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DESIGN AND MANUFACTURING OF CAMPHOR TABLET MAKING MACHINE

PROF. C. R. PATIL[1], MR. R. L. PAWAR[2], MR. S. M. WAGHCHAURE[3]
MR. S. N. MAHALE[4], MR. A. G. PAWAR[5]

[1]*Mechanical Engineering, SIEM*
[2]*Mechanical Engineering, SIEM*
[3]*Mechanical Engineering, SIEM*
[4]*Mechanical Engineering, SIEM*
[5]*Mechanical Engineering, SIEM*

Abstract — *This entire work focuses on the Manufacturing of Tablet making Machine. It is run or operated by using the Mechanical drive. Tablet making Machine are most commonly used in pharmaceutical industry. This Tablet making Machine is use for making the tablets of camphor. Camphor (Kapur) have been used in sweets, incest repellent, anti Rusk coat on tools, anti microbicidal balls, local aesthetics, vapour based camphor gels (Vicks). Camphor is widely used in Hindu religious ceremonies. Camphor Based substances are important part of various pharmacy products. Camphor has been widely used as a fragrance in cosmetics, as a food flavoring, as a common ingredient in household cleaners, as well as in topically applied analgesics and rubefacients for the treatment of minor muscle aches and pains.*
Using this machine the production rate is increased the operating cost is also optimised as the production rate is increase the cycle time is reduced. Initially we design the machine using software. Later on in order to verify or to check the design finite element method is used modelling in catia is done and also meshing is initially done and by using structural analysis software. So that maximum stress as well as maximum deflection induced in the various components is checked this also verifies the design of parts.

Keywords- *Tablet, Machine, Camphor, production, cost*

I. INTRODUCTION

The controlling parameters in compression molding method to develop superior and desired properties of the composite. All the three dimensions of the model (pressure, temperature and time of application) are critical and have to be optimized effectively to achieve tailored product as every dimension of the model is equally important to other one. If time of application of these factors (pressure and temperature) is not sufficient (high or low), it may cause any of defects associated with insufficient pressure or temperature. The other manufacturing factors such as mold wall heating, closing rate of two matched plates of the plates and de- molding time also affect the production process.
The overall properties of camphor differ to a large extent from thermoplastics and other materials. Therefore, it is important to consider properties while designing the mould which will affect mould parameters. Dimensional accuracy of molded camphor parts is very important and in such cases, the design of the mould must allow for shrinkage of the parts. Linear shrinkage values can be obtained from test molded samples of flat camphor sheets and can be used as a rough guideline to mould design values for very simple parts only. Analyzing the above properties of given camphor sample and mould parameters, we have to design and manufacture the camphor compression mould. Hydraulic system should be avoided because hydraulic oil leakage may affect the production vigorously. Hydraulic oil may react with camphor and it is highly undesirable, thus instead of hydraulic system cam and follower operated mechanical system is very much suitable and suggested to use.

II. PROBLEM STATEMENT

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III. METHODOLOGY

The project work start with identification of problem, as the camphor is chemically reactive towards the hydraulic oil thus we cannot use hydraulic press for the operation which is generally prefer for press operation on the other hand we have option of pneumatic press but as the camphor is sublimatory substance which will vaporize the camphor material when come in contact with air and pneumatic system also have high initial investment as well as complicated components like pump ,direction control valve, actuators, FRL unit etc. and those are need to be handled with skilled and experience operator so the press operation must be carried out using the mechanical system which includes the various mechanisms like cam and follower, speed reduction using gears, reciprocating motion for press operation uses the slider crank mechanism.

The next step is literature survey after identification of problem the papers related to chemical properties of camphor, papers on design of cam and follower, research papers on the slider crank and spring design etc are referred. On addition to that we have use the reference books based on design of machine element. The detailed literature survey is given further in the same report.

After the literature survey we studied about the various compression mould and compression moulding machine which are using in market by various companies. Through the market survey we decided our design and started the pre design work which includes drafting and analysis using the software. We use the CATIA V5 for drafting and use the ANSYS 18.2 for structural and dynamic analysis.

We are done with the base and support structure of machine and further work will be selection of spring and gears according to design. We are also generating the NC code for path generation on gear using VMC. At last we are going to assemble the all components and then we will carry few test on it for the quality inspection.

