BIRD -RENEWABLES

SOLAR | WIND | HYDROGEN | WASTE MANAGEMENT

CLEAN ENERGY. SUSTAINABLE FUTURE.

Project 3 – Municipal Waste to Carbon Coal Powder Plant

A Scalable Waste-to-Value Solution for Tamil Nadu

Government Project Report / Concept Proposal

INTEGRATED WASTE-TO-CARBON PROCESS OVERVIEW

1. **WASTE INLET** – Municipal solid waste received at the plant
2. **SEGREGATION** – Sorting of waste into recyclable and process streams
3. **RECYCLING** – Recovery of recyclables for reuse and resale
4. **DRYING** – Moisture reduction for efficient thermal processing
5. **CONTROLLED CARBONIZATION** – High temperature pyrolysis in oxygen-limited environment
6. **POWDER MAKING** – Crushing and milling into fine carbon powder
7. **IP MIXING** – Intellectual property-based additive formulation
8. **CHEMICAL TREATMENT** – Performance boosting and emission control treatment
9. **NOODLE FORMATION** – Binding and extrusion into noodle-shaped bio-carbon
10. **AGRI-WASTE BLENDING** – Blending with agri residue for higher efficiency & stability
11. **FINAL CARBON POWDER PACKING & DISPATCH TO POWER PLANTS** – Quality packing and dispatch for co-firing in power plants

SCALABLE UP TO 1500 TPD | **RECYCLING + CARBON FUEL POWDER + CIRCULAR ECONOMY**

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"Turning Waste into Wealth. Powering a Cleaner, Greener and Self-Reliant Tamil Nadu."

WASTE TO WEALTH
Converts municipal waste into high-value carbon fuel and recyclables.

CLEAN ENERGY ALTERNATIVE
Supports co-firing in power plants and reduces fossil fuel use.

ENVIRONMENTAL IMPACT
Minimizes landfill load, reduces emissions and protects ecosystems.

ECONOMIC BENEFITS
Creates jobs, generates revenue and strengthens local economy.

SUSTAINABLE TAMIL NADU
Aligned with state goals for sustainability and self-reliance.

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STAGE 1

Waste Inlet & Receiving Section

The first critical stage ensures safe, hygienic, and efficient reception of municipal waste into the plant.

SCALABLE PLANT OPERATION UP TO **1500 TPD**

STAGE 1 PROCESS FLOW

1. **WASTE TRUCKS** – Arrival
2. **WEIGHBRIDGE** – Weight Recording
3. **UNLOADING BAY** – Waste Unloading
4. **RECEIVING BUNKER** – Temporary Storage
5. **PRIMARY INSPECTION** – Visual & Manual Check
6. **TRANSFER CONVEYOR** – To Next Stage

EXECUTIVE SUMMARY

Stage 1 establishes a controlled, hygienic, and efficient waste receiving environment. It ensures accurate load recording, preliminary inspection, and safe transfer of waste to the next stage while preventing odour, littering, and environmental contamination.

- **WASTE RECEIVING** – Designed for smooth inflow and safe unloading.
- **INITIAL INSPECTION** – Segregation of bulky, inert, and recyclable items.
- **LOAD RECORDING** – Automated weighbridge with digital data capture.
- **CONTAMINATION IDENTIFICATION** – Removal of hazardous and non-processable waste.
- **ENCLOSED HANDLING** – Covered bunker with odour control & leachate management.

KEY EQUIPMENT

- Weighbridge (Digital)
- Tipping Floor (Reinforced Concrete)
- Covered Receiving Bunker
- Grab Crane / Wheel Loader
- Odor Control Misting System
- Transfer Conveyor (Enclosed)
- Leachate Collection Channel
- Control Room & Monitoring System

SAFETY & ENVIRONMENTAL CONTROLS

- Enclosed structure to control odour & dust
- Odor control misting system
- Leachate collection & treatment ready design
- CCTV monitoring & access control
- Safety signage & pedestrian pathways
- Fire hydrants & emergency response system
- Regular cleaning & housekeeping protocol

EXPECTED OUTCOME

- Efficient & controlled waste intake
- Accurate data & traceability
- Reduced odour, dust & litter
- Enhanced worker & community safety
- Reliable feed to next process stage

Foundation for a clean, safe and efficient plant operation.

