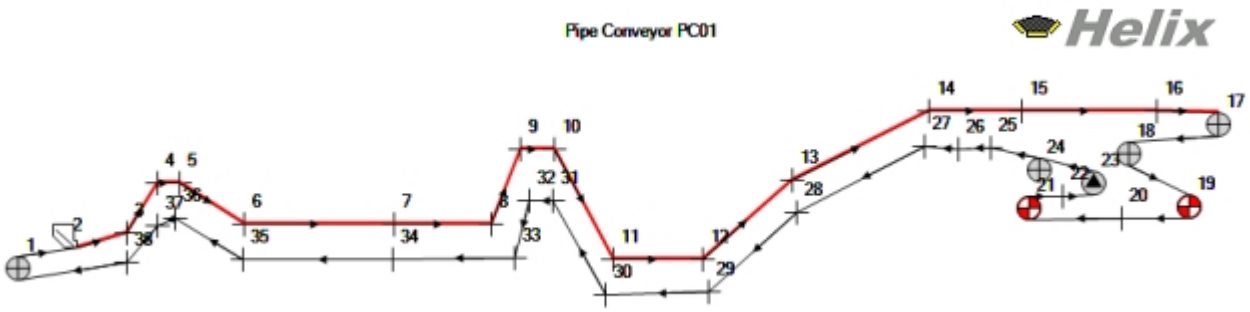
Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Conveyed Material						
Material Description		***COAL BITUMINOUS <50 MESH***		Surcharge Angle	***30***	deg
Low Bulk Density		***800***	kg/m3	Angle of Repose	***45***	deg
High Bulk Density		***870***	kg/m3	Material Lump size	***50***	mm
Conveyor Data						
Conveying Distance		**4030.66**	m	Design Capacity	***1000***	tonnes/hr
Nett Lift / Lower (-)		**7.60**	m	Belt Speed	***5.2***	m/s
Belt Details						
Pipe Dia/Belt Width	**375**	***1460***	mm	Calculated Belt % Full	**77.4**	%
Belt Class & Run Safety Factor		***ST 1400***	**5.4**	Top Cover Thickness	***8***	mm
Belt Rated Tension		***209***	kN/m	Bottom Cover Thickness	***5***	mm
Belt Total Length		**8231.4**	m	Belt Mass	**39.62**	kg/m
Belt Tensions and Power Calculations Visco						
Effective Tens. Fully Loaded		**297.71**	kN	Belt Power - Empty Belt	**1501.4**	kW
Maximum Tension Tmax		**378.51**	kN	Belt Power - Inclines Loaded	**1564.84**	kW
Minimum Tension Tmin		**81.85**	kN	Belt Power - Declines Loaded	**1487.21**	kW
Sag Tension	**1.5** %	**9.12**	kN	Belt Power - Fully Loaded	**1548.12**	kW
Takeup Type		***Horizontal Gravity***		Drive Efficiency	***95.0***	%
Takeup Mass		***17000***	kg	Absorbed Power Fully Loaded	**1629.62**	kW
Takeup Pulley Belt Tension		***83.36***	kN	Installed Motor Power	**2250**	kW
Carry and Return Idlers						
Carry Idler Trough Angle		***360***	º	Return Idler Trough Angle	***360***	º
Carry Idler Spacing		***1.2***	m	Return Idler Spacing	***1.2***	m
Carry Idler No Rolls x Dia		***6 x 152***	mm	Return Idler No Rolls x Dia	***6 x 152***	mm
Dynamics and Miscellaneous Data						
Startup Factor - Fully Loaded		***150***	%	CEMA Temperature Factor Kt	***1.00***	
Startup Factor - Empty		***150***	%	Total Braking Torque LSS	**0.00**	kNm
Starting Time - Fully Loaded		***13.71***	sec	Stop Time - Loaded, Braking	***14.69***	sec
Starting Time - Empty		***9.92***	sec	Stop Time - Loaded, Coasting	***14.69***	sec

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

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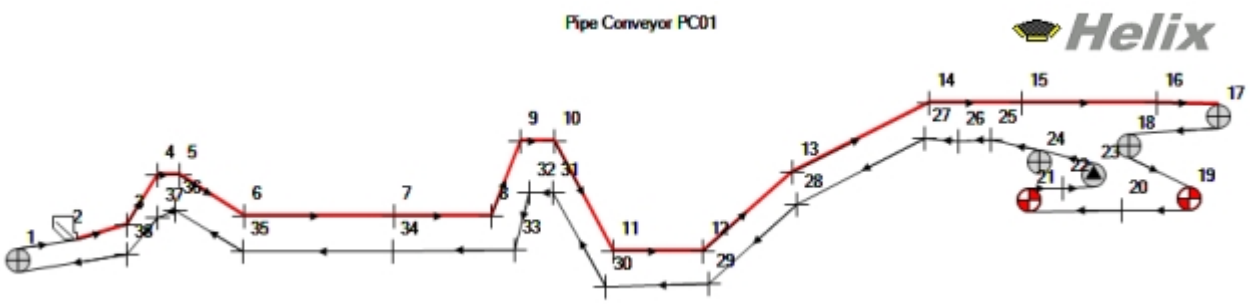

Station / Sectio Station	Description	Section Length m	Section Lift m	X co-ord m	Y co-ord m	Z co-ord m	Cap-acity tph	Ten Adj. kN	Idler Spacing m	Skirt Length m	No. of Scrapers	Friction Factor Input
1 Tail	Tail	5.10	0.08	305.00	4996.00	19.50	0		1.00			0.0000
2 Hopper		5.33	0.00	310.00	4997.00	20.00	1000		1.00			0.0000
3 Int. Pt	P1	98.45	3.80	314.99	4998.87	20.00	1000		1.00			0.0000
4 Int. Pt	P2	102.22	0.00	383.93	5069.06	23.80	1000		1.00			0.0000
5 Int. Pt	P5	263.45	-2.35	441.66	5153.41	23.80	1000		1.00			0.0000
6 Int. Pt	P8	577.95	0.05	614.73	5352.02	21.46	1000		1.00			0.0000
7 Int. Pt	P12	282.91	0.00	1013.67	5770.20	21.50	1000		1.00			0.0000
8 Int. Pt	P13	84.10	4.20	1272.01	5885.52	21.50	1000		1.00			0.0000
9 Int. Pt	P15	93.48	0.00	1350.56	5855.78	25.70	1000		1.00			0.0000
10 Int. Pt	P17	160.04	-6.20	1440.70	5830.99	25.70	1000		1.00			0.0000
11 Int. Pt	P19	355.62	0.00	1598.70	5806.30	19.50	1000		1.00			0.0000
12 Int. Pt	P20	505.50	4.50	1838.96	5544.11	19.50	1000		1.00			0.0000
13 Int. Pt	P21	380.84	3.83	2078.30	5098.89	24.00	1000		1.00			0.0000
14 Int. Pt	P24	641.13	0.00	2440.40	4980.98	27.83	1000		1.00			0.0000
15 Int. Pt	P25	415.65	0.00	3081.53	4982.60	27.83	1000		1.00			0.0000
16 Int. Pt	P26	64.00	-0.23	3442.27	4776.11	27.83	1000		1.00			0.0000
17 Head	Head (P28)	39.12	0.33	3478.86	4723.60	27.10	0		1.00			0.0000
18 Bend	HT Bend	15.00	-0.08	3450.00	4750.00	26.50	0		1.00			0.0000
19 Drive	Drive 1	25.00	0.00	3465.00	4750.00	25.50	0		1.00			0.0000
20 Int. Pt		44.60	0.08	3440.00	4750.00	25.00	0		1.00			0.0000
21 Drive	Drive 2	44.60	0.08	3410.00	4783.00	25.50	0		1.00			0.0000
22 Int. Pt		10.00	0.15	3440.00	4750.00	26.00	0		1.00			0.0000
23 Takeup	Takeup	26.03	0.50	3440.00	4760.00	26.50	0		1.00			0.0000
24 Bend	Bend	11.06	-0.52	3450.00	4784.00	27.00	0		1.00			0.0000
25 Int. Pt	P26 rtn	415.65	0.00	3442.27	4776.11	26.83	0		1.00			0.0000
26 Int. Pt		641.13	0.00	3081.53	4982.60	26.83	0		1.00			0.0000
27 Int. Pt	P24 rtn	367.23	-3.83	2440.40	4980.98	26.83	0		1.00			0.0000
28 Int. Pt		519.25	-4.50	2089.54	5089.34	23.00	0		1.00			0.0000
29 Int. Pt	P20 rtn	355.62	0.00	1838.96	5544.11	18.50	0		1.00			0.0000
30 Int. Pt		160.04	6.20	1598.70	5806.30	18.50	0		1.00			0.0000

Station / Sectio Station	Description	Section Length m	Section Lift m	X co-ord m	Y co-ord m	Z co-ord m	Cap-acity tph	Ten Adj. kN	Idler Spacing m	Skirt Length m	No. of Scrapers	Friction Factor Input
31 Int. Pt	P17 rtn	93.48	0.00	1440.70	5830.99	24.70	0		1.00			0.0000
32 Int. Pt	P15 rtn	84.10	-4.20	1350.56	5855.78	24.70	0		1.00			0.0000
33 Int. Pt		282.91	0.00	1272.01	5885.52	20.50	0		1.00			0.0000
34 Int. Pt		577.95	-0.05	1013.67	5770.20	20.50	0		1.00			0.0000
35 Int. Pt	P8 rtn	263.45	2.35	614.73	5352.02	20.46	0		1.00			0.0000
36 Int. Pt		102.22	0.00	441.66	5153.41	22.80	0		1.00			0.0000
37 Int. Pt		98.45	-3.80	383.93	5069.06	22.80	0		1.00			0.0000
38 Int. Pt		10.39	0.08	314.99	4998.87	19.00	0		1.00			0.0000
Totals:		**8223.05**	**0.45**					**0.00**		**0.00**	**0**	

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

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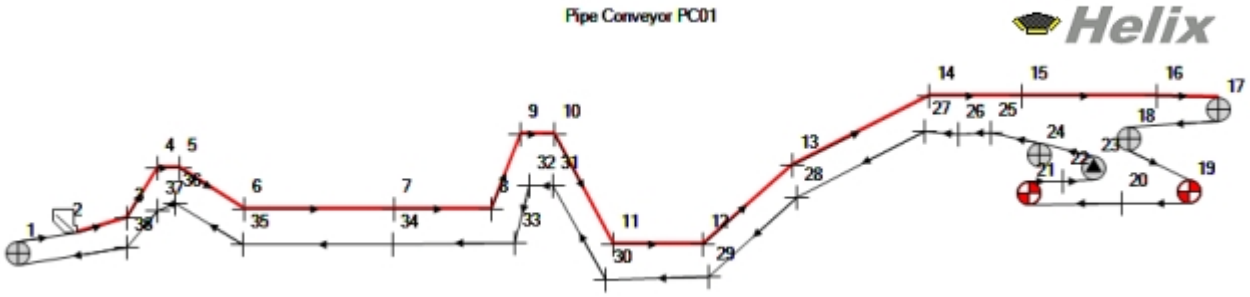
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Drive Torque Start-up Factor Loaded	**150** %	Takeup Pulley Belt Tension	**83.36** kN
Drive Torque Start-up Factor Empty	**150** %	Takeup Mass	**17000** kg

Drive Number		Running		Starting		Braking	
		Fully Loaded	Empty Belt	Fully Loaded	Empty Belt	Fully Loaded	Empty Belt
Drive No.	**1 Drive**						
Pulley No. **19**	Lagging Type		**Ceramic**		**Ceramic**		**Ceramic**
Wrap Angle	°	**180**	**180**	**180**	**180**	**180**	**180**
Co-efficient of Friction		**0.35**	**0.35**	**0.45**	**0.45**	**0.45**	**0.45**
Drive Factor Cw		**0.499**	**0.499**	**0.321**	**0.321**	**0.321**	**0.321**
Calculated Belt Tension T1	***kN***	**375.23**	**366.27**	**658.7**	**645.21**	**110.56**	**120.62**
Calculated Belt Tension T2	***kN***	**177.42**	**174.45**	**270.76**	**265.43**	**93.17**	**97.42**
Minimum Required T2	***kN***	**98.71**	**95.72**	**124.53**	**121.91**	**5.58**	**7.45**
Surplus T2 Tension (T1-T2)	***kN***	**78.71**	**78.73**	**146.23**	**143.52**	**87.59**	**89.97**
Drive No.	**2 Drive**						
Pulley No. **21**	Lagging Type		**Ceramic**		**Ceramic**		**Ceramic**
Wrap Angle	°	**180**	**180**	**180**	**180**	**180**	**180**
Co-efficient of Friction		**0.35**	**0.35**	**0.45**	**0.45**	**0.45**	**0.45**
Drive Factor Cw		**0.499**	**0.499**	**0.321**	**0.321**	**0.321**	**0.321**
Calculated Belt Tension T1	***kN***	**179.26**	**176.29**	**274.34**	**269.68**	**93.38**	**97.13**
Calculated Belt Tension T2	***kN***	**81.85**	**81.85**	**80.47**	**79.95**	**84.6**	**85.43**
Minimum Required T2	***kN***	**48.61**	**47.13**	**62.23**	**60.9**	**2.82**	**3.76**
Surplus T2 Tension (T1-T2)	***kN***	**33.24**	**34.72**	**18.24**	**19.05**	**81.78**	**81.67**

Designers Comments

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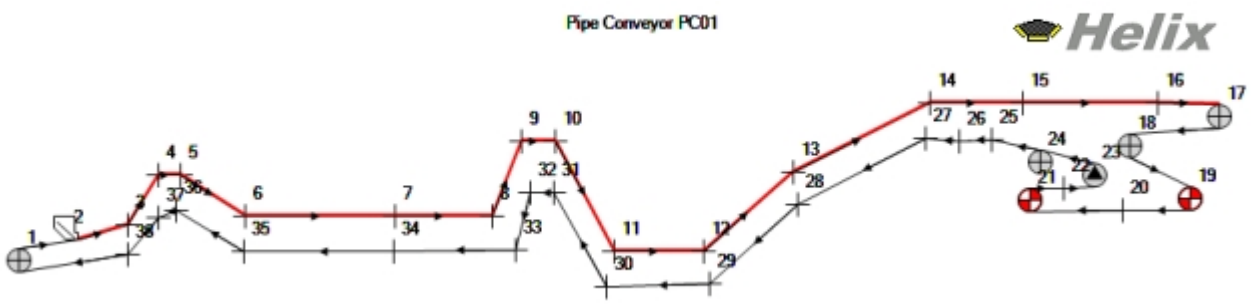

Drive Torque Start-up Factor Loaded 150 %

Drive Torque Start-up Factor Empty 150 %

Takeup Mass 17000 kg

Station No	Running				Starting		Braking		Coasting	
	Fully Loaded Tension kN	Empty Tension kN	Inclines Loaded Tension kN	Declines Loaded Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN
1 Tail	208.34	208.34	208.34	208.34	307.87	345.90	115.42	87.20	115.42	87.20
2 Hopper	209.78	209.78	209.78	209.78	309.81	348.03	116.40	88.04	116.40	88.04
3 Int. Pt	211.38	209.91	211.38	211.36	311.64	348.33	117.77	88.01	117.77	88.01
4 Int. Pt	217.67	213.88	217.67	215.33	322.35	355.66	119.93	89.02	119.93	89.02
5 Int. Pt	220.60	216.47	220.60	217.92	329.87	361.74	118.57	88.54	118.57	88.54
6 Int. Pt	228.34	225.16	229.29	225.61	349.45	379.41	115.26	89.32	115.26	89.32
7 Int. Pt	250.21	246.47	251.05	246.92	397.30	420.45	112.87	93.26	112.87	93.26
8 Int. Pt	261.11	257.19	261.90	257.64	420.92	440.83	111.89	95.47	111.89	95.47
9 Int. Pt	268.25	262.10	269.02	262.55	431.84	448.61	115.50	97.85	115.50	97.85
10 Int. Pt	271.98	265.80	272.72	266.25	439.77	455.49	115.31	98.75	115.31	98.75
11 Int. Pt	272.75	269.77	276.69	266.96	447.74	464.93	109.37	97.91	109.37	97.91
12 Int. Pt	287.08	284.06	290.93	281.25	478.06	491.36	108.77	101.50	108.77	101.50
13 Int. Pt	311.76	306.46	315.53	303.65	525.46	531.01	112.23	108.71	112.23	108.71
14 Int. Pt	328.19	320.25	331.92	317.44	559.01	557.80	112.68	111.05	112.68	111.05
15 Int. Pt	352.00	343.51	355.58	340.70	611.65	602.95	109.58	115.04	109.58	115.04
16 Int. Pt	367.73	358.95	371.19	356.14	646.07	632.58	107.86	117.98	107.86	117.98
17 Head	369.33	360.47	372.71	357.74	650.54	636.28	106.77	117.58	106.77	117.58
18 Bend	372.66	363.75	375.99	361.02	655.36	641.62	108.71	119.05	108.71	119.05
19 Drive	375.23	366.27	378.51	363.54	658.70	645.21	110.56	120.62	110.56	120.62
20 Int. Pt	178.07	175.10	179.14	174.20	272.05	266.96	93.22	97.29	93.22	97.29
21 Drive	179.26	176.29	180.33	175.39	274.34	269.68	93.38	97.13	93.38	97.13
22 Int. Pt	83.04	83.04	83.04	83.04	82.79	82.70	84.73	85.25	84.73	85.25
23 Takeup	83.36	83.36	83.36	83.36	83.36	83.36	83.36	83.36	83.36	83.36
24 Bend	84.81	84.81	84.81	84.81	85.73	86.08	83.95	83.68	83.95	83.68
25 Int. Pt	85.47	85.47	85.47	85.47	86.92	87.48	84.12	83.71	84.12	83.71
26 Int. Pt	96.40	96.40	96.40	96.40	108.12	112.60	85.46	82.14	85.46	82.14
27 Int. Pt	114.83	114.83	114.83	114.83	142.38	152.91	89.11	81.30	89.11	81.30

