LM76 Linear Bearings
NEWS
2.2014
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ONLY SOLUTIONS

NO JIVE!

What do you do when you have rapid oscillation, high loads, fine debris and you can't lubricate? Or when typical PTFE's and self-lubricating plastics can't do the job? When an internationally known manufacturer of high speed quilting machines was faced with this daunting set of parameters, they reached out to LM76...and got a solution.

THE Application

1. **Orientation - Horizontal**
2. **High Compressive Load**
3. **High Speed Oscillation**
4. **Contamination - Dust Particles**
5. **Shaft Size 1" Class L .9995/.9990**
6. **Current Bearing: Steel Linear Ball Bearing - Lubricated**
7. **Life Expectancy - 1 month**
8. **Bearings per system 4**
9. **24/7 Operation**

Steel Series Linear Ball Bearing with recirculating balls

THE Issues

Linear ball bearings are a default option when designing linear systems. Although they have many positive qualities, they have several striking weaknesses. In this application, the stroke was too short - linear ball bearings require a stroke of 1 to 1 1/2 x's the length of the bearing to ensure complete circulation of the balls in each circuit. If the same balls are always on the shaft (load position) they don't have the opportunity to pick-up (distribute) lubricant from the grease reservoir located between the outer shell and the inner retainer - you end up with steel on steel. Lubricant is vital in dissipating heat generated by steel-to-steel contact. Further, in rapid oscillation mode, balls violently slam into one another in a high velocity reversing action that leads to retainer failure (loose balls) and shaft brinelling - grooving. Lastly, lubrication (required for linear ball bearings) attracts debris which eventually penetrates protective seals, fouls ball tracks and turns rolling motion into sliding motion - yet another failure mode. Downtime from these bearing failures results in lost time, lost product and lost revenue.

1-800-513-3163 **www.LM76.com**

THE Solution

Initially, we looked at our Minuteman PTFE, Self Lube linear bearing because it is self-lubricating and suited to rapid oscillation. However, once we calculated PV, Minuteman was off-the-table due to its PV value of 30,000. PV (Pressure Velocity) is the combination (PxV) of Velocity and Pressure. It's an inverse formula which works as follows:

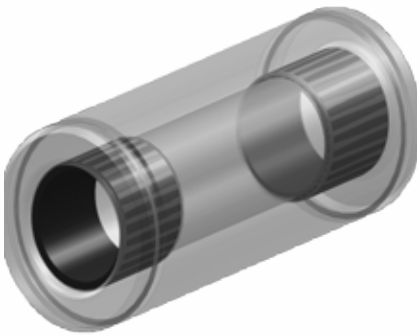
Minuteman PTFE's PV was too Low

Higher Speed (V) - Lower Load (P)
Higher Load - Lower Speed

Our application had a PV of 80,000 which is very high. More problematic is the fact that we have both high load and high speed in our application. Not being able to use a PTFE, we turned to a material that can handle both high loads and high speeds simultaneously, Dupont's® Vespel™ SP21. This material has a PV of 300,000 - more than enough. It also has good dimensional stability, can accommodate both high speed and high loads and is self-lubricating. There's one issue with this material, it's cost is almost always prohibitive unless you are making stator vane bushings for military jet engines. For example, a 1" diameter rod x 12" long is over $1500.00.

After all the math, we spoke with our customer and got approval for 2 design changes:

1. We made the bearing double length to mitigate edge loading and give the bearing more anti-pitch capability.
2. We calculated - given SP21's mechanicals - how many square inches of material would be necessary to handle load/speed and determined we only needed 2 bearing pads at either end of the bearing shell - giving us the performance we needed while allowing a price point that was less shocking. To secure the bearing pads within the aluminum shell, we machined undercuts so they could be snapped into place. All the while making sure we had sufficient contact area, bearing retention and proper sizing to allow for thermal expansion and contraction.