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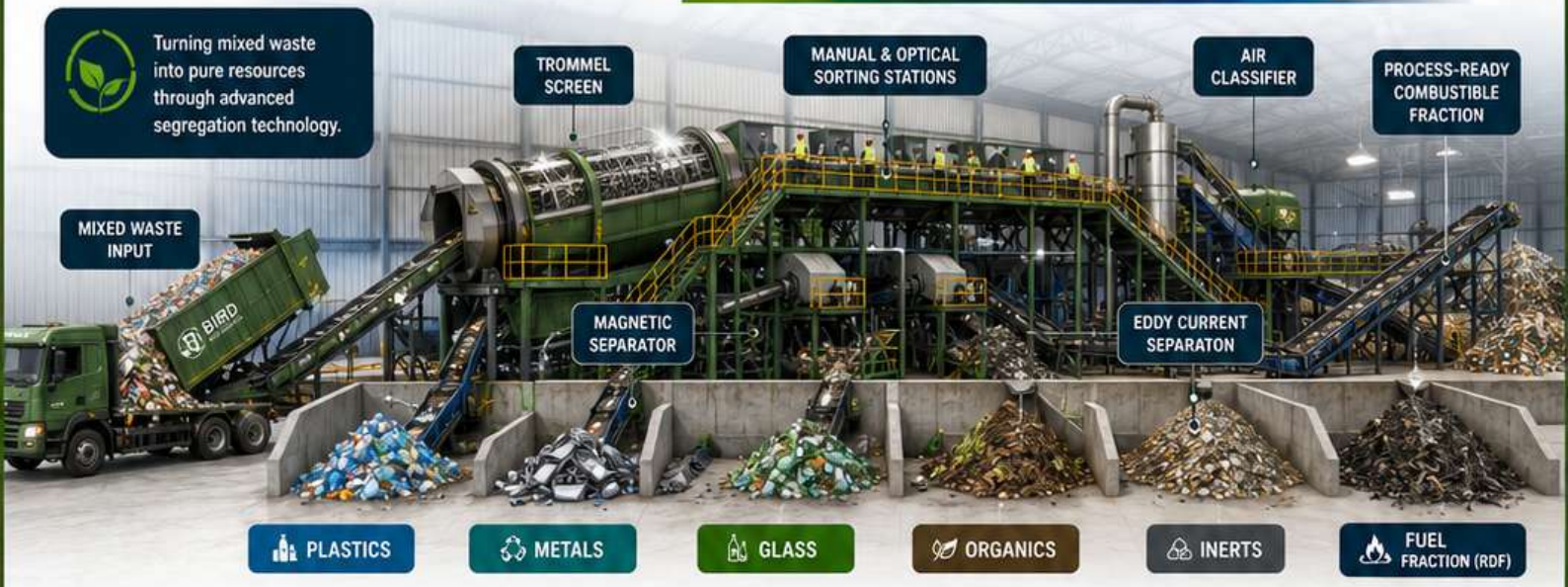
Stage 2 – Complete Waste Segregation

Precision Separation for Maximum Resource Recovery

Turning mixed waste into pure resources through advanced segregation technology.



