Presented on Improved feedstock: pellet, briquettes and Chips

NATIONAL DIALOGUE ON FOREST LANDSCAPE RESTORATION AND WOOD ENERGY IN GHANA
JANUARY 27-28, 2020
FAO REGIONAL OFFICE FOR AFRICA IN ACCRA
Abellon

Leader and Frontrunner
Proven track record of a decade

Unique Skills
in R&D/Technology Development

Winning Team
Highly Capable, Experienced and Stable

Proprietary
Algorithms & Technology
Integrated Approach

**GOODWATTS**
- Waste to Energy
- Solar Parks & Captive Solar Generation

**GOODSTEPS**
- Pellets for Heating
- Biomass Heat Solutions
- Biogas
- Rooftop Solar
- Solar for Agriculture

**GOODROOTS**
- Dairy Farming
- Fodder Management
- Organic Inputs
- Agro-Forestry
Reason for Being

• **Energy access** is a key driver to create economic growth and to emerge from poverty into the mainstream economy. This objective needs to be achieved in a manner that is environmentally and financially sustainable, promotes energy independence and is good for local communities.

• Abellon’s mission is to find innovative solutions achieving all these objectives by combining knowledge from diverse disciplines and aligning efforts with local stakeholders.

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**Triple Bottom Line Approach**

Integrating sustainable development models, income and employment generation, no food-fodder-fuel conflict, and energy self-reliance for the nation.
Genesis & Growth

2009-2010
- Projects Commissioned: 2 Pellet Plants in Gujarat
- Power Trading Licence from CERC
- Global & Local WTE site visits

2011-2012
- Projects Commissioned: Co-gen Power Plant in Gujarat
- 1 Pellet Plant in Gujarat
- MoU with Keppel Seghers for WTE Technology

2013-2014
- Projects Commissioned: 9.9 MW Regional WTE Project in Gujarat with CDM approval
- WTE MoU with Government of Gujarat during Vibrant Gujarat 2013

2015-2016
- Projects Commissioned: Pellet Plant in Ghana
- Research and Identification of 12 Fuel Blends for WTE

2017-2018
- Concession Agreement with AMC for 1000 TPD WTE Project
- Project Acquisitions: 3 Regional WTE projects in Gujarat
- Successful bid for 6 City WTE Projects in Gujarat
- PPA with GUVNL for 14.2 MW WTE project in Ahmedabad

2018-2019
- Government nominated agency under Sarvashakti Kisan Yojna (SKY Project)
- Project Acquisitions: Pellet manufacturing facility in Uttarakhand
- Regional WTE plant in Junagadh

2019-2020
- Foundation ceremony City WTE project Jamnagar
- LOI from Govt. of Guj. for Compressed Biogas production facilities in 10 cities of Gujarat
- First set of Gir cows at Dairy Farming project
Manufacturing and Operations: From Source to Customer

1. Various Sources of Biomass
2. Collection and Preprocessing of Biomass at the Poornakumbha Hub
3. Shredded Material from CCS is transported to the manufacturing plant
4. State-of-the-art Manufacturing
5. Transportation to Plant for Production of Pellexo
6. Transportation of Pellexo to End Customers

- Farmers bring the biomass to the Poornakumbha Hub
- Shredded biomass is transported to Abellon’s Manufacturing Plant
- Abellon’s state-of-the-art Manufacturing Facility
- Sales & Distribution of Pellexo
Research & Development

Global Collaborations

U.S. - India Consortium for Development of Sustainable Advanced Lignocellulosic Biofuel Systems

Indo-German Project for Intercropping of Banana & Sweet Sorghum in marginal lands of Gujarat

Collaborative Research Centre 1026 (CRC) Project, Germany

Funding Agencies

DSIR, Government of India approved R&D Facility

- Patents Filed: 20

Publications

- Technical Publications: 19
- Non-Technical Publications: 05
- Manuscripts under Progress: 06

Funding Agencies

- DSIR, Government of India
- IUSSTF
- SBIRI
- Department of Biotechnology, Government of India
- Global Innovation & Technology Alliance
- Ministry of Science & Technology, Government of India
Abellon CleanEnergy Ghana

- Pellet manufacturing facility: A pioneering effort for the country

- Value from waste model: Potential to utilize 60,000 tons of wood based residues, generate revenues and energy self reliance for the country