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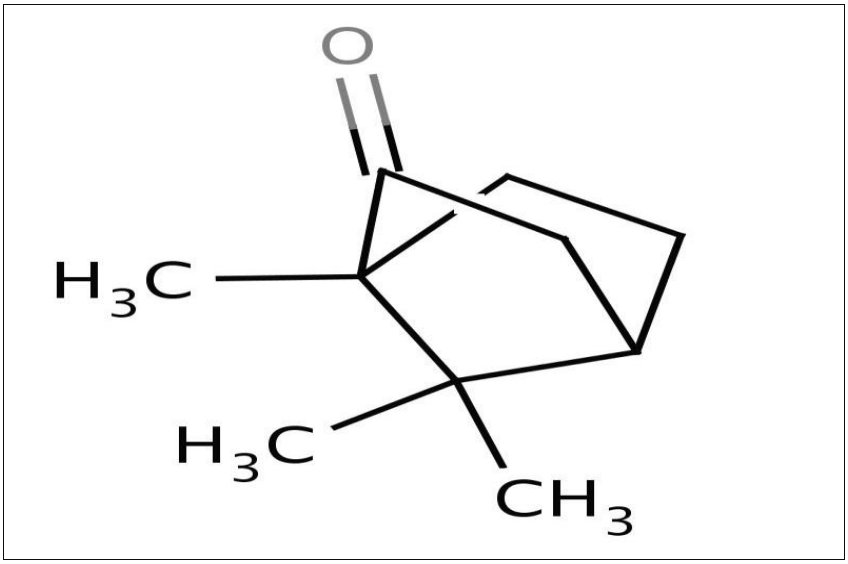
IV. CAMPHOR

The fragrant camphor tree and its products, such as camphor oil, have been coveted since ancient times. Having a rich history of traditional use, it was particularly used as a fumigant during the era of the Black Death and considered as a valuable ingredient in both perfume and embalming fluid. Camphor (Kapur) have been used in sweets, incest repellent, anti Rusk coat on tools, anti microbicidal balls, local anesthetics, vapor based camphor gels (Vicks). Camphor is widely used in Hindu religious ceremonies. Camphor Based substances are important part of various pharmacy products. Since these are sold as without medicinal prescription, it have been in Indian Villages and Urban population frequently for the use of Anti Headache, in common cold or even for sleep induction. Authors have reported, for the first time in literature about potential use of Addiction with Camphor Based Substances. Camphor is poisonous in large doses.

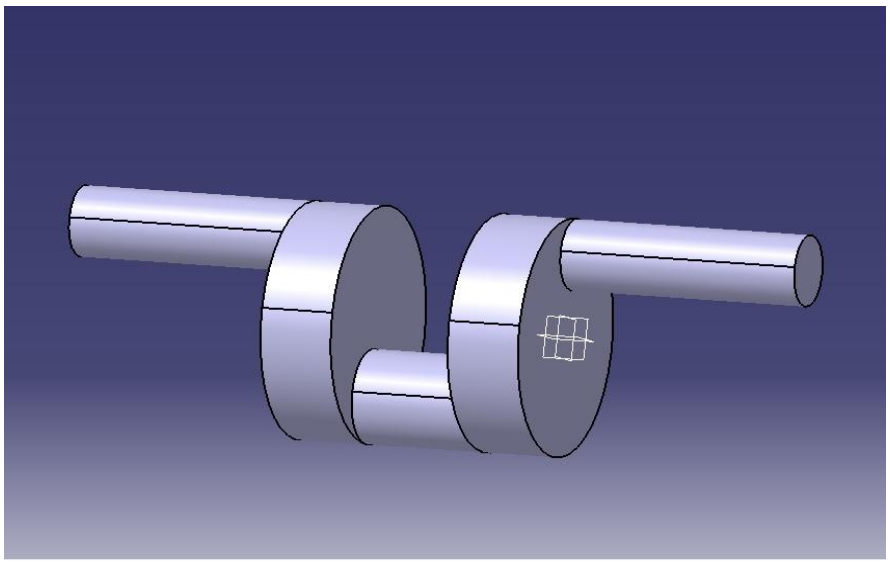


"Figure1. Chemical structure of camphor"

V. DESIGN AND ANALYSIS OF MACHINE COMPONENTS

As our compression moulding machine is mechanically operated there are various mechanical components are use those are need to be design and analyze structurally and dynamically according to boundary conditions which are depends upon the Force and rotational velocity of components.