PROCESS FLOW – COMPLETE WASTE SEGREGATION

1. **MIXED WASTE INPUT** – Municipal solid waste received from Stage 1 processing.
2. **PRIMARY SCREENING** – Trommel screening separates fines and oversized material.
3. **MANUAL & OPTICAL SORTING** – Skilled operators & optical sorters remove recyclables and contaminants.
4. **MAGNETIC RECOVERY** – Ferrous metals extracted using high-intensity magnetic separator.
5. **PLASTIC & GLASS RECOVERY** – Air classification and NIR sorting separate plastics and glass.
6. **WET FRACTION SEPARATION** – Organics & fines separated for composting or further treatment.
7. **PROCESS-READY COMBUSTIBLE FRACTION** – Clean, dry fuel fraction sent to Stage 3 carbonization unit.

RECOVERED STREAMS

PLASTICS	PET, HDPE, LDPE, PP, PS Cleaned & baled for recycling
METALS	Ferrous & Non-Ferrous Recovered for re-melting
GLASS	Cullet glass Processed for reuse
ORGANICS	Compostable fraction Converted to compost/biogas
INERTS	Stone, sand, ceramics, fines Used for construction
FUEL FRACTION (RDF)	High calorific fraction Ready for carbonization

OPERATING SEQUENCE

- Waste is metered into the trommel screen.
- Size-based separation: fines, mids, and oversize.
- Manual & optical sorting remove recyclables and contaminants.
- Magnetic separator extracts ferrous metals.
- Eddy current separator recovers non-ferrous metals.
- Air classifier and optical sorters separate plastics and glass.
- Wet fraction is diverted for organics recovery.
- Clean, dry fuel fraction (RDF) is transferred to Stage 3.

KEY EQUIPMENT & TECHNOLOGIES

- **Trommel Screen** – Size separation
- **Conveyor Systems** – Precision material handling
- **Manual Sorting Stations** – Quality control
- **Optical Sorters (NIR)** – Plastic & material identification
- **Magnetic Separator** – Ferrous metal recovery
- **Eddy Current Separator** – Non-ferrous metal recovery
- **Air Classifier** – Light vs heavy material separation
- **Baling & Storage Systems** – Recovered material handling

AUTOMATION & MONITORING

- Automated conveyors with VFD control
- NIR sensors for material identification
- Metal detectors & sensors for quality assurance
- Real-time data dashboard & KPI tracking
- Dust suppression & negative pressure system
- PLC based control for safe & efficient operation

STAGE 2 BENEFITS

- **HIGHER RECOVERY** – Maximizes recyclables and resource value.
- **CLEANER FEEDSTOCK** – Ensures high-calorific, low-contaminant fuel.
- **LOWER LANDFILL BURDEN** – Diverts maximum waste from landfills.
- **ECONOMIC VALUE** – Generates revenue from recyclables & RDF.
- **SUSTAINABLE IMPACT** – Supports circular economy and resource efficiency.

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Stage 3 – Recyclable Materials Washing & Packing

Recovering Value. Reducing Waste. Powering Circular Economy.

Stage 3 focuses on recovering valuable recyclable materials from the municipal waste stream. Through advanced washing, drying, grading and packing, we ensure high-purity recyclables that support resource recovery, reduce landfill load, and generate additional revenue.

RECYCLABLES RECOVERY PROCESS

1. **RECOVERED RECYCLABLES** – Separated from mixed waste stream.
2. **WASHING** – Multi-stage wash removes dirt, organics & labels.
3. **DRYING** – Efficient drying reduces moisture for quality.
4. **GRADING** – Size & material grading ensures purity & value.
5. **BALING / PACKING** – Compressed into bales for storage & transport.
6. **STORAGE / DISPATCH** – Stored safely and dispatched to certified recyclers & buyers.

RECYCLABLES PROCESSED

- **Plastics** (PET, HDPE, PP, LDPE) – Bottles, containers, packaging
- **Metals** (Ferrous & Non-Ferrous) – Aluminum cans, steel scrap, wires
- **Glass** – Bottles, jars, containers
- **Paper & Cardboard** – Boxes, cartons, office paper
- **Textiles & Others** – Cleaned and sorted for reuse

Clean materials. Higher value. Less waste.

