POSITIVE DRIVE CHAIN EDGE (PDCE) BELTS

Two or more strands of chain connected by cross supports, which carry a mesh belt.

Positive Drive Chain Edge belts are used where it is impracticable or undesirable to operate a friction driven belt because of:
➢ Design limitations
➢ Operational requirements
➢ Where synchronized belt travel is essential
➢ Where periodical inspection and service are difficult to maintain

Positive Drive belt assemblies employing Steel Roller Chains are widely used for conveyor purposes because of uniformity in pitch, high tensile strength with relatively light weight and durability under severe loads. Conveyor belts are regularly produced using chains of various grades of malleable iron, high strength cast alloys, heat-treated malleable iron, stainless steel, and carbon steel. Steel grades as well as Stainless Steel are available with standard or oversized rollers. Stainless Roller Chain is available and should be used for corrosive conditions.

Component Parts: Chain
Cross Supports
Mesh (Fabric)

Applications: Heavy Duty Industrial
Incline Conveyors
Quench Tanks
Washers and Degreasers

Turn Capability: Straight Run Only — Dryers and Ovens
Width: Defined by 3 width dimensions: — Food Processing
Mesh width — Hot Oil Fryers
Chain centers (C/C) — Cookers
Overall width

NOTE: Unless specified otherwise, Chain Centers will be the critical dimension maintained by manufacturing.
Method of Drive: Sprocket driven on the chain strands.
Conveying Surface: Generally equal to the mesh width or the inside guard edge (IGE) dimension if guard edges are used.
Belt Strength: A function of the chain. Consult chain manufacturer or ASME specifications where applicable for the strength rating of a specific chain.
Advantages: Positive Tracking
Small Terminals (Sprockets)
Synchronized Belt Travel

MESH
♦ Balanced Weave
♦ Compound Balanced Weave
♦ Conventional Weave
➢ Any mesh may be specified but second count (SC) within the mesh is a factor of rod spacing, unless a special spiral is used or cross support is attached to underside of mesh.
➢ A Special Spiral is larger than a Standard Spiral and can be manufactured in various shapes such as oval, diamond, square, etc.

Construction Options:
♦ Thicker mesh to accommodate cross support inserted through spirals
♦ Standard thickness but interspersed with special spirals to accommodate large cross supports or when a very dense mesh is specified
♦ Standard thickness when flat bar, channel or angle is attached to underside of mesh

CHAIN TYPES AVAILABLE (Materials and Attachments as required)

♦ **Roller chain**

Includes any precision roller chain with an ANSI designation such as RC50, C2060H or C2082H. Chain types are single or double pitch; double pitch chain can have a standard or oversized roller. **Engineering Class Bushed Roller Chain** are all steel chains, appropriate for heavy-duty service and for difficult operating conditions. Heavy Duty, long pitch oversized roller as commercially available.

♦ **Drag Chain**

Any chain that does not have a roller such as Pintle chain.

Pintle Chain has great durability will handle medium loads at low speeds. Fabricated from malleable iron it will operate satisfactorily at temperatures up to 600° F. for handling heavy loads a high strength cast alloy is recommended. For severely corrosive conditions or temperatures in excess of 1050° F, several types of cast Stainless Alloys are available.

Detachable Link Chain is available in either malleable iron or pressed steel. Positive Drive Conveyors employing Detachable Link Chains are used for light loads, slow speeds, and in applications that are well lubricated where nonabrasive operating conditions exist.

Chain manufacturers' catalogs afford complete data, specifications
and types of attachments available for all types of chains.

CROSS SUPPORTS

Cross Support Material
High Carbon
Stainless Steel
Etc.

Cross Support Spacing
Increment of chain pitch (e.g. every other pitch)
Center distance in inches

Attaching Cross Supports to Mesh
Through mesh -- rods and pipe/rod
Plug welded to underside of mesh -- flat bar and channel

Attaching Cross Supports to Chain
Engage as pins
Through midpitch hole
Bolted to chain attachment

Type of Cross Supports

Rod:
Length is generally the same as the overall width of the belt. Rod edges are welded, washer welded, brazed, washer brazed or drilled and cottered as specified. Winged rods are used to hold the chain sideplates in place when pin size rods are used with riveted hollow pin or cottered chain, located on every chain pitch.
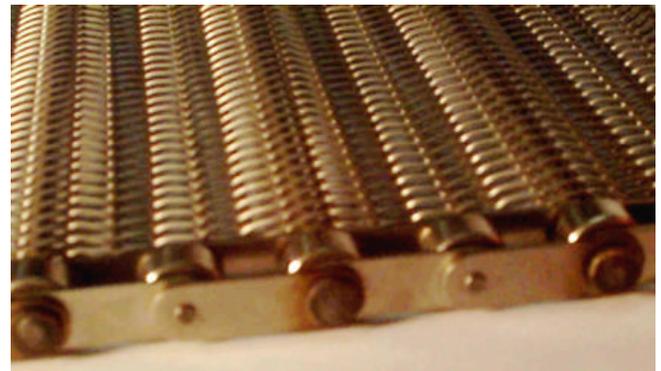
♦ Round rods
When used as cross support and engage chain as pins, standard size is as follows:

