



Belvac Production Machinery Technical Bulletin

Information for Customers Operating & Maintaining Belvac Machines

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THE Belvac Necker (TBN) Linear Slide Bearings and Cam Followers

This tech bulletin serves to provide information on failure modes and inspection methods of the Linear Slide Bearings (# 8951948), and of the Ram Cam Followers (# C93117), which are used on ram assemblies of The Belvac Necker (TBN), see Figure 1 and Figure 2. This tech bulletin will also clarify spare parts recommendation for those two parts.

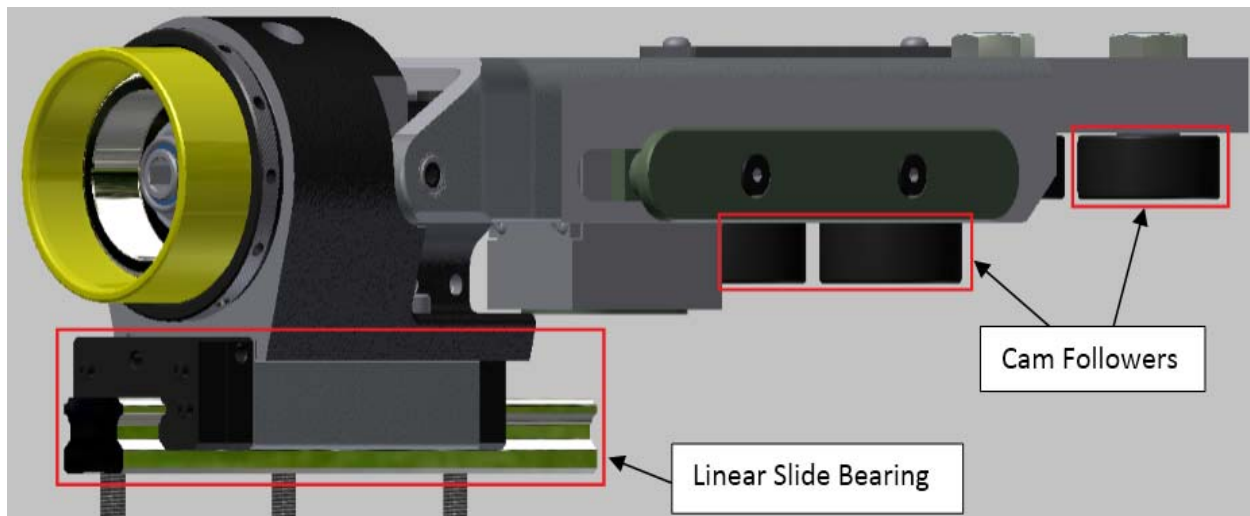


Figure 1: Linear Slide Bearing and Cam Followers as seen on a standard Necker Ram. Linear Slide Bearings and Cam Followers are also used on Flanger and Reformer Push Ram assemblies.

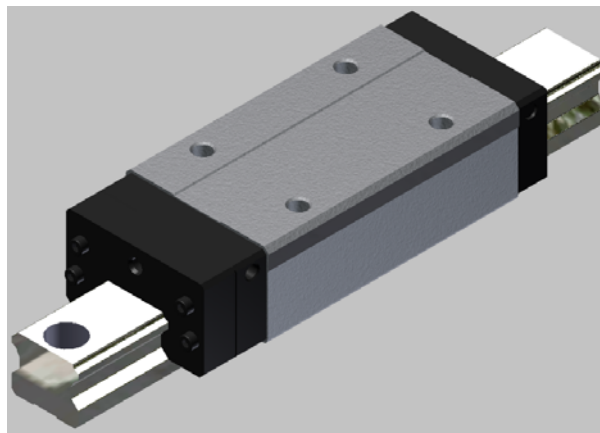


Figure 2: Linear Slide Bearing (# 8951948)



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Linear Slide Bearings

General Maintenance

The Linear Slide Bearings are pre-lubricated and Belvac recommends quarterly lubrication, reference TBN Manual Table 2-3a. Best practices in handling should be followed to ensure no damage occurs during inspection or replacement. The machine area should be kept clean from trash and debris, and the air supply to the machine should be free of particles. Foreign matter contamination is the root cause of several damage modes of the Linear Slide Bearings including Flaking, Gripping Damage, Abnormal Wear, and Cracking and Chipping. See Table 1 and 2 in this bulletin.

Belvac recommends stocking a quantity of Linear Slide Bearings be in your stock for each machine as recommended in the spares list. The Linear Slide Bearings as used on TBN machines service life is longer than the standard warranty period under ideal conditions.

Field Inspection

The Linear bearing life is depended on the plant operation conditions, under ideal conditions the expectancy is several years However, failure may occur with little to no advanced warning even after the bearings are cleared by field inspection.