WATER REUSE & CLEANING

- Closed-loop water system reduces freshwater use
- Multi-stage filtration & sedimentation
- Oil & grease removal for cleaner discharge
- Treated water reused in washing processes
- Ensures compliance with environmental standards

Clean water. Clean process. Clean planet.

DISPATCH & REVENUE SUPPORT

- High-quality bales for better market rates
- Long-term offtake agreements with recyclers & industries
- Weighbridge & digital tracking for transparency
- Supporting local jobs and circular economy
- Additional revenue stream for project sustainability

Value recovery today. Sustainable future always.

RECYCLABLES DIVERTED BEFORE CARBON FUEL PRODUCTION

Ensuring only non-recyclable residues move forward to pyrolysis.

RECOVERED & RECYCLED

Diverted at Stage 3

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MAXIMIZING VALUE. MINIMIZING WASTE.

NON-RECYCLABLE RESIDUES

Move forward to Stage 4

RECYCLE MORE. BURN LESS. BUILD A GREENER TOMORROW.

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Stage 4 – Moisture Waste Dryer (Up to 380°C Drying Section)

The enclosed moisture waste dryer removes excess moisture from the pre-processed waste using controlled hot air up to 380°C, ensuring uniform drying, low dust escape, and high operational safety. Well-dried feedstock improves energy yield, reduces emissions, and ensures stable performance in the carbonization section.

Efficient Moisture Removal for Higher Thermal Efficiency & Stable Carbonization

DRYING PROCESS FLOW

WET WASTE FRACTION
High moisture pre-processed waste

FEEDING SYSTEM
Enclosed conveyor feeds waste into the dryer

THERMAL DRYING
Controlled hot air drying up to 380°C

MOISTURE REDUCTION
Moisture content reduced to <10% for stable carbonization

DRY FEEDSTOCK DISCHARGE
Uniform, dry material ready for Stage 5

KEY DRYING PARAMETERS

- **Drying Temperature:** Up to 380°C
- **Inlet Moisture:** 25% – 40% (typ.)
- **Outlet Moisture:** <10% (target)
- **Residence Time:** Adjustable (15–45 min)
- **Drying Medium:** Controlled Hot Air
- **Heat Source:** Waste Heat / Biomass / Gas
- **Drying Type:** Indirect / Semi-Direct
- **System Operation:** Fully Enclosed

DUST & EMISSION CONTROLS

- Fully enclosed drying system
- Negative pressure operation
- Cyclone separator for bulk dust capture
- Bag filter for fine particulate removal
- Low dust escape to atmosphere
- Emission compliant operation
- Continuous monitoring & alarm system
- Clean air discharge

OPERATIONAL ADVANTAGES

- Significantly improves thermal efficiency
- Reduces energy consumption
- Ensures stable & uniform carbonization
- Lower emissions & pollutant release
- Protects downstream equipment
- Supports continuous & reliable operation
- Improves product quality & yield
- Enclosed design for safety & cleanliness

DRY TODAY, PERFORM BETTER TOMORROW

Effective moisture reduction is the key to unlocking higher energy yield, lower emissions, and consistent performance in the carbonization process. Our enclosed dryer ensures clean, safe, and efficient operation with minimal environmental impact.

LOW MOISTURE. HIGH EFFICIENCY. BETTER CARBON.

