Agro residue biomass pellet co-firing for power generation

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NTPC Dadri
Welcome all delegates on Digital Award Conference for CII Environmental Best Practices Award, 2020

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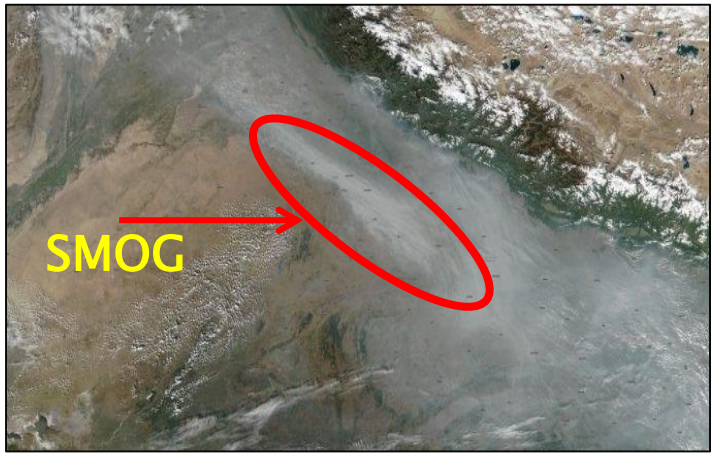
Agro residue biomass pellet co-firing for power generation



Satellite imagery showing smog in NCR regions

Agro residue burning

Uniqueness of the Project

- SMOG was first experienced in NCR during November' 2016.
- The **SMOG scenario repeats** every year during early winters with more intensity.
- In 2019, the **SMOG prevailed for a week between 7-14th November.**
- During this period Air Quality Index (AQI) of NCR crossed 2000 scale (whereas >400 considered as "**severe**").
- Studies revealed that one of the reasons of **SMOG** in NCR is due to agro residue / stubble burning.
- The Rice stubble & other residual's left outs in the fields are because of **Mechanical harvesting.**
- Farmers used to **burn the rice straw /stubbles** in the fields itself for preparing next crop.

Agro residue biomass pellet co-firing for power generation

Stubble plume intrusion makes Delhi air 'very poor', likely to turn 'severe' by Tuesday

10 Nov, 2019, 09.36 PM IST

The Central Pollution Control Board (CPCB) registered Delhi's air quality index (AQI) at 321 at 4 pm on Sunday, up from Saturday's 283. Most of the 37 air quality monitoring stations in Delhi recorded air quality in the 'very poor' category.

News on SMOG crises in NCR

- SMOG scenario triggered to explore alternate options to utilise the agro residue as a source of energy.
- Agro residue may be used as co-firing (in biomass pellet form) for power generation in thermal plants after blending with coal.
- It is an **unique & low cost option** for utilization of agriculture residue.
- The trial operation of co-firing was done during September' 2017.
- During the trial, blending of biomass pellet was done in various ratios to evaluate it's impact on existing system.
- After successful trial of co-firing of Biomass pellet, it has been implemented at Dadri since Nov' 2019.