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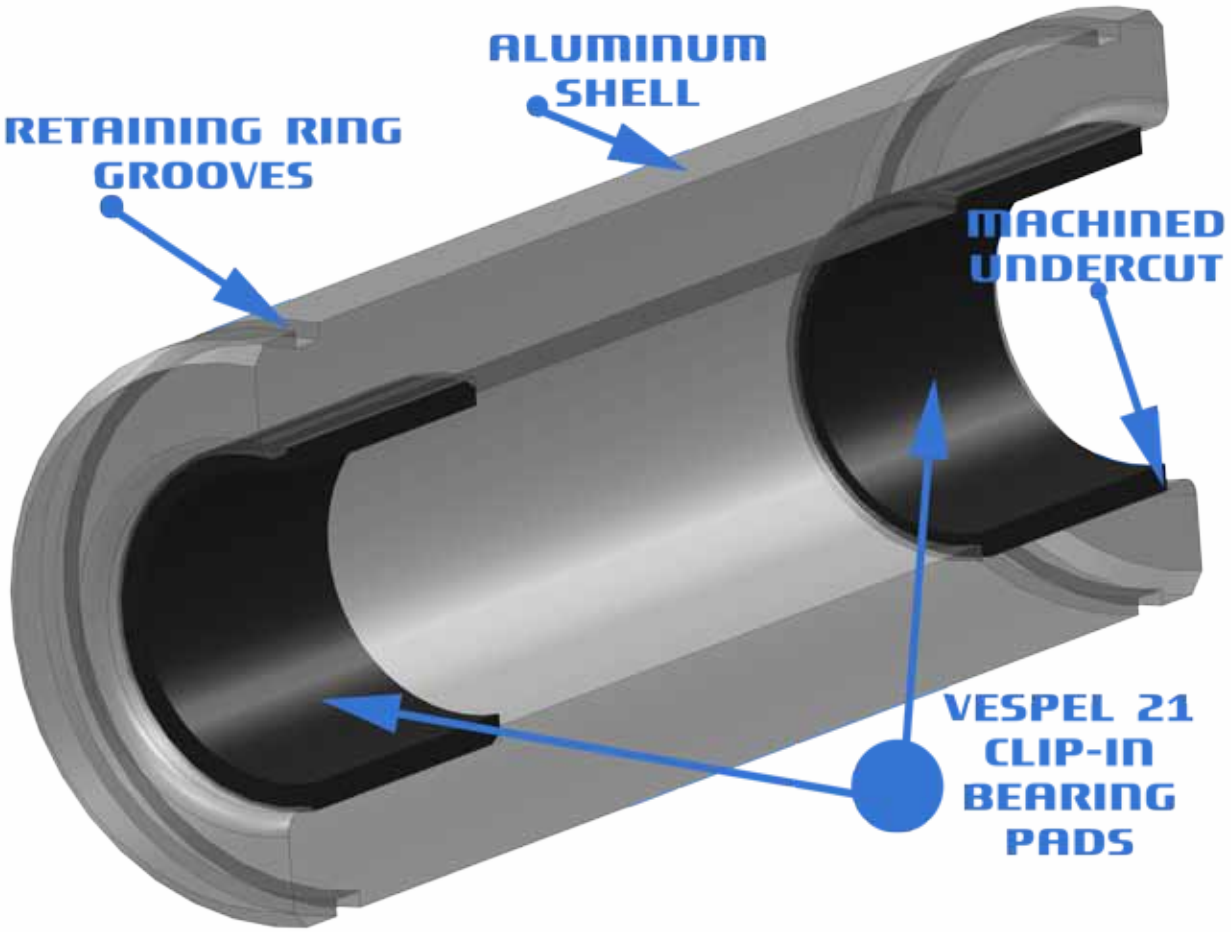

Unlike ordinary ball, needle and roller bearings, DuPont® VESPEL™ 21 bearings:

- need no external lubrication
- perform at temperatures where lubricants break down
- perform well in dirty environments
- can reduce noise, weight and costs
- extend the life of other components by eliminating metal-to-metal wear
- withstand combinations of temperature, pressure and surface velocity beyond the reach of unlubricated metals
- resists creep and mechanical set
- eliminate problems of lubricant loss or migration in the presence of paper dust or lint
- perform at temperatures, pressures and surface velocities that other plastics cannot survive
- increase creep and pound-out resistance

LM76 Linear Bearings

"There are numerous suppliers of linear sleeve bearings. But how many of them can correctly choose materials and engineer them into a demanding application...not many."

John Tarbell - President & Owner LM76

Minuteman PTFE Self-Lubricating Linear Bearings

Black Racer Ceramic Coated Linear Bearings

Linear Shafting

Linear Slides

More Knowledge - More Experience - More Solutions

LM76 was founded in 1976, the parent company J.C. Tarbell had been involved in plain bearing design since 1938 when they became one the first regional distributors for a revolutionary product invented by Walter Chrysler, oil impregnated, sintered bronze bearings. Over the years, J.C. Tarbell moved forward with each new plain bearing material breakthrough: polymers, PTFE's, polyimides and exotic powdered metal technology. LM76 is really an extension of all its history in plain bearing materials - we choose the right material for YOUR application. We distill down to the RIGHT plain bearing material for the job and incorporate it into our linear bearing design. If you can't settle with a catalog offering, call the people who know more about plain bearing materials than anyone else - LM76.

www.LM76.com