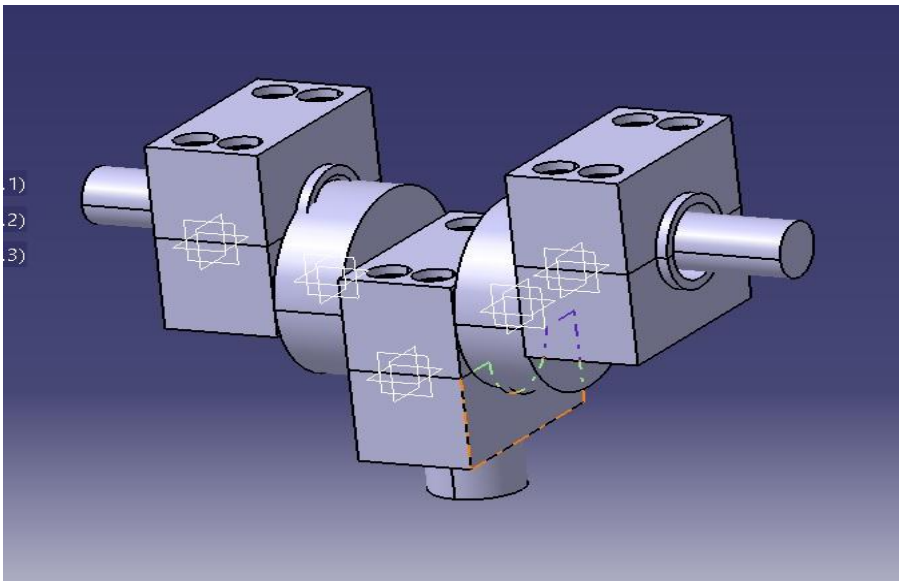
A. Crankshaft for punch holder



"Figure2. Crankshaft for punch holder"

The above fig shows the crankshaft for punch holder this shaft is coupled to motor through the gear pair which does the work of speed reduction. this crankshaft is located at the top of the assembly into the holding post. It convert the rotary motion of motor into the reciprocating motion it is one of the link of slider crank mechanism. The force transmitted by motor and the is converted into press force using the crankshaft

B. Punch holder



"Figure3. Punch holder"

C. Structural analysis of Punch holder assembly

The assembly includes crank shaft, punch holder and punch. From these components the punch holder material is weakest thus it is become a necessary to carry out the structural analysis on the punch holder to avoid the failure during the operation

Boundary conditions

Force on punch holder = 10 KN vertically upward

Rotational velocity = 500 RPM

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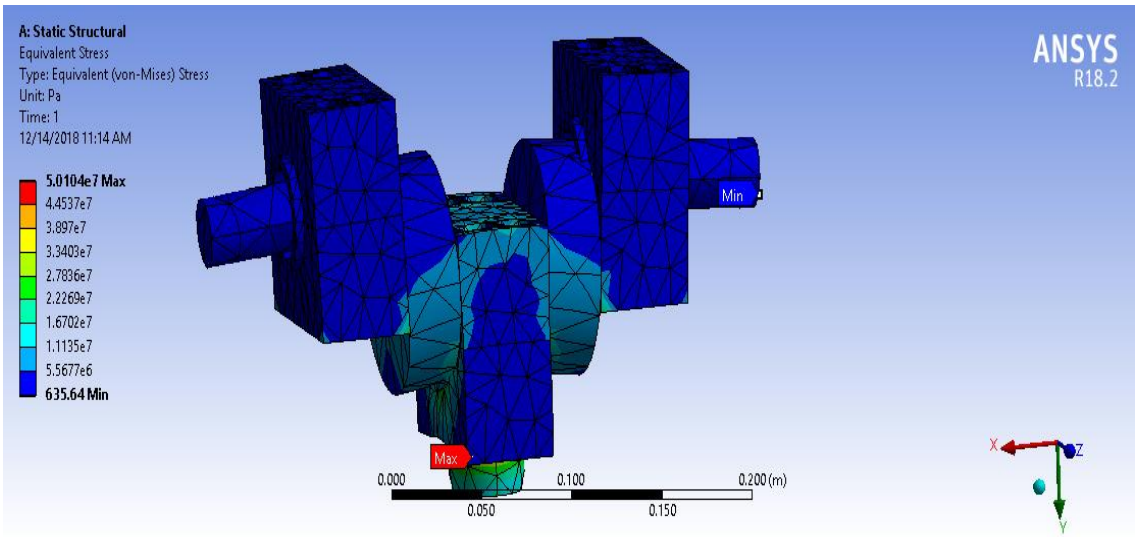