Station No	Running				Starting		Braking		Coasting	
	Fully Loaded Tension kN	Empty Tension kN	Inclines Loaded Tension kN	Declines Loaded Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN
28 Int. Pt	124.08	124.08	124.08	124.08	160.70	174.70	89.90	79.51	89.90	79.51
29 Int. Pt	137.20	137.20	137.20	137.20	186.64	205.54	91.04	77.03	91.04	77.03
30 Int. Pt	148.88	148.88	148.88	148.88	207.11	229.36	94.52	78.01	94.52	78.01
31 Int. Pt	156.67	156.67	156.67	156.67	218.85	242.61	98.62	80.99	98.62	80.99
32 Int. Pt	159.88	159.88	159.88	159.88	224.37	249.01	99.68	81.40	99.68	81.40
33 Int. Pt	161.17	161.17	161.17	161.17	227.73	253.17	99.03	80.16	99.03	80.16
34 Int. Pt	171.04	171.04	171.04	171.04	244.59	272.70	102.38	81.52	102.38	81.52
35 Int. Pt	191.42	191.42	191.42	191.42	279.25	312.81	109.43	84.53	109.43	84.53
36 Int. Pt	201.92	201.92	201.92	201.92	296.25	332.29	113.86	87.11	113.86	87.11
37 Int. Pt	205.76	205.76	205.76	205.76	302.61	339.62	115.34	87.88	115.34	87.88
38 Int. Pt	208.04	208.04	208.04	208.04	307.32	345.25	115.36	87.21	115.36	87.21
Minimum Ten	**83.04**	**83.04**	**83.04**	**83.04**	**82.79**	**82.70**	**83.36**	**77.03**	**83.36**	**77.03**
Maximum Ten	**375.23**	**366.27**	**378.51**	**363.54**	**658.70**	**645.21**	**119.93**	**120.62**	**119.93**	**120.62**
Effective Ten	**297.71**	**288.73**	**300.93**	**286.00**						
Ave. Belt Ten	**216.29**	**213.59**	**217.56**	**212.85**	**336.84**	**351.46**	**103.77**	**92.21**	**103.77**	**92.21**
Belt Elong. m	**7.519**	**7.368**	**7.59**	**7.326**	**14.261**	**15.079**	**1.225**	**0.579**	**1.225**	**0.579**
T/up Travel m	**3.76**	**3.684**	**3.795**	**3.663**	**7.13**	**7.54**	**0.612**	**0.29**	**0.612**	**0.29**

Designers Comments

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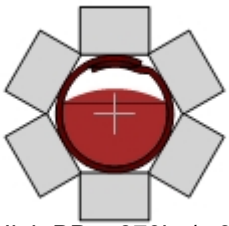
Low BD = 800kg/m3



High BD = 870kg/m3

Conveyed Material

Material Description	*COAL BITUMINOUS <50 MESH*	
Low Bulk Density	*800*	kg/m3
High Bulk Density	*870*	kg/m3
Surcharge Angle	*30*	deg
Angle of Repose	*45*	deg
Material Lump size	*50*	mm

Belt Make & Class

Belt Category	*Goodyear Steel*		
Belt Description	*GOODYEAR FLEXSTEEL STACKER*		
Belt Class / Plies	*ST 1400*	*0*	
Belt Reinforcement Fibre	*Steel*		
Pipe Dia/Belt Width	*375*	*1460*	mm
Belt Modulus		*100800*	kN/m
Cord Diameter		*5.9*	mm
Cord Pitch		*15.9*	mm
Number of Cords		*0*	

Belt Tensions

Belt Rated Tension / m width	*209*	kN/m
Calculated Tension / m width	**259.3**	kN/m
Belt Rated Tension for width	*305.1*	kN
Calculated Max Run Tension	**378.51**	kN
Minimum Tension Tmin	**81.85**	kN
Allowable Tension Rise, Starting	*150*	%
Allowable Belt Tension, Starting	**457.7**	kN
Actual Belt Tension, Starting	**658.7**	kN

Belt Tensions exceed Allowable Tensions

Belt and Material Mass

Belt Top Cover Mass	**13.2**	kg/m
Belt Bottom Cover Mass	**8.2**	kg/m
Belt Carcass Mass	**18.2**	kg/m
Belt Mass Wb (per linear m)	**39.6**	kg/m
Material Mass Wm	**53.4**	kg/m
Total Mass (Wb + Wm)	**93**	kg/m
Total Belt Mass (Wb x L)	**326126**	kg

Belt Speed & Capacity

Belt Speed	*5.2*	m/s
Belt Design Capacity Input	*1000*	tonnes/hr
Section Loading Max Capacity	*1000*	tonnes/hr
Carry Idler Trough Angle	*360*	º

Belt Dimensions

Top Cover Thickness	*8*	mm
Bottom Cover Thickness	*5*	mm
Belt Carcass Thickness	*5.7*	mm
Belt Total Thickness	**18.7**	mm
Belt Total Belt Length (L)	**8231.4**	m
Time for 1 Revolution	**1583.0**	sec

Belt Load Area and Capacity at 800kg/m3

Minimum Rec. Edge Distance	**0**	mm
Belt Overlap Length Low BD	**170**	mm
Load Burden Depth	**249**	mm
Load Burden Width	**330**	mm
Belt Load Area at 100% Full and Low Bulk Density	**0.0863**	m2
Belt Load Area Utilised at Low Bulk Density	**0.0668**	m2
Belt Actual % Full at Low BD	**77.4**	%

Belt Load Area and Capacity at 870kg/m3

Minimum Rec. Edge Distance	**0**	mm
Belt Overlap Length High BD	**170**	mm
Belt Load Area Utilised at High Bulk Density	**0.0614**	m2
Belt Actual % Full at High BD	**71.1**	%

Flooded Belt Capacity at 870kg/m3

Flooded Belt Load Area at 100% Full (High BD)	**0.0863**	m2
Flooded Belt Capacity	**1406**	tonnes/hr
Flooded Belt Material Mass	**75.1**	kg/m

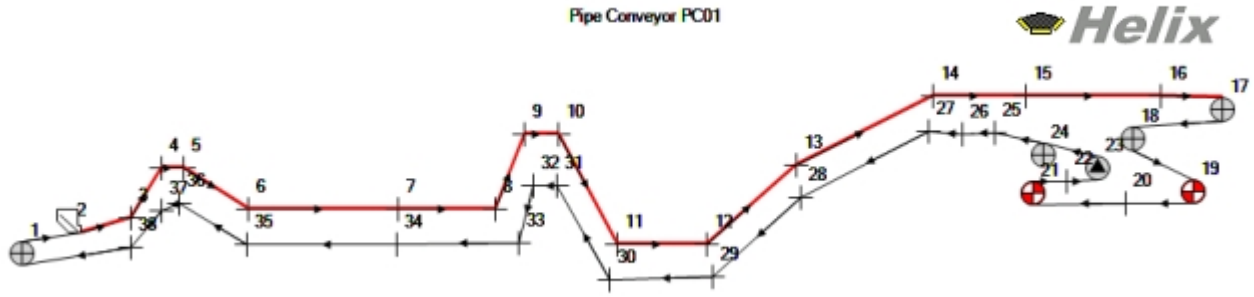
Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also,

the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Allowable Belt Sag % Running 1.5 %

Allowable Belt Sag % Start / Stop 5 %

Takeup Mass 17000 kg

Station No	Running				Starting		Braking		Coasting	
	Fully Loaded Tension kN	Empty Tension kN	Inclines Loaded Tension kN	Declines Loaded Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN
1 Tail	208.34	208.34	208.34	208.34	307.87	345.90	115.42	87.20	115.42	87.20
Idler Spacing m	1.00									
Belt Sag %	0.02	0.02	0.02	0.02	0.02	0.01	0.04	0.06	0.04	0.06
2 Hopper	209.78	209.78	209.78	209.78	309.81	348.03	116.40	88.04	116.40	88.04
Idler Spacing m	1.00									
Belt Sag %	0.05	0.02	0.05	0.05	0.04	0.01	0.1	0.06	0.1	0.06
3 Int. Pt	211.38	209.91	211.38	211.36	311.64	348.33	117.77	88.01	117.77	88.01
Idler Spacing m	1.00									
Belt Sag %	0.05	0.02	0.05	0.02	0.04	0.01	0.1	0.06	0.1	0.06
4 Int. Pt	217.67	213.88	217.67	215.33	322.35	355.66	119.93	89.02	119.93	89.02
Idler Spacing m	1.00									
Belt Sag %	0.05	0.02	0.05	0.05	0.04	0.01	0.1	0.05	0.1	0.05
5 Int. Pt	220.60	216.47	220.60	217.92	329.87	361.74	118.57	88.54	118.57	88.54
Idler Spacing m	1.00									
Belt Sag %	0.05	0.02	0.02	0.05	0.03	0.01	0.1	0.05	0.1	0.05
6 Int. Pt	228.34	225.16	229.29	225.61	349.45	379.41	115.26	89.32	115.26	89.32
Idler Spacing m	1.00									
Belt Sag %	0.05	0.02	0.05	0.02	0.03	0.01	0.1	0.05	0.1	0.05
7 Int. Pt	250.21	246.47	251.05	246.92	397.30	420.45	112.87	93.26	112.87	93.26
Idler Spacing m	1.00									
Belt Sag %	0.05	0.02	0.05	0.05	0.03	0.01	0.1	0.05	0.1	0.05
8 Int. Pt	261.11	257.19	261.90	257.64	420.92	440.83	111.89	95.47	111.89	95.47
Idler Spacing m	1.00									
Belt Sag %	0.04	0.02	0.04	0.02	0.03	0.01	0.1	0.05	0.1	0.05
9 Int. Pt	268.25	262.10	269.02	262.55	431.84	448.61	115.50	97.85	115.50	97.85
Idler Spacing m	1.00									
Belt Sag %	0.04	0.02	0.04	0.04	0.03	0.01	0.1	0.05	0.1	0.05
10 Int. Pt	271.98	265.80	272.72	266.25	439.77	455.49	115.31	98.75	115.31	98.75
Idler Spacing m	1.00									
Belt Sag %	0.04	0.02	0.02	0.04	0.03	0.01	0.1	0.05	0.1	0.05
11 Int. Pt	272.75	269.77	276.69	266.96	447.74	464.93	109.37	97.91	109.37	97.91
Idler Spacing m	1.00									
Belt Sag %	0.04	0.02	0.04	0.04	0.03	0.01	0.1	0.05	0.1	0.05

Tension Calculations - Summary Belt Sag

Station No	Running				Starting		Braking		Coasting	
	Fully Loaded Tension kN	Empty Tension kN	Inclines Loaded Tension kN	Declines Loaded Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN
12 Int. Pt	287.08	284.06	290.93	281.25	478.06	491.36	108.77	101.50	108.77	101.50
Idler Spacing m	1.00									
Belt Sag %	0.04	0.02	0.04	0.02	0.02	0.01	0.1	0.05	0.1	0.05
13 Int. Pt	311.76	306.46	315.53	303.65	525.46	531.01	112.23	108.71	112.23	108.71
Idler Spacing m	1.00									
Belt Sag %	0.04	0.02	0.04	0.02	0.02	0.01	0.1	0.04	0.1	0.04
14 Int. Pt	328.19	320.25	331.92	317.44	559.01	557.80	112.68	111.05	112.68	111.05
Idler Spacing m	1.00									
Belt Sag %	0.03	0.02	0.03	0.04	0.02	0.01	0.1	0.04	0.1	0.04
15 Int. Pt	352.00	343.51	355.58	340.70	611.65	602.95	109.58	115.04	109.58	115.04
Idler Spacing m	1.00									
Belt Sag %	0.03	0.01	0.03	0.03	0.02	0.01	0.1	0.04	0.1	0.04
16 Int. Pt	367.73	358.95	371.19	356.14	646.07	632.58	107.86	117.98	107.86	117.98
Idler Spacing m	1.00									
Belt Sag %	0.03	0.01	0.01	0.03	0.02	0.01	0.11	0.04	0.11	0.04
17 Head	369.33	360.47	372.71	357.74	650.54	636.28	106.77	117.58	106.77	117.58
Idler Spacing m	1.00									
Belt Sag %	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.04	0.05	0.04
18 Bend	372.66	363.75	375.99	361.02	655.36	641.62	108.71	119.05	108.71	119.05
Idler Spacing m	1.00									
Belt Sag %	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.04
19 Drive	375.23	366.27	378.51	363.54	658.70	645.21	110.56	120.62	110.56	120.62
Idler Spacing m	1.00									
Belt Sag %	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.04
20 Int. Pt	178.07	175.10	179.14	174.20	272.05	266.96	93.22	97.29	93.22	97.29
Idler Spacing m	1.00									
Belt Sag %	0.03	0.03	0.03	0.03	0.02	0.02	0.05	0.05	0.05	0.05
21 Drive	179.26	176.29	180.33	175.39	274.34	269.68	93.38	97.13	93.38	97.13
Idler Spacing m	1.00									
Belt Sag %	0.03	0.03	0.03	0.03	0.02	0.02	0.05	0.05	0.05	0.05
22 Int. Pt	83.04	83.04	83.04	83.04	82.79	82.70	84.73	85.25	84.73	85.25
Idler Spacing m	1.00									
Belt Sag %	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
23 Takeup	83.36	83.36	83.36	83.36	83.36	83.36	83.36	83.36	83.36	83.36
Idler Spacing m	1.00									
Belt Sag %	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
24 Bend	84.81	84.81	84.81	84.81	85.73	86.08	83.95	83.68	83.95	83.68
Idler Spacing m	1.00									
Belt Sag %	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
25 Int. Pt	85.47	85.47	85.47	85.47	86.92	87.48	84.12	83.71	84.12	83.71
Idler Spacing m	1.00									
Belt Sag %	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
26 Int. Pt	96.40	96.40	96.40	96.40	108.12	112.60	85.46	82.14	85.46	82.14
Idler Spacing m	1.00									
Belt Sag %	0.05	0.05	0.05	0.05	0.04	0.04	0.06	0.06	0.06	0.06
27 Int. Pt	114.83	114.83	114.83	114.83	142.38	152.91	89.11	81.30	89.11	81.30
Idler Spacing m	1.00									
Belt Sag %	0.04	0.04	0.04	0.04	0.03	0.03	0.05	0.06	0.05	0.06

