Backstop Size Selection for Conveyor Drive Applications

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BACKSTOP Mounting Arrangements

Preventing reverse rotation of inclined or vertical conveyor systems is one of the most common applications for Backstops. There are many configurations of conveyors systems that employ backstops. This paper presents the most common types and provides examples and calculations needed to properly size the backstop in order to maximize performance and improve safety of the conveying system.

Single and Dual Drives

Backstops for low speed overrunning type are installed directly on the extended head shaft, as shown in Figure 1 and 2. TSUBAKI® recommends the single installation of the Backstop to prevent the reverse rotation of head shaft.

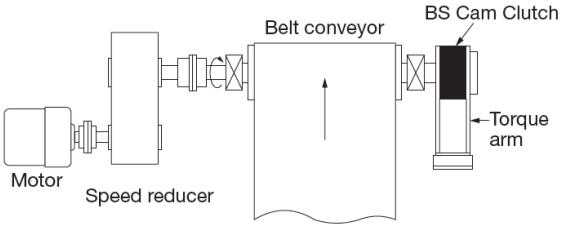


Figure 1

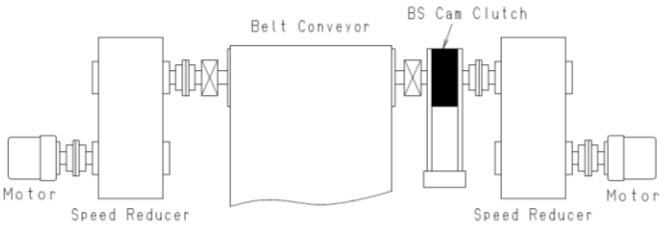


Figure 2

Tandem Drives

When the conveyor arrangement calls for a primary and secondary drive, as shown in Figure 3, the Backstop on the primary drive unit holds the full load. The Backstop on the secondary drive unit holds the back tension from the belt. It keeps belt traction on both conveyor systems.
TSUBAKI® recommends that the Backstop, having the torque capacity equal to the sum of the primary and secondary motors, be installed on the primary drive unit.
The Backstop for secondary drive should be sized from secondary drive motor only.

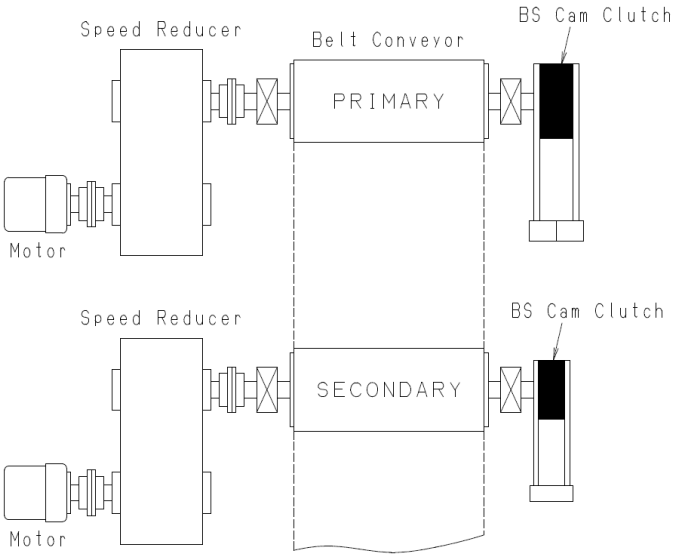


Figure 3

BACKSTOP Size Selection

[Service Factor]

Backstop by definition are required to hold back a load from moving in a reverse direction. Care must be taken in calculating the torque requirements and should be based on maximum or worst case conditions and not average/normal loads. Because any failure of a backstop might result in costly damages or injury, care must be exercised to consider all the possible loads and select appropriate service factors. The Backstop needs to be sized for the breakdown or stalled torque of the drive motors. The following table shoes typical service factors to be applied when size selecting backstops.

Motor Stalled Torque = Motor maximum torque experienced with no shaft rotation

Maximum Stalled Torque or Breakdown Torque % of Normal Motor Rating	Service Factor
175%	1.30
200%	1.30
250%	1.67
300%	2.00

[Load sharing]

The Backstop has no backlash, so two backstops can share the total calculated torque in 50% theoretically. However, we have to consider “Load sharing factor” because Load sharing of backstops on conveyors with multiple drives is a key factor.

