Energy Efficient Air Drying of Biomass (Woodchips, Bark, Saw Dust, Forest Waste, & Bagasse)"

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Belt Dryer Design Basis:
The Metso Kuvo belt dryer is a low-temperature dryer which is designed to remove water efficiently by evaporating moisture from wet biomass, like bark, wood chips, sawdust, bagasse etc. The dryer is able to utilize various low-temperature heat sources; waste heat, low-pressure steam, hot water, or hot air – no primary energy is needed. Dry biomass can then be used as biomass fuel, or in fuel making process. The drying process is gentle to the product and it has high availability and high capacity.
Metso Kuvo Belt Dryers For Biomass

Based on the Following Belt Drying Principles

- Utilization of waste heat
- High availability
- Non-destructive drying
- Low emissions
- Automatic operation
- Low Maintenance
Kuvo Belt Dryer For Biomass

• Several applications

1) Gasification process
   Replacing oil with syn gas in lime kiln
   High oil price
   CO₂ taxation
   Bioethanol/biodiesel production

2) Pelletizing
   Raw material drying before pressing

3) Power production
   To increase combustion efficiency

Biomass drying and gasification can be used to reduce oil consumption in lime kiln
Belt Dryer For Biomass

- Modular Structure Provides flexible dimensioning

- Capacity
  - Evaporation 2 - 20 tons of $\text{H}_2\text{O}/\text{h}$
  - Material flow 20 - 200 loose-$\text{m}^3$/h
  - Dry content in typically 30-60 %
  - Dry content out - up to ~90 %

- Size / unit
  - Area 40 - 260$m^2$
  - Length up to 50m (165 ft)
  - Width up to 6m (20 ft)

For bigger capacities, several dryers can be installed one on top of the other to save floor space
Belt Dryer For Biomass

• Utilization of waste heat

Belt Dryer can utilize several types of low temperature sources

1) Low temperature water  
   40°C…120°C (104°F -250°F)

2) Low pressure steam

3) Hot waste gas

4) Hot oils

Two heat sources like hot water and steam or two hot water sources can be combined in the same air heat exchanger.
KUVO Belt Dryer For Biomass

WET BIOMASS
- Bark
- Wood chips
- Sawdust
- Wood residues
- Bagasse

SECONDARY HEAT
- Hot water 140-212°F
- LP-steam
- Flue gas (clean)
- Hot oil

KUVO BELT DRYER

EVAPORATED WATER

DRY BIOMASS
- Gasification
- Pelletizing
- Combustion
Belt Dryer For Biomass

- Wet Biomass In
- Fresh Air In
- Hot Water or Steam
- Exhaust Air
  Evaporated Water
- Dry Biomass Out
Belt Dryer For Biomass

- WET PRODUCT IN
- AIR IN
- HEAT EXCHANGER
- AIR OUT
- BELT WASHING
- DRY PRODUCT DISCHARGE SCREW
- FEEDING SCREW
- FAN
Belt Dryer For Biomass

- Double layer

**Diagram:**
- WET PRODUCT IN
- FEEDING SCREW
- BELT WASHING
- AIR IN
- HEAT EXCHANGER
- SEMI-DRY PRODUCT IN
- DRY PRODUCT DISCHARGE SCREW
- DRY PRODUCT OUT
- AIR OUT
- SEMI-DRY PRODUCT DISCHARGE SCREW
Belt Dryer  View Inside the Dryer  with Various Materials and Layered Drying
Metso KuvoBelt Dryer
For Biomass
Example Layout 150 m²
KUVO Belt Drying System in Operation
Drying Biomass for Gasification Process

FOREST CHIPS

Biomass & Bark Storage

KUVO Belt Dryer

LIME KILN

GASIFICATION

POWER BOILER

LP-STEAM

CONDENSATE

WATER / GLYCOL
Belt Dryer Installation

- Material: Saw dust
- Side: 258m²
- Layer type: Single pass system
- Heat source: 72°C water/glycol
- Capacity: 7 t/h evap. water

• Uelzen (Germany)
Belt Dryer Installation

- Vielsalm
  (Belgium)

<table>
<thead>
<tr>
<th>Process</th>
<th>Pelletizing</th>
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</thead>
<tbody>
<tr>
<td>Material</td>
<td>Saw dust</td>
</tr>
<tr>
<td>Size</td>
<td>2 x 205 m² (stacked)</td>
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<tr>
<td>Layer type</td>
<td>Double pass sy</td>
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<tr>
<td>Heat source</td>
<td>90°C water/glycol</td>
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<tr>
<td>Capacity</td>
<td>2 x 10t/h evap. water</td>
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**Belt Dryer Installation**

- **Krauchenwies**

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<tr>
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<tr>
<td>Side</td>
<td>120m²</td>
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<tr>
<td>Layer type</td>
<td>Double Pass System</td>
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<tr>
<td>Heat source</td>
<td>water/glycol</td>
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<tr>
<td>Capacity</td>
<td>4.5 t/h evap. water</td>
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### Metso Belt Dryer Installation

<table>
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<tr>
<th>Process</th>
<th>Gasification</th>
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<tbody>
<tr>
<td>Material</td>
<td>Bark &amp; forest chips</td>
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<tr>
<td>Size</td>
<td>150m²</td>
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<tr>
<td>Layer type</td>
<td>Double</td>
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<tr>
<td>Heat source</td>
<td>100°C water/glycol</td>
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<tr>
<td>Capacity</td>
<td>8.3 t/h evap. water</td>
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Heat exchangers mounted on top of the Belt Dryer.
Belt Drying Systems in warmer climates do not require a protective building.
Belt Dryer For Biomass
Stacking the Dryers for Limited Real Estate
Kuvo Belt Dryers include: Exhaust stacks and access platforms, Structural support structure, Rain Protection shields/covers
Metso Kuvo Belt Dryer

For Biomass

Infeed Metering Screws
Meters the material evenly onto the Dyers Belt

Kuvo Belt Dryer uses a very durable Poly Mesh Belt – Belt life Averages 3-5 years

BioPro Expo & Marketplace / Atlanta, GA / March 14-16, 2011
Belt Dryer For Biomass

- Modular construction
Metso Belt Dryers For Biomass

- Expect results

- Utilization of waste heat
- High availability
- Non-destructive drying
- Low emissions
- Automatic operation
- Low Maintenance
ARE THERE ANY QUESTIONS?

THANK YOU FOR YOUR ATTENTION!