ANSI Number	Rod Diameter
RC35 and RC41	.135 in. [3.4 mm]
RC40, C2040 and C2042	.152 in. [3.9 mm]
RC50, C2050 and C2052	.196 in. [5.0 mm]
RC60, C2060H and C2062H	.230 in. [5.8 mm]
RC80, C2080H and C2082H	.307 in. [7.8 mm]

COMPONENT PARTS

Pipe/Rod:
Rods are inserted through any pipe or tubing which is commercially available and the combination is inserted through the mesh. Pipe/tubing length is same width as mesh.

Turned Down Rod:
When rod diameter is specified oversized for the chain according to the previous chart, the ends of the rods can be turned down to approximately the standard pin diameter in order to engage the chain.

Flat Bar:
Any commercially available or manufacturable flat bar may be used as cross supports. Length is determined by type of chain used and attachment (if used). May be inserted through the mesh or attached to underside of mesh as specified. When attached to underside, flat bar is plug welded or brazed to mesh through slots or holes in the flat bar. In general, flat bar is bolted to a chain attachment but in some cases is welded to the chain sideplate.

Channel or Angle:
Any commercially available or manufacturable channel or angle may be used as cross supports. Attached to underside of mesh. When attached to underside, mesh is plug welded or brazed to channel or angle through slots or holes in the channel or angle. In general, bolted to a chain attachment but in some cases welded to the chain sideplate.

STANDARD OPTIONS

Guard Edges
Guard edges are located on the inside of the chain. Height above belt surface and material as specified. Usually are used with round cross supports (rods: turned down rods or pipe/rod) which are inserted through holes in the guard edge.

Styles:
Guard edges are generally plates that may be offset or interlocking design or flat plates that are assembled in either a shingled or staggered arrangement. Plates can be square or rectangular shaped and either flared or notched as required. Plates with double tabs may be used. Bottom tab is inserted through mesh or tabs straddle mesh and are welded or brazed to mesh. Bushed plates or skip pitch plates may be used as guard edges if specified. Turned up guard edges may be specified.

IGE (Inside Guard Edge):
When guard edges are specified, this dimension should be stated in addition to the mentioned dimensions.

Flights (or lifts, Cleats)
Generally, flights are attached to the belt by welding or brazing to the mesh and/or the guard edges (if applicable). Style, material, height and spacing above belt surface as specified. Length of flight is usually the same as the mesh width but can be narrower if specified.

Styles:
Usually, flights are formed angle, although commercially available angle, flat bar, keystock, cut sheet metal or other as specified may be used. Angle types usually have slots or holes punched in the bottom to facilitate plug-welding to mesh.

NOTE: Flights are not meant to carry product up inclines, just to prevent slippage.

Wipers
Attachments, typically wire mesh, free hanging from bottom surface of belt to wipe debris from drip pans, trays, bins, etc. These attachments are located on the underside, usually short lengths of mesh and attached to belt mesh with a straight or crimped connector rod. Mesh designation (if applicable), material, length below belt surface, width of wiper and spacing as specified.

Used to allow reverse bends.
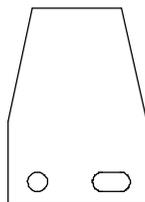
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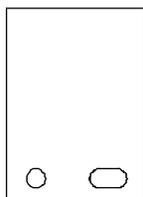
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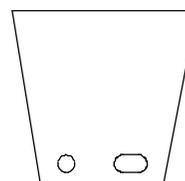
Flared Out

Used to prevent gaps from forming when going around sprockets.

ENGINEERING DATA & CALCULATIONS

BELT TENSION

$T = (wLf_r + WLf_r + WH) \times C$

Definition of terms:

PDCE Belts

T	= belt tension in lbs., [kg]
w	= weight of belt in pounds per linear foot, [kg per linear m]
W	= Belt weight + Product Weight in pounds per linear foot, [kg per linear m]
L	= length of conveyor. Center to center of pulleys in feet, [meters].
fr	= friction factor between belt chain and belt supports (track), dimensionless
H	= rise of incline conveyor in feet, [meters], (+ if incline, - if decline)
C	= force conversion factor

                Imperial: 1.0
                Metric: 9.8

NOTE: The reduction of chain pull due to the weight of the conveyor belt going downhill on the return side usually can be neglected and is omitted from the inclined conveyor formula.