Belvac highly recommends that all customers begin a replacement program of the Linear Slide Bearings at a pace that replaces all bearings on the machine before they reach the end of their fourth (4) year of service operation to ensure continuous production running. Linear Slide Bearing performance will vary based on plant and operational conditions. Failure to have a replacement program and inspection procedure in place could cause extensive damage to the TBN turret and adversely impact production if a failure were to occur.

Field inspection instructions are provided below as a guideline for inspecting damage to the Linear Slide Bearings. Table 1 and 2 in this bulletin includes possible ways Linear Slide Bearings are damaged and the recommended solutions. A field inspection of the bearings after a crash may provide clues to whether the bearings are a root cause in the event.

- if) Checking the Linear Slide Bearings **off** the turret:
 - i. Place two Linear Slide Bearings end to end, immobilize the rails, and check the entire linear slide track by pushing one bearing housing partially on to the second slide track. Wipe off the track as necessary. Do this for the other Linear Slide Bearing. See Figure 3a.
- if) Checking the Linear Slide Bearings **on** the turret:
 - i. Remove the ram and push the slide housing back towards the base to check the front of the slide track. Check the back half of the slide track by mounting the linear slide removal tool (# 8950719 Rev 01 or later), and pushing one bearing housing partially on to the



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removal tool. Wipe off the track as necessary. The push plate may need to be moved. See Figure 3b.

Check the slide track for any scratches, chips, and discoloration. If any such damages to the track are detected, then replace the entire Linear Slide Bearing (track and housing) immediately.

When reinstalling the Linear Slide Bearings, the slides must be checked for looseness between the mounting block and the rail. A tight fit bearing will help prevent Fretting Corrosion. Take hold of the bearing housing and attempt to move both up and down and side to side: there should be no perceptible wobble or looseness, additionally the linear movement must be smooth moving both forwards and backwards. Upon installation, note the torque specification on Belvac drawing # 8952590.

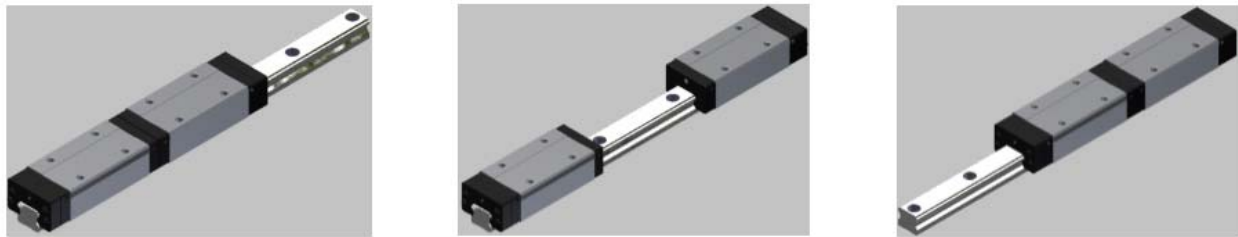


Figure 3a: Checking the slide track with two Linear Slide Bearings off the turret. Note that the rails should be immobilized before sliding the bearing housings.

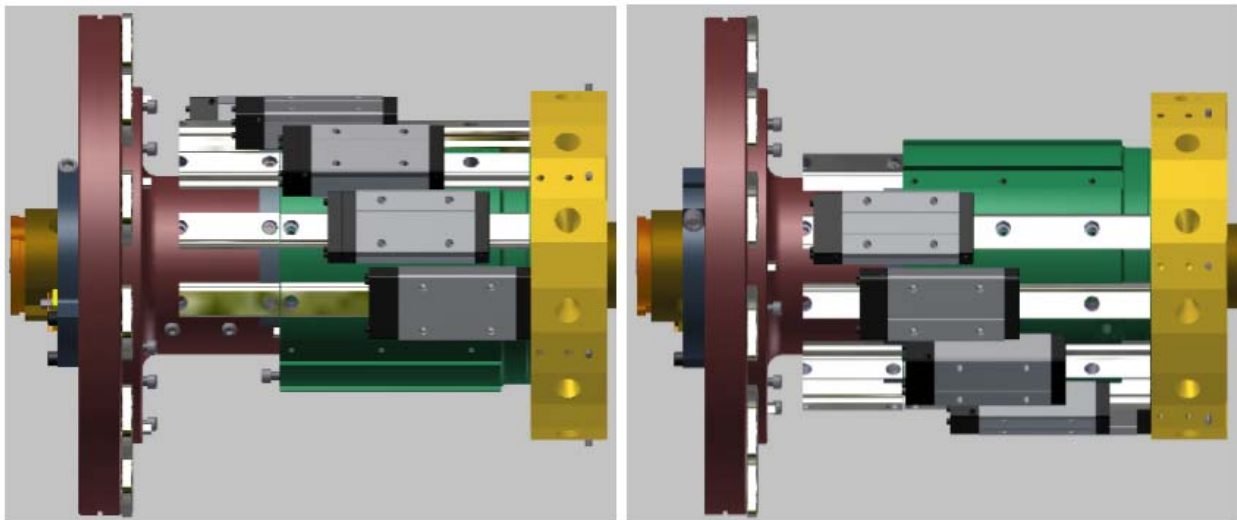


Figure 3b: Checking the slide track with # 8950719, Rev 01 or later, tool on the turret.