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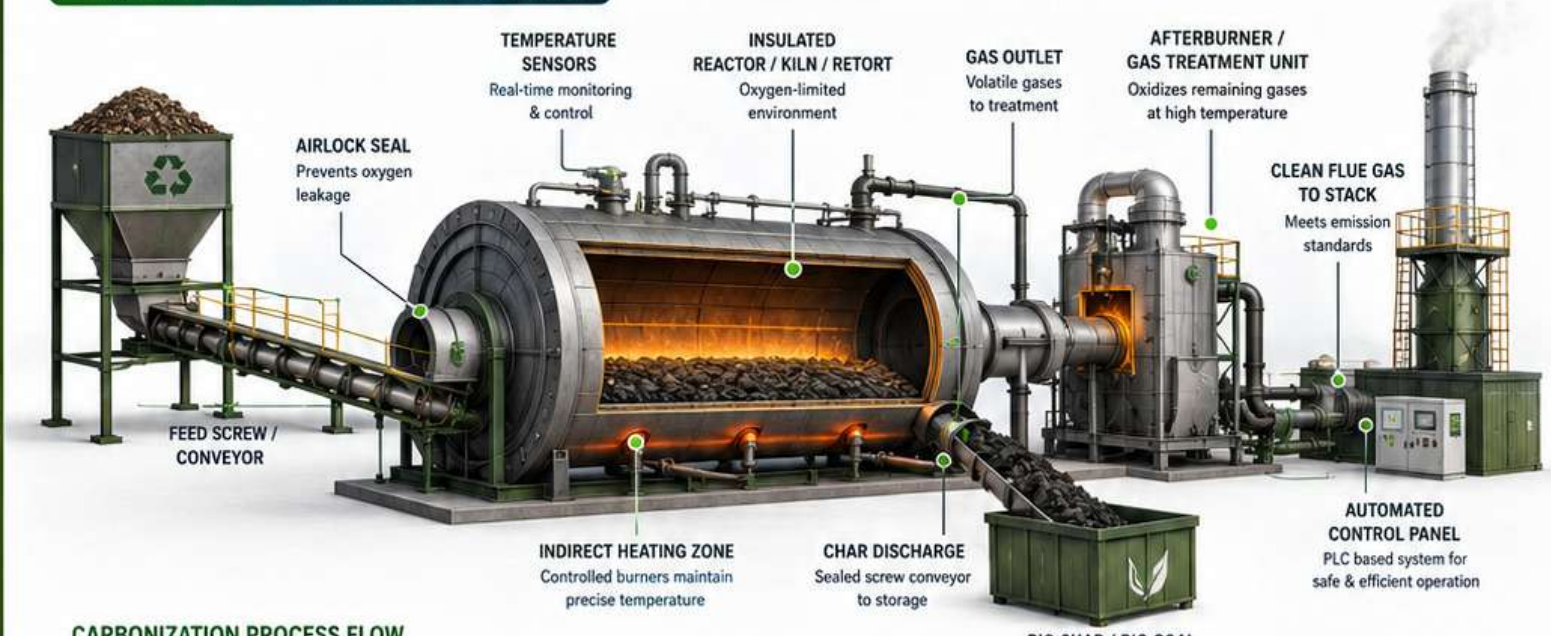
Stage 5 – Controlled Carbonization / Half-Burning to Coal

Low-Oxygen Thermal Conversion for High-Quality Bio Carbon (Biochar / Bio Coal)

Enclosed. Controlled. Clean. No Open Burning.

CONTROLLED CARBONIZATION SYSTEM OVERVIEW



CARBONIZATION PROCESS FLOW

1. DRIED WASTE FEED
Moisture reduced waste is fed into the sealed reactor system.

2. OXYGEN-LIMITED HEATING
Controlled temperature rise (350°C – 700°C) with limited oxygen to prevent combustion.

3. VOLATILE REMOVAL
Volatile gases are driven off and routed to treatment system for clean handling.

4. CARBON-RICH CHAR OUTPUT
Stable, high-carbon bio char is discharged for further use or upgrading.

WHAT HAPPENS IN THIS STAGE?

In Stage 5, dried waste undergoes controlled carbonization in an oxygen-limited environment. The material is heated to high temperatures (350°C – 700°C), causing volatile compounds and moisture to be released as gas. These gases are captured and treated in a closed system. The remaining solid is a stable, carbon-rich material (bio char / bio coal) with high fixed carbon content, low moisture, and reduced emissions.

