Improving Biomass Heating System Efficiency

12 PM ET, January 31, 2013

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Carbonomics and
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- The recording of the webinar and the slides will be available after the event. All registrants will be notified by email.
Improving Biomass Heating System Efficiency

Speakers

- **Shashank Kumar** - Regional Manager of the Atlantic Coasts, Abhitech Energycon Ltd., India
- **Jochen Allenstein** - Founder, Wambesco GmbH, Germany

Moderator

- **Joseph Seymour** - Biomass Thermal Energy Council, Executive Director
Presentation Outline

I. Welcome/Event Intro – Joseph Seymour
II. Issues and Solutions – Shashank Kumar
III. Case Studies – Jochen Allenstein
IV. Q&A – Joseph Seymour

[Full presentation will be available online via BTEC website]
Introduction to BTEC

The Biomass Thermal Energy Council (BTEC) is the industry trade association dedicated to advancing the use of biomass for heat and other thermal energy applications.

Why was BTEC established?
1. To **advocate for and promote** the biomass thermal industry in the national energy policy debate
2. To **reach out** to and **educate** the public and decision makers on the benefits and advantages of using biomass for heat and CHP
3. To develop biomass energy **research and analysis** that enables sound investment and policy decisions
BTEC’s Membership*  
* As of January 15, 2013
# BTEC’s Membership*

* As of January 15, 2013

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2013 BTEC Activities

BTEC has surpassed 110 members, stands strong with numerous biomass thermal initiatives at the state and federal levels - a reflection of BTEC's persistence and determination over several years.

**Key accomplishments in 2012:**

- Concluded a major outreach effort supported by the U.S. Forest Service's Wood Education and Resource Center (WERC) that funded 14 webinars, 5 factsheets, 10 interviews and a informative slide show for public use.
- Working on a project to better engage architects and engineers on biomass heating, supported by a grant from the U.S. Forest Service.
- Helped draft S. 3352, an Investment Tax Credit (ITC) for highly efficient commercial and industrial biomass heating systems.
- Working to include extension of the credit for residential biomass heating systems.
- Focused on shaping the next Farm Bill.
- Supporting regional activities, e.g. successful in including thermal energy in NH and MD's Renewable Portfolio Standard.

Support BTEC’s activities by joining now:  
Shashank Kumar

- Regional Manager of the Atlantic Coasts, Abhitech Energycon Ltd., India
Biomass fired utilities

Opportunities for improvement
Cost of operations

The principal contributor “Fuel”
Ideal Efficiency

Text Book Efficiency

Real Efficiency
The Reason

• Higher unburnts in fly ash, deposits on boiler walls, SPM, CO, NOx and SOx are major operational and environmental problems.

Something to help?!
THERMECT BIO SP
Multifunctional Combustion Catalyst for Biomass.

2013
WHAT DOES IT DO?
In a nutshell, following are the benefits a boiler operator can expect:

- Reduction in biomass fuel consumption
- Reduction in unburnts in Bottom Ash & fly Ash
- Reduction in deposits and encrustations on boiler walls.
- Cleaner Combustion Chamber
- Reduction in Excess Air required.
- Reduction In Stack Emissions & SPM.
- Continuation of Boiler Operation for longer periods.
HOW DOES IT WORK?
Losses in Steam Generation

- Loss due to sensible heat in chimney
- Loss due to Unburnts in fly ash, bottom ash
- Loss due to combustible matter in clinker
- Latent heat of inherent moisture in coal
- Loss due to non-efficient transfer of heat
- Power taken by ID, FD Fans
- Radiation and unmeasured loss
- Loss due to CO

Net Calorific Value available for Water to Steam conversion
Losses in Steam Generation

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- Net Calorific Value available for Water to Steam conversion

THERMACT BIO-SP Action
**Working Principle of THERMACT-BIO_{SP}**

THERMACT-BIO_{SP} catalyst increases the reactivity between carbon in the fiber and moisture in Biomass.

- **C + H_2O → CO + H_2**
- **C + H_2 → CH_4**
- **CO + \( \frac{1}{2} \) O_2 → CO_2**
- **C + H_2O → CO_2 + H_2O**
Moisture Losses.

• In normal circumstances, the inherent moisture present in biomass absorbs heat from the combustion process to first go from room temperature to 100°C.

• Then using further more energy as latent energy of vaporization it goes in to vapor phase.

• This amounts to loss of energy generated by combustion.
Excess Air Losses.

• Similar to moisture in fuel, the atmospheric air injected in a boiler to aid in combustion also absorbs useful heat and escapes out the chimney, constituting a significant loss.

• Using the inherent moisture of the fuel affords us some self-generated oxygen from the $\text{H}_2\text{O}$ and reduces the need for external oxygen, i.e., air.

• This amounts to significant savings of energy that would've normally been lost.
Unburnts Losses.

- THERMACT reduces unburnts in Fly Ash as a result of an efficient & complete combustion of biomass.

**Without Thermact BIO SP**

Fly ash is sticky as it contains considerable amount of unburnts and moisture.

**With Thermact BIO SP**

Fly ash is free flowing fine powder, free from moisture. The gray color of the fly ash indicates less unburnts.
Unburnts Losses.

- THERMACT BIO SP reduces unburnts in Bottom Ash as a result of an efficient & complete combustion of biomass.

Without Thermact BIO SP

With Thermact BIO SP

Bottom ash is blackish in color indicating presence of unburned carbons from an incomplete combustion.

Bottom ash is whitish indicating absence of unburned carbons.

Abhitech Energycon Ltd
SPM (Suspended Particulate Matter)

- THERMACT BIO SP reduces Smoke Emissions by reducing SPM.

