Installation of belt dryer
Belt dryer

2,5 TO 10,0 T/H WATER EVAPORATION RATE

ACCURATE AND HOMGENEOUS
In the production process of wood pellets, raw materials such as saw dust or shavings with water contents of 50% and higher are typically dried to 10%. The TECCON belt dryer designed for low value heat sources optimizes the drying process by a smart arrangement of components. The moisture content of the dried material exiting the belt dryer is kept within a tight tolerance, thus creating excellent preconditions for the production of high quality wood pellets at low operating costs. The TECCON belt dryer features a highly efficient and flexible system for drying fibrous wood material. Hot water from boilers and waste heat from industrial processes are commonly used for drying. The evaporation rate ranges from 2.5 to 10 tons of water per hour.

1 CAD rendering of a TECCON belt dryer, showing air intakes at the upper section of the enclosure and exhaust fans which blow the humid air to the stacks
2 Rotation monitoring
3 Air blower connected to the continuous belt cleaning device
With long standing in-house experience in operating its own pellet plant and renowned for its engineering excellence, TECCON minimizes investment risks and achieves a highly profitable realization of wood pellet plants.

The innovative and patented PELLET TOWER has become a well-accepted key feature of pellet plants designed and installed by TECCON. With the belt dryer and additional technologies for pre-processing, storing and conveying, a complete range of solutions for pellet plants is offered to the customer. TECCON installations reflect the state of art, are user friendly and carefully tailored to the needs of its customers. TECCON is entirely competent to offer comprehensive services, ranging from early consulting stages like pre-feasi-
By feeding dried material with great uniformity into the PELLET.TOWER, the belt dryer is regarded as a key element of the wood pellet plant, contributing significantly to energy efficiency and operational reliability.

bility studies to plant completion and start up, augmented by plant operation assistance worldwide. TECCON also attaches particular importance to optimizing and upgrading existing pellet plant operations.
Wet raw material, most commonly fibres from sawmills, is fed continuously onto the TECCON belt dryer. The drying is effected by exposure to heated air. A set of screw conveyors evenly distribute the material across the width of an air permeable fabric belt. The height of the layer, adjusted by vertically moving the screw conveyors, is varied in order to meet specific requirements of raw materials. On the suction side of the exhaust fans ambient air is drawn through heat exchangers and through the layer of shavings which slowly travels on the permeable fabric belt. On the pressure side, the humid air is moved on to the stacks and released to the atmosphere. In direct contact with heated air during the first phase of the drying process, the fibres release their surface moisture. Subsequently, water from the inside begins to diffuse to the surface of the wood particles and is again absorbed by heated air. During the progressive drying process, zoning of the drying tunnel permits separate adjustment of the air volumes of each zone to the decreasing moisture release. Therefore each zone is separately served by a variable speed fan. Supported by advanced instrumentation, the whole drying process is characterized by excellent controllability. One or several turning devices maintain a uniform air flow through the layer of fibres and contribute to the equalization of their moisture content. By regulating key process variables such as height of layer, air throughput and dwell time, the moisture of the fi-
bres will precisely conform to the set point. To maintain the cleanliness and permeability high velocity air impingement onto the returning fabric belt is continuously employed. In addition, wet cleaning is used, when necessary. At the outlet of the drying tunnel, the layer of the dried particles falls into a discharge screw supplying the next process stage.

A dual stage heat exchanger during installation
FLOW OF FIBRES

Material intake
Uniform height and density of a layer, built up from fibres, are crucial for an efficient drying process. In TECCON belt dryers two counter-rotating screw conveyors are employed to evenly feed wet material onto the belt, thus achieving the essential uniformity. By means of a stroke spindle drive the desired height of the layer is set. Heat tracing and thermal insulation can be used to prevent fibres from freezing (optional).

Turning devices
One or several turning devices mix the drier upper tier of the layer with the wetter lower tier to equalize the moisture content over the height. Turning devices also loosen up the particles, enhancing a uniform hot air flow. The number of turning devices and their positioning lead to considerable energy savings and qualitative improvement of the dried material.

Material outlet
At the end of the drying tunnel the fibres leave the process belt after the drive roll and are taken over by a screw conveyor or discharging them at the final transfer point, where the moisture content of the dried material is continuously measured as an input for control loops.

