DESIGN AND DEVELOPMENT OF BAGASSE DRYER FOR MODERN JAGGERY HOUSE

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ABSTRACT

Sugar industry in India is a well-developed industry and one of the largest after textiles. It provides rural employment opportunities and plays an important role in Indian economy. Jaggery is also manufactured from sugarcane juice and is very widely used not only in individual households but also in many applications. Manufacture of sugar involves many technical aspects and the capital investment is also on the higher side. Compared to this, production of jaggery is very simple and the capital cost is also very limited. Due to its wide applications, the market for jaggery is continuously growing.

The bagasse is the only fuel used in the jaggery making industry in india, .In the lakshmi jaggery house located in ghunaki near kolhapure produces jaggery products . The improvement of the use of bagasse in the furnaces is an important industrial strategy nowadays. This subject has become of great interest due to the increasing of production rate and profit. The state of art of sugar cane bagasse drying is presented here. This work shows an improvement of the system efficiency due to sugar cane bagasse drying.

I. INTRODUCTION

Thermal energy for evaporation is provided by combustion of bagasse, which is a biomass generated after cane crushing. The dry bagasse is excellent solid fuel with less than 2 % ash and heating value equivalent to B-grade coal (about 4500 kcal /kg). Material flow diagram for jaggery making process is presented in figure 1. Major steps involved in the process are mechanical crushing, evaporation, juice clarification and cooling. The typical baggess composition is presented in table 1.The bagasse generated on site is completely consumed for juice heating and evaporation. This technical note is background information for presentation; the points presented in this note will be illustrated during presentation

Factors in consideration of project Compatibility with the objective, plan.

i. Availability of needed scientific and engineering skills in R & D.
ii. Market prospects and potential of the proposed new product.
iii. Availability of production skills needed.
iv. Financial return expected.

v. Cost and availability of capital required for investment.

vi. Estimate of costs of development, production and marketing.

vii. Growth prospects for the future.

Table 1

Elements	**Unit**	**Composition**
Carbon	% wt	44.5%
Hydrogen	% wt	5.2%
Nitrogen	% wt	0.19%
CO_2	% wt	0%
Sulphur	% wt	0%
Oxygen	% wt	44.4%
Water	% wt	5.60%
Total		100.0%

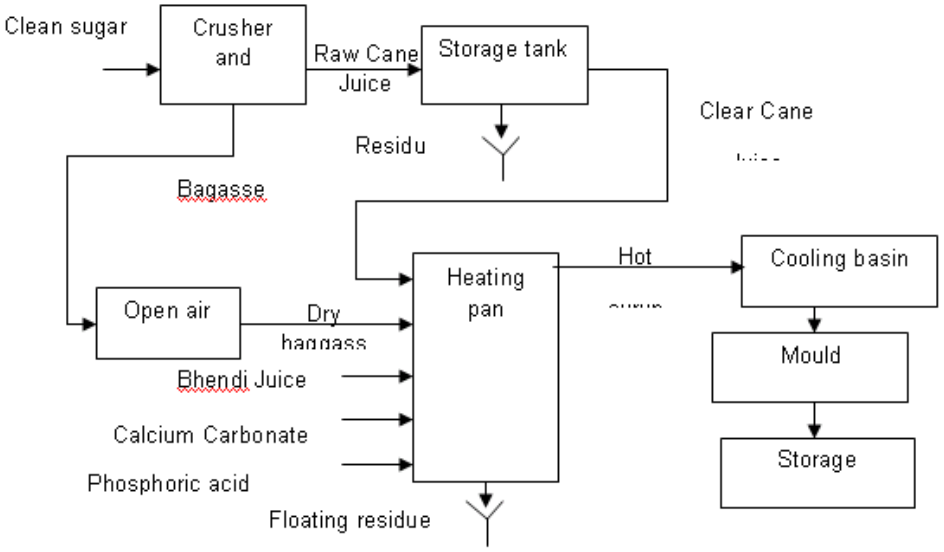

Figure 1 Process flow diagram for jaggery plant

II. CONVEYOR CHAIN

Renold has, for many years, been a leader and innovator involved in the design and manufacture of standard conveyor chain and the development of engineered products for such applications as escalators, travelators,

sterilizers, cement conveyors, leisure rides and numerous other specialised systems for the mechanical handling industry. We have a detailed understanding of the maintenance needs on such applications and can now offer the manufacturers and operators of conveyor systems the benefits of this knowledge. Chain is one of the most widely used moving mediums in mechanical handling systems, being robust and very adaptable, but it is also one of the most neglected components within such equipment when general or routine maintenance is carried out. In many cases this product is attended to when problems occur, normally when the chain is already damaged and the only real option is to fit a replacement to the system.