- Member of the BCTA & Global Alliance for Clean Cookstoves

- Recently recognized as winner of the 2015 African Business Award for Innovation
Challenges in Ghana: Efficient Waste Utilization

Widely practiced harmful and inefficient waste disposal

Unused potential of Wood Waste
Major Problem: Forest Degradation & GHG

Up to 11% of global greenhouse gas emissions come from deforestation and forest degradation.
Fuel Used for Heating

80% of population relies on traditional biomass, including fuel wood or charcoal, agricultural waste and animal dung to fulfill their daily energy needs.
The solution is ... Improved Feedstock like Pellets, Briquettes

*Sustainable Approach for Efficient Biomass & Waste Utilization...*
Wood Waste & Residue Sources

Small Saw Mill Clusters

Large Size Saw Mills

Forest Residue
Wood Village Consist of Carpenters, Saw millers, Lumber cutters, Planners etc

Wood Waste Collection – Major Source of Employment

Truck to Load Biomass

Saw mill shed

Women stuffing biomass sacks

Biomass is ready in sacks to load
Pellet Manufacturing Facility in Ghana
Pellets: A Sustainable Source of Energy

**Efficient**
Their uniform shape and size ensures that Eco-Pellets offer remarkable consistency & burning efficiency. Eco-Pellets have low moisture and ash content, which further add to their performance.

**Cost Effective**
Customers can significantly lower their energy costs through use of eco-pellets.

**Safe**
Eco-pellets are absolutely safe to use and store as there is no risk of fire hazards.

**Sustainable & Eco Friendly**
Use of Eco-Pellets reduces emissions through utilization of biomass residue, and replacement to conventional fossil fuels.

**Smokeless Operation**
Eco-Pellets offer smokeless operation as well as clean and hygienic working environment.

**Easily Available**
Eco-Pellets are manufactured locally, within the country, using the abundant biomass resources available as a result of a thriving timber industry. Thus, unlike imported fuels such as LPG and Diesel, there is no fear of shortages, stock-outs, or undue price fluctuations.

**Convenient Pack Size**
Eco-Pellets are available in 15kg bags for small commercial, industrial and residential use. We can also supply pellets in bulk quantities for large scale industrial requirements.
## Pellets: An Improved Feedstock (Fuel) for Ghana

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Charcoal &amp; Firewood</th>
<th>Pellets</th>
<th>Benefit / Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Technical &amp; Physical</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>&lt;20%</td>
<td>40%</td>
<td>Maximum energy utilization</td>
</tr>
<tr>
<td>Production Ratio</td>
<td>1 kg charcoal = 7 kg wood</td>
<td>1 kg pellet = 1.5 kg Biomass</td>
<td>No energy loss during production</td>
</tr>
<tr>
<td>Bulk Density</td>
<td>200 kg/m³</td>
<td>650 – 700 kg/m³</td>
<td>Saving of storage space</td>
</tr>
<tr>
<td>Fixed Carbon</td>
<td>60-70%</td>
<td>15-20%</td>
<td>Complete Combustion due to higher Volatile matter</td>
</tr>
<tr>
<td>Production</td>
<td>Traditional process</td>
<td>Modern scientific Technology</td>
<td>Highly efficient production process</td>
</tr>
</tbody>
</table>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Material</td>
<td>Large Wood Pieces</td>
<td>Any Wood Waste or</td>
<td>Maximise Forestry Recovery, Utilisation of Waste, Reduce GHG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Agri Residue</td>
<td></td>
</tr>
<tr>
<td>Production Ratio</td>
<td>1 kg charcoal = 7 kg wood</td>
<td>1 kg pellet = 1.5 kg</td>
<td>Saving of Environmental Resources, Reducing Deforestation &amp; Land Degradation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biomass</td>
<td></td>
</tr>
<tr>
<td><strong>Health &amp; Safety</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Carbon</td>
<td>Yes</td>
<td>No</td>
<td>Reduce IAP</td>
</tr>
<tr>
<td>Safe</td>
<td>No</td>
<td>Yes</td>
<td>No Risk of Bush Animals, No Harassment for Girls. Non Flammable</td>
</tr>
</tbody>
</table>
## Pellets: An Improved Feedstock (Fuel) for Ghana

