



ENVIROPOL
AN ISO 45001:2018 CERTIFIED



INNOVATIVE HYBRID WESP/BIOMASS DRYER FOR WASTE HEAT RECOVERY AND DECARBONIZATION








AWARDED BY CII FOR MOST
INNOVATIVE PRODUCT FOR
THE YEAR 2021

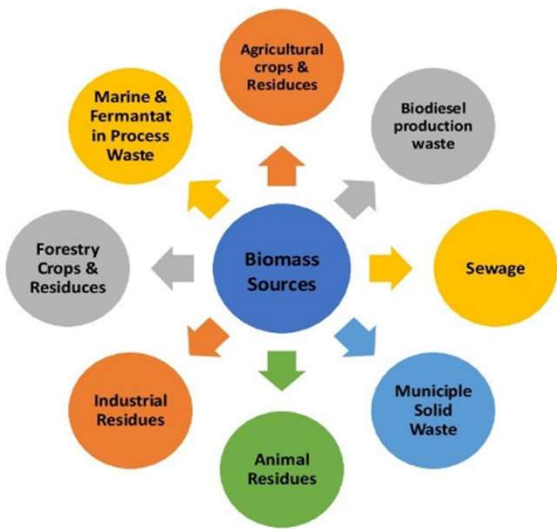
Dated :27.06.2024

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Why is the demand growing for Biomass Drying ???



- Net Zero Carbon emissions by 2070
- Mandate to replace fossils fuels by 20 %
- Usage of biomass for other applications
- Biomass densifications
- Sharp increase in price of Bagasse/ Biomass



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Biomass Type.....

WOOD	SUGAR CANE	OTHERS - Primary	OTHERS -Secondary
Chipper dust	Bagasse	Coffee Husk	Tamarind Shell
Saw dust	Mill Bagasse	Groundnut Shell	Corn waste
Screen/ Knots rejects	Bagasse Pith	Coconut Shell	Julia flora
ETP Filter Cake	Horkel Pith	Coconut Fiber	
Bark		Rice Husk	Coir waste
Match stick waste	Cane Trash	Rice Straw	Mango seed
MLSS		Wheat Straw	

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Sugar Cane Based Biomass- Moisture ,Ash and GCV

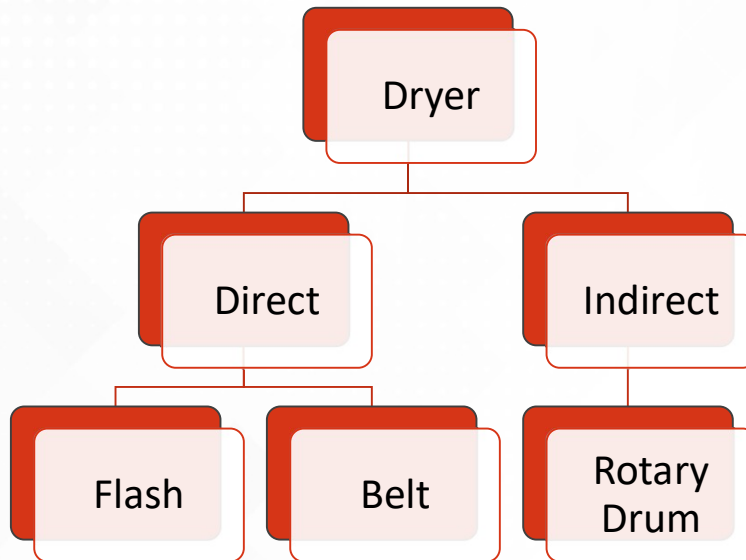
Parameter	Units	Bagasse	Bagasse Wet Pith	Bagasse Pith	Cane Trash
Total moisture	%	48-52	63	50.0	18 -20
Ash on Dry basis	%	2.5	4.1	4.5	18
GCV on Dry basis	k cal /kg	4540	4000	4035	4400
GCV on ARB	k cal /kg	2180-2360	1580	2020	3520-3620

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Prevailing -Type of Dryers for biomass