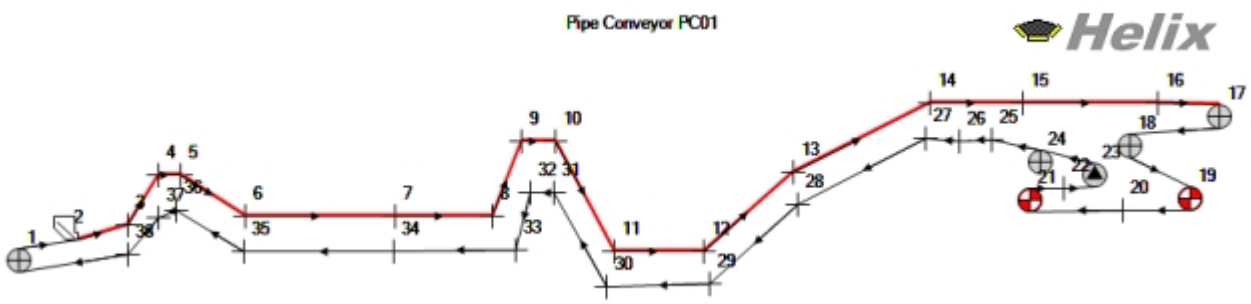
Station No	Running				Starting		Braking		Coasting	
	Fully Loaded Tension kN	Empty Tension kN	Inclines Loaded Tension kN	Declines Loaded Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN	Fully Loaded Tension kN	Empty Tension kN
28 Int. Pt	124.08	124.08	124.08	124.08	160.70	174.70	89.90	79.51	89.90	79.51
Idler Spacing m	1.00									
Belt Sag %	0.04	0.04	0.04	0.04	0.03	0.03	0.05	0.06	0.05	0.06
29 Int. Pt	137.20	137.20	137.20	137.20	186.64	205.54	91.04	77.03	91.04	77.03
Idler Spacing m	1.00									
Belt Sag %	0.04	0.04	0.04	0.04	0.03	0.02	0.05	0.06	0.05	0.06
30 Int. Pt	148.88	148.88	148.88	148.88	207.11	229.36	94.52	78.01	94.52	78.01
Idler Spacing m	1.00									
Belt Sag %	0.03	0.03	0.03	0.03	0.02	0.02	0.05	0.06	0.05	0.06
31 Int. Pt	156.67	156.67	156.67	156.67	218.85	242.61	98.62	80.99	98.62	80.99
Idler Spacing m	1.00									
Belt Sag %	0.03	0.03	0.03	0.03	0.02	0.02	0.05	0.06	0.05	0.06
32 Int. Pt	159.88	159.88	159.88	159.88	224.37	249.01	99.68	81.40	99.68	81.40
Idler Spacing m	1.00									
Belt Sag %	0.03	0.03	0.03	0.03	0.02	0.02	0.05	0.06	0.05	0.06
33 Int. Pt	161.17	161.17	161.17	161.17	227.73	253.17	99.03	80.16	99.03	80.16
Idler Spacing m	1.00									
Belt Sag %	0.03	0.03	0.03	0.03	0.02	0.02	0.05	0.06	0.05	0.06
34 Int. Pt	171.04	171.04	171.04	171.04	244.59	272.70	102.38	81.52	102.38	81.52
Idler Spacing m	1.00									
Belt Sag %	0.03	0.03	0.03	0.03	0.02	0.02	0.05	0.06	0.05	0.06
35 Int. Pt	191.42	191.42	191.42	191.42	279.25	312.81	109.43	84.53	109.43	84.53
Idler Spacing m	1.00									
Belt Sag %	0.03	0.03	0.03	0.03	0.02	0.02	0.04	0.06	0.04	0.06
36 Int. Pt	201.92	201.92	201.92	201.92	296.25	332.29	113.86	87.11	113.86	87.11
Idler Spacing m	1.00									
Belt Sag %	0.02	0.02	0.02	0.02	0.02	0.01	0.04	0.06	0.04	0.06
37 Int. Pt	205.76	205.76	205.76	205.76	302.61	339.62	115.34	87.88	115.34	87.88
Idler Spacing m	1.00									
Belt Sag %	0.02	0.02	0.02	0.02	0.02	0.01	0.04	0.06	0.04	0.06
38 Int. Pt	208.04	208.04	208.04	208.04	307.32	345.25	115.36	87.21	115.36	87.21
Idler Spacing m	1.00									
Belt Sag %	0.02	0.02	0.02	0.02	0.02	0.01	0.04	0.06	0.04	0.06
Minimum Ten	**83.04**	**83.04**	**83.04**	**83.04**	**82.79**	**82.70**	**83.36**	**77.03**	**83.36**	**77.03**
Maximum Sag	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.11**	**0.06**	**0.11**	**0.06**

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Takeup Mass 17000 kg

Station / Pulley Station		Section Length m	Section Lift m	Tensions T1 Run kN	T2 Run kN	Tp Pulley	Drive Te kN	Ten Adj. kN	Material Accel. kN	Skirt Friction kN	Scraper Friction kN	Section Effective Tension	Visco Friction Factor
1	Tail	5.10	0.08	208.34	209.62	1.28						0.16	0.0396
2	Hopper	5.33	0.00	209.78	209.78				1.44			0.15	0.0247
3	Int. Pt	98.45	3.80	211.38	211.38							6.29	0.0247
4	Int. Pt	102.22	0.00	217.67	217.67							2.93	0.0247
5	Int. Pt	263.45	-2.35	220.60	220.60							7.74	0.0323
6	Int. Pt	577.95	0.05	228.34	228.34							21.87	0.0325
7	Int. Pt	282.91	0.00	250.21	250.21							10.90	0.0331
8	Int. Pt	84.10	4.20	261.11	261.11							7.14	0.0339
9	Int. Pt	93.48	0.00	268.25	268.25							3.73	0.0343
10	Int. Pt	160.04	-6.20	271.98	271.98							0.77	0.0346
11	Int. Pt	355.62	0.00	272.75	272.75							14.33	0.0347
12	Int. Pt	505.50	4.50	287.08	287.08							24.68	0.035
13	Int. Pt	380.84	3.83	311.76	311.76							16.43	0.0292
14	Int. Pt	641.13	0.00	328.19	328.19							23.81	0.0319
15	Int. Pt	415.65	0.00	352.00	352.00							15.73	0.0326
16	Int. Pt	64.00	-0.23	367.73	367.73							1.60	0.0243
17	Head	39.12	0.33	369.33	371.52	2.19						1.14	0.0406
18	Bend	15.00	-0.08	372.66	374.87	2.21						0.36	0.0406
19	Drive	25.00	0.00	375.23	177.42	1.66	197.81					0.65	0.0406
20	Int. Pt	44.60	0.08	178.07	178.07							1.19	0.0408
21	Drive	44.60	0.08	179.26	81.85	0.83	97.41					1.19	0.0408
22	Int. Pt	10.00	0.15	83.04	83.04							0.32	0.0412
23	Takeup	26.03	0.50	83.36	83.93	0.57						0.88	0.0412
24	Bend	11.06	-0.52	84.81	85.38	0.58						0.09	0.0412
25	Int. Pt	415.65	0.00	85.47	85.47							10.93	0.0412
26	Int. Pt	641.13	0.00	96.40	96.40							18.43	0.045
27	Int. Pt	367.23	-3.83	114.83	114.83							9.25	0.0458
28	Int. Pt	519.25	-4.50	124.08	124.08							13.12	0.0448
29	Int. Pt	355.62	0.00	137.20	137.20							11.68	0.0514

Station / Pulley Station	Section Length m	Section Lift m	Tensions T1 Run kN	Tensions T2 Run kN	Tensions Tp Pulley	Drive Te kN	Ten Adj. kN	Material Accel. kN	Skirt Friction kN	Scraper Friction kN	Section Effective Tension	Visco Friction Factor
30 Int. Pt	160.04	6.20	148.88	148.88							7.79	0.0527
31 Int. Pt	93.48	0.00	156.67	156.67							3.21	0.0538
32 Int. Pt	84.10	-4.20	159.88	159.88							1.29	0.0544
33 Int. Pt	282.91	0.00	161.17	161.17							9.87	0.0546
34 Int. Pt	577.95	-0.05	171.04	171.04							20.38	0.0553
35 Int. Pt	263.45	2.35	191.42	191.42							10.50	0.057
36 Int. Pt	102.22	0.00	201.92	201.92							3.84	0.0589
37 Int. Pt	98.45	-3.80	205.76	205.76							2.28	0.0597
38 Int. Pt	10.39	0.08	208.04	208.04							0.30	0.0407
Totals:					**9.32**	**295.2**	**0.00**	**1.44**	**0.00**	**0.00**	**286.95**	

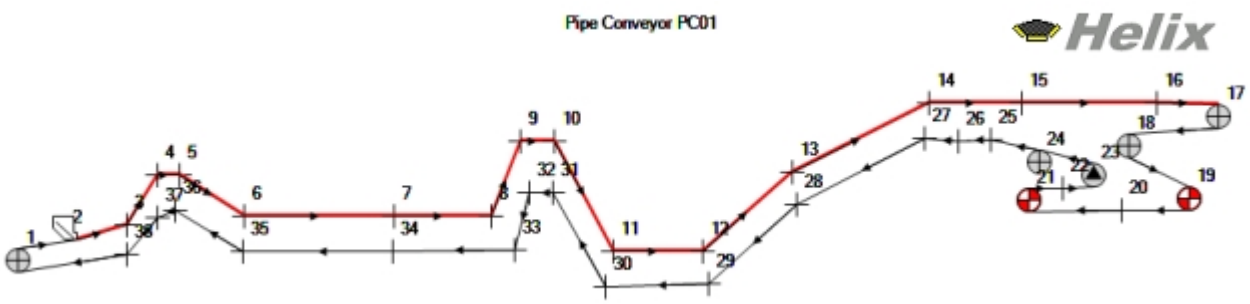
Maximum Tension	**375.23**	kN	Total Effective Tension	**297.71**	kN
Minimum Tension	**81.85**	kN	Total Belt Power (Te x V)	**1548.12**	kW
Average Tension Fully Loaded	**216.29**	kN	Belt Modulus	**100800**	kN/m
Average Tension Belt Stationary	**81.86**	kN	Total Belt Length	**8231.36**	m
Average Tension Difference	**134.43**	kN	Belt Elastic Elongation	**7.519**	m
			Takeup Movement	**3.76**	m

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Station / Pulley Station		Section Length m	Section Lift m	Tensions T1 Run kN	T2 Run kN	Tp Pulley	Drive Te kN	Ten Adj. kN	Material Accel. kN	Skirt Friction kN	Scraper Friction kN	Section Effective Tension	Visco Friction Factor
1	Tail	5.10	0.08	208.34	209.62	1.28						0.16	0.0396
2	Hopper	5.33	0.00	209.78	209.78							0.13	0.0247
3	Int. Pt	98.45	3.80	209.91	209.91							3.97	0.0247
4	Int. Pt	102.22	0.00	213.88	213.88							2.59	0.0247
5	Int. Pt	263.45	-2.35	216.47	216.47							8.69	0.0323
6	Int. Pt	577.95	0.05	225.16	225.16							21.31	0.0325
7	Int. Pt	282.91	0.00	246.47	246.47							10.72	0.0331
8	Int. Pt	84.10	4.20	257.19	257.19							4.91	0.0339
9	Int. Pt	93.48	0.00	262.10	262.10							3.70	0.0343
10	Int. Pt	160.04	-6.20	265.80	265.80							3.97	0.0346
11	Int. Pt	355.62	0.00	269.77	269.77							14.29	0.0347
12	Int. Pt	505.50	4.50	284.06	284.06							22.40	0.035
13	Int. Pt	380.84	3.83	306.46	306.46							13.79	0.0292
14	Int. Pt	641.13	0.00	320.25	320.25							23.26	0.0319
15	Int. Pt	415.65	0.00	343.51	343.51							15.44	0.0326
16	Int. Pt	64.00	-0.23	358.95	358.95							1.52	0.0243
17	Head	39.12	0.33	360.47	362.61	2.14						1.14	0.0406
18	Bend	15.00	-0.08	363.75	365.91	2.16						0.36	0.0406
19	Drive	25.00	0.00	366.27	174.45	1.63	191.82					0.65	0.0406
20	Int. Pt	44.60	0.08	175.10	175.10							1.19	0.0408
21	Drive	44.60	0.08	176.29	81.85	0.84	94.44					1.19	0.0408
22	Int. Pt	10.00	0.15	83.04	83.04							0.32	0.0412
23	Takeup	26.03	0.50	83.36	83.93	0.57						0.88	0.0412
24	Bend	11.06	-0.52	84.81	85.38	0.58						0.09	0.0412
25	Int. Pt	415.65	0.00	85.47	85.47							10.93	0.0412
26	Int. Pt	641.13	0.00	96.40	96.40							18.43	0.045
27	Int. Pt	367.23	-3.83	114.83	114.83							9.25	0.0458
28	Int. Pt	519.25	-4.50	124.08	124.08							13.12	0.0448
29	Int. Pt	355.62	0.00	137.20	137.20							11.68	0.0514
30	Int. Pt	160.04	6.20	148.88	148.88							7.79	0.0527

Station / Pulley Station	Section Length m	Section Lift m	Tensions T1 Run kN	T2 Run kN	Tp Pulley	Drive Te kN	Ten Adj. kN	Material Accel. kN	Skirt Friction kN	Scraper Friction kN	Section Effective Tension	Visco Friction Factor
31 Int. Pt	93.48	0.00	156.67	156.67							3.21	0.0538
32 Int. Pt	84.10	-4.20	159.88	159.88							1.29	0.0544
33 Int. Pt	282.91	0.00	161.17	161.17							9.87	0.0546
34 Int. Pt	577.95	-0.05	171.04	171.04							20.38	0.0553
35 Int. Pt	263.45	2.35	191.42	191.42							10.50	0.057
36 Int. Pt	102.22	0.00	201.92	201.92							3.84	0.0589
37 Int. Pt	98.45	-3.80	205.76	205.76							2.28	0.0597
38 Int. Pt	10.39	0.08	208.04	208.04							0.30	0.0407
Totals:					**9.19**	**286.27**	**0.00**			**0.00**	**279.54**	

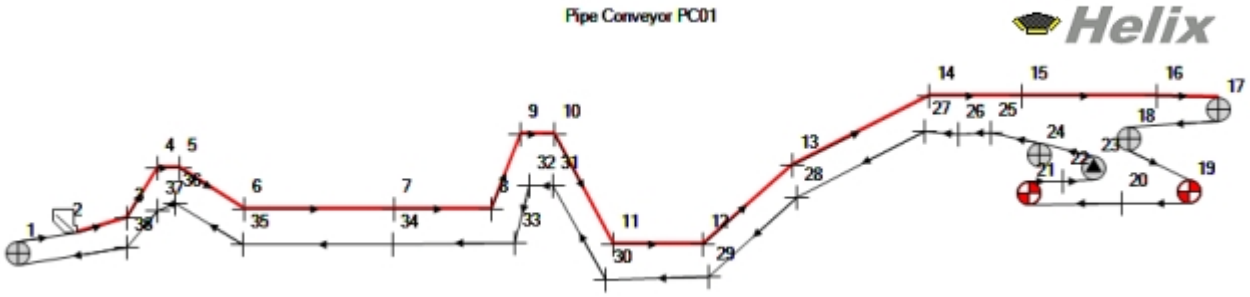
Maximum Tension	**366.27**	kN	Total Effective Tension	**288.73**	kN
Minimum Tension	**81.85**	kN	Total Belt Power (Te x V)	**1501.4**	kW
Average Tension Fully Loaded	**213.59**	kN	Belt Modulus	**100800**	kN/m
Average Tension Belt Stationary	**81.86**	kN	Total Belt Length	**8231.36**	m
Average Tension Difference	**131.73**	kN	Belt Elastic Elongation	**7.368**	m
			Takeup Movement	**3.684**	m

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Station / Pulley		Section Length m	Section Lift m	Tensions T1 Run kN	T2 Run kN	Tp Pulley	Drive Te kN	Ten Adj. kN	Material Accel. kN	Skirt Friction kN	Scraper Friction kN	Section Effective Tension	Visco Friction Factor
Station													
1	Tail	5.10	0.08	208.34	209.62	1.28						0.16	0.0396
2	Hopper	5.33	0.00	209.78	209.78				1.44			0.15	0.0247
3	Int. Pt	98.45	3.80	211.38	211.38							6.29	0.0247
4	Int. Pt	102.22	0.00	217.67	217.67							2.93	0.0247
5	Int. Pt	263.45	-2.35	220.60	220.60							8.69	0.0571
6	Int. Pt	577.95	0.05	229.29	229.29							21.76	0.0323
7	Int. Pt	282.91	0.00	251.05	251.05							10.85	0.033
8	Int. Pt	84.10	4.20	261.90	261.90							7.12	0.0337
9	Int. Pt	93.48	0.00	269.02	269.02							3.70	0.0341
10	Int. Pt	160.04	-6.20	272.72	272.72							3.97	0.0625
11	Int. Pt	355.62	0.00	276.69	276.69							14.24	0.0344
12	Int. Pt	505.50	4.50	290.93	290.93							24.60	0.0349
13	Int. Pt	380.84	3.83	315.53	315.53							16.39	0.0291
14	Int. Pt	641.13	0.00	331.92	331.92							23.66	0.0318
15	Int. Pt	415.65	0.00	355.58	355.58							15.61	0.0323
16	Int. Pt	64.00	-0.23	371.19	371.19							1.52	0.0395
17	Head	39.12	0.33	372.71	374.85	2.14						1.14	0.0406
18	Bend	15.00	-0.08	375.99	378.15	2.16						0.36	0.0406
19	Drive	25.00	0.00	378.51	178.49	1.61	200.02					0.65	0.0406
20	Int. Pt	44.60	0.08	179.14	179.14							1.19	0.0408
21	Drive	44.60	0.08	180.33	81.85	0.83	98.48					1.19	0.0408
22	Int. Pt	10.00	0.15	83.04	83.04							0.32	0.0412
23	Takeup	26.03	0.50	83.36	83.93	0.57						0.88	0.0412
24	Bend	11.06	-0.52	84.81	85.38	0.58						0.09	0.0412
25	Int. Pt	415.65	0.00	85.47	85.47							10.93	0.0412
26	Int. Pt	641.13	0.00	96.40	96.40							18.43	0.045
27	Int. Pt	367.23	-3.83	114.83	114.83							9.25	0.0458
28	Int. Pt	519.25	-4.50	124.08	124.08							13.12	0.0448
29	Int. Pt	355.62	0.00	137.20	137.20							11.68	0.0514
30	Int. Pt	160.04	6.20	148.88	148.88							7.79	0.0527

