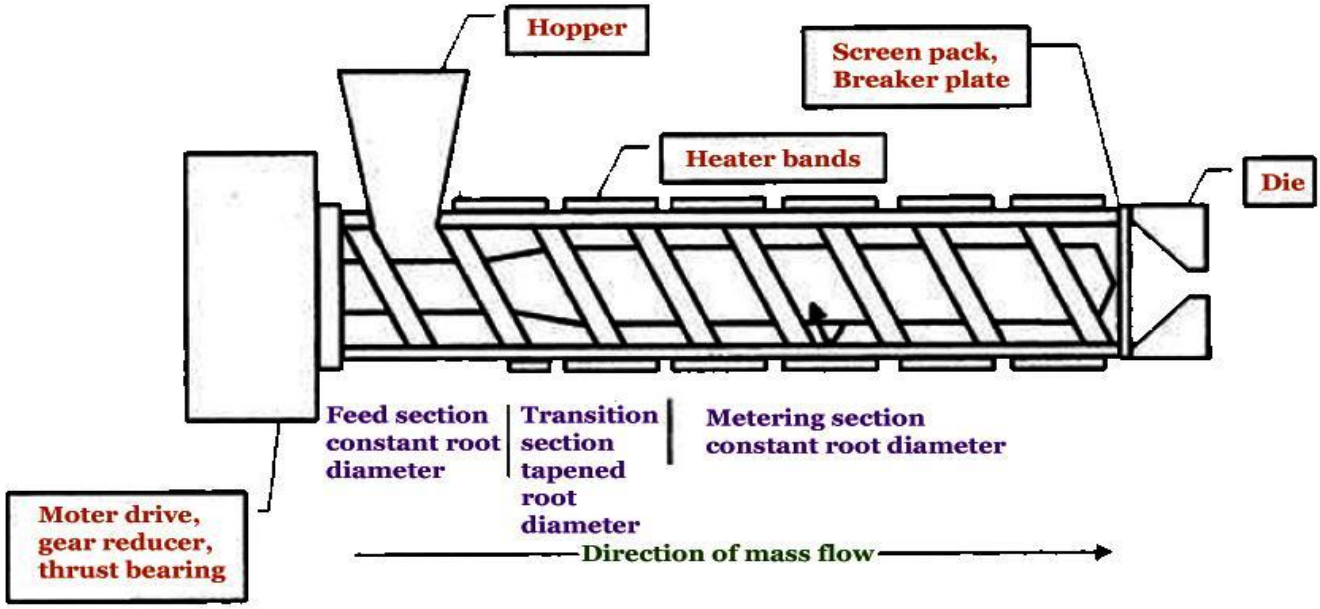
The machine is design using locally available raw materials which make it cheap and easy to maintain and repair. The machine employs the principle of conveying and heating to effect shredding and melting material fed through the hopper. The result of experimental analysis shows that for every use plastic fed into the hopper about temp of 230 deg.C is required to melt it. In this project we will make eco-friendly environment by recycling of waste plastic. Plastic are not degradable material therefore in proper disposal after using constitute environmental problem. This will help to solve disposal problems of plastic.

I INTRODUCTION

Recycling is the process of converting waste material into new material and object. It is an alternative to "conventional" waste disposal that can save material. Recycling can prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, thereby reducing; energy usage air pollution and water pollution. A Recycling machine is that which perform the function of melting into the granular for the production of new products. Recycling is an aspect of environmental engineering. Environmental engineering deal with development of technically reasonable solution to environmental problem by designing and maintaining the system to control the waste production produce by the municipality and private industries. Plastic recycling is where our hopes for the future in term of waste.

This project deals with design and construction of a plastic recycling machine. This ensuring effective waste management. The machine employs the principle of conveying and heating to effect shredding and melting of the materials. Recycling of plastic is an important step towards reducing waste plastic and controlling of some amount of pollution.

The hopper use for feeding plastic and the heater will be use for heating/melting of waste plastic and the die will be use for final product. In today's manufacturing scenario, manufacture do not want any of there inputs finally turned as waste and discarded. So they channelized their efforts as well as resources into the development of efficient recycling method. Recycling is very much crucial for preserving and protecting our resources for ourselves and for future generation.