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<th>Pellets</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Social &amp; Economical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>Unorganised</td>
<td>Organised</td>
<td>Expert and Professional Approach</td>
</tr>
<tr>
<td>Revenue Generation</td>
<td>No</td>
<td>Yes</td>
<td>Saving Revenue Loss to Govt. Helps to increase Forex Reserves</td>
</tr>
<tr>
<td>Employment</td>
<td>Less</td>
<td>More</td>
<td>Provide Direct as well as Indirect Employment</td>
</tr>
<tr>
<td>Labour Condition</td>
<td>Poor</td>
<td>Good</td>
<td>No Labour Exploitation Follow Safety Standards</td>
</tr>
</tbody>
</table>
Pellet based Gasification Application

**Industrial**
- Utility requirement for industrial heating and Boilers
- Co-firing in Large thermal Power plants

**Commercials / Institutions**
- Heating needs at community level and large spaces such as Mesh, Canteen, educational institutions, etc.
- Cooking Needs at Chops Bars, Restaurants, Hotels.
- Agri Processing for Heating and Drying.

**Retails**
- Use in pellet stoves in domestic / home heating and cooking
Time to Switch...Pellet Based Industrial Boilers

Converting Oil / Gas Based Boiler to Pellet Based Boiler – Upto Limited Capacity
Time to Switch...Pellet based Boilers

LPG Boiler

Biomass Pellet Based Gasifier Boiler

Save 25 – 30%
Time to Switch... Pellet based Boilers

Customer are Saving 25% each month using Pellets
Bulk Cooking with Steam...

Save 20-25 % fuel cost just by switching over from Direct flame to Steam Cooking
Converting LPG Oven into Pellet Based Oven

Saving of 30%
## Challenges and Solutions: Pellet Manufacturing

### Challenge: Maintaining quality standards in Pellet manufacturing
- **Input Quality**: Pellet quality is an outcome of quality of biomass input, e.g., moisture, ash content, etc.
- **FG quality**

### Solution: Maintaining quality standards in Pellet manufacturing
- Established pellet quality standards in line with international standards such as DIN Plus/ENPlus.
- Own QC team with established protocols for biomass quality testing prior to use
- Batch-wise and hourly testing of production

### Quality parameters

<table>
<thead>
<tr>
<th>Quality parameters</th>
<th>Unit</th>
<th>DINplus</th>
<th>Enplus-A1</th>
<th>Enplus-A2</th>
<th>EN-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>mm</td>
<td>4≤D≤10</td>
<td>6 (±1)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>6 (±1)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>6 (±1)&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Length</td>
<td>mm</td>
<td>≤5 x D</td>
<td>3,15 ≤L ≤40&lt;sup&gt;1&lt;/sup&gt;</td>
<td>3,15 ≤L ≤40&lt;sup&gt;1&lt;/sup&gt;</td>
<td>3,15 ≤L ≤40&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bulk density</td>
<td>kg/m&lt;sup&gt;3&lt;/sup&gt;</td>
<td>-</td>
<td>≥600</td>
<td>≥600</td>
<td>≥600</td>
</tr>
<tr>
<td>Net calorific</td>
<td>MJ/kg</td>
<td>≥18*</td>
<td>≥16,5</td>
<td>≥16,3</td>
<td>≥16,0</td>
</tr>
<tr>
<td>Moisture</td>
<td>w-%</td>
<td>≤10</td>
<td>≤10</td>
<td>≤10</td>
<td>≤10</td>
</tr>
<tr>
<td>Fines</td>
<td>w-%</td>
<td>≤1</td>
<td>≤1&lt;sup&gt;2&lt;/sup&gt;</td>
<td>≤1&lt;sup&gt;2&lt;/sup&gt;</td>
<td>≤1&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mechanical durability</td>
<td>w-%</td>
<td>≥97,7*</td>
<td>≥97,5</td>
<td>≥97,5</td>
<td>≥95,5</td>
</tr>
<tr>
<td>Ash</td>
<td>w-%</td>
<td>≤0,5*</td>
<td>≤0,7</td>
<td>≤1,5</td>
<td>≤3,0</td>
</tr>
<tr>
<td>Ash melting behavior (DT)</td>
<td>°C</td>
<td>-</td>
<td>≥1200</td>
<td>≥1100</td>
<td>≥1100</td>
</tr>
</tbody>
</table>