PROCESS BELT
The process belt is driven by a geared motor connected to the rubber covered roll. The speed of the motor is infinitely variable according to the requirements of the process. The air-permeable belt made of antistatic synthetic hybrid fabric is a key element of the technology and fulfills the twofold task of transporting and passing hot air through the layer of fibres. Bronze wires woven into the fabric in working direction prevent electrostatic charging.

The edges of the process belt of the TECCON dryer are bent upwards by a special design. Thereby the air flow is much better sealed off and leakage kept to a minimum. Less dust deposits, significant energy savings and lower maintenance input are achieved.

Belt assembly
After passing the main drive roll, cleaning devices, tensioning unit and guiding system the belt runs round the main return roll and travels over the belt support rolls through the drying tunnel. Support rolls minimize fabric sagging and help to keep the layer from cracking up.
Belt guiding system
Directional stability of the belt, permitting only minute deviations, is accomplished by a fully automatic guiding system. In addition, contact-free sensors are employed to monitor the belt edges to avoid any damage during operation.

Dry cleaning of belt
Best overall efficiency and full operational availability of the dryer can only be reached when the maximum mesh opening of the fabric belt is maintained at all times. An integrated self-cleaning unit, located directly after the drive roll and featuring a powerful air blower, supplies continuously high velocity air. Adhering particles are removed and recycled to the dried material discharge conveyor.

Wet cleaning of belt
High pressure water nozzles clean off particularly resistant contaminants whenever needed. The wet cleaning unit, placed in the back run, ultimately ensures a sustainable performance of the process belt because of its high air permeability.
**AIR SYSTEM AND ENCLOSURE**

**AIR SYSTEM**

**Airflow**
Exhaust fans draw hot air through layer and process belt. When dry hot air is passed top down through the fibres, moisture is absorbed. Fine dust particles carried along with the drying air settle on the layer. The entire drying tunnel is kept under a slightly reduced pressure because of the induced draft fan. Therefore air leakage and consequently dust problems are prevented. Unwanted cold air is largely inhibited from entering the drying section via material inlet and discharge. The upwards bent edges of the process belt provide additional lateral sealing.

**Drying tunnel with zoning**
During the first phase of the drying process, when wet fibres start moving on the process belt, a much larger air volume is necessary to remove water vapor than during the last phase prior to discharge. For this reason, stationary baffle plates are incorporated in the drying tunnel to adjust the required air volumes in different drying zones. Each zone is served by a separate exhaust fan to control the air volumes required for efficient drying of the fibres. Due to the advanced air distribution the overall power consumption for the belt dryer is optimized.

**Heat exchanger**
Heat exchangers operated with a water/glycol mix, warm up the drawn-in ambient air, before the air is entering the drying tunnel and passing through the layer of fibres and meshes of the process belt. The number and size of heat exchangers are determined by process parameters. Multistage exchangers are used to optimize the heat efficiency in the temperature range from 50 to 120 °C for hot water. Alternatively, heat exchangers utilizing low pressure steam or hot air can be offered.
ENCLOSURE
Modular design
The modular design of the TECCON dryer allows for flexible adaptation to customer requirements and easy installation. Proven components, expedient project implementation and optimized costs will be of significant benefit to plant operators.

Base frame and exhaust air collector
A base frame of galvanized steel transfers the loads of the plant to the foundation. A stainless steel exhaust air collector of air tight design has been aerodynamically optimized, but is still easy to clean.
Functional groups

CONTROL, VISUALIZATION, SAFETY EQUIPMENT, AUXILIARIES

CONTROL, VISUALIZATION

All functions of the belt dryer are monitored and actuated by a central control system. Important production data such as ambient air temperature, drying air temperature before and after the layer of fibres, air pressure in the exhaust collector, inlet and outlet temperatures of the heating fluid in the exchangers, the water content of the dried material are measured and displayed.

Based on these measurements, specialized control software continuously adjusts process parameters such as belt and fan speeds, thus ensuring constant moisture of the dried fibres and cost efficient operation of the dryer. The process control system is highly flexible and dynamic. Soft start mode for drives supports smooth operation and helps to control the drying process. The operating personnel benefits from user-friendly visualization, combined with remote control and remote maintenance. Furthermore, the software is especially suited for optimizing and fine tuning the process, for instance by trend analysis. Having numerous monitoring devices relating to rotation, current consumption of motors, directional process belt run, differential pressure and vibration I & C Technology also integrates all necessary safety functions. The high degree of computerization contributes to streamlined operation and the need for personnel is kept to a minimum.

