

Screw Conveyor Master XL/Reeves Drive Upgrade

Motorized Torque Arm

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Introduction –

This customer services customers by packaging and shipping salt for the food, water conditioning, industrial, agricultural and packaged de-icing markets. Salt is a combination of sodium ion, with a chloride ion, making it one of the most basic molecules on earth. Salt has many uses and is used in some 14,000 commercial applications.

Application Review

- 1) The customer is using a Manually adjusted Reeves Motordrive, 3hp, size 232, 31.4:1 ratio, 134/13.4 rpm with an output chain drive to the Screw Conveyor driveshaft.
- 2) Screw Conveyor Feeding a Bucket elevator. Variable speed control needed to Regulate product flow to the elevator.
- 3) Low Duty cycle, manual speed adjustment based on product size. Corrosive Salt atmosphere, with wide ambient temperature swings



Opportunity –Customer wishes to control speed and product flow remotely via VFD, as well as eliminate drive components, Input Flange Bearing and the potential of mechanical component failures. An opportunity also exists to enhance safety by eliminating drive component pinch points into a compact drive arrangement.

*When Replacing a mechanical adjustable speed drive, starting output torque values can be 250% of actual Running torque, thus an increase in motor hp may be required. (see Example below)

MOTODRIVE TORQUE VALUES AND MOTOR / INVERTER HP REPLACEMENT REQUIREMENT SELECTION												
Torque values for Reeves Motordrive: 3 HP size 232, 31.4:1 ratio, 134 / 13.4 RPM												
<u>Based on running torque</u>												
Motor Base RPM (Hz)	Output Torque (lb-in)	Output rpm	Calculated Ratio	Use Reducer Ratio	Reducer Efficiency	Motor rpm	Hz	Motor RPM % of Base	Speed Factor	Motor Torque Required (lb-in)	Motor HP Required	Use Motor hp
1750	1427	134	13.1	17.89	0.96	2397	82.2	137.0	0.73	83.1	3.16	7.5
60	1890	100		17.89	0.96	1789	61.3	102.2	1.00	110.0	3.06	
	3425	55.2		17.89	0.96	988	33.9	56.4	1.00	199.4	5.54	
(1)	3425	13.4		17.89	0.96	240	8.2	13.7	0.95	199.4	5.83	
<u>Based on starting torque</u>												
Motor Base RPM (Hz)	Output Torque (lb-in)	Output rpm	Calculated Ratio	Use Reducer Ratio	Reducer Efficiency	Motor rpm	Hz	Motor RPM % of Base	Speed Factor	Motor Torque Required (lb-in)	Motor HP Required	Use Motor hp
1750	2378	134	13.1	17.89	0.96	2397	82.2	137.0	0.73	138.5	5.27	10
60	3150	100		17.89	0.96	1789	61.3	102.2	1.00	183.4	5.09	
	5708	55.2		17.89	0.96	988	33.9	56.4	1.00	332.4	9.23	
(1)	5708	13.4		17.89	0.96	240	8.2	13.7	0.95	332.4	9.71	

The starting output torque value is the running torque x 2.5 (250% - motordrive starting capability) divided by 1.5 (150% - inverter starting capability)

Solution –. MTA size 2 M2H21T18C with Screw adapter, adjustable packing gland. Based upon the unique hp/torque capabilities for the Reeves Motodrive we increased the hp to compensate the constant hp/high torque capability of a mechanical adjustable speed drive

SAVINGS CATEGORY	DATA	NOTES
DOWNTIME (UNPLANNED)		
Cost of Unplanned Downtime (\$/hr) or (\$/min)	\$2,000.00	Belt lets go on Reeves or Bearing goes out
Number of Unplanned Downtime Failures (X/yr)	4	Belt slips/breaks Chain Breaks/Bearing goes
Time Spent on Failure Replacement (hr) or (min)	0.5	Depends on Failure
Number of Dodge/Reliance Downtime Failures (X/yr)	0	
Time Spent on Dodge/Reliance Replacement (hr or min)	2	
DOWNTIME SAVINGS SUB-TOTAL	\$4,000.00	
LABOR		
Labor Rate (\$/hr) or (\$/min)	\$100.00	
Number of Total Failures (X/yr)	8	Total = unplanned + planned downtime.
Time Spent on Failure Replacement (hr) or (min)	0.5	
Number of Total Dodge/Reliance Failures (X/yr)	0	
Time Spent on Dodge/Reliance Replacement (hr or min)	0	
LABOR SAVINGS SUB-TOTAL	\$400.00	
MATERIALS		
Cost of Replaced Product (\$ each)	\$10,000.00	
Number of Total Failures/Replacements (X/yr)	0.25	Usually/ Belt/Chain or Bearing replacement
Cost of Dodge/Reliance Product (\$ each)	\$5,000.00	
Number of Dodge/Reliance Failures/Replacements (X/yr)	0	To account for initial purchase of TCO product.
Cost of Other Materials - Shafting, etc. (\$ each)	\$250.00	Shafting/Bearing- No More Bearing CemaScrew
Replacements of Other Materials - Shafting, etc. (X/yr)	1	
Replacements of Other Materials - Dodge/Reliance (X/yr)	0	
MATERIALS SAVINGS SUB-TOTAL	\$2,750.00	
EFFICIENCY		
Existing System (Motor/Gearbox) Efficiency (%)	75	Motor x Gearbox = Total (%)
Dodge System (Motor/Gearbox) Efficiency (%)	85	Motor x Gearbox = Total (%)
Horsepower (HP)	5	
Number of Units	1	
Cost of Energy (\$ / kW Hr)	0.1	
Annual Hours of Operation (Hrs)	4160	
EFFICIENCY SUB-TOTAL	\$243.40	
TOTAL ANNUAL TCO SAVINGS		\$7,393.40