*Note: * indicates the lower limit of the range; °C indicates degrees Celsius.*
Challenges and Solutions: Pellet Manufacturing

**Challenge**

– Changing traditional practices of burning/decomposition/landfill disposal of waste/biomass
– Diversity and spread of biomass availability
– Seasonal variations in biomass supply
– Collection and processing of biomass
– Quality of biomass: moisture and ash content

**Solution**

– Assigning value to waste: Providing incentive economic value for waste supplied
– Generating awareness of income and employment opportunities from waste
– Mapping of biomass species and their characteristics: over 300 species mapped Globally
– Decentralized Biomass Collection Model:
  – Tie ups with rural community for biomass collection within 50km radius
  – Partnerships with organized players for process biomass
  – Agro forestry model promoting bamboo as an energy crop.
Challenges and Solutions: Pellet Manufacturing

**Challenge: Technology**

- Pelletization technology at nascent stage in developing countries of Asia and Africa.
- Finding the right technology partner is a challenge

**Solution: Technology**

- Tie-up with leading global pelletization technology suppliers
Challenges and Opportunities

Challenges:
- Wood Waste quality parameter
- Collection model: Size, scale and coverage
- Small volume but multiple movements
- Traditional technologies are predominant
- Affordability of Pellet technologies
- Wood burning or degradation against use for BioEnergy
- Funding for Improved Feedstock Projects

Opportunities:
- Huge potential of bioenergy: Wealth out of Waste
- Increase consumption of biofuels: Reduce forest degradation
- Replacing traditional technologies by improved fuel technologies
- Easy to adopt in existing system
- Dedicated buyer or user or application
- Employment generation and value chain
Barriers to Markets Uptake

Customers or Users don’t want to change from traditional practices.

Customers or Users don’t want to pay extra cost for improved fuel.

Diversity and spread of wood waste available.

Logistics and supply chain management are critical to success.

Need for a modern BioEnergy approach driven by technology systems and large scale organized efforts.

Innovation led and integrated approach essential to tap into the entire value chain.

Predominant work to be done at grass root level.
**Recommendation & Conclusion**

<table>
<thead>
<tr>
<th>Recommendation</th>
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</thead>
<tbody>
<tr>
<td>Restriction on using illegal Wood / Wood Waste. Policy / Mandate to use Forestry Residue and Wood Waste</td>
</tr>
<tr>
<td>Exemption on duties and taxes for Local Pellets / Briquettes as Fuel and on Pellet application systems (Stove / Gasifier / Boilers / Dryer).</td>
</tr>
<tr>
<td>Tax Credit or Indirect Benefit to the Industry using Biomass Pellet or Briquette as fuel.</td>
</tr>
<tr>
<td>Benchmark initiative and approach from African Countries like Rwanda, Kenya, South Africa etc.</td>
</tr>
<tr>
<td>FAO &amp; GBEP should come up with Study on “Potential of switching the traditional fuel to improved fuel in Ghana”.</td>
</tr>
<tr>
<td>Favourable policy and financial support for Biomass Fuel Sector.</td>
</tr>
<tr>
<td>Govt. to Create Awareness and Intervention Improved feedstock.</td>
</tr>
<tr>
<td>Pellet as fuels to be given equivalent status to conventional fuels.</td>
</tr>
<tr>
<td>Research and knowledge sharing for tapping full potential of BioEnergy</td>
</tr>
</tbody>
</table>
Awards & Accolades

Zayed Future Energy Price 2014
Ashden Award 2011
African Business Awards 2015
Dun & Bradstreet Infrastructure Award 2015
Renewable Energy India Awards 2015

Energy Globe Award 2015 (National Winner)
Dubai Internation Award 2014
Project of the Year 2013
Parivartan Award 2013 (semi-finalist)
Buckminster Award 2013 (semi-finalist)

Land for Life Award 2013 & 2014
Renewable World Award 2012 & 2013
World Bioenergy Award 2012 (semi-finalist)
Golden Peacock Award 2011
AREA Award 2009 & 2010

Making Earth Good Again
THANK YOU...

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