Prevailing -Type of Dryers



Flash Dryer



Belt Dryer

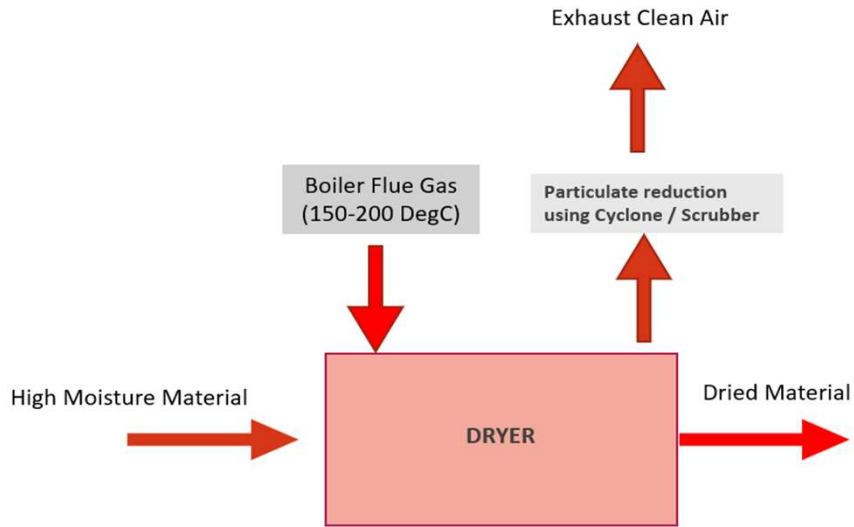


Rotary Dryer

Common Heat Sources available for Drying



Boiler Flue Gas (waste Heat)- Low temp Drying

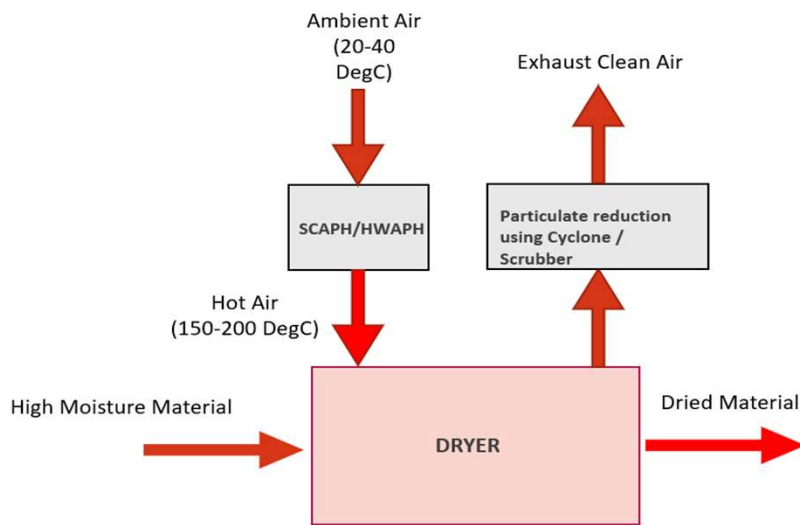


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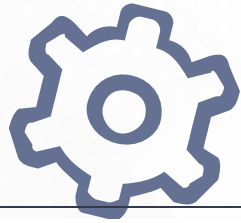
Common Heat Sources for Drying



Hot -Waste water /Steam



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BAGASSE DRYER

Gaining while Greening



New dimension- in Drying Technology



**Prolonged
Cogeneration**



**Fuel
Saving**

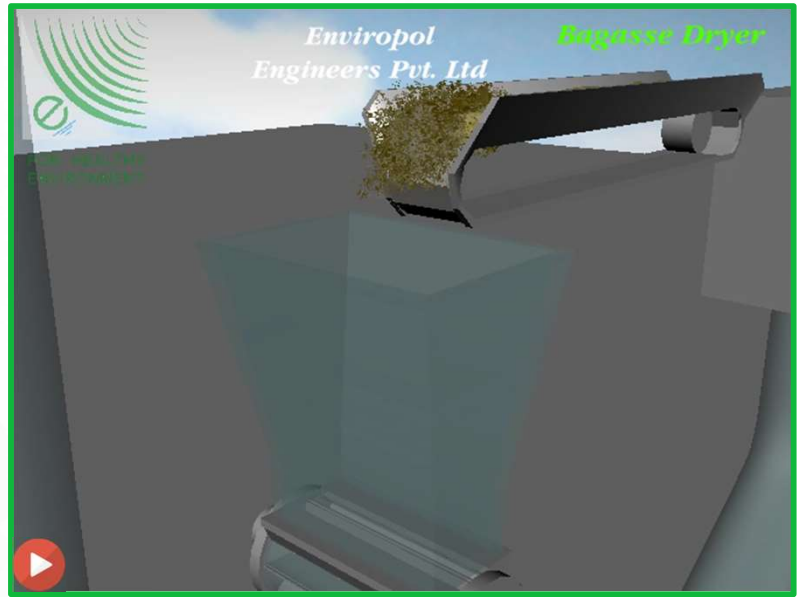
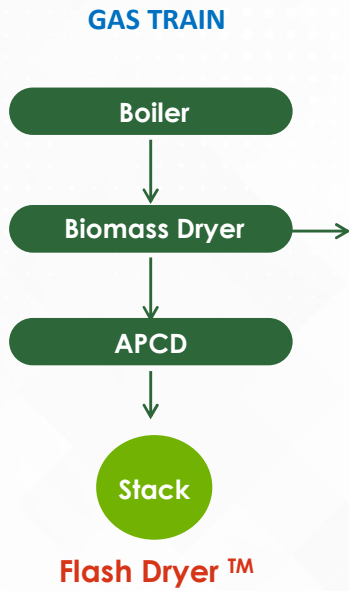


