Flat driving belts and their use for driving the MVE generators

A brief history

The torque transmission from one driving shaft to the other (or several driven shafts) by means of a flat driving belt is one of the oldest and most popular transmissions modalities. In a predominant majority of cases, the full-leather belts as fabricated from a specially tanned and set out leather were used. Over the technical development of industry, such belts were surpassed because of their still deeper inability to face any growing requirements. In terms of their solidity and tensibility, the leather belts were not able to meet the growing demands.
In the first half of 20th century, a German industrialist Mr. SIEGLING was the first to develop the flat stratified belts. These had for basis a highly strong tensile body that was lined by frictional layers from split leather. Successively were developed and perfected the flat split belts of higher strength parameters, and the assortment of frictional layers was enlarged. Both European and world-wide manufacturers were rapidly growing in number.

Application advantages and limitations of flat split belts

a) High transmissions efficiency.
The transmission efficiency achieves 98% where the transmission is correctly designed. It is higher by 5-6 % in comparison with wedge-shaped belts. Moreover, the wedge-shaped belts are as markedly higher in energy losses as by 8-10 %. The other general advantage of flat belts consists in their functioning as a flexible coupling and therefore restrain the engineering equipment damage. Neither lower construction costs are negligible as compared with the use of wedge-shaped belts or the hard coupling of the driving- and driven equipment parts, nor is any minimal maintenance costs where the drive mechanism is based on the flat driving belts.

- Of a certain inconvenience can be such transmissions that are characterized by non-sufficient angle of lapping of a smaller belt roller in a shortage of space.
- Disadvantageous is the drive by flat belts in case of any low circular speed values up to 5 m/s.

b) About the transmission efficiency of the flat belts.
Transmission efficiency is limited by the following basic parameters:

- By the friction factor between the belt and its pulley or roller. This friction factor fluctuates within the 0.3-0.45 μ range according to the friction layer in relation to the flat steel belt roller. Friction factor (FF) is also markedly influenced by circumferential belt velocity, the value of which levels up the FF.

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- By the angle of roller lapping. The ideal is 180° lapping angle. However, this situation is of a single instance in practice. In general, it can be scale-tolerated as follows:

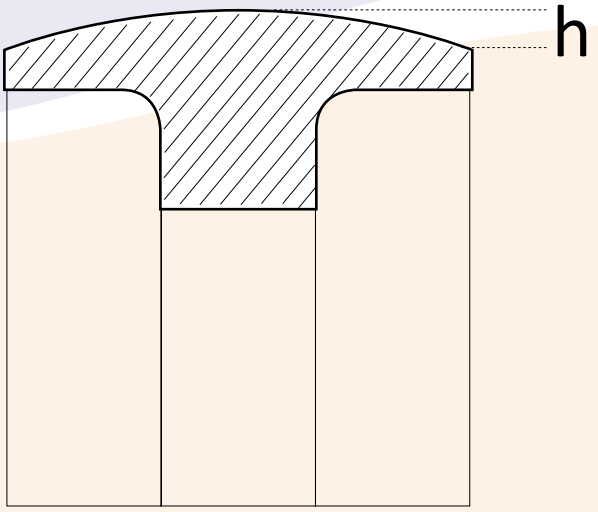
for the light stainless drives	110° - 120°
for higher output capacity	130° - 140°
for high output capacity	150° - 160°

In case of non-sufficient lapping angle, the belt shear slipping can be increased with consequential worsening of the transmission efficiency with a simultaneous hazard of damaging or destruction of the belt.

- By the tightening force (pressure onto the belt rollers). As a rule, the belt must be tightened by a force, which corresponds to the double value of calculated belt stress. This parameter is diffcult to measure, therefore the rule has been defined to keep up the 1.5-2.5% pretensioning length scale for belts with PAD foiled tension body.

Note:
It is known that every belt becomes elongated during the operation, namely, during its first phases. Therefore, during the operation it is necessary to observe any initiation of eventual shear slipping and tighten up the belt, if needed.

- The shapes of belt rollers (pulleys):
Minimum one of rollers must be cambered for a correct travel of the belt. The best solution is to have both rollers cambered, namely, in vertical position of the driving mechanism.



Diameter in mm	Belt pulley width 25-250 mm	Belt pulley width > 250 mm
40 - 112	0,3	-
125 - 140	0,4	-
160 - 180	0,5	-
220 - 224	0,6	-
250 - 335	0,8	-
400 - 500	1	-
560 - 710	1,2	-
800 - 1000	1,2	1,5
1120 - 1400	1,5	2
1600 - 2000	1,8	2,5

Basic product range of the flat stratified belts

The belt product range can simply be classified according to the two basic stand-points:

a) according to the pattern and strength of the tensioning body

- belts with the PAD-foiled tensioning body
- performance standard range (see the table in the end of article)
- belts with the tensioning body from the PET-cords are of a limited application, and they are applicable as a replacement of full-leather belts. They are advantageous due to a possibility of connecting them by clamps, stitching etc.
- belts with the tensioning body from aramide fibers. High strength, small elongation, complicated connection, sensitivity to overheating at the traction slip.

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b) according to the nature of frictional layers

- frictional layers from the split chrome tanned leather. High abrasion resistance, quiet running, oil-greas-dust and impurities resistance. Application up to 15m/s maximum circumferential speed.
- frictional layers from the rubber elastomer. High friction factor, quiest running, resistance against lubricants, application up to 70m/s circumferential speed. Unsuitable for a stroke-frequent operation and changing-over of rollers.

Operating and maintenance mode

The operating and maintenance mode is very simple at the correctly calculated and performed belt driving:

- keep up the belt duly tensioned in avoidance of any shear slippage
- keept up the belt rollers and pulleys in a clean status without any coating by lubricants, dust and impurities
- apply any auxiliary lubricants for increasing the friction factor only in an imperative necessity and only in belts with friction surface from leather
- keep up the correct regulation of a straight running of the belt on its rollers
- any eventual cleaning of contaminated belt must be executed at the stand-still status and without using any organic solvents. (benzine can be used)

Basic technical parameters of the flat belts

Belt type POLIFIX	Allowed tension strength in N/cm maximum elongation 3%	Minimal allowed diameter roller in mm	Heat resistance in °C
GTI 140	140	60	od -15 °C do +100 °C
GTI 200	200	100	od -15 °C do +100 °C
GTI 280	280	150	od -15 °C do +100 °C
GTI 400	400	200	od -15 °C do +100 °C
GGT 140	140	60	od -15 °C do +100 °C
GGT 200	200	100	od -15 °C do +100 °C
GGT 280	280	150	od -15 °C do +100 °C
GGT 400	400	200	od -15 °C do +100 °C
UTI 140	140	75	od -20 °C do +80 °C
UTI 200	200	100	od -20 °C do +80 °C
UTI 280	280	150	od -20 °C do +80 °C
UTI 400	400	200	od -20 °C do +80 °C

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