Station / Pulley Station	Section Length m	Section Lift m	Tensions T1 Run kN	Tensions T2 Run kN	Tp Pulley	Drive Te kN	Ten Adj. kN	Material Accel. kN	Skirt Friction kN	Scraper Friction kN	Section Effective Tension	Visco Friction Factor
31 Int. Pt	93.48	0.00	156.67	156.67							3.21	0.0538
32 Int. Pt	84.10	-4.20	159.88	159.88							1.29	0.0544
33 Int. Pt	282.91	0.00	161.17	161.17							9.87	0.0546
34 Int. Pt	577.95	-0.05	171.04	171.04							20.38	0.0553
35 Int. Pt	263.45	2.35	191.42	191.42							10.50	0.057
36 Int. Pt	102.22	0.00	201.92	201.92							3.84	0.0589
37 Int. Pt	98.45	-3.80	205.76	205.76							2.28	0.0597
38 Int. Pt	10.39	0.08	208.04	208.04							0.30	0.0407
Totals:					**9.32**	**295.22**	**0.00**	**1.44**	**0.00**	**0.00**	**286.95**	

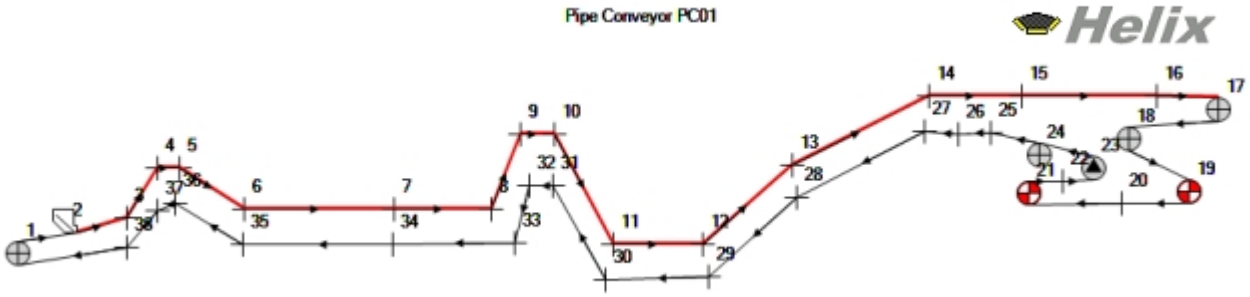
Maximum Tension	**378.51**	kN	Total Effective Tension	**300.93** kN
Minimum Tension	**81.85**	kN	Total Belt Power (Te x V)	**1564.84** kW
Average Tension Inclines Loaded	**217.56**	kN	Belt Modulus	**100800** kN/m
Average Tension Belt Stationary	**81.86**	kN	Total Belt Length	**8231.36** m
Average Tension Difference	**135.7**	kN	Belt Elastic Elongation	**7.59** m
			Takeup Movement	**3.795** m

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Station / Pulley Station		Section Length m	Section Lift m	Tensions T1 Run kN	T2 Run kN	Tp Pulley	Drive Te kN	Ten Adj. kN	Material Accel. kN	Skirt Friction kN	Scraper Friction kN	Section Effective Tension	Visco Friction Factor
1	Tail	5.10	0.08	208.34	209.62	1.28						0.16	0.0396
2	Hopper	5.33	0.00	209.78	209.78				1.44			0.13	0.0247
3	Int. Pt	98.45	3.80	211.36	211.36							3.97	0.0247
4	Int. Pt	102.22	0.00	215.33	215.33							2.59	0.0247
5	Int. Pt	263.45	-2.35	217.92	217.92							7.69	0.0323
6	Int. Pt	577.95	0.05	225.61	225.61							21.31	0.0325
7	Int. Pt	282.91	0.00	246.92	246.92							10.72	0.0331
8	Int. Pt	84.10	4.20	257.64	257.64							4.91	0.0339
9	Int. Pt	93.48	0.00	262.55	262.55							3.70	0.0343
10	Int. Pt	160.04	-6.20	266.25	266.25							0.71	0.0346
11	Int. Pt	355.62	0.00	266.96	266.96							14.29	0.0347
12	Int. Pt	505.50	4.50	281.25	281.25							22.40	0.035
13	Int. Pt	380.84	3.83	303.65	303.65							13.79	0.0292
14	Int. Pt	641.13	0.00	317.44	317.44							23.26	0.0319
15	Int. Pt	415.65	0.00	340.70	340.70							15.44	0.0326
16	Int. Pt	64.00	-0.23	356.14	356.14							1.60	0.0243
17	Head	39.12	0.33	357.74	359.88	2.14						1.14	0.0406
18	Bend	15.00	-0.08	361.02	363.18	2.16						0.36	0.0406
19	Drive	25.00	0.00	363.54	173.55	1.63	189.99					0.65	0.0406
20	Int. Pt	44.60	0.08	174.20	174.20							1.19	0.0408
21	Drive	44.60	0.08	175.39	81.85	0.84	93.54					1.19	0.0408
22	Int. Pt	10.00	0.15	83.04	83.04							0.32	0.0412
23	Takeup	26.03	0.50	83.36	83.93	0.57						0.88	0.0412
24	Bend	11.06	-0.52	84.81	85.38	0.58						0.09	0.0412
25	Int. Pt	415.65	0.00	85.47	85.47							10.93	0.0412
26	Int. Pt	641.13	0.00	96.40	96.40							18.43	0.045
27	Int. Pt	367.23	-3.83	114.83	114.83							9.25	0.0458
28	Int. Pt	519.25	-4.50	124.08	124.08							13.12	0.0448
29	Int. Pt	355.62	0.00	137.20	137.20							11.68	0.0514
30	Int. Pt	160.04	6.20	148.88	148.88							7.79	0.0527

Station / Pulley Station	Section Length m	Section Lift m	Tensions T1 Run kN	T2 Run kN	Tp Pulley	Drive Te kN	Ten Adj. kN	Material Accel. kN	Skirt Friction kN	Scraper Friction kN	Section Effective Tension	Visco Friction Factor
31 Int. Pt	93.48	0.00	156.67	156.67							3.21	0.0538
32 Int. Pt	84.10	-4.20	159.88	159.88							1.29	0.0544
33 Int. Pt	282.91	0.00	161.17	161.17							9.87	0.0546
34 Int. Pt	577.95	-0.05	171.04	171.04							20.38	0.0553
35 Int. Pt	263.45	2.35	191.42	191.42							10.50	0.057
36 Int. Pt	102.22	0.00	201.92	201.92							3.84	0.0589
37 Int. Pt	98.45	-3.80	205.76	205.76							2.28	0.0597
38 Int. Pt	10.39	0.08	208.04	208.04							0.30	0.0407
Totals:					**9.32**	**295.2**	**0.00**	**1.44**	**0.00**	**0.00**	**286.95**	

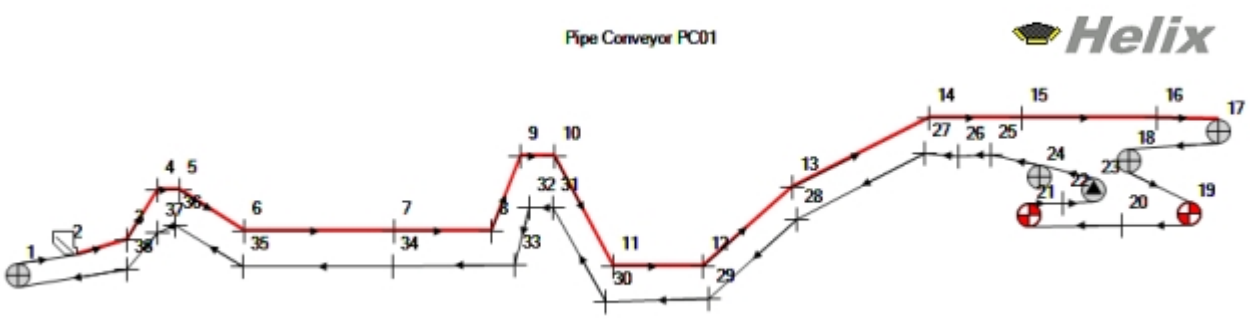
Maximum Tension	**363.54**	kN	Total Effective Tension	**286** kN
Minimum Tension	**81.85**	kN	Total Belt Power (Te x V)	**1487.21** kW
Average Tension Declines Loaded	**212.85**	kN	Belt Modulus	**100800** kN/m
Average Tension Belt Stationary	**81.86**	kN	Total Belt Length	**8231.36** m
Average Tension Difference	**130.99**	kN	Belt Elastic Elongation	**7.326** m
			Takeup Movement	**3.663** m

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



System Masses

Mass of Belt	**326,135**	kg
Mass of Material	**215,313**	kg
Carry Idler Equivalent Mass	**102,867**	kg
Return Idler Equivalent Mass	**106,743**	kg
Pulley Equivalent Mass	**6,789**	kg
Drive Equivalent Mass	**82,912**	kg
Total System Equivalent Mass	**840,759**	kg

Tensions and Accelerating Forces

Effective Tens. Fully Loaded	**297.71**	kN
Effective Tension Empty	**288.73**	kN
Total Braking Force	**0.00**	kN
Tension Available to Accelerate Conveyor		
Accelerating Tension - Loaded	**318.87**	kN
Accelerating Tension - Empty	**327.86**	kN

Starting Times & Acceleration Rates

Starting Time - Fully Loaded	**13.71**	sec
Starting Time - Empty	**9.92**	sec
Acceleration Rate - Loaded	**0.38**	m/s2
Accelerating Rate - Empty	**0.52**	m/s2

Belt Tension Rise Starting / Braking

Max Belt Tension, Start/Brake	**658.70**	kN
Belt Width	**1460**	mm
Maximum Belt Tension / width	**451.16**	kN/m
Belt Rated Tension / width	**209**	kN/m
Actual Max Tension, Start/Brake	**215.9**	%

WARNING: Belt Tension Rise during Starting Exceeds Allowable Tension Rise

Input Data

Belt Speed	***5.2***	m/s
Belt Rated Tension	***209***	kN/m
Allow. Belt Start Tension Rise	***150***	%
Drive Inertia	***66***	kg-m2
Total Braking Torque	***0***	kNm
Start-up Factor - Loaded	***150***	%
Start-up Factor - Empty	***150***	%
Installed Power	***2250***	kW
Drive Efficiency (Average)	***95***	%

Stopping Times & Deceleration Rates

Stopping Time Loaded Braking	**14.69**	sec
Stopping Time Loaded Coasting	**14.69**	sec
Stopping Time Empty Braking	**11.26**	sec
Stopping Time Empty Coasting	**11.26**	sec
Deceleration - Loaded Braking	**-0.35**	m/s2
Deceleration - Loaded Coasting	**-0.35**	m/s2
Deceleration - Empty Braking	**-0.46**	m/s2
Deceleration - Empty Coasting	**-0.46**	m/s2

Stopping Distances & Discharge Volumes

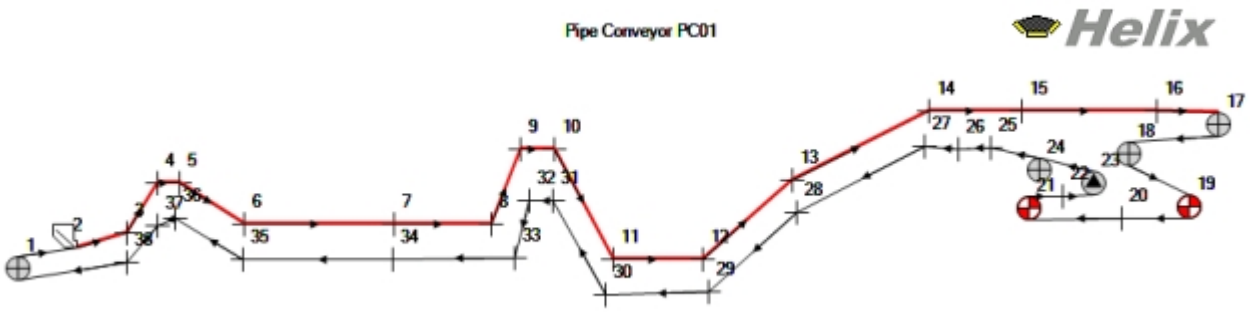
Stopping Distance Loaded Braking	**38.18**	m
Stopping Distance Loaded Coasting	**38.18**	m
Stopping Distance Empty Braking	**29.29**	m
Stopping Distance Empty Coasting	**29.29**	m
Discharge Mass, Braking	**2040**	kg
Discharge Mass, Coasting	**2040**	kg
Discharge Volume, Braking	**2.55**	m3
Discharge Volume, Coasting	**2.55**	m3

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



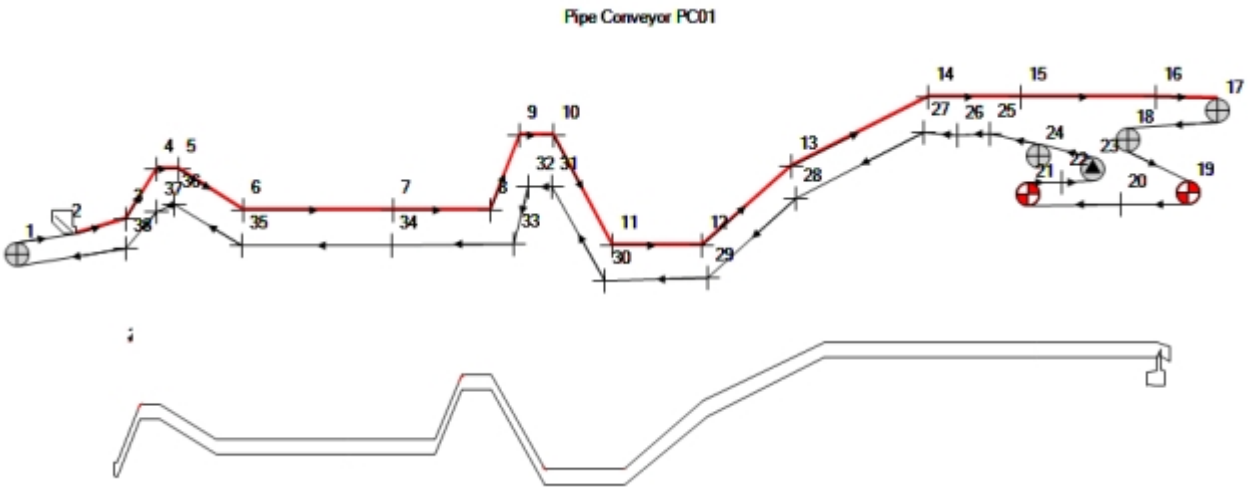
	Carry Side Idlers		Return Side Idlers	
Idler Category	***Helix Pipe Conveyor***		***Helix Pipe Conveyor***	
Idler Description	***1400 Belt 350 Pipe Dia Series 30 6 Roll Panel 152 Offset***		***1400 Belt 350 Pipe Dia Series 30 6 Roll Panel 152 Offset***	
Idler Design Belt Width	***1460***	mm	***1460***	mm
Idler Series	***30***		***30***	
Drawing Number				
Nominal Idler Spacing	***1.2***	m	***1.2***	m
Total Number of Idlers	**4034**		**4186**	
Idler Price	***0***		***0***	
Troughing Angle	***360.0***	deg	***360.0***	deg
Idler Shaft Diameter	***30.0***	mm	***30.0***	mm
Idler Bearing Diameter	***25.0***	mm	***25.0***	mm
Number of Idler Rolls	***6***		***6***	
Idler Roll Diameter	***152***	mm	***152***	mm
Idler Rotation Speed	**653**	rpm	**653**	rpm
Roll Face Width	***222***	mm	***222***	mm
Roll Bearing Centres	***157.8***	mm	***157.8***	mm
Shaft Support Centres	***245.4***	mm	***245.4***	mm
Idler Support Fixing Width	***0***	mm	***0***	mm
Idlerset Rotating Mass	***25.5***	kg	***25.5***	kg
Idlerset Total Mass	***0***	kg	***0***	kg
Idler Vertical Misalignment Allowance	***3.0***	mm	***5.0***	mm
Dynamic Load Factor	**1.38**		**1.40**	
Belt Deviation Load	***500***	N	***500***	N
Total Load on Centre Roll	**1,408**	N	**858**	N
Type of Bearing	***Ball***		***Ball***	
Bearing Designation	***6305***		***6305***	
Bearing Dynamic Load Rating C	***22,500***	N	***22,500***	N
Bearing L10h Life	**832,771**	hrs	**3,676,730**	hrs
Allowable Shaft Deflection at Bearing	***8.00***	min	***8.00***	min
Actual Shaft Deflection at Bearing	**1.00**	min	**0.61**	min