- High Carbon Content
- Low Moisture & Ash
- Stable & Easy to Store
- Ready for Upgradation or Use

KEY OUTCOME

Conversion of waste into a valuable carbon-rich intermediate product for fuel, industrial use, or further activation.

REDUCED SMOKE. ZERO OPEN BURNING.

All reactions occur in sealed, controlled equipment. Gases are captured and treated. No open dumping, no open burning, no uncontrolled emissions.

PROCESS CONTROL

- PLC-based automation for temperature, oxygen & gas flow
- Real-time temperature monitoring
- Adjustable heating zones
- Data logging & alarms
- Consistent product quality control

ENVIRONMENTAL PROTECTION

- Enclosed system (no open emissions)
- Volatile gases treated in afterburner
- Particulate & gas filtration before stack release
- Meets CPCB / TNPCB emission norms

SAFETY MEASURES

- Oxygen monitoring
- Over-temperature protection
- Emergency shutdown system
- Pressure relief & interlocks
- Fire detection & suppression
- Trained operators & SOP compliance

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Stages 6 & 7 – Carbon Powder Making and Proprietary IP Material Mixing

Transforming Carbonized Char into High-Performance, Proprietary Bio Carbon Powder

STAGE 6 CARBON POWDER MAKING

From Carbonized Char to Fine Carbon Powder

Carbonized char undergoes a multi-step mechanical processing sequence in a fully enclosed, dust-controlled system to produce fine, high-purity bio carbon powder with consistent particle size distribution.

- **MULTI-STAGE SIZE REDUCTION** – Crushing, pulverizing, and milling for ultra-fine consistency
- **DUST-CONTROLLED SYSTEM** – Enclosed process with advanced filtration & dust extraction
- **PARTICLE SIZE CONTROL** – Precision screening ensures uniform grading and performance
- **MAXIMUM POWDER PURITY** – Minimized contamination for high-performance applications

CARBONIZED CHAR INLET

1. **CRUSHING** – Reduces char to smaller fragments
2. **PULVERIZING** – Further size reduction for fine grinding
3. **MILLING** – High-energy milling for ultra-fine powder
4. **SCREENING** – Precision screening for consistent particle size
5. **DUST-CONTROLLED HANDLING** – Enclosed transfer & collection into storage

FINE CARBON POWDER OUTLET

STAGE 7 PROPRIETARY IP MATERIAL MIXING

Precision Blending for Superior Performance

The fine carbon powder enters a closed, precision mixing system where a proprietary performance additive formulation is uniformly blended to enhance functionality, durability, and end-use performance across applications.

- **CLOSED MIXING SYSTEM** – Sealed environment ensures product integrity and operator safety
- **HOMOGENEOUS BLENDING** – High-shear mixing for uniform distribution of proprietary additives
- **PROPRIETARY FORMULATION** – Confidential performance additive formulation for enhanced properties
- **TRACEABILITY & CONTROL** – Automated process control for batch-to-batch consistency

POWDER PRODUCTION

Advanced size reduction & screening delivers ultra-fine, high-purity bio carbon powder.

DUST CONTROL | PARTICLE SIZE CONTROL | PURE & CONSISTENT

CLOSED MIXING SYSTEM

Proprietary performance additive formulation blended in a sealed, precision environment for uniform dispersion.

CLOSED & SAFE | HOMOGENEOUS MIXING | CONSISTENT QUALITY

QUALITY CONSISTENCY

Engineered for reliability, performance, and application-ready bio carbon powder solutions.

PERFORMANCE ENHANCED | BATCH-TO-BATCH CONSISTENCY | APPLICATION READY

ENGINEERED PRECISION. PROVEN CONSISTENCY. POWERING A SUSTAINABLE FUTURE.

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Stages 8 & 9 – Secondary Chemical Treatment and Hot Noodle Formation

Chemically Enhanced. Structurally Strong. Formed for Performance.
Turning Treated Carbon Mix into High-Value Noodle-Form Carbon Product.