This section has been designed with the manufacturer and operator in mind. It covers the functional aspects of using Renold conveyor chain and emphasizes the correct use of preventative maintenance procedures, which will ensure better machine performance, less down time, lower overall maintenance costs and extended chain life.

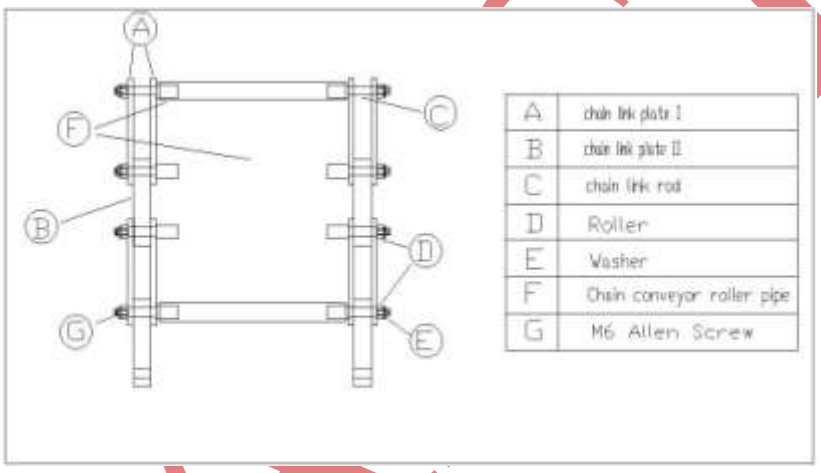

Fig 2 Construction of conveyor chain

Fig 3.Actual construction of chain conveyor

III. SPROCKET

The design and actual condition of the sprocket influences the chain operating life the most. Generally speaking, the following recommendations should be followed:

a) Sprockets of the biggest possible diameter should be employed to lower the pressure on chain joints and the polygonal effect.

b) Driving wheels should be located at conveyor end, especially with complicated conveyor designs (e.g. conveyors that include fermentation or dry-up compartments).

c) If the conveyor employs two or more interconnected chains, their driving sprockets must not be interlocked

Implementation of sprocket is shown in image which is mounted on the shaft and it is engaged with chain which is runs on the duct chamber. It is having three teeth sprocket.

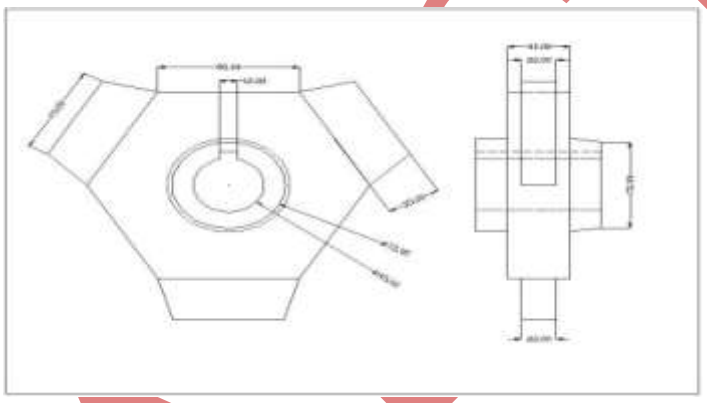

Fig 4 Sprockets

Fig 5 Actual construction and assembly of sprocket

IV. SHAFT AND BEARING

We use the m.s. shaft of 45mm diameter for the two sprocket. Shaft if fitted in the two pedestal bearings of inner diameter 45mm. this shaft is connected to the gearbox and giving power to sprocket to pull the conveyor chain on the dryer.

V. DUCT CHAMBER

Duct chamber is used in between furnace and chimney. It is the elongated part of the original chamber which takes flue gasses from furnace and give to the chimney. It is the bricks construction and having two chambers for flowing the flue gasses. Chamber having 1.6 mm metal sheet on the upper side of duct. This metal sheet drawn out heat from flue gasses and heated at higher temperature, and chain conveyor runs on the metal sheet and drawn wet baggas on heated sheet. Baggas takes out heat from metal sheet and dried .low temperature flue gasses are taken out from chimney.

