




A Belt Press is a Belt Press?

NAWT 6TH WASTE TREATMENT SYMPOSIUM
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What's the differences?



- Gravity Length
- Wedge Length
- Pressure Diameters
- Bearing / Journal Diameters
- Frame member sizes
- Overall length

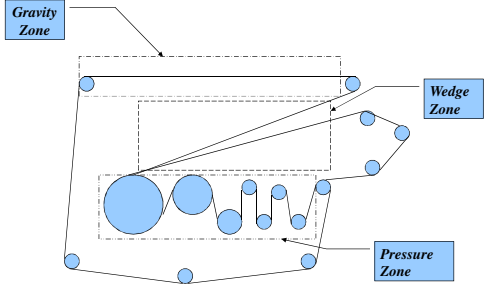
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Agenda

- Basics of Belt Press Design
- Factors to consider in evaluating Belt Presses
- Questions

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Basics of Operation



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Basics of Belt Press Operation:

- Three primary zones:
 - Gravity: A cake is formed from a dilute dispersion of solid particles on top of a filter cloth.
 - Wedge: Formed cake is sandwiched between two filter cloths and low squeeze pressure applied.
 - Pressure: High squeeze pressure applied by serpentine path of two belts around a series of rolls.

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Gravity Zone Design

- Cake Formation
 - Even Feed Distribution
 - Initially no cake when the feed slurry is placed on the filter cloth.
 - As slurry flows through filter cloth, solids deposit on surface
 - Resistance to filtrate flow increases with time exponentially.
 - Increasing the belt speed improves the thickening by spreading the cake over more area, producing a thinner cake, and significantly reducing flow resistance.
 - Plows: Enhance filtrate flow by dislodging deposited solids, provide compression by kneading

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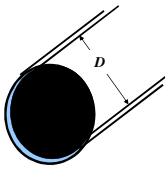
Wedge Section Design

- Cake is Formed is Encapsulated between belts.
- Consolidate loosely packed solid particles so the potential for squeeze out in the pressure zone is reduced
- Gradual increase in cake pressure from zero to pressure of first roll.

Pressure Zone

- Cake thickness is fixed, so the resistance to expressed filtrate is fixed.
- Longer time under pressure means more liquid is expressed.
- Slower belt speed enhances performance.
- Three Belt Design: high speed in gravity zone, low speed in pressure zone

Pressure Section Design



$Pressure = (2T * W) / D * \pi * W * (R/360)$
 $= 2T/D\pi(R/360)$

Where: $T =$ Belt Tension
 $W =$ Belt Width
 $D =$ Roll Diameter
 $R =$ Degrees of roll wrap

Notice outer belt has longer belt path than inside belt

Factors to Consider: Ranked in order of Importance

1. Filtration Area:
 - a) Gravity: Length x Width
 - b) Wedge: Length x Width
 - c) Pressure: Contact area of filter cloth and Roll
2. Feed Distribution: Uniform thickness across width
3. Pressure Zone Configuration:
 - a) Number of Rolls
 - b) Roll Diameters / Decreasing size
 - c) First Roll Perforated
4. Belt Tension Capability:
 - a) Cylinder size / Power Unit
 - b) Journal Bearing Size
 - c) Roll Shell Thickness
 - d) Frame Strength


Factors to Consider: Ranked in order of Importance

5. References:
 - a) Performance: Similar Process
 - b) Service
 - c) Parts
6. Belt Tracking Assembly
7. Accessibility: Operation Observation / Maintenance
8. Filtrate Collection Pans
9. Belt Wash Assembly
10. Materials of Construction
 - a) Member Size
 - b) Coating System
11. Bearings:
 - a) Type
 - b) Diameter

Factors to Consider: Ranked in order of Importance

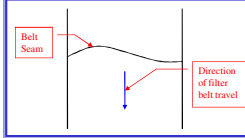
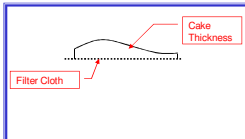
11. Overall Layout:
 - a) Discharge Location
 - b) Feed Location
12. Financial Condition of Company

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FEED DISTRIBUTION

- Uneven distribution causes:
 - Premature clipper wire failure
 - Accelerated wear on roll coating
 - Cake solids concentration is lowered
 - Belt misalignment