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



19 Feb 2018 12:55 **Vertical Curve Radius Calculations** Page 22/47

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation			***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor			***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded			**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty			**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus			***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension	***209*** kN/m		***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running:	***115*** %	Starting	***150***	%

Vertical Curve Radius Calculations

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation			***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor			***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded			**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty			**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus			***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension	***209***	kN/m	***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running:	***115***	% Starting	***150***	%

Station / Sectio Station	Curve Type	Load Capacity tonnes/hr	Design Vertical Curve Radius m	Running Fully Loaded Tension kN	Running Fully Loaded Radius m	Running Empty Tension kN	Running Empty Radius m	Starting Fully Loaded Tension kN	Starting Fully Loaded Radius m	Starting Empty Tension kN	Starting Empty Radius m	Braking Fully Loaded Tension kN	Braking Fully Loaded Radius m	Braking Empty Tension kN	Braking Empty Radius m	Minimum Reqd. Radius m
1 Tail				208.34		208.34		307.87		345.9		115.42		87.2		
2 Hopper		1000		209.78		209.78		309.81		348.03		116.4		88.04		
3 Int. Pt	Concave	1000		211.38		209.91		311.64		348.33		117.77		88.01		
Belt Tension at Curve kN				211.38		209.91		311.64		348.33		117.77		88.01		
Min. Concave Lift Off Radius					725		720		1069		1195		404		302	**1195**
Min. Edge Tension Radius																
Max. Centre Tension Radius																
4 Int. Pt	Convex	1000	300	217.67		213.88		322.35		355.66		119.93		89.02		
Belt Tension at Curve kN				217.67		213.88		322.35		355.66		119.93		89.02		
Min. Edge Tension Radius																**0**
Max. Buckling Radius																
Belt Edge Tension Rise at Curve kN				0		0		0		0		0		0		
Total Edge Tension at Curve kN and %				217.67	71%	213.88	70%	322.35	106%	355.66	117%	119.93	39%	89.02	29%	
Centre Tension at Curve kN				217.67		213.88		322.35		355.66		119.93		89.02		
5 Int. Pt		1000		220.6		216.47		329.87		361.74		118.57		88.54		
6 Int. Pt		1000		228.34		225.16		349.45		379.41		115.26		89.32		
7 Int. Pt		1000		250.21		246.47		397.3		420.45		112.87		93.26		

Vertical Curve Radius Calculations

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation			***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor			***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded			**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty			**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus			***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension	***209*** kN/m		***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running:	***115*** %	Starting	***150***	%

Station / Sectio Station	Curve Type	Load Capacity tonnes/hr	Design Vertical Curve Radius m	Running				Starting				Braking				Minimum Reqd. Radius m
				Fully Loaded		Empty		Fully Loaded		Empty		Fully Loaded		Empty		
				Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	
8 Int. Pt	Concave	1000		261.11		257.19		420.92		440.83		111.89		95.47		
Belt Tension at Curve kN				261.11		257.19		420.92		440.83		111.89		95.47		
Min. Concave Lift Off Radius					896		883		1444		1513		384		328	**1513**
Min. Edge Tension Radius																
Max. Centre Tension Radius																
9 Int. Pt	Convex	1000	300	268.25		262.1		431.84		448.61		115.5		97.85		
Belt Tension at Curve kN				268.25		262.1		431.84		448.61		115.5		97.85		**0**
Min. Edge Tension Radius																
Max. Buckling Radius																
Belt Edge Tension Rise at Curve kN				0		0		0		0		0		0		
Total Edge Tension at Curve kN and %				268.25	88%	262.1	86%	431.84	142%	448.61	147%	115.5	38%	97.85	32%	
Centre Tension at Curve kN				268.25		262.1		431.84		448.61		115.5		97.85		
10 Int. Pt	Convex	1000		271.98		265.8		439.77		455.49		115.31		98.75		
Belt Tension at Curve kN				271.98		265.8		439.77		455.49		115.31		98.75		**0**
Min. Edge Tension Radius																
Max. Buckling Radius																
Belt Edge Tension Rise at Curve kN				0		0		0		0		0		0		
Total Edge Tension at Curve kN and %				271.98	89%	265.8	87%	439.77	144%	455.49	149%	115.31	38%	98.75	32%	
Centre Tension at Curve kN				271.98		265.8		439.77		455.49		115.31		98.75		
11 Int. Pt	Concave	1000	300	272.75		269.77		447.74		464.93		109.37		97.91		

Vertical Curve Radius Calculations

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation			***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor			***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded			**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty			**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus			***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension	***209*** kN/m		***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running:	***115*** %	Starting	***150***	%

Station / Sectio				Running				Starting				Braking				Minimum Reqd. Radius
				Fully Loaded		Empty		Fully Loaded		Empty		Fully Loaded		Empty		
Station	Curve Type	Load Capacity tonnes/hr	Design Vertical Curve Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	m
Belt Tension at Curve kN				272.75		269.77		447.74		464.93		109.37		97.91		
Min. Concave Lift Off Radius					936		926		1536		1595		375		336	**1595**
Min. Edge Tension Radius																
Max. Centre Tension Radius																
12 Int. Pt		1000	300	287.08		284.06		478.06		491.36		108.77		101.5		
13 Int. Pt		1000	300	311.76		306.46		525.46		531.01		112.23		108.71		
14 Int. Pt	Convex	1000		328.19		320.25		559.01		557.8		112.68		111.05		
Belt Tension at Curve kN				328.19		320.25		559.01		557.8		112.68		111.05		**0**
Min. Edge Tension Radius																
Max. Buckling Radius																
Belt Edge Tension Rise at Curve kN				0		0		0		0		0		0		
Total Edge Tension at Curve kN and %				328.19	108%	320.25	105%	559.01	183%	557.8	183%	112.68	37%	111.05	36%	
Centre Tension at Curve kN				328.19		320.25		559.01		557.8		112.68		111.05		
15 Int. Pt		1000		352.0		343.51		611.65		602.95		109.58		115.04		
16 Int. Pt		1000		367.73		358.95		646.07		632.58		107.86		117.98		
17 Head				369.33		360.47		650.54		636.28		106.77		117.58		

Vertical Curve Radius Calculations

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation			***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor			***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded			**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty			**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus			***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension	***209***	kN/m	***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running:	***115***	% Starting	***150***	%

Station / Sectio Station	Curve Type	Load Capacity tonnes/hr	Design Vertical Curve Radius m	Running				Starting				Braking				Minimum Reqd. Radius m
				Fully Loaded		Empty		Fully Loaded		Empty		Fully Loaded		Empty		
				Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	
18 Bend				372.66		363.75		655.36		641.62		108.71		119.05		
19 Drive				375.23		366.27		658.7		645.21		110.56		120.62		
20 Int. Pt				178.07		175.1		272.05		266.96		93.22		97.29		
21 Drive				179.26		176.29		274.34		269.68		93.38		97.13		
22 Int. Pt	Concave			83.04		83.04		82.79		82.7		84.73		85.25		
Belt Tension at Curve kN				83.04		83.04		82.79		82.7		84.73		85.25		
Min. Concave Lift Off Radius					285		285		284		284		291		293	**293**
Min. Edge Tension Radius																
Max. Centre Tension Radius																
23 Takeup				83.36		83.36		83.36		83.36		83.36		83.36		
24 Bend				84.81		84.81		85.73		86.08		83.95		83.68		
25 Int. Pt	Concave			85.47		85.47		86.92		87.48		84.12		83.71		

Vertical Curve Radius Calculations

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation	***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor	***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded	**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty	**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus	***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension ***209*** kN/m	***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running: ***115*** % Starting	***150***	%

Station / Sectio Station	Curve Type	Load Capacity tonnes/hr	Design Vertical Curve Radius m	Running Fully Loaded Tension kN	Running Fully Loaded Radius m	Running Empty Tension kN	Running Empty Radius m	Starting Fully Loaded Tension kN	Starting Fully Loaded Radius m	Starting Empty Tension kN	Starting Empty Radius m	Braking Fully Loaded Tension kN	Braking Fully Loaded Radius m	Braking Empty Tension kN	Braking Empty Radius m	Minimum Reqd. Radius m
Belt Tension at Curve kN				85.47		85.47		86.92		87.48		84.12		83.71		
Min. Concave Lift Off Radius					293		293		298		300		289		287	**300**
Min. Edge Tension Radius																
Max. Centre Tension Radius																
26 Int. Pt				96.4		96.4		108.12		112.6		85.46		82.14		
27 Int. Pt	Convex			114.83		114.83		142.38		152.91		89.11		81.3		
Belt Tension at Curve kN				114.83		114.83		142.38		152.91		89.11		81.3		**0**
Min. Edge Tension Radius																
Max. Buckling Radius																
Belt Edge Tension Rise at Curve kN				0		0		0		0		0		0		
Total Edge Tension at Curve kN and %				114.83	38%	114.83	38%	142.38	47%	152.91	50%	89.11	29%	81.3	27%	
Centre Tension at Curve kN				114.83		114.83		142.38		152.91		89.11		81.3		
28 Int. Pt				124.08		124.08		160.7		174.7		89.9		79.51		
29 Int. Pt				137.2		137.2		186.64		205.54		91.04		77.03		
30 Int. Pt	Concave			148.88		148.88		207.11		229.36		94.52		78.01		

Vertical Curve Radius Calculations

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation			***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor			***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded			**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty			**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus			***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension	***209*** kN/m		***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running:	***115*** %	Starting	***150***	%

Station / Sectio Station	Curve Type	Load Capacity tonnes/hr	Design Vertical Curve Radius m	Running				Starting				Braking				Minimum Reqd. Radius m
				Fully Loaded		Empty		Fully Loaded		Empty		Fully Loaded		Empty		
				Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	
Belt Tension at Curve kN				148.88		148.88		207.11		229.36		94.52		78.01		
Min. Concave Lift Off Radius					511		511		711		787		324		268	**787**
Min. Edge Tension Radius																
Max. Centre Tension Radius																
31 Int. Pt	Convex			156.67		156.67		218.85		242.61		98.62		80.99		
Belt Tension at Curve kN				156.67		156.67		218.85		242.61		98.62		80.99		**0**
Min. Edge Tension Radius																
Max. Buckling Radius																
Belt Edge Tension Rise at Curve kN				0		0		0		0		0		0		
Total Edge Tension at Curve kN and %				156.67	51%	156.67	51%	218.85	72%	242.61	80%	98.62	32%	80.99	27%	
Centre Tension at Curve kN				156.67		156.67		218.85		242.61		98.62		80.99		
32 Int. Pt	Convex			159.88		159.88		224.37		249.01		99.68		81.4		
Belt Tension at Curve kN				159.88		159.88		224.37		249.01		99.68		81.4		**0**
Min. Edge Tension Radius																
Max. Buckling Radius																
Belt Edge Tension Rise at Curve kN				0		0		0		0		0		0		
Total Edge Tension at Curve kN and %				159.88	52%	159.88	52%	224.37	74%	249.01	82%	99.68	33%	81.4	27%	
Centre Tension at Curve kN				159.88		159.88		224.37		249.01		99.68		81.4		
33 Int. Pt	Concave			161.17		161.17		227.73		253.17		99.03		80.16		

Vertical Curve Radius Calculations

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation	***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor	***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded	**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty	**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus	***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension ***209*** kN/m	***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running: ***115*** % Starting	***150***	%

Station / Sectio Station	Curve Type	Load Capacity tonnes/hr	Design Vertical Curve Radius m	Running Fully Loaded Tension kN	Running Fully Loaded Radius m	Running Empty Tension kN	Running Empty Radius m	Starting Fully Loaded Tension kN	Starting Fully Loaded Radius m	Starting Empty Tension kN	Starting Empty Radius m	Braking Fully Loaded Tension kN	Braking Fully Loaded Radius m	Braking Empty Tension kN	Braking Empty Radius m	Minimum Reqd. Radius m
Belt Tension at Curve kN				161.17		161.17		227.73		253.17		99.03		80.16		
Min. Concave Lift Off Radius					553		553		782		869		340		275	**869**
Min. Edge Tension Radius																
Max. Centre Tension Radius																
34 Int. Pt				171.04		171.04		244.59		272.7		102.38		81.52		
35 Int. Pt				191.42		191.42		279.25		312.81		109.43		84.53		
36 Int. Pt				201.92		201.92		296.25		332.29		113.86		87.11		
37 Int. Pt	Convex			205.76		205.76		302.61		339.62		115.34		87.88		
Belt Tension at Curve kN				205.76		205.76		302.61		339.62		115.34		87.88		**0**
Min. Edge Tension Radius																
Max. Buckling Radius																
Belt Edge Tension Rise at Curve kN				0		0		0		0		0		0		
Total Edge Tension at Curve kN and %				205.76	67%	205.76	67%	302.61	99%	339.62	111%	115.34	38%	87.88	29%	
Centre Tension at Curve kN				205.76		205.76		302.61		339.62		115.34		87.88		
38 Int. Pt	Concave			208.04		208.04		307.32		345.25		115.36		87.21		

Vertical Curve Radius Calculations

Belt Width	***1460***	mm	% Belt Mass for Lift-off Calculation		***75***	%
Belt Mass - New Belt	***39.62***	kg/m	Curve Tension Safety Factor		***1***	
Top Cover Mass - New Belt	***13.15***	kg/m	Average Drive Torque Start-up Factor - Loaded		**150**	%
Bottom Cover Mass	***8.22***	kg/m	Average Drive Torque Start-up Factor - Empty		**150**	%
Worn Belt Mass	**29.72**	kg/m	Belt Modulus		***100800***	kN/m
Reduction of Top Cover Mass	**75.3**	%	Belt Rated Tension	***209*** kN/m	***305.1***	kN
Conveyed Material Mass	**53.42**	kg/m	Allowable Edge Tension - Running:	***115*** % Starting	***150***	%

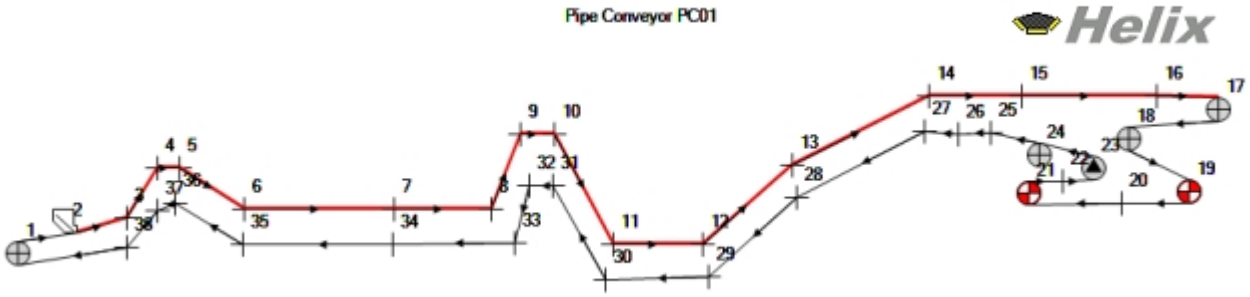
Station / Sectio Station	Curve Type	Load Capacity tonnes/hr	Design Vertical Curve Radius m	Running				Starting				Braking				Minimum Reqd. Radius m
				Fully Loaded		Empty		Fully Loaded		Empty		Fully Loaded		Empty		
				Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	Tension kN	Radius m	
Belt Tension at Curve kN				208.04		208.04		307.32		345.25		115.36		87.21		
Min. Concave Lift Off Radius					714		714		1055		1185		396		299	**1185**
Min. Edge Tension Radius																
Max. Centre Tension Radius																

