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Review on Increasing Boiler Efficiency Using Solar Bagasse Dryer

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Abstract : *Sugar Factories Combined With Co-Generation Have Voluminous Potential Of Energy Conservation. Analyzing All The Energy Inputs And Utilizations Of Conjugated Boiler And Co-Generation Performance Of Plant Can Be Known. Sugar Cane Bagasse Drying Is One Of The Best Measure Of Energy Conservation In Boiler. Objective Of This Work Is To Reduce The Moisture Of Bagasse By Using Solar Energy. Significance Of Bagasse Drying Is That The Efficiency Of Boiler Increases By 0.5 % By Reducing Fuel Bagasse Moisture By 1 %. Need Of Bagasse Drying Is For The Conservation Of Energy In Boilers, Because There Are More Than 700 Sugar Factories In India And Each Sugar Industry Must Have Boiler For The Production Of Processing Steam. Some Factories Are Cogeneration Plants Too, Cogeneration Plants Need Comparatively Bigger Than On The Sugar Factory Without Cogeneration And Number Of Cogeneration Plants On Sugar Industries Increasing Day By Day.Sugar Cane Bagasse Have High GCV But Due To Average 50% Moisture It Is Not Possible To Achieve Its Full Heat. This Work Suggests To Use Solar Energy To Dry Bagasse To Improve Boiler Efficiency.*

Keywords: *Bagasse, Co-Generation, Dryer, Moisture Solar Energy, GCV, Boiler, Efficiency, Sugar Factory.*

I. INTRODUCTION

The Sugar Consumption In India Increasing 7 To 8 % Per Annum, The Numbers Of Sugar Industries Are Also Increasing To Meet Market Demand. Obviously The Consumption Of Energy In Sugar Industry Hiking Day By Day, Due To Energy Crisis Now Day's Availability Of Fuel Became Scarce. The Implementation Of Modern Techniques And Measures Of Energy Saving Will Make Big Reduction In Total Sugar Losses And Energy Consumption. Therefore The Conservation Of Energy In Sugar Industry Has Great Significance (A. N. Pathak, 1999)[9]. Need Of Bagasse Drying Is For The Conservation Of Energy In Boilers, Because There Are More Than 700 Sugar Factories In India And Each Sugar Industry Must Have Boiler For The Production Of Processing Steam. Some Factories Are Cogeneration Plants Too, Cogeneration Plants Need Comparatively Bigger Than On The Sugar Factory Without Cogeneration And Number Of Cogeneration Plants On Sugar Industries Increasing Day By Day.

Malegaon Sahakari Sakhar Karkhana Ltd. (MSSKL) Shivnagar, Baramati, Is The Leading Name In The Co-Operative Sugar Sector In Maharashtra. The Installed Capacity Of The Factory Is 4000 TCD. The Plant Has Installed The Co-Generation Power Plant Of 21 MW Utilizing The Bagasse From The Sugar Plant In 2009. The Surplus Power Of 14.0 MW Remaining After The Home Load Consumption Is Exported To The MSEDCL Grid. Bagasse Drying Is The One Of The Best Measures To Conserve Energy In Cogeneration Plants. Bagasse Is A Byproduct Of Sugarcane After Crushing Into The Mills. Bagasse Have Changing Potential Of Heating Values, Depending Upon The Various Factors Like Soil, Climate, Milling Efficiency Etc. Generally GCV Of Bagasse Varies Between 1600 To 2300 Kcal/Kg. The Moisture Contain In Bagasse Varies From 45 To 55%. The GCV Of Bagasse Can Be Calculated As GCV = 196.05 × (100 – Moisture % - Ash %) – 31.14 × Brix Kj/Kg. It Has Been Observed That Reduction In Moisture By 1% Increases Boiler Efficiency By 0.5% And Increases GCV Of Bagasse By196 Kj/Kg Or 47 Kcal/Kg. (Sankalp Shrivastav, 2013).

Objective Of This Work Is To Reduce The Bagasse Moisture. If The Moisture Of Bagasse Decreases With 1 %, The Calorific Value Of Bagasse Increases By 196 Kj/Kg And The Efficiency Of Boiler Increases With 1 %. (Sankalp Shrivastav , 2013)[3]

II. Literature Review

Lakshmi Pathi Jakkamputi, Mohan J.K.Mandapati "Improving The Performance Of Jaggery Using Solar Energy, 2016"- This Paper Present Analytical Calculations Done To Study The Performance Improvement Of The Jagerry Making Unit Using Solar Collector And Solar Dryer.

Mr.Avesahemad S.N.Husainy "Review On Direct, Indirect And Mixed Mode Solar Dryer, 2017"- Experimently It Is Proved That Solar Drying Technology Is Economical Viable And Possible.In This Review Paper We Reviewed Dirct Mode,Indirect Mode And Mixed Mode Solar Dryer For Various Agricultural Crop.

J. Sudhakaran ,Dp. Vijay, "Control Of Moisture Content In Bagasse By Using Bagasse Dryer", 2013- Experimental Results Showed That 3 To 4% Reduction In Bagasse Moisture Will Increase Gross Calorific Value Of Bagasse By 700 To 800 KJ/Kg And It Will Improve Efficiency Of Boiler By 1.5 To 2%. Most Bagasse Has Moisture Content Between 48 % And 55 % By Weight. The Lower Bagasse Moisture Contents Are Generally Found In Hawaii (United States). Typically A Mill Wet Bagasse Contains 51% Moisture With A Gross Calorific Value Of 2250 Kcal/Kg (9400 KJ/Kg). Sugarcane Is Both A Food And Energy Crop That Is Also A Non-Exhausting Source. The Production Of Electrical Energy From Sugarcane Fiber (Bagasse) Is Assuming Great Importance.The Main Source Of Energy Saving Is To Control Bagasse Moisture.Then Bagasse Dryer Was Installed. Around 45% Of Wet Bagasse Was Passed Through The Dryer .