8 SECONDARY CHEMICAL TREATMENT & CONDITIONING

Precision Treatment. Consistent Quality. Ready for Forming.

PROCESS FLOW – STAGE 8

Conditioned Carbon Mix → Secondary Chemical Treatment → Homogeneous Mixing → Treated & Conditioned Mix Ready

The pre-carbonized material undergoes secondary chemical treatment to enhance binding, stability, and performance characteristics. Precise dosing of binding agents and stabilizers ensures a uniform, high-quality mix for extrusion.

TREATMENT PURPOSE
- Enhances binding strength and structural integrity
- Improves water resistance and durability
- Ensures consistent carbon performance

PROCESS CONDITIONING
- Chemical additives improve particle adhesion
- Moisture and pH balanced for optimum results
- Homogeneous mixing for uniform distribution

QUALITY CONTROL
- Real-time monitoring of moisture, temperature & pH
- Viscosity and mix consistency verification
- In-process sampling for batch quality assurance

9 HOT NOODLE FORMATION (EXTRUSION)

Heat. Pressure. Precision. Formed for Strength.

The treated mix is thermally conditioned and extruded through a high-pressure forming system to create noodle-like carbon structures. This process locks in strength, stability, and enables excellent adsorption and handling properties.

FORMING TECHNOLOGY
- High temperature extrusion for optimal binding
- Controlled pressure ensures uniform noodle formation

PRODUCT BENEFITS
- High bulk density and durability
- Superior adsorption surface area
- Easy to handle, transport & store

COOLING & HANDLING
- Cooled and stabilized for structural retention
- Conveyed to storage or packaging system

PROCESS FLOW – STAGE 9

Treated & Conditioned Mix → Heated Forming / Extrusion → Noodle Formation → Cooling & Stabilization → Noodle-Form Carbon Product

PROCESS MONITORING & QUALITY ASSURANCE

REAL-TIME MONITORING
Continuous tracking of temperature, pressure, moisture & flow.

QUALITY CHECKPOINTS
In-line testing for mix consistency, extrusion quality & product specs.

PRODUCT STANDARDS
Meets performance criteria for adsorption, stability & strength.

TRACEABILITY
Batch-wise tracking ensures accountability and compliance.

KEY OUTCOMES – STAGES 8 & 9

- ✓ Chemically enhanced and well-conditioned carbon mix
- ✓ Strong, uniform noodles with high surface area
- ✓ Improved adsorption, durability & handling
- ✓ Consistent, high-quality carbon product

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Stages 10 & 11 – Agri-Waste Blending, Final Carbon Powder Packing & Dispatch

From Agri-Residue to Industrial-Grade Carbon Powder.
Scalable Supply. Reliable Dispatch. Powering a Cleaner Future.

10 & 11: FINAL CARBON POWDER PRODUCTION, PACKING & DISPATCH

10 Agri-Waste Powder → 11 Final Blending (Mixer) → Finished Carbon Powder → Packed in Bags / Jumbo Bags (25 kg / 50 kg / 1 MT) → Storage & Staging → Dispatch to Power Plants

OUR PROCESS FLOW — STAGES 10 & 11

Agri-Waste Powder → Final Blending (Mixer) → Finished Carbon Powder → Packing in Bags or Jumbo Bags → Storage & Staging → Dispatch to Power Plants

FINAL PRODUCT CHARACTERISTICS

- High Purity Carbon Powder
- Uniform Particle Size (Optimized for Combustion)
- High Calorific Value
- Low Moisture Content
- Enhanced Combustion Efficiency
- Low Ash & Emissions
- Consistent Quality & Reliability
- Suitable for Co-firing in Power Plants

