

Fire Protection of Sugarcane Bagasse –A Case Study Of Renuka Sugar’s 30 MW Co-Generation Plant at Ichalkranji.

R.B. LOKAPURE*, A.P.KADAM, V.B.NERLE***.**

Dept of Mechanical Engineering, Bharti Vidhayapeeth college of Engg., Shivaji University. Kolhapur, India

ABSTRACT

Now a day’s sugarcane bagasse is playing an important role as a renewable source of fuel. This is a cheap & easily available fuel from sugar plant. But its availability in loose condition creates risk of sudden fire hazard. In this paper the main stress is given on How to handle risk of fire? And to save this valuable fuel. Also generation of power from bagasse is reducing the ecological damage, thus it proved itself as an eco-friendly fuel. so it is necessary to take some firm steps to avoid fire risk near storage of bagasse piles & loose bagasse yard and to save this valuable renewable fuel without damaging of plant, bagasse handling machinery & life of human being which captured by sudden huge fire.

Keywords-Bagasse, co-generation, piles, renewable fuel, Water hydrant.

1. INTRODUCTION.

Bagasse is the name given to the final remaining fibrous material in the process of cane milling or crushing. The cane is passed through a set of two or three rollers and the juice from cane is extracted. Such a process is repeated four or five times and the material coming out of the final set of rollers (called the mill), is called the ‘Bagasse’ (i.e. [1]). Bagasse is made of dry fiber of cellulose material, some sucrose and non sugars and water. The material is very light in nature and its bulk density in loose state is around 120kgs/m³. (i.e. [2]). This therefore poses a problem for storage, as large open space required for storage of unused loose bagasse. The surplus bagasse after satisfying the needs of the factory is therefore stored in the form of bales but almost all sugar factories running their co-generation plants, so storing of bales having less advantageous other than to store in loose condition. Since running of co-generation plant use either loose or stored bagasse during load & under load condition.

1.1 PRESENT SCENARIO OF SUGAR PLANTS IN INDIA.

Sugar industry is the second largest agro based processing industries in our country next to Textile industry. It is located in rural area and has become center for rural development and has transformed

the rural life with economic, educational and social development.

There are 465 sugar factories out of which 117 sugar factories are in Maharashtra all working in co-operative sector (i.e. [2]). India is the largest producer of sugar and sugarcane in the world. 10% of world sugar produced in India & 30% of sugar required for our country is produced in Maharashtra. Sugar industry is very fortunate in having its own fuel. The two fold use of steam –one as a motive force to generate power and its exhaust to use for heating is a fortunate combination from the point of view of heat economy. In fact the sugar industry is very fortunate having its own water, fuel, power as infrastructure required for factory.

The bagasse is generally in the range of 25 to 30% of cane and is sufficient to generate steam/power of the factory. This bagasse generally contains 2 to 3% of sugar and 40 to 50 % of moisture. It is burnt in a special type of boilers. The boilers in the sugar factory are of 10 kg to 21 kg working pressure. Now a day’s many factories have installed high pressure boilers of 45 to 67 kg working pressure. From this high pressure boilers extra-power can be generated. Thus total sugar factories in our country has potential to generate 5000 MW power (i.e. [7]).

. Generally steam requirement of sugar factory is 45 to 50 % on cane. Now the general analysis of bagasse is given below (As in table -1), (i.e. [3]).

TABLE – 1.
BAGASSE ANALYSIS

Description	Specification
Moisture %	50.0
Ash %	0.5-2.5
Volatile Matter %	35 -43
Fixed Carbon %	3.5 -13
Carbon %	45 -47
Hydrogen %	6 -6.5
Oxygen %	40 -42.50
Nitrogen %	1 -3.26
Sulfer %	0 -0.36
Bulk Density kg/m ³	125 – 130
Higher heating value (GCV) Kcal/Kg	2200 to 2270

1.2 SOME CASES OF FIRE ACCIDENTS IN BAGASSE YARD & NECESSARY PRECAUTIONS REQUIRED.

Following is the list of leading sugar plants with its annual bagasse production data, (As in table-2), (i.e.[4]).

TABLE - 2

LIST OF SUGAR PLANT WITH BAGASSE PRODUCTION.
SEASON 2011-12.

