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State-of-the-art side flexing belt system

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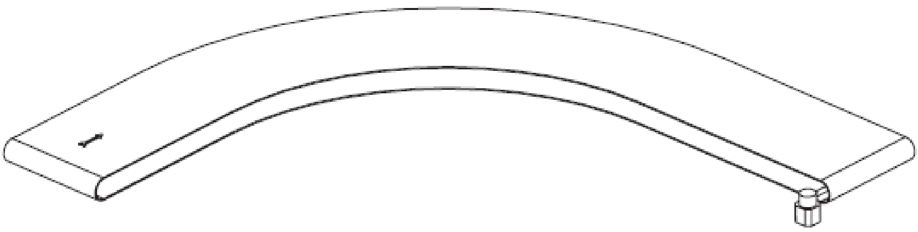
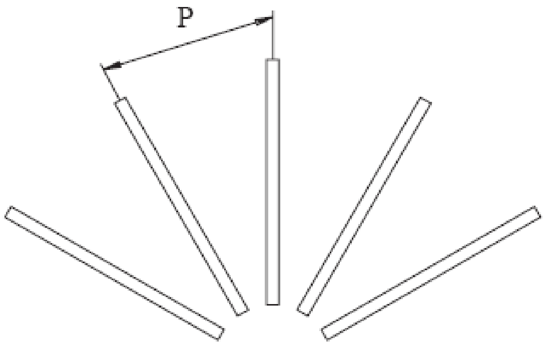
How does a side flexing belt work

A simple example of a side flexing conveyor is the L-shape: Straight section,curve, straight section.
The belt runs as a straight running belt in the straight sections; in the curve the belt pitch compresses at the inner radius to compensate for the difference of the arc length.
After the curve the belt is stretched and runs again as a straight running belt.
In the curve section only the outer edge remains at true pitch. This outer section transfers all the tensile forces.



True pitch in outside radius

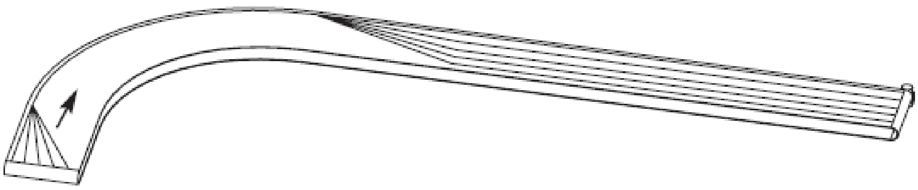


P = pitch

When the belt travels straight, the pitch is the same over the entire width. The belt is able to distribute the tensile forces across the full width of straight running sections.
When the belt travels in the curve the pitch will vary over the belt width. Only on the outer radius will the original pitch be maintained, therefore is only the outer edge able to transfer tensile forces.
When calculating the belt length it is important to use the outer arc length.

Load Line

To understand the function of a side flexing belt it is important to understand the distribution of the forces in the belt.
In a straight running belt the load lines are distributed evenly over the belt width.
In a side flexing belt the links are compressed in the inside radius and thus cannot absorb any tensile forces. Hence, the entire tensile force must be transferred on the outer radius where the pitch is normal.
The illustration below shows the distribution of the tensile forces load lines in a side flexing belt.



In the curve the tensile force will concentrate in the outside radius.
After the curve the tensile force will spread over the entire belt width again in the form of a fan and after a certain length the forces will again be distributed evenly like in a straight running belt.
evenly like in a straight running belt.
In straight running belts, where the tensile force is distributed evenly, the tensile capacity will tensile capacity will increase in relation to the belt width.
In a side flexing belt only the outer hinges of the belt can transfer the entire tensile force in curves. Thus a larger width sideflexing belt will not have increased tensile capacity.

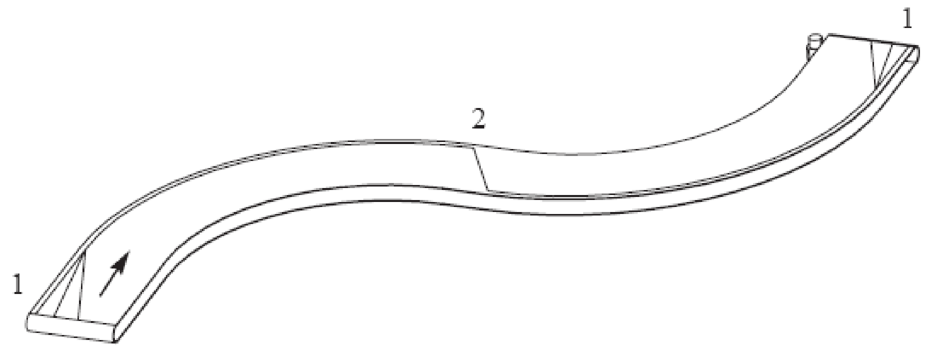
Layout following the load lines

It is important to observe these load lines when designing the conveyor.