Agro residue biomass pellet co-firing for power generation

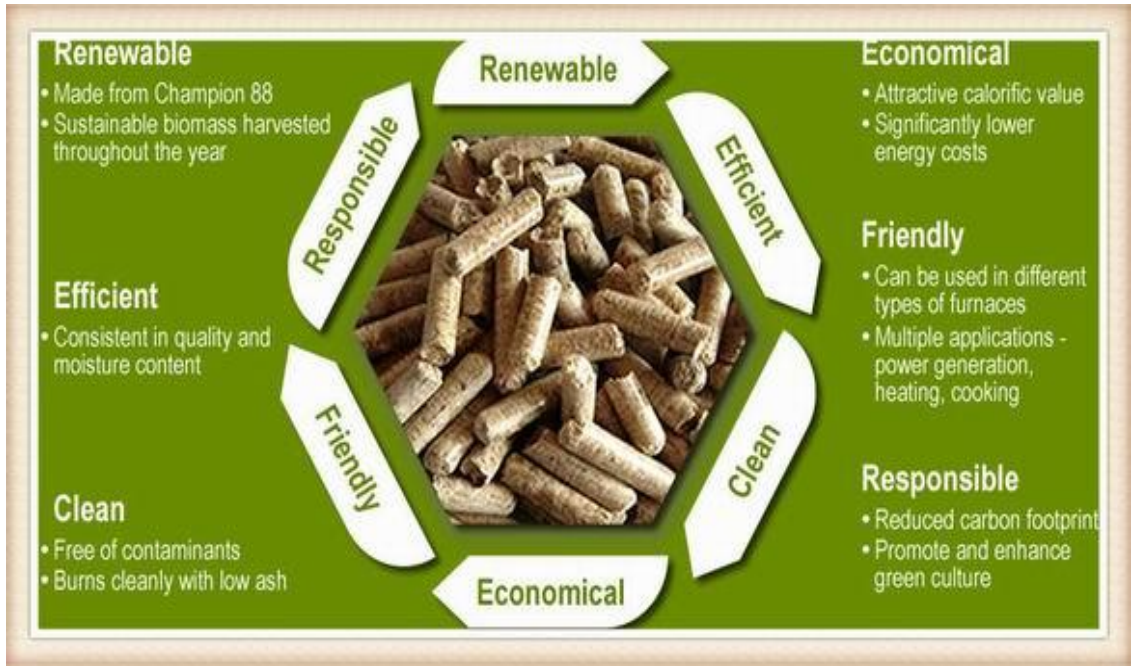
Description	Savings
Natural Resource Conservation	6,000 ton Coal eq*
Green House Gas emission reduction	7,885 ton CO_2 eq*
Ash evacuation & Transportation	Rs 0.7 million/annum**
SO_2 Emission Control Devices	Rs 18.2 million/annum**
Energy Recovery from Waste	1,200 kWh/ton of Biomass pellet
Farmers Benefit	Rs 1,500 – 2,000 / acre

* Project period – Five Months (Nov, 2019 – March, 2020)
** Calculated on 100% PLF at 10 % blending for 210 MW unit

Tangible Benefits

- **Industrial Benefit**
  - Conservation of Natural Resources.
  - Green House Gas (GHG) reduction.
  - Cost savings in ash handling.
  - Reduction in O&M cost for SO_2 emission control devices.
  - Energy recovery from waste.

- **Benefit to Farmer**
  - Enhancing income of farmers.



Benefits of Agro Residues Biomass Pellets

Intangible Benefits

- **Improvement in Environment Quality**
  - Significant reduction in SO_2, NOx & PM emissions.
  - Improvement in Ambient Air Quality.
  - Maintaining Soil fertility of fields.

- **Social Benefits / Skill Development**
  - Employment opportunities in rural areas.
  - Opportunities for New business for farmers.
  - Development of Entrepreneurial skills.

Agro residue biomass pellet co-firing for power generation

Biomass Pellets Handling

Replication Potential within Group Companies

- The experience of co-firing has been shared among other NTPC stations through **Technical Paper** and **Demonstration** for replication.
- Agro residue biomass pellet co-firing project is under implementation in **21 NTPC** coal stations.
- The procurement for **7.1 million ton / annum** of biomass pellet has been initiated for co-firing in power generation among NTPC stations.
- Accordingly, **Supply contract** for biomass pellet for other NTPC projects have been initiated and are in advance stage.
- Simultaneously, required i**nfrastructure** is also being developed in other NTPC plants.
- **Local vendors** for supply of biomass pellet have been explored for respective Power stations.