SAFETY DEVICES

Personal safety

All accesses to drying tunnel sections and screw conveyors are secured by limit switches. Opening a monitored access door triggers an immediate emergency stop. Automatic restarting of the equipment is ruled out. Unmonitored openings are bolted with screws, gaining access requires tools. All drives can be equipped with lockable repair switches attached to each unit.

General safety

The belt dryer has been developed, designed and built in full compliance with the currently applicable best engineering practice. TECCON has put particular
emphasis on standards for safe operation, also drawing from extensive own experience.
The safety of the machines is subject to the following EC directives:
- Machinery directive 2006 / 42 / EG
- EMV directive 2004 / 108 / EG
- Low-voltage-directive 2006 / 95 / EG
and applied harmonized standards.

Compliance with the guidelines is confirmed by the declaration of conformity according to Machinery Directive 2006 / 42 / EG certified by CE marking. Further safety features are
- Comprehensive explosion and fire protection concept
- Suitability for installation in ATEX Zone 22

ACCESSORIES
Optional packages for customizing the dryers are available.

Operating comfort
- Feeding bin with metering device at the discharge
- Sound dampers for exhaust air
- Continuous In-line moisture measurement at raw material inlet

Plant performance
- Additional turning devices
- Pressure, temperature, rotation, position and motor current monitoring
- Automatic fire extinguishing system with dry extinguishing lines
- Two-stage heat exchangers for usage of low temperature heat
- Super Premium Efficiency drives and fans

Weather ability
- Enclosure for outdoor installation
- Insulation of exhaust air collector
- Heat tracing of water-carrying pipes
- Container for housing of electric and I & C equipment

DIMENSION SHEET
Belt dryer with an evaporation rate of 2.5 to 10.0 t/h.
Dimensions L1, L2 and L3 will vary according to the evaporation rate, the specification of fibres and the type of heat available.

TECCON belt dryer
The TECCON belt dryer is tailored to meet all the parameters of a drying process which help to upgrade the production and quality of wood pellets. Therefore, the dryer is uniquely suited for wood pellet plants. Among the most important features are:

**Process belt-lateral sealing**
The edges of the belt are bent upwards with a difference in height of about 100 mm. The trough shaped belt makes it difficult for the drying air to bypass the fiber layer. By introducing this barrier, undesirable airflows are remarkably diminished with following operational advantages:
- Higher energy efficiency
- Improved dust containment
- Less effort for cleaning, especially in exhaust collectors
- Lower maintenance costs
- Lower dust emissions

**Zoning of the drying tunnel**
- More precise control of drying process
- Increased flexibility
- Uniform moisture content
- Lower energy consumption
- Excellent response to partial load operation

**Additional turning devices**
- Greatly improved homogeneity of moisture in dried fibres
- Tangible energy savings

**Speed controlled fan drives**
- Cost effectiveness
- Exact control of the drying process
- Excellent performance under partial load operations

**Optimized heat exchangers**
- Energy efficiency
- Economical use of low-temperature energy sources

**Comprehensive I & C technology**
- Easy to operate
- Automatic operation
- Low maintenance costs
- High availability
- Low electric power consumption
- High quality dried fibres

**Quality components**
- High reliability
- High expected technical lifetime
- Low expenditures for maintenance
- Low energy losses

**Operational safety**
- Sophisticated fire and dust explosion protection concept
- Advanced air pollution control
- Optimal quality of dried material for wood pellets

**Optimized for wood pelleting plants**
Homogeneous Dried Fibrous Material Accurately Meeting Specifications

User Friendly, Low Maintenance

Excellent Availability and Technical Lifetime

Low Dust Emissions

Low Thermal and Electric Energy Consumption

The air-permeable process belt of antistatic synthetic-metal-hybrid material is particularly suited for the dual function: Transport of and airflow through the layer of fibres. The edges of the process belt in TECCON’s dryer design are bent upwards. This approach minimizes bypass air leakages, leading to reduced energy losses and less dust deposits.
CAD image of a TECCON belt dryer

TECCON KONSTRUKTIONEN GMBH
Katschbergstrasse 78 – 80
9851 Lieserbrücke, Austria
Phone: +43 4762-44 820
Fax: +43 4762-44 820 29
office@teccon.at

www.teccon.at

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