Plant	Cane crushed.(MT)	Bagasse produced.(MT)
DRK Panchganga(Renuka Sugar)	5.34 Lac.	1.49 Lac.
Warana	13.90	3.89
Dr.D.Y.Patil	3.36	0.94
Hamidwada	4.33	1.21

In the region of Western Maharashtra following so many fire accidents happened in bagasse yard as discussed below.

1.1.1 Warana Co-Operative Sugar & Co-Generation Plant. (Cap-8000TCD/36MW.)

In this plant suddenly bagasse was caught by rapid fire. At this incident there was no provision of own- quick highly sophisticated fire fighting system.(Installed by Renuka sugar) Also at 11th hour situation this plant is totally depend on external aid of fire fighting vehicles. So due to this plant was lost following items.

Total loss of 5,000MT bagasse.

One tractor with trolley.

One JCB vehicle.

Thus plant lost two nos. of vehicles along with valuable fuel. The total estimated cost of plant loss given by authority is Rs.1.75 Crore. (i.e. [4] Dt.02March 2012).

1.1.2 Dr.D.Y.Patil Co-Operative Sugar & Co-Generation Plant.(Cap-2500TCD/12MW)

In this plant bagasse heap was caught fire suddenly due to slightly touch of bagasse dumping trolley with high voltage power transmission line, which is passing over stored bagasse heap. Due to this action of high voltage, the vehicle driver thrown away from its seat and due to sudden heavy sparks bagasse was caught by rapid fire. During this accident the vehicle driver was seriously injured by heavy electric shock & fire. And finally this driver was found dead. At this incident there was no provision of own- quick highly sophisticated fire fighting system. Also at 11th hour situation this plant is totally depend on external aid of fire fighting vehicles. So due to this plant was lost following items.

Total loss of 10,000MT bagasse.

One tractor with trolley.

Death of tractor driver.

Thus plant lost one vehicle along with sudden death of its driver & valuable fuel. The total estimated cost of plant loss given by authority is Rs.1.5 Crore. (i.e.[4] Dt.06Feb. 2012).

1.1.3 Hamidwada Co-Operative Sugar & Co-Generation Plant.(Cap-3500TCD/12MW)

In this plant bagasse heap was caught fire suddenly due to action of electric short circuit. This resulted into heavy fire caught by a huge storage of bagasse.

At this incident there was no provision of own-quick highly sophisticated fire fighting system. Also at 11th hour situation this plant is totally depend on external aid of fire fighting vehicles. So due to this plant was lost following items.

Total loss of 10,000MT bagasse.

Store material kept near bagasse was caught by fire. having cost Rs.50 Lac.

The total estimated cost of plant loss given by authority is Rs.2.0 Crore. (i.e.[4] Dt.21March 2012).

2. NECESSARY CAUTIONS TO BE TAKEN WHILE STORING BAGASSE IN YARD.

- I] Avoid storage of bagasse below & near high voltage (H.T.) transmission lines
- II] Avoid route of electric supply cables & cable trenches far away from stored bagasse or bagasse heaps.
- III] Always kept raw & useful material far away from storage of bagasse area.
- IV] Installation of Fire Hydrant(self auto-mode fire fighting) system around the area of bagasse yard.
- V] Posting of proper supervision staff with necessary communication facility.
- VI] Daily record of bagasse storage data, proper review taken by higher authority.
- VII] Training of all the involved staff in normal & emergency operating system.

Thus in this way doing proper planning & taking some necessary steps, also creating awareness among workers about sudden bagasse fire and emergency action plan will definitely avoid risks of heavy fire.

In this way we can save a valuable fuel & life of human being working near bagasse. Also it is quite suitable & self-dependent thing of installing self auto-mode fire fighting system which is having less cost than cost paid by fire incidents say upto crores of rupees loss.

Since, definitely erection cost of self auto-mode fire fighting system is less than to pay much more after happening of fire accident.

Now such like a system is erected & efficiently run by Shree Renuka Sugar at its co-generation

plant.(D.R.K.Panchganga,Ichalkranji Unit.) This system proves itself quite efficient with quick response.

Now whatever the amount invested by Renuka thus pay-back by this system, every year by using efficient way.