• To ensure correct engagement and optimum drive the sprockets must be placed where the belt is running straight and the forces are evenly distributed. Easy conveyors thus recommens placing the drive station in a distance from the curve of minimum 1,5 x belt width.

• At the idler end it must be ensured that the belt is stretched, so that the pins in the belt are parallel with the idler shaft when they rotate around it. A straight section before the curve of minimum 1 x belt width ensures correct rotation around the idler shaft.

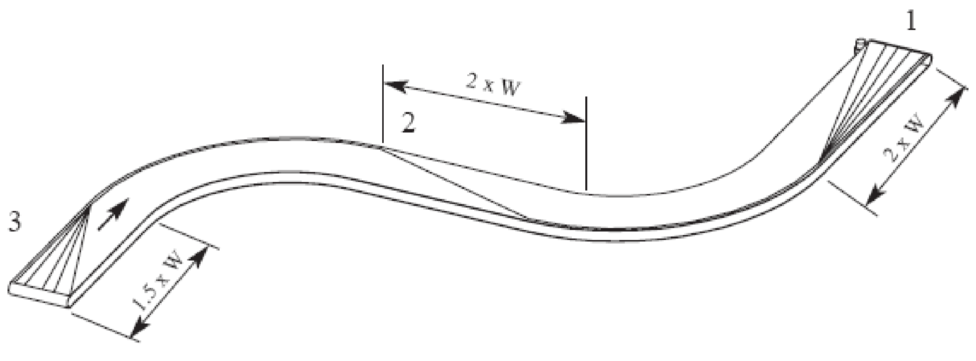
• In an S-conveyor it is important that the tensile force is distributed evenly across the belt width between the two curves before it is compressed on the opposite side of the belt. A straight section between two opposite running curves of 1 x belt width ensures a good distribution of the tensile force. The distance can be smaller but this may influence the stability of the belt and cause vibrations.



Bad Layout

1. The load line pattern shows uneven forces at the sprockets.
2. The straight sections in this S-curve are too short causing a severe change of direction between curves.

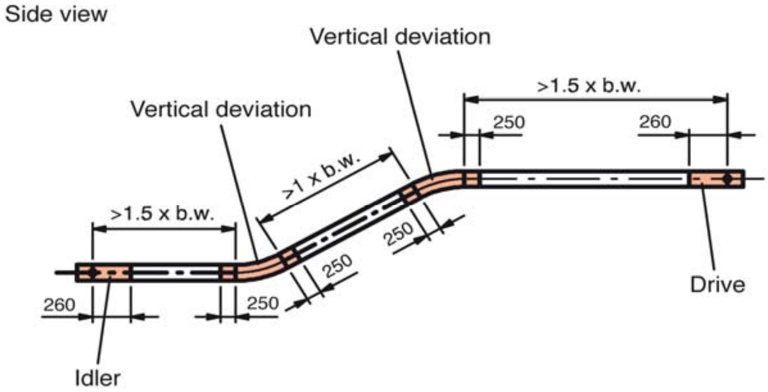
This will result in a pulsation of the belt and in a worst case senario could cause a break.

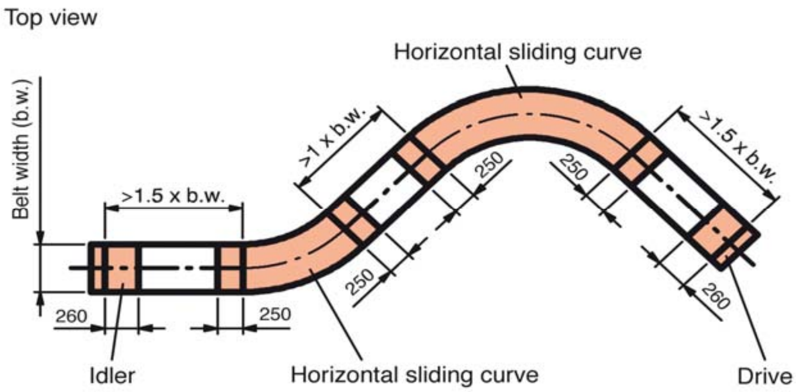


Good Layout

1. The load is distributed evenly over the belt width at the drive end.
2. The load is transferred evenly from one side of the belt to the other.
3. True pitch over the entire belt width at the idler end ensures a proper engagement.