Original Distributor




Poor Distribution: Clipper seam

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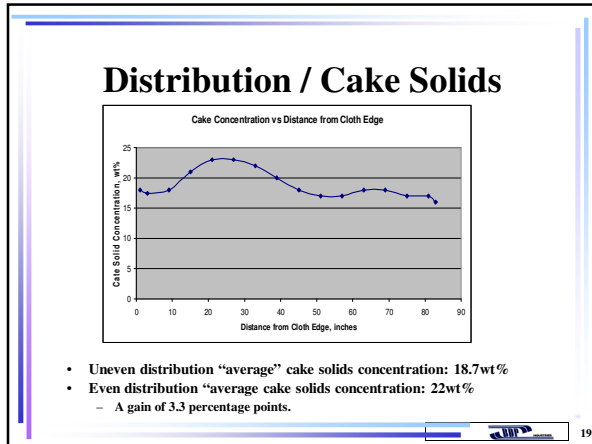
Revised Distributor



Good Distribution: Clipper seam

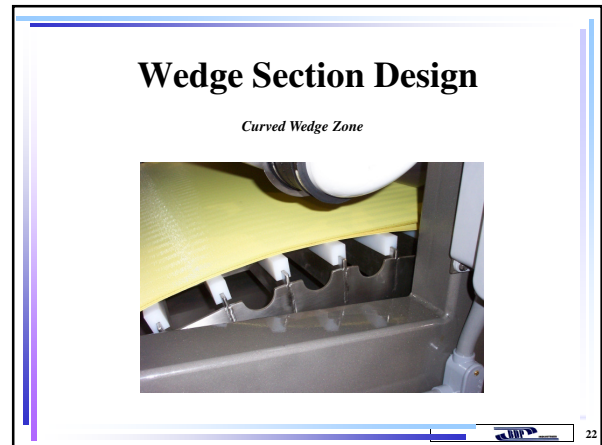
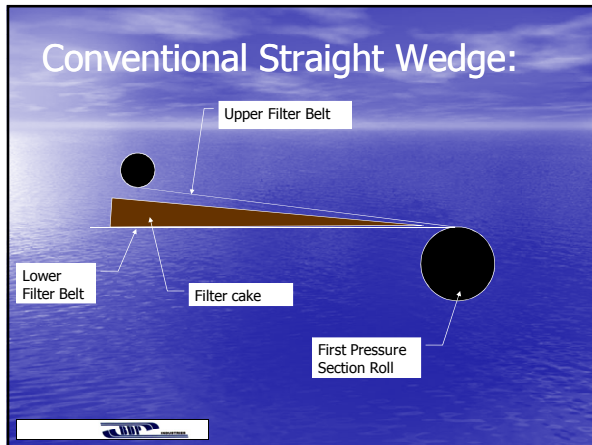
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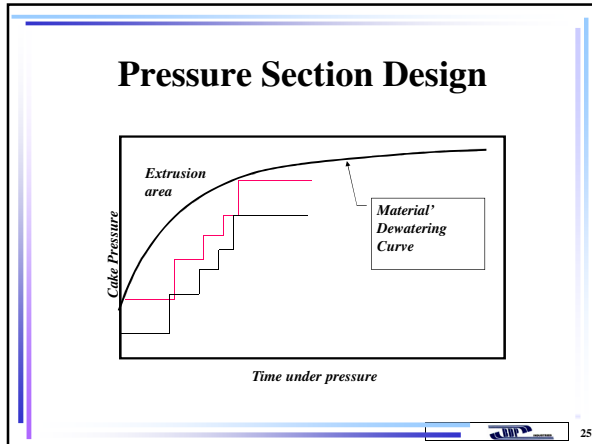
Roll Wear

- Even cake = Even roll coating wear!!!!!!
- Uneven cake = Uneven roll coating wear:
 - Tracking misalignment
 - Lowers cloth life
 - Lowers cake solids



Pressure Section Design

- Number of Rolls: more rolls, more time under pressure, higher shear and reduced belt life.
- Diameter of rolls, Decrease in diameter.
- Number of Perforated rolls
- Roll Construction, rigid
- Roll Coating, reduce wear on belt.



◆ CONVENTIONAL HORIZONTAL PRESSURE SECTION

- Re-absorption of filtrate.
 - Lowers discharge cake solids.
- Elevated belt press installation.
 - Higher installation cost.
- Operator platforms around belt press.
 - Hinders operator access.
- Structures that hinder maintenance.