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Viscoelastic Calculations Input Data

Belt Rubber Description	***Rubber description ...***	Carry Idler Centre Roll Dia	***152*** mm
Top Cover Dynamic Modulus E'	***6*** N/mm2	Carry Idler Centre Roll Drag	***2*** N
Top Cover Dynamic Loss Factor Tan(delta)	***0.13***	Carry Idler Wing Roll Dia	***152*** mm
Belt Top Cover Temperature	***30*** deg C	Carry Idler Wing Roll Drag	***2*** N
Rolling Resistance Factor RRF Top	***0.072*** RRF Bot. ***0.072***	Return Idler Centre Roll Dia	***152*** mm
Bottom Cover Dynamic Modulus E'	***6*** N/mm2	Return Idler Centre Roll Drag	***2*** N
Bot Cover Dynamic Loss Factor Tan(delta)	***0.13***	Return Idler Wing Roll Dia	***152*** mm
Belt Bottom Cover Temperature	***30*** deg C	Return Idler Wing Roll Drag	***2*** N
Belt & Material Flexure Adjustment factor	***1***	Idlerset Skew Angle	***0.1*** deg
☐ Belt has Turnover on Return Run		Idlerset Forward Tilt angle	***0.1*** deg

Station / Section			friction factor f (loaded)										Empty
			Total	Indentation			Matl.& Belt		Idler Drag		Idler Skew & Tilt		
No	Section Length	Idler Spacing	Loaded Friction factor f	Indent factor fi	Indent factor %	Freq uency rad/s	Flexure friction fm	Flexure friction %	Drag factor fr	Drag factor %	Tilt friction ft	Tilt friction %	Empty Friction factor f
1	5.10	1.00	0.0396	0.00646	16.3	1671	0.00045	1.1	0.03088	77.9	0.00183	4.6	0.0396
2	5.33	1.00	0.0247	0.00859	34.8	1257	0.00110	4.5	0.01315	53.3	0.00183	7.4	0.0396
3	98.45	1.00	0.0247	0.00859	34.8	1257	0.00110	4.4	0.01315	53.3	0.00183	7.4	0.0396
4	102.22	1.00	0.0247	0.00859	34.8	1257	0.00108	4.4	0.01315	53.3	0.00183	7.4	0.0396
5	263.45	1.00	0.0323	0.01621	50.2	1257	0.00106	3.3	0.01315	40.8	0.00183	5.7	0.0571
6	577.95	1.00	0.0325	0.01646	50.7	1257	0.00104	3.2	0.01315	40.5	0.00183	5.6	0.0577
7	282.91	1.00	0.0331	0.01716	51.8	1257	0.00099	3.0	0.01315	39.7	0.00183	5.5	0.0593
8	84.10	1.00	0.0339	0.01795	53.0	1257	0.00095	2.8	0.01315	38.8	0.00183	5.4	0.0611
9	93.48	1.00	0.0343	0.01839	53.6	1257	0.00092	2.7	0.01315	38.3	0.00183	5.3	0.0620
10	160.04	1.00	0.0346	0.01866	54.0	1257	0.00091	2.6	0.01315	38.1	0.00183	5.3	0.0625
11	355.62	1.00	0.0347	0.01877	54.2	1257	0.00090	2.6	0.01315	37.9	0.00183	5.3	0.0629
12	505.50	1.00	0.0350	0.01915	54.7	1257	0.00088	2.5	0.01315	37.6	0.00183	5.2	0.0640
13	380.84	1.00	0.0292	0.01339	45.8	1257	0.00084	2.9	0.01315	45.0	0.00183	6.3	0.0506
14	641.13	1.00	0.0319	0.01616	50.6	1257	0.00080	2.5	0.01315	41.2	0.00183	5.7	0.0568
15	415.65	1.00	0.0326	0.01680	51.6	1257	0.00076	2.3	0.01315	40.4	0.00183	5.6	0.0582
16	64.00	1.00	0.0243	0.00859	35.3	1257	0.00073	3.0	0.01315	54.1	0.00183	7.5	0.0395
17	39.12	1.00	0.0406	0.00756	18.6	1429	0.00029	0.7	0.03088	76.1	0.00183	4.5	0.0406
18	15.00	1.00	0.0406	0.00756	18.6	1429	0.00029	0.7	0.03088	76.1	0.00183	4.5	0.0406
19	25.00	1.00	0.0406	0.00756	18.6	1429	0.00029	0.7	0.03088	76.1	0.00183	4.5	0.0406
20	44.60	1.00	0.0408	0.00756	18.5	1429	0.00051	1.2	0.03088	75.7	0.00183	4.5	0.0408

Station / Section			friction factor f (loaded)										Empty
			Total	Indentation			Matl.& Belt		Idler Drag		Idler Skew & Tilt		
No	Section Length	Idler Spacing	Loaded Friction factor f	Indent factor fi	Indent factor %	Freq uency rad/s	Flexure friction fm	Flexure friction %	Drag factor fr	Drag factor %	Tilt friction ft	Tilt friction %	Empty Friction factor f
21	44.60	1.00	0.0408	0.00756	18.5	1429	0.00050	1.2	0.03088	75.7	0.00183	4.5	0.0408
22	10.00	1.00	0.0412	0.00756	18.4	1429	0.00091	2.2	0.03088	75.0	0.00183	4.5	0.0412
23	26.03	1.00	0.0412	0.00756	18.4	1429	0.00090	2.2	0.03088	75.0	0.00183	4.5	0.0412
24	11.06	1.00	0.0412	0.00756	18.4	1429	0.00089	2.2	0.03088	75.0	0.00183	4.5	0.0412
25	415.65	1.00	0.0412	0.00756	18.4	1429	0.00088	2.1	0.03088	75.0	0.00183	4.5	0.0412
26	641.13	1.00	0.0450	0.01145	25.4	1429	0.00084	1.9	0.03088	68.6	0.00183	4.1	0.0450
27	367.23	1.00	0.0458	0.01230	26.9	1429	0.00075	1.6	0.03088	67.5	0.00183	4.0	0.0458
28	519.25	1.00	0.0448	0.01143	25.5	1429	0.00068	1.5	0.03088	68.9	0.00183	4.1	0.0448
29	355.62	1.00	0.0514	0.01806	35.1	1429	0.00064	1.2	0.03088	60.1	0.00183	3.6	0.0514
30	160.04	1.00	0.0527	0.01941	36.8	1429	0.00059	1.1	0.03088	58.6	0.00183	3.5	0.0527
31	93.48	1.00	0.0538	0.02049	38.1	1429	0.00057	1.1	0.03088	57.4	0.00183	3.4	0.0538
32	84.10	1.00	0.0544	0.02112	38.8	1429	0.00055	1.0	0.03088	56.8	0.00183	3.4	0.0544
33	282.91	1.00	0.0546	0.02137	39.1	1429	0.00054	1.0	0.03088	56.5	0.00183	3.4	0.0546
34	577.95	1.00	0.0553	0.02202	39.8	1429	0.00053	1.0	0.03088	55.9	0.00183	3.3	0.0553
35	263.45	1.00	0.0570	0.02380	41.7	1429	0.00050	0.9	0.03088	54.2	0.00183	3.2	0.0570
36	102.22	1.00	0.0589	0.02567	43.6	1429	0.00047	0.8	0.03088	52.5	0.00183	3.1	0.0589
37	98.45	1.00	0.0597	0.02656	44.5	1429	0.00045	0.8	0.03088	51.7	0.00183	3.1	0.0597
38	10.39	1.00	0.0407	0.00756	18.6	1429	0.00045	1.1	0.03088	75.8	0.00183	4.5	0.0407
Totals:			**8223.05**	**0.45**					**0.00**		**0.00**	**0**	

Designers Comments

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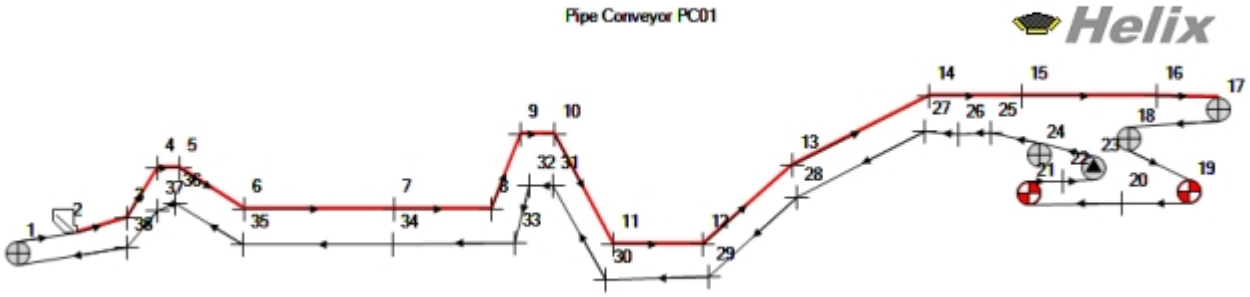
Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Carry Roll Diameter	152	mm	Belt Speed	5.2	m/s
Return Roll Diameter	152	mm	Takeup Mass	17000	kg
			Belt Resonance +/- Tolerance	2	%

Station / Sectio		Running Fully Loaded Belt Resonance									
Station	Description	Start Belt Tension kN	End Belt Tension kN	Belt Transverse Wave Frequency Range Hz	to Hz	Idler Roll Excitation Frequency Hz	Section Idler Spacing m	Critical Idler Spacing Start m	Critical Idler Spacing End m	Idler Spacing within +/- 10% m	Mode
1 Tail	Tail	209.62	211.38	36.18	36.34	10.89	1	3.32	3.34	OK	
2 Hopper		209.78	217.67	23.46	23.9	10.89	1	2.15	2.2	OK	
3 Int. Pt	P1	211.38	220.6	23.55	24.07	10.89	1	2.16	2.21	OK	
4 Int. Pt	P2	217.67	228.34	23.9	24.5	10.89	1	2.2	2.25	OK	
5 Int. Pt	P5	220.6	250.21	24.07	25.67	10.89	1	2.21	2.36	OK	
6 Int. Pt	P8	228.34	261.11	24.5	26.23	10.89	1	2.25	2.41	OK	
7 Int. Pt	P12	250.21	268.25	25.67	26.6	10.89	1	2.36	2.44	OK	
8 Int. Pt	P13	261.11	271.98	26.23	26.78	10.89	1	2.41	2.46	OK	
9 Int. Pt	P15	268.25	272.75	26.6	26.82	10.89	1	2.44	2.46	OK	
10 Int. Pt	P17	271.98	287.08	26.78	27.53	10.89	1	2.46	2.53	OK	
11 Int. Pt	P19	272.75	311.76	26.82	28.71	10.89	1	2.46	2.64	OK	
12 Int. Pt	P20	287.08	328.19	27.53	29.47	10.89	1	2.53	2.71	OK	
13 Int. Pt	P21	311.76	352	28.71	30.53	10.89	1	2.64	2.8	OK	
14 Int. Pt	P24	328.19	367.73	29.47	31.22	10.89	1	2.71	2.87	OK	
15 Int. Pt	P25	352.0	369.33	30.53	31.29	10.89	1	2.8	2.87	OK	
16 Int. Pt	P26	367.73	372.66	31.22	31.43	10.89	1	2.87	2.89	OK	
17 Head	Head (P28)	371.52	375.23	48.28	48.52	10.89	1	4.43	4.46	OK	
18 Bend	HT Bend	374.87	178.07	48.5	33.32	10.89	1	4.45	3.06	OK	
19 Drive	Drive 1	177.42	179.26	33.26	33.43	10.89	1	3.05	3.07	OK	
20 Int. Pt		178.07	83.04	33.32	22.6	10.89	1	3.06	2.07	OK	
21 Drive	Drive 2	81.85	83.36	22.43	22.64	10.89	1	2.06	2.08	OK	
22 Int. Pt		83.04	84.81	22.59	22.84	10.89	1	2.07	2.1	OK	
23 Takeup	Takeup	83.93	85.47	22.72	22.93	10.89	1	2.09	2.11	OK	
24 Bend	Bend	85.38	96.4	22.92	24.39	10.89	1	2.1	2.24	OK	
25 Int. Pt	P26 rtn	85.47	114.83	22.93	26.67	10.89	1	2.11	2.45	OK	
26 Int. Pt		96.4	124.08	24.39	27.74	10.89	1	2.24	2.55	OK	

Carry Roll Diameter	152 mm	Belt Speed	5.2 m/s
Return Roll Diameter	152 mm	Takeup Mass	17000 kg
		Belt Resonance +/- Tolerance	2 %

Station / Sectio		Running Fully Loaded Belt Resonance									
Station	Description	Start Belt Tension kN	End Belt Tension kN	Belt Transverse Wave Frequency Range Hz	to Hz	Idler Roll Excitation Frequency Hz	Section Idler Spacing m	Critical Idler Spacing Start m	Critical Idler Spacing End m	Idler Spacing within +/- 10% m	Mode
27 Int. Pt	P24 rtn	114.83	137.2	26.67	29.19	10.89	1	2.45	2.68	OK	
28 Int. Pt		124.08	148.88	27.74	30.43	10.89	1	2.55	2.79	OK	
29 Int. Pt	P20 rtn	137.2	156.67	29.19	31.23	10.89	1	2.68	2.87	OK	
30 Int. Pt		148.88	159.88	30.43	31.55	10.89	1	2.79	2.9	OK	
31 Int. Pt	P17 rtn	156.67	161.17	31.23	31.68	10.89	1	2.87	2.91	OK	
32 Int. Pt	P15 rtn	159.88	171.04	31.55	32.65	10.89	1	2.9	3	OK	
33 Int. Pt		161.17	191.42	31.68	34.56	10.89	1	2.91	3.17	OK	
34 Int. Pt		171.04	201.92	32.65	35.51	10.89	1	3	3.26	OK	
35 Int. Pt	P8 rtn	191.42	205.76	34.56	35.84	10.89	1	3.17	3.29	OK	
36 Int. Pt		201.92	208.04	35.51	36.04	10.89	1	3.26	3.31	OK	
37 Int. Pt		205.76	208.34	35.85	36.07	10.89	1	3.29	3.31	OK	
38 Int. Pt		208.04	208.34	36.05	36.07	10.89	1	3.31	3.31	OK	

Designers Comments

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Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018

Takeup Travel

Takeup Type	***Horizontal Gravity***	
☐ **Auto Calc Takeup Mass**		
Takeup Mass step increment	***1000***	kg
Max no. of Calc Increments	***100***	
Takeup Mass kg (Manual Input)	***17000***	kg
Takeup Mass Calculated	**17000**	kg

Takeup Travel Estimate

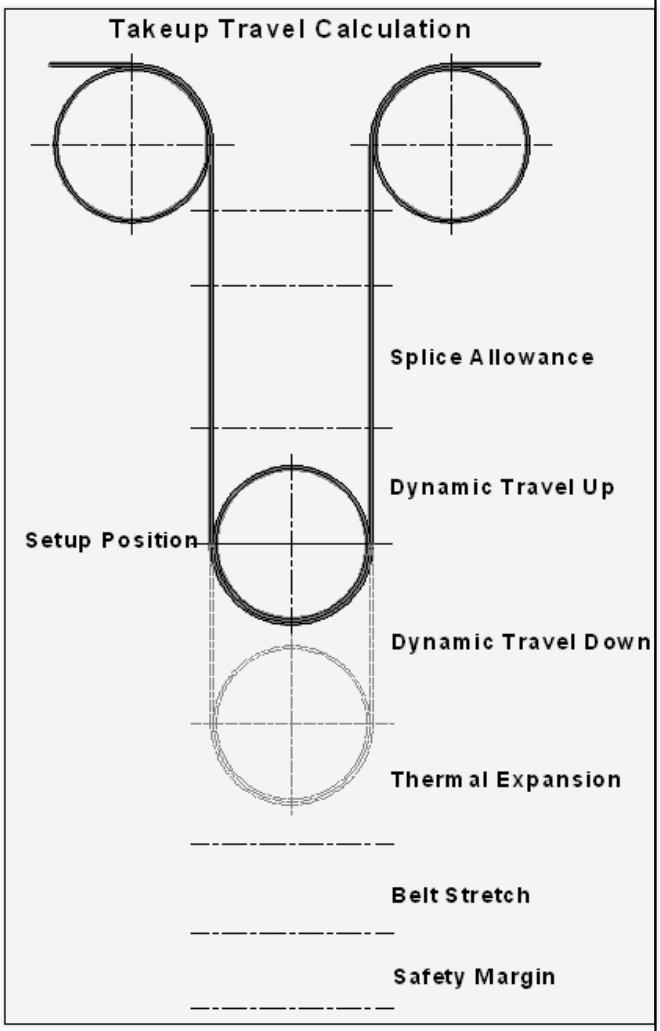
Safety Margin Top	+	***0.5***	m
Belt Splice Allowance	+	***2***	m
Dynamic Travel Up	+	***1***	m
Dynamic Travel Down	+	***2***	m
Safety Margin Bottom	+	***0.5***	m