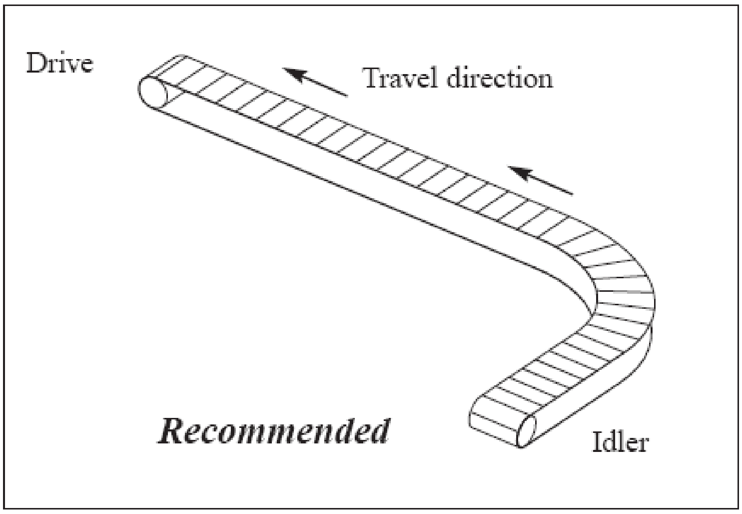
Overall dimensions

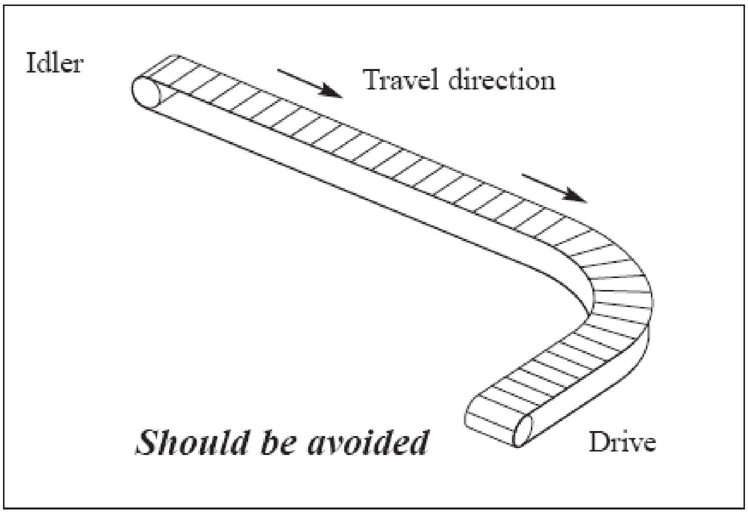




The drive

The drive unit must be placed, so that the chain/belt is pulled. Pushing the belt is therefore not recommended.
Belt tension increases as you move from the idler shaft to the drive shaft.
On straight sections the tension will double if the belt length is doubled.
In curves the friction will increase against the inner radius of the guide rail. This means that the tension does not increase linearly but exponentially. It takes more power to pull the belt through a curve. The higher the load on the belt before the curve the larger the increase of the friction.
When placing of the drive it is important to minimize the sections before the curve and maximize the sections after the curve.





Load & Speed properties

The tensile force of a side flexing belt depends on the outer hinges and any reinforcement links. In side flexing belts, however, the speed is also an essential parameter. In side flexing belts there is a great radial load in the curve. At the point of contact between belt and wearstrip heat will occur due to friction. The temperature influences the friction properties of the materials. The friction coefficient will increase with the temperature, a higher friction coefficient will result in more heat being generated etc. It is important to avoid this as it will result in either the curve or the wearstrip melting.
On the basis of numerous tests and data collated from existing applications Easy conveyors has laid down some load/speed relations between our standard belt materials and UHMW PE HD 1000 and TCP (special high speed material) respectively.
Attention should be paid to the max. permissible tensile forces stated that apply only at relatively low speeds and that will decrease as speed increases.

Sizes for calculation of needed materials;

Length of the Head drive section		260,5mm	
Length of the idler unit		260,5mm	
Straight parts at the curves, both sides		250mm	
Needed connectors in a straight section		1 each 0,5 mtr	(for the widthness)
Needed straight connectors		1 set each 2995mm	
Needed section profile per meter		2	
Needed sliding strip per meter		4	
Neede gide rail bracket per meter per side		2	

Needed heavy duty profile and clips ;

Width	clips / mtr	HD profile / mtr
128	0	0
210	2	1
312	4	2
414	6	3
518	6	3