3 FIRE PROTECTION SYSTEM-A REVIEW AT RENUKA SUGAR & CO-GENERATION PLANT.

Presently at the DRK.Panchganga sugar & the co-generation plant, (Lease unit of Renuka Sugars.Belgaum) beginning from the erection stage necessary steps taken by management to avoid fire risk.

For protection of the plant against fire, main plant ,transformer area,bagasse storage yard (i.e.Fig.1)etc.are protected by Hydrant system(i.e. Fig.2,3)apart from portable &mobile fire extinguishers. Fire water pumps of hydrants are installed in a fire water pump house located with pump suction connected in the raw water reservoir.(Cap-10 Lac,Ltr) Two fire water pumps one of which is electric motor driven (i.e. Fig.4) & the other diesel engine driven(i.e.Fig.5,6,7) which would be brought in operation automatically sensed by pressure transmitter. Thus hydrant system will feed pressurized water to hydrant valves located throughout the plant.

4 HOW SYSTEM WORKS?

In this fire water pump house there are two pumps present out of this one pump is called as Johnny pump & other as fire pump (such details given in table -4).Johnny pump is having low capacity used for minor requirement and other is used major requirement which is working on the base of sensing line pressure &operates on auto mode due to falling of line pressure.

In emergency case, working of Diesel engine started by operator. The necessary communication required for this is carried out by using Walkie Talkie set. This is done by bagasse yard supervisor to pump house operator (i.e.Fig.8)

In this plant total 45 nos. fire hydrants are located round the area of bagasse storage yard (Fire Hydrant details collected from –web site (i.e.[5,6])). The total investment cost on system is **Rs. 90Lac** (Cost include-Diesel engine with pump &Elec. Motor with pump,Hydrants with pipeline etc.)

TABLE-4
PUMP HOUSE DETAILS.

Name	Pump	Motor
Johnny pump	100m ³ /Hr	20 HP
Fire pump	273 m ³ /Hr	150HP/1485RPM
Diesel engine	273 m ³ /Hr	Engine Rating 133HP

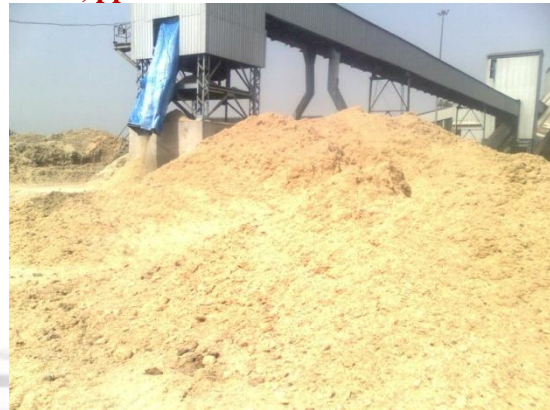


Fig. 1 Bagasse from mill



Fig.2 Water hydrant tap



Fig.3 Double door hose box with jet nozzle



Fig.4 Main fire pump.



Fig. 5 Diesel engine.



Fig.6 Engine control panel.



Fig. 7 Engine coupled with pump.



Fig.8 Walkie Talkie used by bagasse operator.

5 CONCLUSION.

While facing with fire risk of bagasse only one person could not be able to fight, but taking some essential steps such as action plan, knowledge of fire fighting system with safety awareness among workers etc, one can easily come over the risk of bagasse fire & save this renewable fuel along with minimum loss of property.

Also it seems to be better to invest Rs.90 Lac. for fire equipments rather than to waste Rs.2.0 Crore.

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REFERENCES

- [1] D.B.Uphade, S.R.Patil, Proceedings, 'The Sugar Technologists' Association Of India', 2009. Page no. Engg.-76,77.
- [2] D.S.Gurav. Proceedings, 'The Deccan Sugar Technologists' Association Of India', 2006. Page no. G-8.
- [3] DPR Prepared by 'Ugar Sugar's, Consultancy, Ltd. 2008. Chapter-8 page no. 37,38, Appendix-1, page no.54.
- [4] www.esakal.com
- [5] www.pcbassam.org/
- [6] "http://en.wikipedia.org
- [7] www.cogenindia.org