Agro residue biomass pellet co-firing for power generation

Description	Potential
India's total Installed capacity (Coal based)	198,734 MW
Availability of Biomass across India	350 million ton/annum
Biomass Power Potential in India	19,500 MW (14,000 MW by co-firing)
Biomass pellet Requirement (on 100% PLF at 10 % blending)	248 million ton / annum
Green House Gas reduction potential	352 million ton CO_2 eq / annum

Replication Potential of Project within the sector

- **Steps initiated by GOI**
  - MoP framed the enabling policies for replication at other power stations across India.
  - MoP / CEA issued advisory for biomass pellets co-firing.
  - Standardization of specifications for Biomass pellet.
  - Methodology development for estimation of power generation through biomass pellet and its compensation by CERC.
- **Steps initiated by NTPC**
  - NTPC has organised **training programmes** on biomass pellet co-firing for Power sector engineers.
  - **Demonstration** of co-firing project to engineers of other power stations for getting first hand knowledge
- Biomass pellets can be manufactured from **different agro residue** as available locally near thermal power plants (corn stalk & cobs, rice straw & stubbles, groundnut shells, mustard stalk etc).

Technical & other challenges

Challenges	Mitigation Measures	Result
Maintain of **supply chain** of biomass pellets	Multiple source of supply has been ensured **by Vendors development** through interaction and training.	Regular supply achieved
Quality of Biomass pellet gets deteriorated because of moisture	Ensuring of transportation through covered trucks.	Quality of Biomass pellet maintained
Safe unloading of Biomass pellet	Development of **Truck Tippler** facilities.	Safe and efficient unloading achieved
Integration facilities for **Handling & Co-firing** with existing system	Automation of biomass feeding and calibrated with existing system	Stable firing in required blending ratio
Fire possibilities during pulverizing	**Modulation control** of HAD & CAD has been provided at mill inlet rather than mill outlet.	Fire possibilities has been reduced

Agro residue biomass pellet co-firing for power generation

Blended Biomass Pellets fed to Boiler

Achieving National Benchmark / standards

- Based on trial conducted at Dadri, **MoP has framed policy** for use of biomass pellet in co-firing (blending capping 5-10%).
- **MoP/CEA issued advisory** to all thermal power plant for use of biomass pellet in co-firing.
- Biomass pellet contains less **Sulfur Content** resulting reduction in **SO_2 emissions.**
- Biomass pellet contains less **Ash content** (< 20 %).

Priority plans with resource requirement

Priority Plan	Resource Requirement
Implementation of co-firing of biomass pellet in power generation across **NTPC stations**.	**System Modification** required for Feeding & Firing.
Ensure **uninterrupted supply** through reliable vendor of biomass pellets.	**Development of vendors** by means of interacting and organising of training seasons.
Ensuring **availability of co-firing system** across NTPC.	**Automation** of unloading, feeding and firing system and **integration** with existing system
Controlling of **fugitive Dust Emission during** unloading and temporary storage.	Providing of **Covered shed** for unloading and temporary storage

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Biomass Pellet Conveying System

Best Practices

- Ensuring of **Moisture free Environment** for biomass pellet.
- Ensuring of **Blending ratio** less than **<10%.**
- Adherence to biomass pellet **specification.**
- Modify the existing system for effective co-firing of biomass pellet.
- **Integration** with existing system.
- System **Automation** for unloading & feeding.
- Maintaining temperature at mill inlet side to **avoid fire** during pulverization.
- Ensuring of **regular supply** of biomass pellets.

Rising with learning

Learning from the project implementation

- **Moisture free** environment to be ensured to avoid quality deterioration.
- **Modulation control** has been provided for mill inlet point rather than mill outlet point.
- Biomass pellet blending shall be **restricted to <10 %** to avoid slagging, corrosion and fouling possibilities.
- Ensure the **proper grinding** of biomass pellet to reduce un- brunt carbon in ash.
- Biomass pellet ash have **high resistivity**, resulting impact on ESP performance.

video


DEADLY SMOG
DESCENDS OVER NORTH INDIA
HEALTH EMERGENCY
DECLARED IN NATIONAL CAPITAL

Migratory Birds at NTPC Dadri

Thank You

NTPC Dadri