Thermal Expansion Distance

Minimum Site Temperature		***0***	deg
Maximum Site Temperature		***45***	deg
Belt Expansion co-efficient m/m per degree C		***1.17E-05***	
Total Belt Length		**8231.36**	m
Thermal Expansion Distance	+	**0**	m

Permanent Belt Stretch

Permanent Stretch co-efficient % of Belt Length		***0.15***	%
Permanent Belt Stretch Distance	+	**0**	m
Total Takeup Travel Distance		**0**	m



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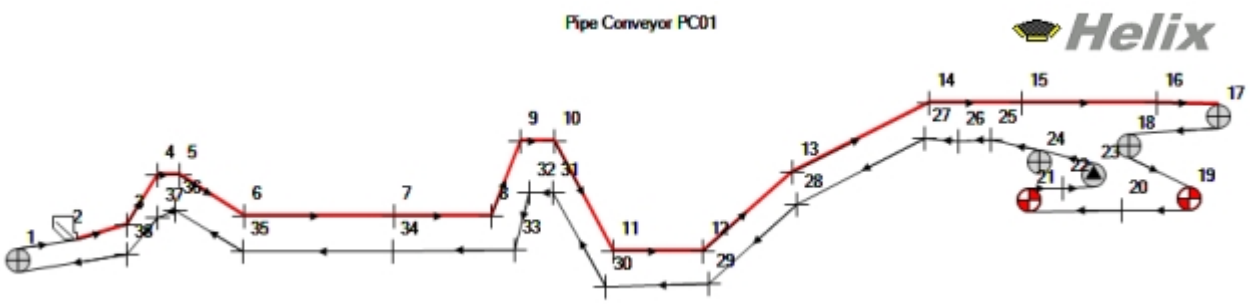

Drive No.	1 Drive	
Drive Description	**Head**	
Load Share on Drive Pulley	**67**	%
Starting Torque Factor, Fully Loaded	**150**	%
Starting Torque Factor, Empty	**150**	%
Number of Motors on Drive Pulley	**2**	
Motor Description	**Toshiba TIK 750 kW**	
Motor Power Rating	**750**	kW
Motor Voltage	**3300**	Volts
Gearbox Description	**No Selection**	
Drive Efficiency	**95**	%

High Speed Coupling		
HS Coupling Make		
HS Coupling Model		
Low Speed Coupling		
LS Coupling Make		
LS Coupling Model		
Brake		
Brake Location	**High Speed**	
Low Speed Brake Torque Input	**0**	kNm
Equiv HS Brake Torque	**0**	Nm
Holdback		
Static Analysis Runback Force Fv	**3981**	N
Static Analysis Horizontal Force Fh	**293729**	N
Calculated Holdback Torque	**N/A**	Nm
Holdback Required (Yes / No)	**No**	Fv>Fh/2
Holdback Torque 3 x Motor FLT	**443110**	Nm
Holdback Make	**Not Installed**	
Holdback Model		

Pulley No.	19	
Pulley Condition	**Moist**	
Pulley Lagging Type	**Ceramic**	
Belt Wrap Angle	**180**	°
Coefficient of Friction, Running	**0.35**	
Drive Factor Cw, Running	**0.5**	
Coefficient of Friction, Starting	**0.45**	
Drive Factor Cw, Starting	**0.32**	
Pulley and Shaft Dimensions		
Pulley Shell Diameter	**1000**	mm
Pulley Lagging Thickness	**12**	mm
Pulley Outside Diameter	**1024**	mm
Pulley Shaft Diameter at Hub	**320**	mm
Pulley Shaft Diameter at Brg	**320**	mm
Pulley and Belt Speed		
Motor Full Load Speed	**1760**	rpm
Required Gearbox Ratio	**18.147**	:1
Selected Gearbox Ratio	**1**	:1
Required Pulley Speed	**96.99**	rpm
Calculated Pulley Speed for Reducer	**1760**	rpm
Required Belt Speed	**5.2**	m/s
Calculated Belt Speed	**94.36**	m/s
Drive Inertia		
Motor Inertia	**22**	kg-m2
High Speed Coupling Inertia	**0**	kg-m2
High Speed Brake Disc Inertia	**0**	kg-m2
Flywheel Inertia	**0**	kg-m2
Gearbox Inertia (HSS)	**0**	kg-m2
Total Drive Inertia	**44**	kg-m2
Total Drive Equivalent Mass	**55275**	kg

Drive No.	2 Drive	
Drive Description	**Head**	
Load Share on Drive Pulley	**33**	%
Starting Torque Factor, Fully Loaded	**150**	%
Starting Torque Factor, Empty	**150**	%
Number of Motors on Drive Pulley	**1**	
Motor Description	**Toshiba TIK 750 kW**	
Motor Power Rating	**750**	kW
Motor Voltage	**3300**	Volts
Gearbox Description	**No Selection**	
Drive Efficiency	**95**	%

High Speed Coupling		
HS Coupling Make		
HS Coupling Model		
Low Speed Coupling		
LS Coupling Make		
LS Coupling Model		
Brake		
Brake Location	**High Speed**	
Low Speed Brake Torque Input	**0**	kNm
Equiv HS Brake Torque	**0**	Nm
Holdback		
Static Analysis Runback Force Fv	**3981**	N
Static Analysis Horizontal Force Fh	**293729**	N
Calculated Holdback Torque	**N/A**	Nm
Holdback Required (Yes / No)	**No**	Fv>Fh/2
Holdback Torque 3 x Motor FLT	**189100**	Nm
Holdback Make	**Not Installed**	
Holdback Model		

Pulley No.	21	
Pulley Condition	**Moist**	
Pulley Lagging Type	**Ceramic**	
Belt Wrap Angle	**180**	º
Coefficient of Friction, Running	**0.35**	
Drive Factor Cw, Running	**0.5**	
Coefficient of Friction, Starting	**0.45**	
Drive Factor Cw, Starting	**0.32**	
Pulley and Shaft Dimensions		
Pulley Shell Diameter	**850**	mm
Pulley Lagging Thickness	**12**	mm
Pulley Outside Diameter	**874**	mm
Pulley Shaft Diameter at Hub	**260**	mm
Pulley Shaft Diameter at Brg	**260**	mm
Pulley and Belt Speed		
Motor Full Load Speed	**1760**	rpm
Required Gearbox Ratio	**15.489**	:1
Selected Gearbox Ratio	**1**	:1
Required Pulley Speed	**113.63**	rpm
Calculated Pulley Speed for Reducer	**1760**	rpm
Required Belt Speed	**5.2**	m/s
Calculated Belt Speed	**80.54**	m/s
Drive Inertia		
Motor Inertia	**22**	kg-m2
High Speed Coupling Inertia	**0**	kg-m2
High Speed Brake Disc Inertia	**0**	kg-m2
Flywheel Inertia	**0**	kg-m2
Gearbox Inertia (HSS)	**0**	kg-m2
Total Drive Inertia	**22**	kg-m2
Total Drive Equivalent Mass	**27637**	kg

Designers Comments

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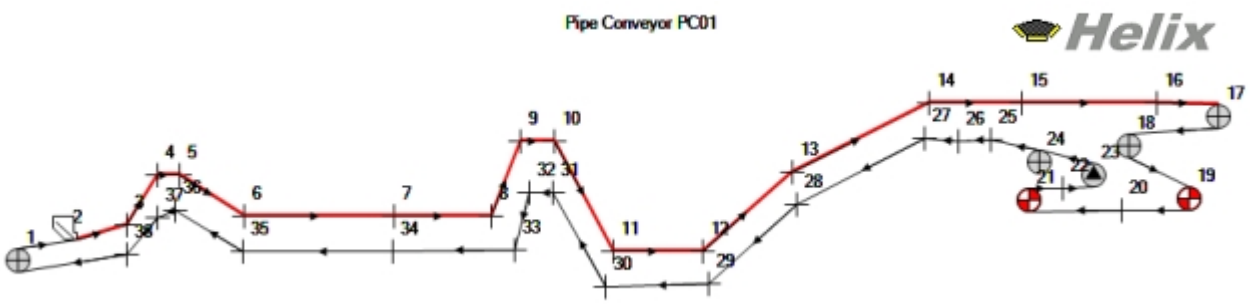
Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Drive No.	1 Drive	Pulley No.	19	
Drive Description	Head	Total Motor Power on Drive	1500	kW
Number of Motors on Drive Pulley	2	Absorbed Power at Pulley	1037.24	kW
Motor Category	Toshiba	Drive Efficiency	95	%
Motor Description	Toshiba TIK 750 kW	Absorbed Power at Motor	545.92	kW
Motor Power Rating	750 kW	Motor Full Load Speed	1760	rpm
Motor Voltage	3300 Volts	Motor Full Load Torque	4840	Nm
Number of poles	4	Motor Full Load Current	155.9	Amps
Motor Frame Size	D500LL	Motor Efficiency @ Duty Point	94.96	%
Motor Shaft Diameter	90 mm	Motor Power Factor @ Duty Pt	0.86	
Motor Shaft Height	500 mm	Mass of Motor	6400	kg
Motor Inertia	22 kg-m2			

Drive No.	2 Drive	Pulley No.	21	
Drive Description	Head	Total Motor Power on Drive	750	kW
Number of Motors on Drive Pulley	1	Absorbed Power at Pulley	510.9	kW
Motor Category	Toshiba	Drive Efficiency	95	%
Motor Description	Toshiba TIK 750 kW	Absorbed Power at Motor	537.79	kW
Motor Power Rating	750 kW	Motor Full Load Speed	1760	rpm
Motor Voltage	3300 Volts	Motor Full Load Torque	4840	Nm
Number of poles	4	Motor Full Load Current	155.9	Amps
Motor Frame Size	D500LL	Motor Efficiency @ Duty Point	94.94	%
Motor Shaft Diameter	90 mm	Motor Power Factor @ Duty Pt	0.86	
Motor Shaft Height	500 mm	Mass of Motor	6400	kg
Motor Inertia	22 kg-m2			

Designers Comments

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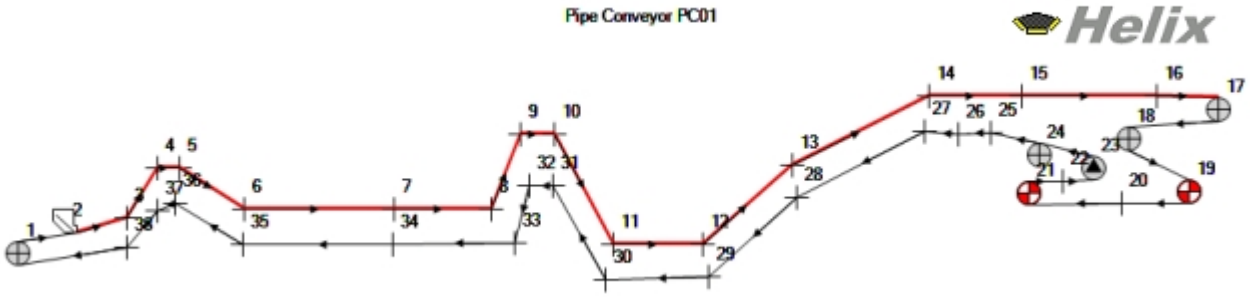

Drive No. 1 **Drive**			Pulley No. **19**		
Drive Description	**Head**		Coupling Size		
Number of Motors on Drive Pulley	**2**		Motor Power Rating	**750**	kW
Selection Mode	**Manual**		Motor Full Load Speed	**1760**	rpm
Coupling Category	**Voith**		Coupling Rated Slip	**0**	%
Coupling Description	**No Selection - Direct Drive**		Peak Torque %	**0**	% FLT
Coupling Power Rating	**0**	kW	Run-up Torque % (2 sec)	**0**	% FLT
Min. Required Ramping Time		sec	Coupling Output Speed	**1760**	rpm
Max Starting Time	**0**	sec	Mass of Coupling	**0**	kg

Drive No. 2 **Drive**			Pulley No. **21**		
Drive Description	**Head**		Coupling Size		
Number of Motors on Drive Pulley	**1**		Motor Power Rating	**750**	kW
Selection Mode	**Manual**		Motor Full Load Speed	**1760**	rpm
Coupling Category	**Voith**		Coupling Rated Slip	**0**	%
Coupling Description	**No Selection - Direct Drive**		Peak Torque %	**0**	% FLT
Coupling Power Rating	**0**	kW	Run-up Torque % (2 sec)	**0**	% FLT
Min. Required Ramping Time		sec	Coupling Output Speed	**1760**	rpm
Max Starting Time	**0**	sec	Mass of Coupling	**0**	kg

Designers Comments

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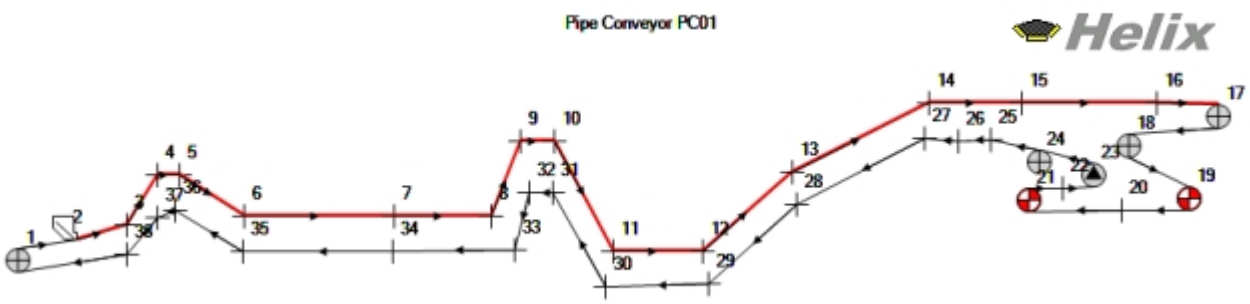

Drive No.	1 Drive		Pulley No.	19	
Drive Description	Head		Motor Power Rating	750	kW
Number of Motors on Drive Pulley	2		Motor Full Load Speed	1760	rpm
Selection Mode	Manual		Motor Torque @ FL Speed	4070	Nm
Gearbox Category	Flender		Motor Torque at Pulley Speed	73848	Nm
Gearbox Description	No Selection		Gearbox Rated Torque	0	Nm
Type			Service Factor Required	1.5	
Size			Service Factor Calculated	0	
Code					
Ratio	1		Plus Speed Selection Tolerance	5	%
Number of Stages	0		Minus Speed Selection Tolerance	5	%
			Fluid Coupling Slip	0	%
Design Efficiency (Input)	95	%	Required Gearbox Ratio	18.147	:1
Gearbox Actual Efficiency		%	Selected Gearbox Ratio	1	:1
Maximum Input Shaft Speed	1800	rpm	Required Pulley Speed	96.99	rpm
Minimum Input Shaft Speed	500	rpm	Calculated Pulley Speed for Reducer	1760	rpm
Input Shaft Diameter	0	mm	Required Belt Speed	5.2	m/s
Output Shaft Diameter	0	mm	Calculated Belt Speed	94.36	m/s
Gearbox Inertia	0	kg-m2	Mass of Gearbox	0	kg

Drive No.	2 Drive		Pulley No.	21	
Drive Description	Head		Motor Power Rating	750	kW
Number of Motors on Drive Pulley	1		Motor Full Load Speed	1760	rpm
Selection Mode	Manual		Motor Torque @ FL Speed	4070	Nm
Gearbox Category	Flender		Motor Torque at Pulley Speed	63034	Nm
Gearbox Description	No Selection		Gearbox Rated Torque	0	Nm
Type			Service Factor Required	1.5	
Size			Service Factor Calculated	0	
Code					
Ratio	1		Plus Speed Selection Tolerance	5	%
Number of Stages	0		Minus Speed Selection Tolerance	5	%
			Fluid Coupling Slip	0	%
Design Efficiency (Input)	95	%	Required Gearbox Ratio	15.489	:1
Gearbox Actual Efficiency		%	Selected Gearbox Ratio	1	:1
Maximum Input Shaft Speed	1800	rpm	Required Pulley Speed	113.63	rpm
Minimum Input Shaft Speed	500	rpm	Calculated Pulley Speed for Reducer	1760	rpm
Input Shaft Diameter	0	mm	Required Belt Speed	5.2	m/s
Output Shaft Diameter	0	mm	Calculated Belt Speed	80.54	m/s
Gearbox Inertia	0	kg-m2	Mass of Gearbox	0	kg