II OBJECTIVE

There are several objective of this project as follow:

i. To design and fabricate new machine for recycling of waste plastic.
ii. Innovative use of scrap material.

III SCOPE

Using currently available information and data on plastic recycling, temperature control and various mechanical parameter machines has been developed. Due to a simple design, use of low cost and scarp component. The machine is developed is lesser cost as compared to another conventional machines. Hence the low cost plastic recycling machine.

IV CALCULATION

Analytical design of die thickness

Let die material M.S

$$\sigma = \frac{s_{yt}}{F.S}$$

let consider F.S 3.5 for better results

$$£ = \frac{460}{3.5}$$

$$\sigma_{max} = 131.43 N/mm^2$$

Using clavarino's equation as our Die is closed vessel

$$t = \frac{D_i}{2}\left[\frac{\sigma + (1-2\mu)P_i}{\sigma - (1+\mu)P_i} - 1\right]$$

$$t = 6.54\ mm$$

$$i.e\ t = 7mm$$

FRAME : Height of the frame[h_f] = 600 mm

Length of frame [l] = 460mm

Width of frame [w] = 170mm

Outside surface area of frame

$$A = 2(h_h * w) + 2(h_f * l) + 2(w * l)$$

$$A = 2(600 * 170) + 2(600 * 460) + 2(460 * 170)$$

$$A = 912.4 * 10^3 mm^2$$

SHAFT : Crusher required 1.5HP motor

Power (P)=1.5HP

1.5HP=1119 watt

P=1119 watt

Given material

IS C-30 soft (SAE 1030)

S_{ut}=527Mpa

S_{yt}=296Mpa

Factor of safety (FOS) = 6

According to ASME code

The allowable shear stress for shaft

τ_{max} =<0.3 syt or <.018 sut

τ_{max}<0.3×296 or <0.18×527

τ_{max}<88.88 mpa or <94.86 mpa

select minimum value ,

τ_{max}=88.88 mpa

but for factor of safety is 6

the allowable shear stress is

$$,=\frac{88.88}{FOS}$$

$$\tau_{max}=\frac{88.88}{6}$$

τ_{max} =14.81 mpa

Now, as we know

load factor (Kl)=1.75

$$P=\frac{2\pi NT}{60*K1}$$

$$1190=\frac{2\pi*671*T}{60*1.75}0=2\pi*671*T/60*1.75$$

$$T=27.86N.M$$

SYSTEM REQUIREMENT:

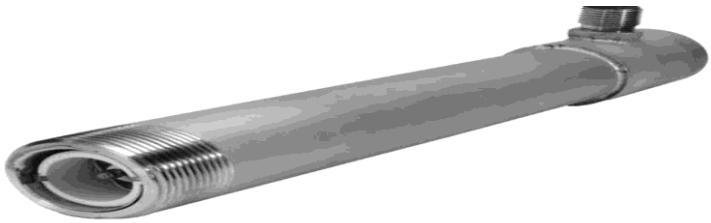
Sr. No.	Component Details	Photos of Component
1	**Pipe Heater :** Max Working Temperature 750deg C, Insulation Resistance 5Ohm	
2	**Permanent Magnet Brushless DC Motor :** 48 volts ,33Amp ,1.5 KW	
3	**SELEC TC513 TEMPERATURE CONTROLLER :** Single Display, 3 Digit, 7 Segment LED display, 85-270V AC/DC	

Table.1: Specifications of the components used

VI CONCLUSION

This machine is very suitable for the developing economy and environment. It is not only helpful to the setting up of recycling activities which in turn affect the environment and economy; it is also a very good source of self-employment. It has the capacity to reduce unemployment in developing countries like Nigeria. I recommend this machine to the informal sector of the Nigerian economy and other developing nations. I also recommend it to the young entrepreneur and those who are unemployed. It is cheap to obtain and easy to maintain and possess ability to generate substantial income in a period of time. I therefore recommend that subsequent work on plastic recycling should be focused on further improvement and incorporation of this equipment.

VII FUTURE SCOPE

- The machine can be implement in the society, college, apartment etc. which will reduces the plastic waste and pollution in country.
- It can be used for plastic brisk and benches.
- Recycled plastic grains can be turned into fabrication of cloths.

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