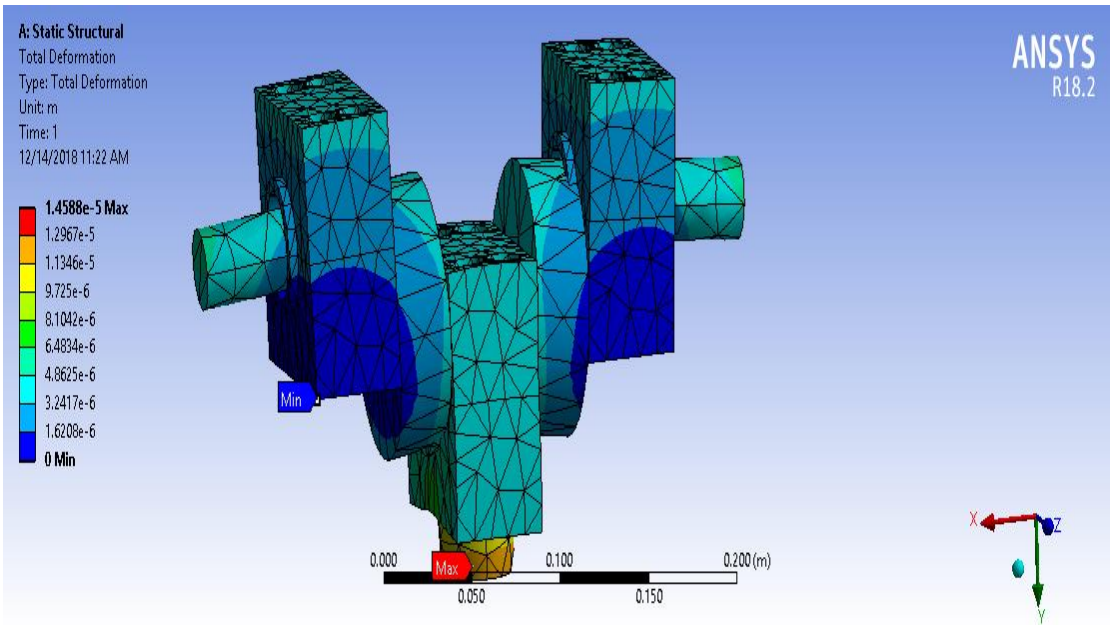
"Figure4. stress induced in the material with extreme boundary conditions"

The above structural analysis is carried out on the ANSYS 18.2 for the punch holder assembly which is undergoing through the cyclic force due to continuous reciprocating motion and hammering of punch during punching operation this is responsible for the maximum stress generation into the middle Punch holder

Material of punch holder

- Cast iron
- Ultimate tensile strength = 414 Mpa

The maximum stress induced due to extreme boundary condition is 50.104 Mpa which is less than the ultimate tensile strength of the cast iron which is 414 Mpa. The above design is safe as far as maximum stress induced in the material due to extreme boundary condition is concern.



"Figure5. Deformation due extreme boundary conditions"

This is the second step of the of the structural analysis where we calculated the maximum deformation due to extreme boundary condition after evolution of the results from the ANSYS workbench 18.2 we come to know that the maximum deformation due to extreme boundary conditions is 14.588 micrometer. The deformation of 14.588 micrometer is almost negligible in this case thus the design for the punch holder is safe as far as the maximum deformation due to extreme boundary condition is concern

IV. CONCLUSION

From the chapter of validation, using various software we can conclude that punch for the desired tablet product is withstanding in all the working conditions. The objective of the project was to manufacture a Tablet making machine for camphor product as per given dimensions. In this project, we studied various moulding techniques used for manufacturing of polymer products. According to the desired properties of product, mechanical drive system is preferable for machine. Using various research papers and design data books we studied the methods of gear and spring design. Pre design work such as modeling of desired product in geometric modeling software was helpful in visualization as well as for machine shape and geometry finalization. This punch was analyzed using software to find out maximum stress induced in all parts during the moulding process. Drafting of the punch after analysis was important in manufacturing point of view.

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