Fig 6 Duct Chamber

Construction of the duct chamber connected to the chimney is shown in following CATIA drawing. In the three-D modelling it shows two chambers. Flue gases enter in the lower chamber and heats upper side of the lower chamber below the conveyor chain. Then it enters to upper chamber it again heats the upper side of upper chamber and exhausted through chimney in the atmosphere.

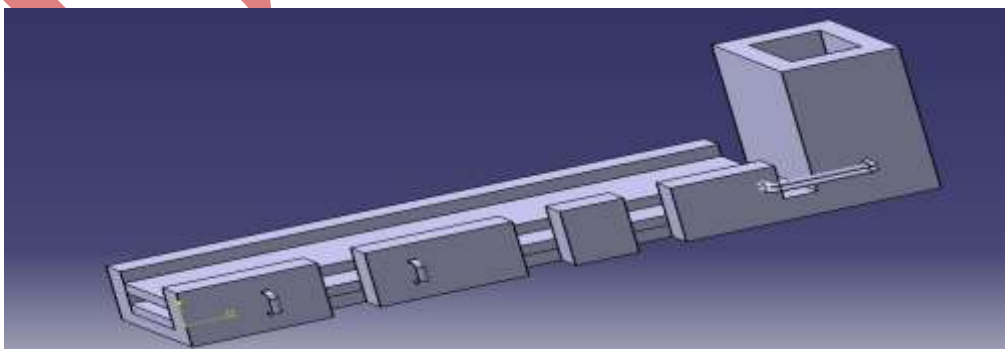

Fig 7 CATIA Drawing of Duct Chamber

VI. WORKING

The sugarcane is crushed in crusher. The juice is so formed is collected in juice reservoir and the wet solid residual i.e. wet baggase is carried towards dryer by using conveyor. Two bevel gears are used to transmit the power to the conveyor. The baggase is spread on metal sheets which are mounted permanently over all the area of duct. There are two layers of such metal sheet membrane on which two square bars of dimensions (12 x 12) and (10 x 10) respectively are welded. The square bar having dimensions (12 x 12) is welded in inner side because the roller rotates over it while the (10 x10) square bar is kept outward on which chain link rod floats.

Between these two square bars the chain assembly floats and displaces from one place to another place. The roller pipe carries baggase over thin sheets which are at very high temperature leads to formation of dry baggase which can be stored or used directly as fuel for preparation of jiggery. When three phase AC supply is given to motor, motor rotates with 1440 rpm. The speed reduction is done by using suitable gear boxes upto 5 rpm for the sprocket shaft. The sprocket shaft rotates the chain assembly which takes approximately 8 minutes for completing a single rotation of chain assembly.

VII. COST ESTIMATION

Table 2

SR. NO.	PART NAME	RATE	QTY	TOTAL(Rs.)
1	ELECTRICK MOTOR	10000	1	10000
2	GEAR BOX	50000	2	100000
3	BEARING	1000	8	8000
4	CHAIN MATERIAL	100000	-	50000
5	SHAFT	500	4	2000
6	C –CHANEL	50/kg	50kg	2500
7	METAL SHEET	48/kg	100kg	4800
8	STRIP	48/kg	2kg	96
9	WELDING ROD	5 /pcs	80	400
10	COLOUR	300/lit	0.75 lit	225
			TOTAL	178021/-

VIII. CONCLUSION

The use of chain transmissions presents the user with many different problems and aspects. All such factors must be considered and solved during the design of particular chain transmission. The information presented above cannot fully explain all problems pertaining to this area. Its purpose is to highlight the basic problems and to help avoid elementary errors.

IX. FUTURE SCOPE

Every machine have scope for its future modification for gaining more and more beneficial out put with the least input. Hence human is always trying for achieving it. Being technology it comes under the research and development activity. Our product being the small and compact one, still it has so many scopes for it's future developments as following

i. By increasing rigidity the machine
ii. can install at every normal jaggery house.
iii. Same mechanism is developed for minimizing the production cost of jaggery.
iv. Minimize the drying time for baggas.
v. Minimize the labors.

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