Flue Gas Cleaning



**Improved
Boiler
Operations & Efficiency**

Stage-1 : Flash Dryer- How it works ??




Special Features – Enviropol Flash Dryer



 Regulated Feeding

 Short residence Time

 High reduction in Moisture

 High efficiency Cyclone

 Higher heat Transfer

 Corrosion/erosion Resistant

 No air infiltration

Performance Results from Dryer



Particulars	Improvement (%)
<u>Moisture Reduction</u>	20-27
<u>Fuel Saving</u>	06-10
Excess Air Reduction	20-30
<u>Carbon Emission Reduction</u>	09-12
Increase in dried Bagasse GCV	18-24
Increase in Boiler Thermal efficiency	09-12
Reduction in CO Concentration	80-90
Reduction in Particulate matter	90-95
Reduction in flue gas volume due to temp drop	30-35



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Few of our Installations...



80 TPH Boiler



50 TPH Boiler



100 TPH Boiler

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Few of our Installations...



70 TPH Boiler



210 TPH Boiler



90 TPH Boiler

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Transport of Wet and Dry Bagasse...



Transport of wet bagasse



Transport of dry bagasse

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Case Study : – Innovative Bagasse Dryer in HP Cogen Boiler



BAGASSE FIRED HP BOILER

Parameter	Design Value	Units
Fuel	Bagasse	
Moisture in Mill Bagasse	50	%
Steam Evaporation [MCR]	80	TPH
Steam outlet Pressure	87	Ksc
Steam outlet temperature	515	°C
Feed Water Temperature from HP heater to Economizer	180	°C
Draught system	Balanced- FD & ID Fans	
Flue gas temperature at APH out	145	°C
APC Device	ESP	
Back end Equipment	Economizer& APH	



DESIGN INPUT PARAMETERS

Description	Unit	Value
Boiler Steam Generation Capacity	TPH	80
Bagasse Dryer Capacity	TPH	31
Bagasse moisture at inlet	%	49
Temperature of inlet flue gas (*)	Deg C	140
Quantity of inlet flue gas	m³/sec	60
Particle size distribution		Standard
Quantity		1 Set

DESIGN OUTPUT PARAMETERS

Predicted moisture in Bagasse at outlet	%	39.5±0.2
Predicted flue gas temperature at outlet	Deg C	70±2
Predicted pressure drop across dryer	Mmwc	135±10

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Data Collection-Avg. data from 4 tests



Parameter	Boiler- Design	With Dryer	Units
Steam Generation	80	*71 /87	TPH
Main Steam Pressure	86	86	kscg
Main Steam Temperature	515	517	°C
Feed water Temperature	180	186	°C
Flue gas outlet temp	133	72	°C
Fuel	Bagasse	Bagasse	
Moisture Content	48-50	38.0	%
GCV of Fuel	2375 - 2270	2825	Kcal/kg
Fuel Temperature to Boiler	30	50-65	°C



(*) On the day of testing, steam demand was only 71 TPH on 24 hrs. average basis. However the Boiler steam generation capacity enhanced to about 87 TPH on account of reduced moisture in bagasse

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Performance Results---

BCML- PERFORMANCE WITH DRYER

Parameter	Without Dryer in operation	Energy Gains with Dryer	Increase/Reduction
Bagasse Moisture	47.63 %	38 %	9.63 pp [20%]
Bagasse GCV	2375 kcal/kg	2810 kcal/kg	18%
Boiler Thermal Efficiency	70 %	76 %	6 % point
Steam Economy Upgrade	2.4 -2.5	3.1- 3.2*	11-12%
Flue Gas Temp to Stack	133°C	72°C	61°C
Excess Air Reduction			~20%
CO ₂ Reduction			33-35 t/CO ₂ e/day
SPM reduction in FG			80- 90%
NOx reduction est.			15-20%
N ₂ O reduction est.			5-10%

(*) Considering reduced weight of bagasse after dryer.