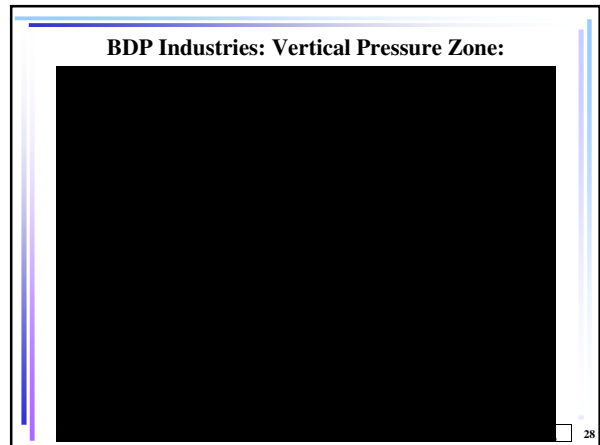
Filtrate runs down face of upper rolls and pools around lower rolls.

Horizontal Arrangement

◆ VERTICAL PRESSURE SECTION

- Increased cake solids.
 - Collection pans eliminates re-wetting of cake.
- No platforms required for operator access.
 - Lower installation cost.
- No structures to hinder maintenance.

Filtrate collection pans



Belt Tension Assembly:

- Assembly must be capable of producing 70pli belt tension. PE certified calculations must be provided.
- Assembly must provide the capability for setting the tension of each of the belts independently.
- Certified calculations of Roll Deflection at 70 pli belt tension

Belt Tensioning Assembly:

- Rack and Pinion Assembly, Hydraulic cylinder activated
 - On/Off and Pressure Regulator Control of Each of three belts
 - Rugged construction to insure alignment of tensioning roller.

References

- Find similar process references
- Make sure it is the same model
- Similar Operational Frequency
- Questions:
 - Capacity: flow rate, feed solids – lb/hr per m
 - Cake Solids
 - Polymer Usage
 - Maintenance cost
 - Maintenance Frequency and Recent Repairs
 - Ease of maintenance
 - Responsiveness of Manufacturer
 - Sample Testing

Belt Tracking Critical Design Factors

The diagram shows a belt system with three rollers. Callouts indicate the following factors:

- High torque loading and belt supports in tank
- Excessive deflection may result in belt misalignment
- At least 20 degree wrap on driving roll
- Low to medium deflection of belt 20 to 40 degrees may occur
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- Low to medium deflection of belt 20 to 40 degrees may occur

Belt Looping: caused from high belt tension or tracking issues

A close-up photograph showing a belt looping over a roller, illustrating the issue of belt looping.

Accessibility

A photograph of an industrial facility showing a walkway or platform designed for accessibility, likely for maintenance or inspection purposes.

Filtrate Collection Pans

A photograph showing a filtrate collection pan installed in an industrial setting, used for collecting liquid from a belt.

Belt Wash Assembly

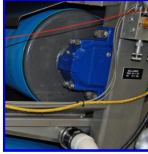

- Wash belt prior to any cake side roll
- Self Cleaning Shower header
- Containment of wash spray on both side of the belt
- Some applications require washing both sides of the belt

Materials of Construction

- Frame must have a design safety factor of 10, actual stresses must be 1/10 the allowable member stress at 50pli belt tension. Substantiate with PE Calcs.
- Frame must provide adequate spatial clearance between rolls for variations in operating cake thickness and access for cleanup and belt changing.
- Frame must have adequate width to mount bearing and keep it from rocking. On a 2 meter unit it must be 4”.
- Precision machined for mounting bearings.

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Bearings

- Type: Split Case vs Pillow Block
- At a belt speed of 15 FPM and 70PLI belt tension the L₁₀ bearing life must be a minimum of 1,000,000 hours.
- Bearing can not be proprietary design that can only be purchased from the belt press manufacturer. Must be procurable from USA bearing manufacturer such as Dodge.

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Overall Layout




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Financial Condition

- Dunn and Bradstreet Report
- Years in Business
- Number of units manufactured per year
- Shop size and manufacturing capabilities / equipment
- Service staff: education / experience / location / number of personnel.
- Performance Warranty

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National Association of Wastewater Transporters
 Fourth Annual Waste Treatment Symposium
 Orlando, Florida




PERFORMANCE DATA NAWT SYMPOSIUM ON LIME STABILIZED BLEND OF SEPTAGE /	
FLOW RATE	120 GPM
SOLIDS CAPACITY	3,120LB/HR
DISCHARGE CAKE SOLIDS	42%
APPROXIMATE CAPITAL COSTS PER LB/HR OF CAPACITY	\$140

BDP Industries, model 3DP Belt Press

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Questions?????

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