Friction Factor for Chains
f = .35 for drag chain, non-rotating rollers or sliding on side plates on metal
f = .20 for drag chain, non-rotating rollers or sliding on side plates on UHMW
f = .10 for chains moving on rollers
Increase above values by 50% when poorly lubricated.

Maximum Single Strand Chain Pull:
For 2 Strand Conveyor uniformly loaded - Use 50% of total chain pull T.
For 3 Strand Conveyor uniformly loaded - Use 62.5% of total chain pull T.
For 4 Strand Conveyor uniformly loaded - Use 31.2% of total chain pull T.
These values are for chains uniformly spaced across the width of the conveyor.

Ultimate Strength Required in Chain:
For speeds less than 25 ft. per min. - Use 5 times maximum single strand chain pull.
For speeds less than 25 to 50 ft. per min. - Use 6 times maximum single strand chain pull.
For speeds less than r 50 to 100 ft. per min. - Use 7 times maximum single strand chain pull.
For speeds greater than 100 ft. per min. - Use 8 times maximum single strand chain pull.
Above values are for normal operating conditions. For unusual conditions, such as in ovens, corrosive solutions or handling abrasive materials consult with our Engineering Department.

POWER REQUIREMENTS

The requirements of a speed reducing train or a reduction unit to transmit power to the conveyor are usually in terms of torque output at a specific speed.

Torque Output in inch-lbs. = Total Chain Pull x 1/2 (pitch diameter of chain edge drive sprockets)

NOTE: It is common practice to select a reduction unit whose output is substantially more than the theoretical requirements as determined by this formula. This is done to allow for high starting friction, lack of rigidity in the conveyor frame, poor lubrication, misalignment of parts and nonuniform loading.

$$R.P.M. = \frac{Belt\ Speed\ (inches\ per\ min.)}{3.14 \times Pitch\ Dia.\ of\ Chain\ Drive\ Sprockets}$$

These formulas apply for a direct drive from the reduction unit to the drive shaft of the chain edge sprockets.

If additional speed reduction between the reduction unit and the conveyor drive shaft is used, then the requirements of the unit are as follows:

$$Torque\ Required = \frac{Torque\ as\ above\ x\ Chain\ Edge\ Sprocket\ Speed}{Reduction\ Unit\ Output\ Speed}$$

Horsepower Requirements:

$$Output\ H.P.\ of\ Reducer = \frac{Torque\ Required\ (inch\text{-}lbs)\ x\ \ Output\ R.P.M.}{63,025}$$

Motor H.P. = Output H.P. plus losses in the speed reducer.

To select the proper size of motor to drive a conveyor through a speed reducer, use the chart below.
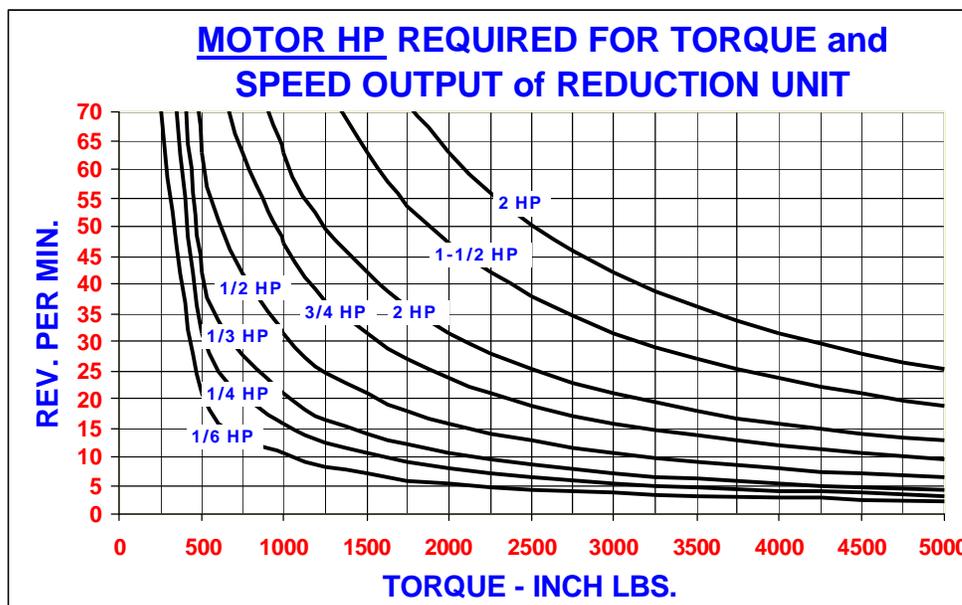
NOTE: The values in this chart are representative of commercial worm gear reduction units on the market, but they should be used as a guide only. Consult the recommendations of the manufacturer of the particular unit to be used in each installation.