R.O.I

If we follow the power generation route, the net saving works out to INR 1, 12,390 per day considering current power tariff of INR 3.0 /kWh to the grid.

The savings, on account of sale of bagasse to other industry is calculated to INR 92,400 per day considering the current rate of bagasse as INR 1750 / Ton.

The above figure represents a Return on Investment well within less than 500 working days.



Short Video of BCML installation during commissioning



ENVIRO
N ISO 9001 : 2015 C

Common *Fears* /Queries in the Mind of End Users before Installation



- Fire Hazard
- Jamming /Choking
- Temp Range of heat source
- Loss of Volatiles Matters
- Weather to install in suction/Pressure
- Operations and Maintenance
- Adaptability of dried bagasse
- Return on Investment
- Operations and Maintenance
- Decarbonization –Carbon Credits and Es certs
- **Outlet Emissions**



HYBRID DRYER

BAGASSE DRYING & FLUE GAS CLEANING



Innovative Hybrid Model of Bagasse Dryer



HYBRID DESIGN

Milled Bagasse Moisture reduced to 38-40 % from 50 %

New Age Technology



Emission Up to 10 mg/Nm³



First Installation in the World.. Commercialized in 2019



WESP as part of Hybrid Model at DSW

- Gas flow- 220,000 m³/hr @ 140 deg c
- Outlet particulate emissions- < 50 mg/Nm³
- Bagasse Moisture drop - 22 %
- Net Bagasse Saving- 7 %
- Year of Commissioning- 2019

HYBRID DESIGN



Case Study : Innovative Hybrid Model on Cogen Boiler

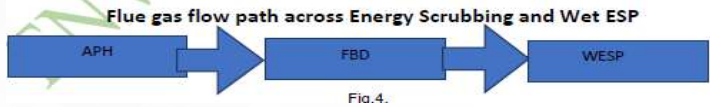
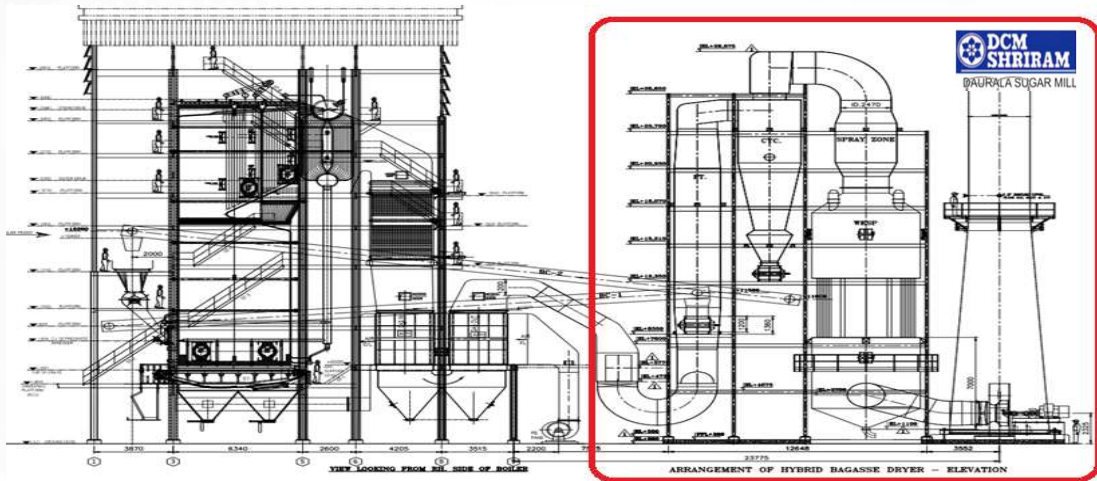
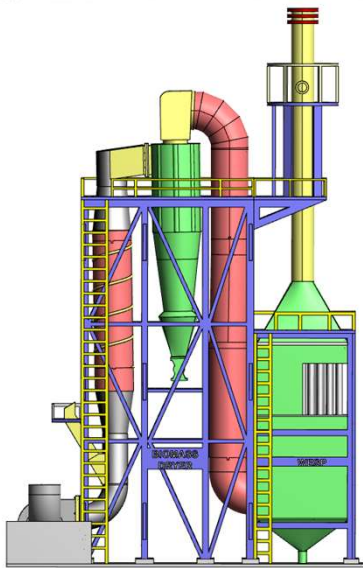


Fig.4.