Dual Drive Application

For dual drive to a single head shaft, if the required backstop capacity is in excess of the listed capacity in the catalogue, a twin arrangement of Backstop Cam Clutch is the solution, as shown in Figure 4. And we have to consider “Load sharing factor”.

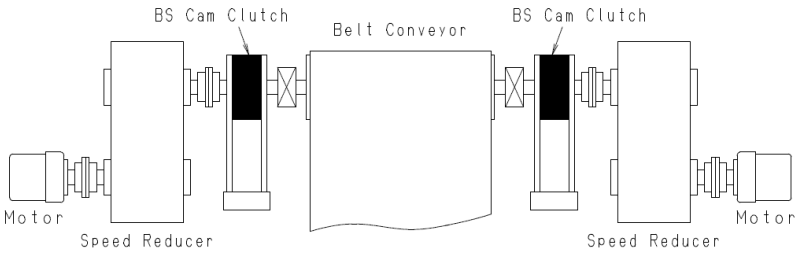


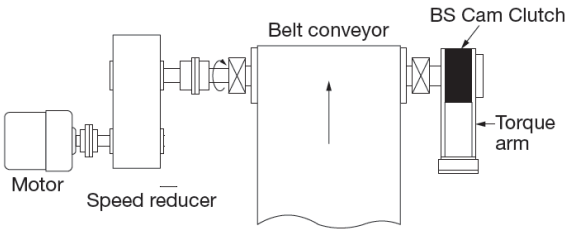
Figure 4

In this usage, load sharing factor becomes 1.7 for two Backstop Cam Clutches, not 2.

Example of Backstop Size Selection

[Example No.1: Single Drive/ Single Backstop]

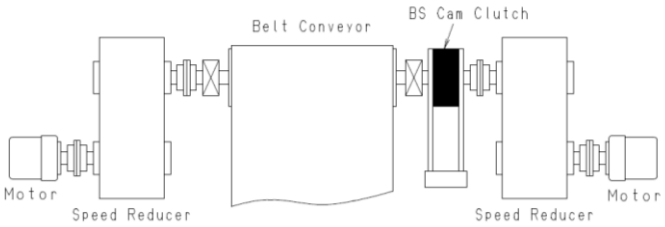
Application information:
Drive motor – 125 HP
Head shaft – 43.75 RPM
Shaft Dia. – 6.00”
250% stalled torque motor – 1.67 SF



Selection:
125 HP X 5250 X 1.67 SF/ 43.75 RPM = 25,050 FT.LBS.
Backstop size = BS165F (Bore range: 3.94 to 6.50”)
Torque capacity of BS165F = 32,500 FT.LBS > 25,050 FT.LBS

[Example No.2: Dual Drive/ Single Backstop]

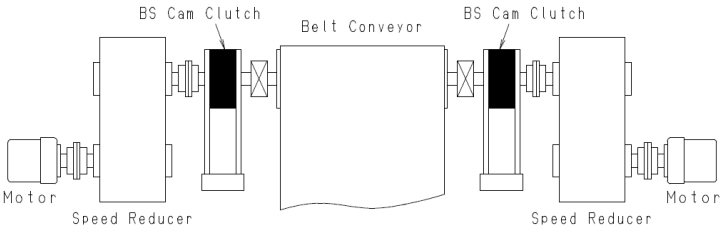
Application information:
Drive motor – 2 X 400 HP
Head shaft – 29.17 RPM
Shaft Dia. – 11.25”
200% stalled torque motor – 1.30 SF



Selection:
2 X 400 HP X 5250 X 1.30 SF/ 29.17 RPM = 187,179 FT.LBS.
Backstop size = BS300F (Bore range: 9.05 to 11.81”)
Torque capacity of BS300F = 254,000 FT.LBS > 187,179 FT.LBS

[Example No.3: Dual Drive/ Dual Backstop]