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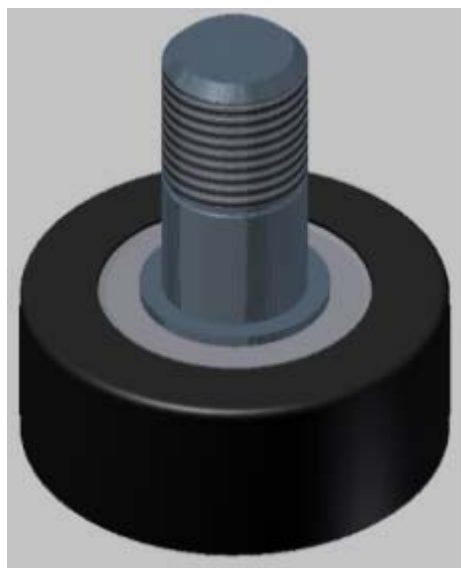
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Cam Follower

The Ram Cam Followers (P/O# C93117), see Figures 1 and 4, are coated with black oxide and have a 20" radius "crowned" rolling surface. The Cam Followers are used on the Necker, Flanger, and Reformer Rams. Belvac recommends stocking a quantity of Cam Followers per machine as recommended in the spares list.



Field Inspection

Since the black oxide coating on the Cam Followers breaks in easily, a discoloration tracking pattern on the surface of the Followers can be visible very early during their usage. See Figure 5. In contrast, the Follower crown is very difficult to see without close, instrument aided inspection. Thus, it is recommended to perform quarterly visual inspections for discoloration, and use those results as the metric for replacing the Followers. The field inspection instruction is provided below.

- i. Inspect the Cam Followers visually. If during visual inspection the black oxide wear is more than 80% of the rolling surface, then the Cam Follower should be replaced. See Figure 6.
- ii. If a Cam Follower does not rotate smoothly, then it must be replaced.



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Figure 5: Light wear on the surface of the Cam Follower. It is common to see wear of this magnitude after the first full day of running the machine.



Figure 6: Significant wear on the surface of the Cam Follower. It is recommended to replace the part.







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Table 1: Linear Slide Bearing Damage Modes. Source: THK

Damage Modes		Details	Solutions	Pictures
Surface Fatigue	Flaking	Fragments of the material break away from the raceway and the rolling elements in scale-like form.	<p>Refill the lubricant at shorter intervals. (Semi-Quarterly)</p> <p>Keep machine area clean to minimize foreign matter contamination.</p>	
	Rust	<p>Surface of the Linear guideway forms rust.</p> <p>Will cause early Flaking</p>	<p>Refill the lubricant at shorter intervals. (Semi-Quarterly)</p> <p>Reconsider storage location (spares).</p> <p>Improve ventilation (High Humidity)</p>	
Plastic Deformation	Indentation	Raceways become dented because of the stress caused by rolling elements.	Ensure the Linear Slide Bearings are securely mounted.	
	Gripping Damage	<p>Raceways become dented because of foreign particles and/or abrasive dust.</p> <p>Will cause early Flaking</p>	Keep machine area clean to minimize foreign matter contamination.	







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Table 2: Linear Slide Bearing Damage Modes Continued. Source: THK.

Damage Modes		Details	Solutions	Pictures
Wear	Seizure	Raceways and rolling elements become discolored and rough. Will cause early Flaking	Refill the lubricant at shorter intervals. (Semi-Quarterly)	
	Abnormal Wear	Raceways and rolling elements wear abnormally.	Refill the lubricant at shorter intervals. (Semi-Quarterly) Keep machine area clean to minimize foreign matter contamination.	
	Fretting Corrosion	Dents are formed with spacing equal to the diameter of the rolling element, with oxide abrasive dust being produced simultaneously.	Refill the lubricant at shorter intervals. (Semi-Quarterly) Ensure the Linear Slide Bearings are securely mounted.	
Fractures	Cracking	Linear guideway element cracks.	Refill the lubricant at shorter intervals. (Semi-Quarterly)	
	Chipping	Linear guideway element partially breaks away.	Ensure the Linear Slide Bearings are securely mounted.	