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Hybrid Model -Bagasse Drying and Flue gas cleaning



DESP can be eliminated with this- Gaining while Greening concept



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... Summary of Tests conducted during the season



Average of 4 Tests conducted during the season

Particulars	Unit	APH outlet- Dryer inlet	Dryer outlet- WESP inlet	WESP outlet- Stack
Flue gas Temp	° C	135	72	68
Bagasse Moisture	%	50	39	-
Particulate in gas Emission	mg/Nm ³	4000	195	32-35
Flue gas Draught	mmWC	130	260	280

Benefits Achieved from Hybrid Model At DSW....



Qualitative Gains

- Bagasse Drying & Flue gas cleaning in one go
- Particulate Emission Control well below CPCB norms for Stack pollutants discharge
- Substantial Control on Gaseous pollutants discharge
- Lower Power Consumption as compared to conventional route (ESP followed by Dryer)
- Carbon Emission reduction with increased Green Power and lowered GHG emission
- Smaller Footprint & Compact Lay-out for Enviro-Energy scheme

Quantitative Gains

- BD & WESP integrated Particulate Emission reduction : **> 99.1%**
- Milled bagasse Moisture reduction [& GCV in fuel increase] : **22 %**
- Net Bagasse saving: **6.5 %**
- Productivity enhancement : **9 %**
- Carbon Emission Reduction:- **-30 tCO₂e/day [900 tCO₂e/month]**
- Revenue generated : **INR- 250 Lac/ 170 Days + Carbon Credits and Escerts trading**

Summary..



What all a Hybrid Model can Deliver for 20 MW Bagasse Based Cogeneration Plant

Extra Green Energy Produced: 1.2-1.5 MWh

Particulate emissions : 10-50 mg/Nm3

Other Pollutants Reduction...

Stack Flue Gas	Other Pollutants
SO ₂	Absent
Hg Compounds	Absent
Amino-acid	Countered with Alkaline water scrubbing

Gaseous pollutants Reduction...

Location	GHG Emission Reduction
	tCO ₂ e/m
Additional Green Power	900-1200
N ₂ O reduction	100-150
Overall Emission reduction	1000-1350

Potential For Replication...



Considering (+) 530 sugar Mills & (+) 10,000 MW of Bagasse based cogeneration presently available in India, Hybrid model of bagasse dryer has a great potential for replication to produce

Additional Clean Green Energy : 2500 GW
Reduction in GHG : + 2.5 million tCo₂e
on yearly basis

(considering 170 days of sugar cane crushing season /Year)



Potential For Replication...



Considering (+) 552 Paper & Pulp Mills besides 48 PAT related P & P mills presently in operation in India, Hybrid Model of Biomass Dryer has a great potential for replication to produce