PACKING & LOGISTICS

- Available Packaging Options: 25 kg, 50 kg Bags & 1 MT Jumbo Bags
- Automated Filling & Weighment System for Accuracy
- Stitched, Durable & Moisture-Resistant Bags
- Palletized for Safe Handling & Transport
- Indoor Storage & Weather-Protected Warehousing
- Fleet of Covered Trucks for Timely Dispatch
- Scalable Industrial Supply Chain for Bulk Orders

END USE IN POWER PLANTS

- Used as a Co-firing Fuel with Coal
- Improves Combustion Efficiency & Heat Output
- Reduces Greenhouse Gas Emissions
- Low Ash Handling & Reduced Boiler Wear
- Supports Clean & Cost-Effective Energy Generation
- Ideal for Thermal Power Plants Across Industries

SCALABLE INDUSTRIAL SUPPLY
Built for Bulk. Ready for Tomorrow.

DISPATCH READINESS
On-Time Delivery. Every Time.

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SCAN TO KNOW MORE

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Project 3 – Plant Benefits, Safety, Automation & Government Value

Building a Cleaner, Safer & Sustainable Tamil Nadu

Government Project Report / Concept Proposal – Final Page

SAFE, SMART & SUSTAINABLE OPERATIONS

AUTOMATION & PLC/SCADA MONITORING
Real-time monitoring and control for maximum efficiency, reliability and safety.

ENCLOSED HANDLING SYSTEM
Fully enclosed waste handling & conveying system to prevent spillage and exposure.

DUST CONTROL SYSTEM
Advanced bag filters and air scrubbers ensure minimal dust emissions.

ODOR CONTROL SYSTEM
Bio-filters and scrubbers control odours for a clean neighbourhood.

LEACHATE MANAGEMENT
Leachate collection, treatment & safe disposal with zero discharge.

FIRE PROTECTION SYSTEM
Automatic fire detection, sprinklers and hydrant network for full protection.

WORKER SAFETY & PPE
PPE compliance, training and a strong safety-first work culture.

EMERGENCY RESPONSE PLAN
Prepared emergency protocols, mock drills & rapid response teams.

SUSTAINABLE RESOURCE RECOVERY
Converts waste to valuable carbon fuel, supporting a circular economy.

PROJECT BENEFITS & GOVERNMENT VALUE

LANDFILL REDUCTION
Diverts waste from landfills, reduces land pollution and extends landfill life.

CLEANER STREETS
Improves sanitation, reduces open dumping and creates cleaner communities.

RECYCLING RECOVERY
Recovers recyclables for reuse, reduces resource extraction and saves energy.

VALUE-ADDED CARBON FUEL PRODUCTION
Produces high quality bio carbon powder with high calorific value for industries.

EMPLOYMENT GENERATION
Creates direct and indirect jobs in operations, logistics and maintenance.

CIRCULAR ECONOMY
Supports sustainable growth with resource recovery and waste to value solutions.

SCALABLE CAPACITY UP TO 1500 TPD
Designed for modular expansion up to 1500 TPD to meet future demand.

SUPPORT TO THERMAL POWER PLANTS
Provides low-ash, high energy carbon fuel for co-firing and emission reduction.

OUR COMMITMENT TO TAMIL NADU

Bird Renewables is committed to delivering a world-class, environmentally responsible and economically viable waste-to-value solution that supports the vision of a Clean, Green & Developed Tamil Nadu.

Together, let's convert waste to wealth, protect our environment and build a stronger, sustainable future for generations to come.

CLEAN TECHNOLOGY | SUSTAINABLE SOLUTIONS | BETTER ENVIRONMENT | BRIGHTER TOMORROW

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SCAN TO KNOW MORE ABOUT BIRD RENEWABLES

Clean Technology. Sustainable Tomorrow.

WASTE TO VALUE. CARBON TO FUTURE. | FOR A CLEANER PLANET AND A BETTER TAMIL NADU.

BIRD RENEWABLES – WASTE TO VALUE FOR A CLEANER TAMIL NADU