Chetan T. Patel, Dr.Bhavesh K. Patel, Vijay K. Patel, "Efficiency With Different Gcvof Coal "2013 -In This Reaserch Paper From The Data Related To The Boiler, If Higher GCV Coal Is Used, Then The Efficiency Should Be Increased.Ash And Moisture Content Inside The Fuel Will Affect The Efficiency. Here By Using Semi Bituminous Coal Efficiency Is 80.20% Because Of Its High Heating Value And Less Moisture And Ash Content, While Indian Lignite Coal Gives 77.51% Efficiency On The Same Boiler Because Of It Has A More Ash And Moisture Contents Than The Semi Bituminous Coal. From This Indirect Method Mathematical Model, The Efficiency Should Be Easily Calculated. Simulation Should Be Carried Out By The Adding Different Value Of Data.Efficiency Depends On The Moisture Of Fuel.

J. Sudhakaran ,Dp. Vijay, "Control Of Moisture Content In Bagasse By Using Bagasse Dryer", 2013- Experimental Results Showed That 3 To 4% Reduction In Bagasse Moisture Will Increase Gross Calorific Value Of Bagasse By 700 To 800 KJ/Kg And It Will Improve Efficiency Of Boiler By 1.5 To 2%. Most Bagasse Has Moisture Content Between 48 % And 55 % By Weight.

III. Methodology

Solar Bagasse Dryer Design Is Depends Upon The Requirement At The Plant. First Of All The Collection Of The Required Data From The Sugar Factory Will Be Done. Then After The Calculation Of The Boiler Efficiency With Existing Bagasse Moisture By Indirect Method. Then There Will Be Design Of Solar Bagasse Dryer On The Basis Of Various Aspects Like Bagasse Feed Rate, Moisture Percentage To Ne Reduced Etc. Final Results Will Show The Reduction In Bagasse Moisture And Ultimately The Increase In Efficiency Of Bagasse Will Be Calculated.

IV. Observations

We Have Collected Some Information From Malegaon Sugar Factory Which Will Help Us For Our Experimental Analysis**.**

4.1 Data Collection From MSSKL

Sr.No.	Parameters	Values
1	Boiler	80 TPH
2	Bagasse feed rate	36453 TPH
3	Steam Pressure	67 kg/cm^2
4	Steam Temperature	522 °C
5	Feed water temperature	103°C
6	Flue gas temperature	140 °C

Table4.1 Data Collection From MSSKL

4.2 Data Of Ultimate Analysis Of Bagasse

Sr.No.	Parameters	Values
1	Moisture	50 %
2	Pol	2%
3	Ash	1.4%
4	Carbon	22.66%
5	Hydrogen	2.92%
6	Oxygen	20.9%
7	GCV	2272 Kcal/kg

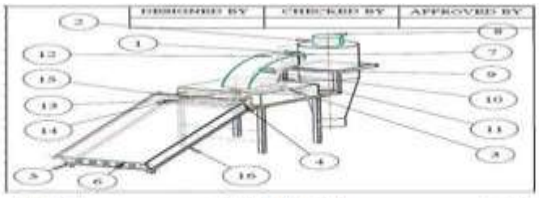
Table 4.2: Ultimate Analysis Of Bagasse

4.3 Boiler Efficiency Calculation

The Indirect Method Of Boiler Efficiency Calculation Is Measures First All The Losses From Boiler And Then Subtracting Losses From Supplied Heat Gets Boiler Efficiency

V. Proposed Experimental Setup

The Proposed Experimental Setup Will Be As Shown In Figure. It Consist Of Absorber Plate, One End Of Solar Collector Has Air Inlet Vent, Dryer Chamber, An Outlet Vent Is Provided Towards The Upper End At The Side Of Cyclone Cum Bagasse Collector. Access Door Is Provided For Bagasse Feeding. The Roof And Two Opposite Side Walls Are Covered With 5mm Thick Transparent Glass Which Provides Additional Heating. Two Air Blowers Are There, One Is To Force The Atmospheric Air To Take Heat Of Solar Absorber And Another Suction Blower Is Placed On Bagasse Collector To Induce Air And Bagasse Mixture. Bagasse And Air Mixture Is Separated After Drying Chamber Due To Air Vents Through Suction Blower And Dried Bagasse Collected In The Collector.



IND	PART NAME	QTY
1	CYCLONE BODY	1
2	CYCLONE OUTLET TOP PLATE	1
3	DRYER BOX COVER	1
4	DRYING BOX	1
5	FRAME	1
6	GLASS	1
7	INLET	1
8	OUTLET CYCLONE	1
9	OUTLET PART 1	1
10	OUTLET PART 2	1
11	OUTLET PART 3	1
12	OUTLET PART 4	1
13	SCB TO DB BOTTOM CURVED	1
14	SCB TO DB CONNECTOR	2
15	SCB TO DB CURVED CONNECTOR	1
16	SOLAR COLLECTOR BOX	1

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