Reduction in GHG : +2.0 million tCO₂e
on yearly basis

Besides quantum increase in Green Energy & Cleaner Environment



Similar opportunity lies for other industries using biomass

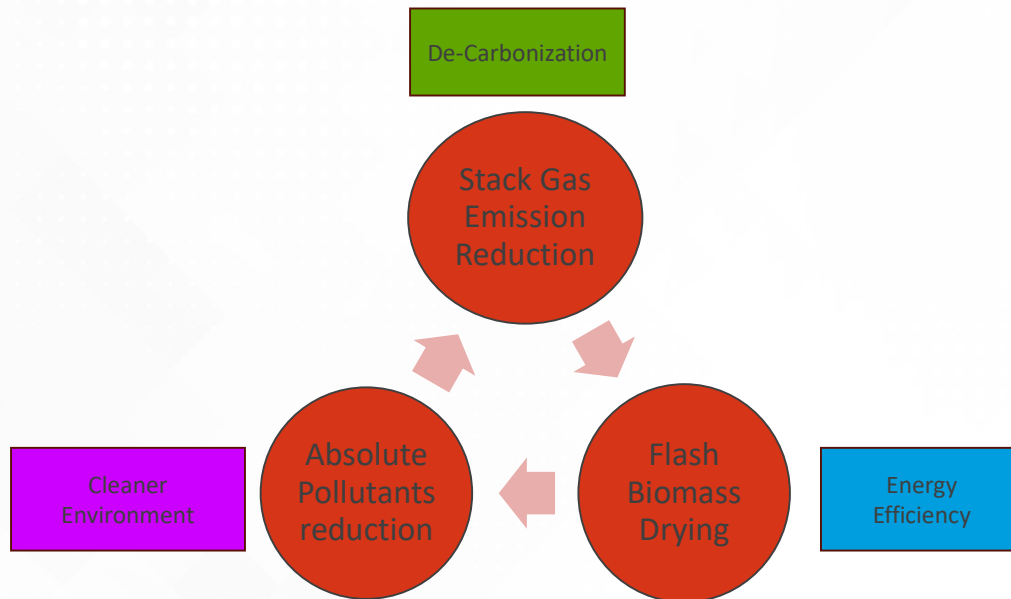


PAT [Perform, Achieve & Trade] & Min. of Power Carbon Credit Trading Scheme 2023



- With Sugar sector coming under PAT [as per the Min.of Power Notification of May 2023], the increase in specific steam generation in boilers with dried bagasse firing would be availing of EsCerts.
- Over & above, the very recent Min. of Power Gazette notification on Carbon Credit Trading Scheme [June 2023] ,the above renewable energy gains can be related to displacement of equivalent imported coal firing in boilers elsewhere. In essence, Flash Biomass Dryer would contribute to EsCerts & Decarbonization.

CIRCULAR ECONOMY



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AIR POLLUTION REDUCTION- way forward



• Absolute Emission Reduction

With increased Boiler thermal efficiency with FDB in place, the quantity of fuel burnt is lowered ; resulting in reduction of all gaseous pollutants viz., SO₂,NO_x, N₂O,HgO & CO₂, through stack flue gas to landscape.

• Specific Emission Reduction

Solid Pollutants [SPM, PM₁₀ & PM 2.5] in stack flue gas shall be considerably lowered [< 30 mg/Nm³] through WESP in place . Waste heat recovery in Clarified water used in WESP through Boiler make up feed water heating in wide-gap PHE .

• Temperature Reduction

Having a norms on temperature of any gas going to environment will lead to reduction in absolute and specific emission reduction.

- Subsidies on capex

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Certification & Awards....



ENVIROPOL ENGINEERS (P) LTD.

Most Innovative Energy Saving Product

INNOVATIVE HYBRID DRYER FOR BAGASSE

ENVIROPOL - Hybrid Dryer/WESP is a way forward to make "Air Pollution Control (APC)" a Revenue Generating Model in sugar Industry through innovative integration of Bagasse Drying & Wet Electrostatic Precipitation to generate enormous amount of green & clean Energy.

Our Manufacturing Range

- Hybrid Model-A : Bagasse Dryer+ WESP
- Hybrid Model- B : Bagasse Dryer + WSS

Applications

Sugar & other Biomass based Power Generating Plants

Rajesh Verma

Managing Director

Team Members

Unique Features

- Established First of its own kind "Revenue Generating APC model" in the world for Sugar Industry
- Receiving Patent from Government of India (Patent No- 363763)
- Receiving "Industry Excellence Award" from "Sugar Technology Association of India"
- Publications in various National/International Journals including Cogen India/STAI/ISSCT

2021

22nd National Award for Excellence in Energy Management

Confederation of Indian Industry

Gaining while Greening

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Certification & Awards....



Patent Awarded

INTELLECTUAL PROPERTY INDIA

भारत सरकार
GOVERNMENT OF INDIA

भारत के पेटेंट कार्यालय
THE PATENT OFFICE
भारत सरकार
PATENT CERTIFICATE

पेटेंट नं. / Patent No. : 363763

अर्जन नं. / Application No. : 2016/1041275

बतलाव दिनांक / Date of Filing : 02/12/2016

पेटेंट / Patents : ENVIROPOL ENGINEERS PVT. LTD.

This is to certify that the holder of the patent is the inventor of the DEVICE AND SYSTEM FOR REDUCING POLLUTANTS FROM FLUE GAS STREAM. It is hereby certified that a patent has been granted to the patentee for an invention entitled DEVICE AND SYSTEM FOR REDUCING POLLUTANTS FROM FLUE GAS STREAM as disclosed in the above mentioned application for the term of 20 years from the 2nd day of December 2016 in accordance with the provisions of the Patents Act, 1970.