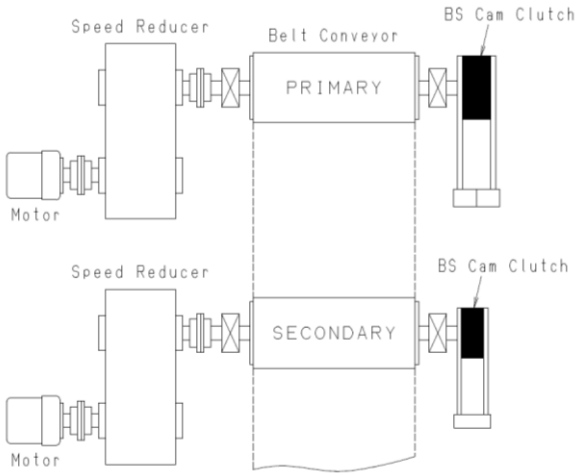
Application information:
Drive motor – 2 X 1000 HP
Head shaft – 31.82 RPM
Shaft Dia. – 13.5”
200% stalled torque motor – 1.30 SF



Selection:
2 X 1000 HP X 5250 X 1.30 SF/ 31.82 RPM = 428,975 FT.LBS.
Correction torque = 428,975/ 1.7 = 252,338 FT.LBS.
Backstop size = BS360F X 2 pcs (Bore range: 9.84 to 14.17”)
Torque capacity of BS360F = 360,000 FT.LBS > 252,338 FT.LBS

[Example No.4: Tandem Drive/ Tandem Backstop]

Application information:
Primary drive motor – 750 HP
Secondary drive motor – 750 HP
Head shaft – 38.89 RPM
200% stalled torque motor – 1.30 SF

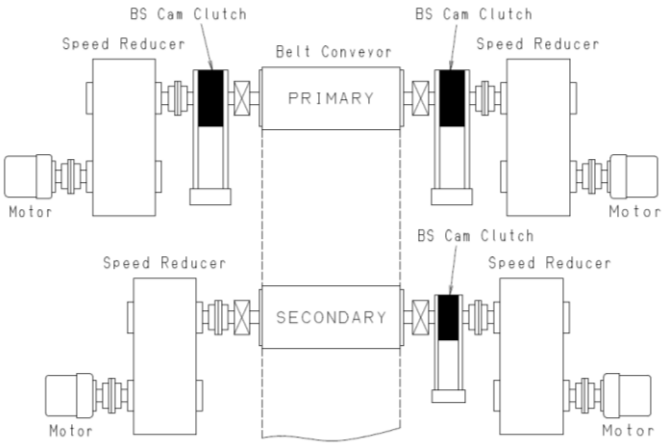


Selection (Primary Backstop):
2 X 750 HP X 5250 X 1.30 SF/ 38.89 RPM = 263,242 FT.LBS.
Backstop size = BS360F (Bore range: 9.84 to 14.17”)
Torque capacity of BS360F = 360,000 FT.LBS > 263,242 FT.LBS

Selection (Secondary Backstop):
750 HP X 5250 X 1.30 SF/ 38.89 RPM = 131,621 FT.LBS.
Backstop size = BS270F (Bore range: 7.87 to 10.63”)
Torque capacity of BS270F = 141,000 FT.LBS > 131,621 FT.LBS

[Example No.5: Dual Tandem Drive/ Dual tandem Backstop]

Application information:
Primary drive motor – 2 X 1500 HP
Secondary drive motor – 2 X 1500 HP
Head shaft – 40 RPM
175% stalled torque motor – 1.30 SF



Selection (Primary Backstop):
4 X 1500 HP X 5250 X 1.30 SF/ 40 RPM = 1,023,750 FT.LBS.
Correction torque = 1,023,750/ 1.7 = 602,206 FT.LBS.
Backstop size = BS465F X 2 (Bore range: 13.78 to 18.31")
Torque capacity of BS465F = 722,000 FT.LBS > 602,206 FT.LBS

Selection (Secondary Backstop):
2 X 1500 HP X 5250 X 1.30 SF/ 40 RPM = 511,875 FT.LBS.
Backstop size = BS425F (Bore range: 12.79 to 16.73")
Torque capacity of BS425F = 542,000 FT.LBS > 511,875 FT.LBS

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