**Trial data:** 86 mg/m³ (i.e. 28 %) reduction in particle density indicating lower SPM and cleaner emissions & positive effect of Thermact on Environment.

**Without Thermact BIO SP**

**With Thermact BIO SP**
Sediments and Deposits.

- Carbon in biomass acts as a binder which traps other unburnts and ash to form these scales and deposits.
- **THERMACT BIO SP** reduces availability of this binding carbon by reducing unburnts.

**Without Thermact BIO SP**  
![Image of deposits without Thermact BIO SP]

**With Thermact BIO SP**  
![Image of deposits with Thermact BIO SP]

Thermact BIO SP reduces deposits by not allowing carbon to stick to the surface.
Slag

- THERMACTBIOSP reduces availability of this binding carbon by reducing unburnts

Without Thermact BIO SP

With Thermact BIO SP
Relation between Air Ratio and Heat Efficiency

- Heat Loss
- Optimum Combustion Region
- Combustion Efficiency
- Energy Loss by Imperfect Combustion
- Heat Loss by Excess Air

- 1.15
- 1.3 Air Ratio
- 2.74
- 4.85 O₂ Content in Flue Gas (%)

Formation of Black Smoke (Insufficient Air)
Optimum Air Ratio
Increase of NOx and SOx (Excess Air)
Emissions.

• **Carbon Monoxide**
  – Due to the earlier illustrated accelerated complete combustion, less CO formation occurs.
  – Environmental impact.
  – Chemical advantage. Energy released in the formation of CO is a mere 27% of that released in formation of CO2. Both consume the same quantity of C.

• **NOx and SOx**
  – Reduction in excess air requirement automatically reduces nitrogen presence to begin with.
  – More sulphur is trapped in the ash.
ABOUT THERMACT
<table>
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<th>Product Specifications</th>
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<td><strong>Name</strong></td>
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<td><strong>Packing</strong></td>
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<tr>
<td><strong>Appearance</strong></td>
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<tr>
<td><strong>Odor</strong></td>
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<td><strong>pH(10% solution)</strong></td>
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<td><strong>Dosage</strong></td>
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TLCP results

- TCLP (Toxic Characteristic Leaching Procedure) tested by SGS, USA (http://www.us.sgs.com/)

- Thermact was tested for
  - Presence of all types of hazardous chemicals such as Volatiles, Semi-volatiles, Metals & Pesticides.

- The results showed that
  - No harmful chemicals are found to be present
  - Thermact is non-hazardous and will not lead to any sort of environmental pollution, both through flue gases or through ash.

- These results indicate that
  - Thermact will not have any adverse effect on boiler tubes.
THERMRACT BIO SP USAGE
THERMACT-BIO$_{Sp}$ molecules forms a grid within the Combustion chamber acting with carbon and moisture present in Biomass.

THERMACT-BIO$_{Sp}$ Feeder

Air
ABOUT ABHITECH
• Headquarters :- Mumbai, India.
  – Manufactures and markets combustion catalysts for a wide range of liquid and solid fuels including gasoline, diesel, heavy fuel oil, other petroleum derivatives, coal and coke.
  – Each of these unique and revolutionary products have been formulated in collaboration with the R&D – Chemical department of the Indian Institute of Technology.
  – We have our client base spread out over 5 continents with international offices in Europe and Africa, outside of India.
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Abhitech Energycon Ltd
Jochen Allenstein

- Founder, Wambesco GmbH, Germany
Ask questions using the **Questions Panel** on the right side of your screen.

The webinar slides and recording will be made available after today.

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Seth Baruch  
sbaruch@carbonomicsonline.com
BTEC Supported Events
BTEC Plaque

Is your biomass heating system “out of sight, out of mind”?

Showcase your clients and their biomass heating installations with BTEC’s professionally-designed plaque.

http://www.biomassthermal.org/resource/siteRecognitionProgram.asp
Thank You!
BMHK Kessel Herstnr. 536

Fotodoku 02.06.2012

Ansicht Ebene 17m ÜH 3.2, die Fotos sind von oben nach unten in das Paket fotografiert.
Vorderwand 17m

Foto 5

Foto 6
Vorderwand 17m

Foto 7
Rückwandwand 17m

Foto 14
Ansicht Ebene 14m ÜH 3.1, die Fotos sind von oben nach unten in das Paket fotografiert.
Vorderwand 14m

Foto 1

Foto 2
Vorderwand 14m

Foto 5

Foto 6
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Foto 9
Rückwand 14m

Foto 10

Foto 11
Einsatz des Brennstoff-Additivs Thermact Bio sp der Fa. Abhitech Energycon Limited im Biomasseheizkraftwerk Landesbergen GmbH

Sehr geehrte Damen und Herren,


Folgende Feststellungen wurden getätigt:

- Während des Einsatzes des Additivs reduzierte sich der CO-Anteil im Roh- und Reingas um ca. 20%.
- Der Betriebsstoffeinsatz zur Reduktion von NOx reduzierte sich um ca. 30%.
- Der Regelwert O2 konnte auf 3,7% reduziert werden.
- Die Schlacken im Feuerraum wiesen eine wesentlich porösere Konsistenz auf.
- Der Endüberhitzer wies entgegen früherer Betriebszeiten keinerlei Verschlickungen auf.
- Eine Brennstoffersparnis von ca. 5% bei Einsatz des Additivs hat sich bestätigt.

Im Allgemeinen konnte festgestellt werden, dass das Additiv einen positiven Einfluss auf die Feuerführung hat.

Diese Stellungnahme wurde von der Betriebsführung der Biomasseanlage verfasst und erfolgt nicht im Auftrag und Namen der Eigentümer (Gesellschafter) der BMKL GmbH.

Mit freundlichen Grüßen

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