Appreciation from end users

DCM SHRIRAM INDUSTRIES LTD.
UNIT: ANDHRA SUGAR WORKS

Date: 24.08.2021

TO WHOMSOEVER IT MAY CONCERN

HYBRID - WESP/BAGASSE DRYER

This is to certify that M/s. Enviropol Engineers Pvt. Ltd. has successfully commissioned Hybrid Model of Bagasse Dryer (Bagasse Dryer with Integrated Wet Electrostatic Precipitator (WESP)) at our 90 TPH Bagasse Fired Boiler installed last year.

The performance of Hybrid Dryer has been found satisfactory. It is clearing the Flue Gases to below 50 mg/Nm³ while reducing the moisture in Bagasse by 11 units (from 30% to 19%).

WESP Integrated with Dryer is also a High Efficiency Fueling Filter in

BALRAMPUR CHINI MILLS LIMITED

Date: 14.04.2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that M/s Enviropol Engineers Pvt. Ltd., has had Design, Engineering, Manufacturing, Supply of Bagasse Flash Dryer system for 80 TPH, Bagasse Fired Boiler at M/s. Balrampur Chini Mills Ltd, Balrampur (UP) in the year 2020-21.

The system is running satisfactory since the commissioning.

For BALRAMPUR CHINI MILLS LTD.
AUTHORIZED SIGNATORY

CII Award for Most Innovative product of year 2021

CII
Confederation of Indian Industry

22nd National Award for Excellence in Energy Management 2021

This is to certify that
Bagasse Flash Dryer & Its Hybrid Model
offered by
Enviropol Engineers (P) Ltd
has been recognized as
"Most Innovative Energy Saving Product"
This acknowledgment is based on the evaluation by the panel of judges at the "National Award for Excellence in Energy Management" held during 24 - 27 August 2021.

Rajesh Verma
Managing Director
Enviropol Engineers (P) Ltd.

Ravichandran Puroshothaman
Executive Director
Confederation of Indian Industry



Excellence Award from STAI



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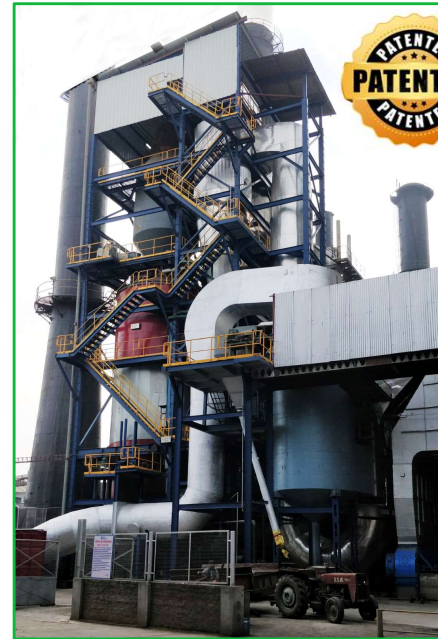
CONCLUSION...



The Hybrid Dryer/WESP is a way forward to view the investments on **Air Pollution Control Device- APCD** as revenue generating projects through Flue gas cleaning & Bagasse saving/ producing additional clean energy & Contributor to Low Carbon Economy.

The Integrated **Wet Electrostatic Precipitator-WESP**, being the most advanced emission control technology in the world as on today, and its presence as last equipment before stack makes the Hybrid Model a perfect device to maintain cleaner environment even during varying operating conditions of Bagasse Dryer.

The Hybrid scheme can be easily extended to other High Moisture fuels viz., Bagasse pith [55 to 60 %], Chipper dust etc.



Products Range



ENVIRONMENT



- Wet Scrubber
- Slurry De-Watering
- Electrostatic Precipitator
- Flue Gas Desulfurization
- **EGB/MEPA**
- Chemical Scrubber
- Bag Filter

ENERGY



- Bagasse Dryer
- **Hybrid Dryer**
Gaining while Greening
- Bio-Mass Dryers
- Co-generation Power Projects
- Biomass Fired Boilers

Our Offices...



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Overseas Branches:

- Thailand 
- Vietnam 
- Philippine 
- Indonesia 
- Kenya 
- Sri Lanka 