Designers Comments

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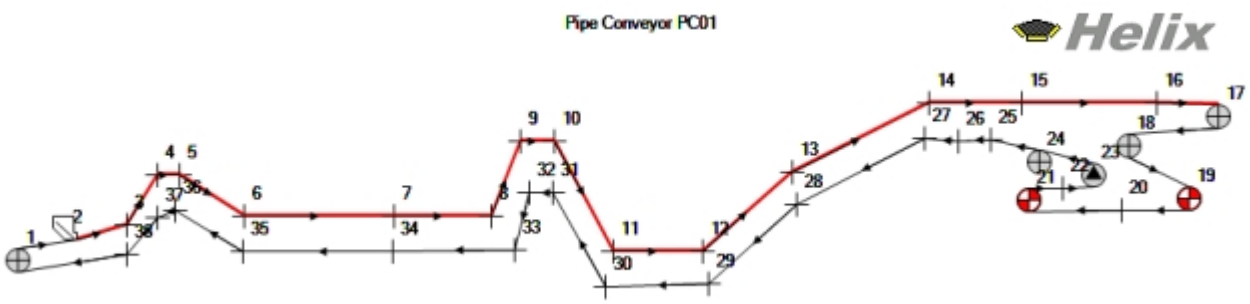
Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Drive / Brake No. 1 Drive — Pulley No. 19

Description	Head		Brake Location	High Speed	
Load Share on Drive Pulley	67	%	Disc Material	Mild Steel	
Brake Category	Svendborg BSFH 200		Disc Diameter	600	mm
Brake Description	Svendborg		Disc Thickness	30	mm
Caliper	BSFH 206		Co-eff of Friction (Pad-Disc)	0.4	
Number of Motors on Drive Pulley	2		Caliper Clamping Force Minimum	6000	N
Brake Selection Input Data			Caliper Clamping Force Maximum	8300	N
Low Speed Brake Torque Input	0	kNm	Pad offset Width W	60	mm
Equiv HS Brake Torque	0	Nm	Maximum Air Gap	3	mm
Design Braking Torque Input	1000	Nm	*Recommended working airgap is 1mm*		
Selected Brake's Torque Rating	1063	Nm	Disc Initial Speed	1480	rpm
Design Stopping Time	10.0	sec	Disc Moment of Inertia	3.0	kg-m2
Consecutive No of Stops	3		Required Gearbox Ratio	18.147	: 1
Average No of Stops	6		Drive Efficiency	95	%
Ambient Temperature	40	deg C	Mass of Caliper	26	kg
Disc Temperature after stops	74	deg C	Brake Caliper Price	$0.00	

Drive / Brake No. 2 Drive — Pulley No. 21

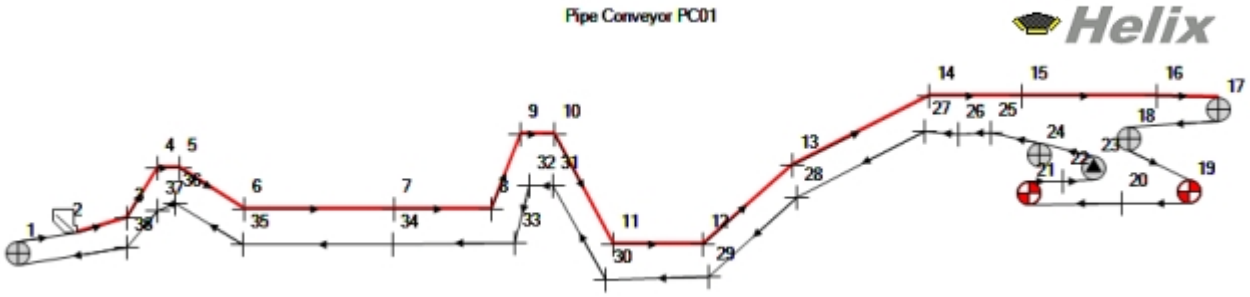
Description	Head		Brake Location	High Speed	
Load Share on Drive Pulley	33	%	Disc Material	Mild Steel	
Brake Category	Svendborg BSFH 200		Disc Diameter	600	mm
Brake Description	Svendborg		Disc Thickness	30	mm
Caliper	BSFH 206		Co-eff of Friction (Pad-Disc)	0.4	
Number of Motors on Drive Pulley	1		Caliper Clamping Force Minimum	6000	N
Brake Selection Input Data			Caliper Clamping Force Maximum	8300	N
Low Speed Brake Torque Input	0	kNm	Pad offset Width W	60	mm
Equiv HS Brake Torque	0	Nm	Maximum Air Gap	3	mm
Design Braking Torque Input	1000	Nm	*Recommended working airgap is 1mm*		
Selected Brake's Torque Rating	1063	Nm	Disc Initial Speed	1480	rpm
Design Stopping Time	10.0	sec	Disc Moment of Inertia	3.0	kg-m2
Consecutive No of Stops	3		Required Gearbox Ratio	15.489	: 1
Average No of Stops	6		Drive Efficiency	95	%
Ambient Temperature	40	deg C	Mass of Caliper	26	kg
Disc Temperature after stops	74	deg C	Brake Caliper Price	$0.00	

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Drive No.	1 Drive	Pulley No.	19	
Drive Description	**Head**	Motor Power Rating	**750**	kW
Load Share on Drive Pulley	**67** %	Motor Full Load Speed	**1760**	rpm
Starting Torque Factor, Fully Loaded	**150** %	Motor Torque @ FL Speed	**4070**	Nm
Starting Torque Factor, Empty	**150** %	Motor Torque at Pulley Speed	**73848**	Nm
Number of Motors on Drive Pulley	**2**	Pulley Shaft Diameter at Brg	**320**	mm
Drive Efficiency	**95** %			

High Speed Coupling			Low Speed Coupling		
HS Coupling Category			LS Coupling Category		
HS Coupling Make			LS Coupling Make		
HS Coupling Model			LS Coupling Model		
Coupling Type			Coupling Type		
Coupling Torque Rating	**0**	Nm	Coupling Torque Rating	**0**	Nm
Service Factor Required	**3.5**		Service Factor Required	**3.5**	
Service Factor Calculated	**0**		Service Factor Calculated	**0**	
Maximum Shaft Bore	**0**	mm	Maximum Shaft Bore	**0**	mm
Minimum Shaft Bore	**0**	mm	Minimum Shaft Bore	**0**	mm
Maximum Rotation Speed	**99**	rpm	Maximum Rotation Speed	**99**	rpm
High Speed Coupling Inertia	**0**	kg-m2	Low Speed Coupling Inertia	**0**	kg-m2
Drawing Number			Drawing Number		
High Speed Coupling Mass	**0**	kg	Low Speed Coupling Mass	**0**	kg
High Speed Coupling Price	**0**		Low Speed Coupling Price	**0**	

Fluid Coupling

☑ Direct Drive

Fluid Coupling **No Selection - Direct Drive**

Fluid Coupling Size

Drive No.	2 Drive		Pulley No.	21	
Drive Description	**Head**		Motor Power Rating	**750**	kW
Load Share on Drive Pulley	**33**	%	Motor Full Load Speed	**1760**	rpm
Starting Torque Factor, Fully Loaded	**150**	%	Motor Torque @ FL Speed	**4070**	Nm
Starting Torque Factor, Empty	**150**	%	Motor Torque at Pulley Speed	**63034**	Nm
Number of Motors on Drive Pulley	**1**		Pulley Shaft Diameter at Brg	**260**	mm
Drive Efficiency	**95**	%			

High Speed Coupling			Low Speed Coupling		
HS Coupling Category			LS Coupling Category		
HS Coupling Make			LS Coupling Make		
HS Coupling Model			LS Coupling Model		
Coupling Type			Coupling Type		
Coupling Torque Rating	**0**	Nm	Coupling Torque Rating	**0**	Nm
Service Factor Required	**3.5**		Service Factor Required	**3.5**	
Service Factor Calculated	**0**		Service Factor Calculated	**0**	
Maximum Shaft Bore	**0**	mm	Maximum Shaft Bore	**0**	mm
Minimum Shaft Bore	**0**	mm	Minimum Shaft Bore	**0**	mm
Maximum Rotation Speed	**99**	rpm	Maximum Rotation Speed	**99**	rpm
High Speed Coupling Inertia	**0**	kg-m2	Low Speed Coupling Inertia	**0**	kg-m2
Drawing Number			Drawing Number		
High Speed Coupling Mass	**0**	kg	Low Speed Coupling Mass	**0**	kg
High Speed Coupling Price	**0**		Low Speed Coupling Price	**0**	

Fluid Coupling

☑ Direct Drive

Fluid Coupling **No Selection - Direct Drive**

Fluid Coupling Size

Designers Comments

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018

Helix

Station / Sectio								Calculated		Selected			
Station	Description	Shaft Length mm	Wrap Angle deg	T1 Run kN	T2 Run kN	Resul-tant Force kN	T1 Start kN	Defl. Dia mm	Dt. Dia mm	Shaft Dia mm	Brg Dia mm	Brg Ctrs mm	Shaft Mass kg
1	Tail	2920	180.0	208.3	209.6	0.4	307.9	247.5	267.5	280	280	2200	1411
17	Head	3020	180.0	369.3	371.5	0.5	650.5	285.6	323.8	340	340	2200	2152
18	Bend	3020	180.0	372.7	374.9	0.4	655.4	286.2	324.8	340	340	2200	2152
19	Drive	3020	180.0	375.2	177.4	0.5	658.7	265.4	304.7	320	320	2200	1907
21	Drive	2860	180.0	179.3	81.8	0.4	274.3	220.0	251.1	260	260	2200	1192
23	Takeup	2800	180.0	83.4	83.9	0.4	83.4	196.9	197.1	200	200	2200	691
24	Bend	2520	10.0	84.8	85.4	0.4	85.7	107.4	87.9	110	90	2200	188

Designers Comments

* Denotes manual pulley shaft dimensions entered

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Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018

Helix

Station / Sectio

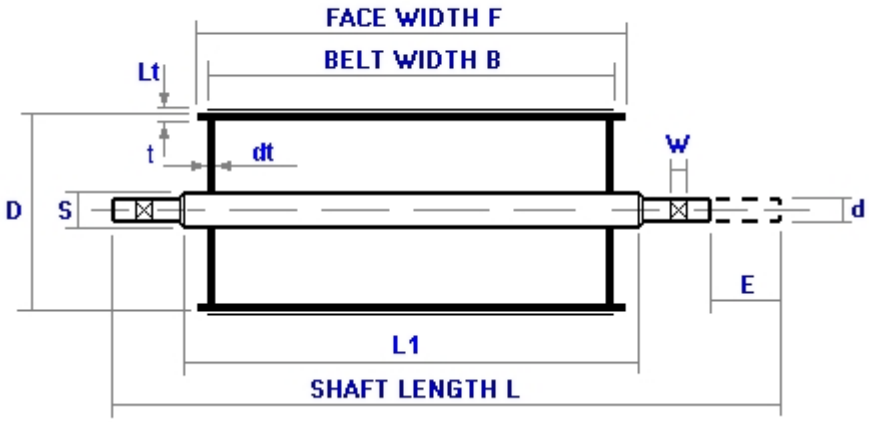
Station	Description	Shell Dia mm	Lagging mm	Face Width mm	Shaft Length mm	Brg Ctrs mm	Shaft Dia mm	Brg Dia mm	Wrap Angle deg	Pulley Speed rpm	Pulley & Shaft Mass kg	Mom of Inertia kgm2
1	Tail	850	12	1700	2920	2200	280	280	180.0	113.6	2573	176.3
17	Head	1000	12	1700	3020	2200	340	340	180.0	97.0	3729	342.9
18	Bend	850	12	1700	3020	2200	340	340	180.0	113.6	3282	193.6
19	Drive	1000	12	1700	3020	2200	320	320	180.0	97.0	3493	336.2
21	Drive	850	12	1700	2860	2200	260	260	180.0	113.6	2363	172.5
23	Takeup	700	12	1700	2800	2200	200	200	180.0	137.2	1555	90.6
24	Bend	700	12	1700	2520	2200	110	90	10.0	137.2	1070	87.4

Designers Comments * Denotes manual pulley dimensions entered

This is a demonstration model of an existing pipe conveyor. The pipe diameter is too small for the load capacity - pipe is 77% full and this is larger than 70% recommended. This may result in material spillage and opeing of the pipe tube and is not recommended. Also, the horizontal and vertical curve radii used are 300m - to 580m - this is too small in some cases e.g the 440m radius at P25 and will cause excessive belt tension rise in the curves. Curve radii should be increased and load decreased. See Curve Calculation for Pipe Conveyor under Calcs menu in Helix delta-T6.

Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Station / Sectio

Station	Description	Shell Dia mm	Shell t mm	Calc Shell t mm	Lagging mm	OD mm	Face Width mm	Shaft Length mm	Shaft Dia mm	Brg Dia mm	Pulley & Shaft Mass kg	Mom of Inertia kgm2
1	Tail	850	17	24.2	12	874	1700	2920	280	280	2573	176.3
17	Head	1000	22	32.2	12	1024	1700	3020	340	340	3729	342.9
18	Bend	850	17	32.3	12	874	1700	3020	340	340	3282	193.6
19	Drive	1000	22	27.8	12	1024	1700	3020	320	320	3493	336.2
21	Drive	850	17	19.1	12	874	1700	2860	260	260	2363	172.5
23	Takeup	700	20	15.3	12	724	1700	2800	200	200	1555	90.6
24	Bend	700	20	15.4	12	724	1700	2520	110	90	1070	87.4

Designers Comments **Belt Width mm 1460**

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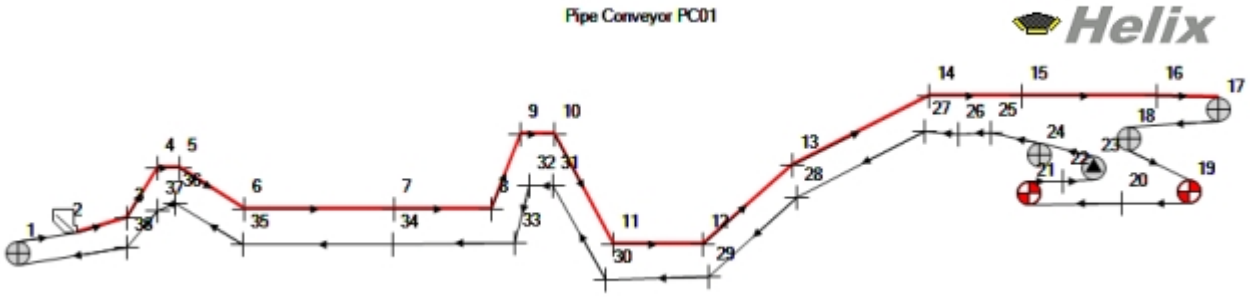
Helix Technologies Pty Ltd

Project	Demo Pipe Conveyor	Client	ABC Engineering
Project No.	Pipe Conveyor Example	Prepared By	PCB
Conveyor No.	Pipe Conveyor PC01	Design Date	19 February 2018



Station / Sectio

Station	Description	Shell Dia mm	Lagging mm	Face Width mm	Brg Ctrs mm	Drive Power kW	Wrap Angle deg	Pulley Speed rpm	T1 Run kN	T2 Run kN	T1 Start kN	T2 Start kN
1	Tail	850	12	1700	2200		180.0	113.6	208.34	209.62	345.9	347.67
									Running	Full	Starting	Empty
17	Head	1000	12	1700	2200		180.0	97.0	369.33	371.52	650.54	653.23
									Running	Full	Starting	Full
18	Bend	850	12	1700	2200		180.0	113.6	372.66	374.87	655.36	657.95
									Running	Full	Starting	Full
19	Drive	1000	12	1700	2200	1500	180.0	97.0	375.23	177.42	658.7	270.76
									Running	Full	Starting	Full
21	Drive	850	12	1700	2200	750	180.0	113.6	179.26	81.85	274.34	80.47
									Running	Full	Starting	Full
23	Takeup	700	12	1700	2200		180.0	137.2	83.36	83.93	83.36	84.29
									Running	Full	Starting	Empty
24	Bend	700	12	1700	2200		10.0	137.2	84.81	85.38	86.08	87.01
									Running	Full	Starting	Empty

Designers Comments

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