Tapered Roller Bearing Test Rig: Axially Loaded Application to Accelerate Bearing Failure

Andrew Compton  
*Virginia Commonwealth University*

Donnie Miller  
*Virginia Commonwealth University*

Thomas Miller  
*Virginia Commonwealth University*

Milton Chandler  
*Virginia Commonwealth University*

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**Project Goal:**
- To design an accelerated fatigue life test rig that will study Association of American Railroad Class K, 6 ½ x 9 inch double row tapered roller bearings by applying an axial load instead of the conventional radial load

**Applied Load:**
- Axially applied loads cause failure to occur at a more rapid pace in Class K bearings due to characteristic simultaneous loading on each roller while in motion (depicted in Fig. 4)

**Components:**
1. Electric Motor – rotates the main driven cone shaft via a gear box
2. Main Driven Cone Shaft – rotates press-fitted cone assembly and secondary cone spline shaft
3. Cone Assembly – rotates inside of the static cup
4. Cup – supported, cooled, and held statically by the split pillow block
5. Secondary Cone Spline Shaft – rotates secondary cone assembly inside of cup
6. Hydraulic Piston – supports secondary cone spline shaft and applies load (19,942 lb) from hydraulic cylinder via slip-fitted thrust bearings

**Testing Method Specifications**
- **Bearing Specifications:**
  - 23 rollers per row          46 total rollers
  - Class K
  - 6 ½ x 9 inch
  - Double row
  - Tapered
- **Axial Load Required:**
  - Total Load required by Piston: 19,941.9 lb
  - Ram Selection: 30,000 lb to allow for increased loading in future applications
- **Heat Generated:**
  - Per roller = 22.12 BTU/min
  - Total = 1017.4 BTU/min
- **Torque Required:**
  - 43.99 lb-ft per roller
  - 2023.76 lb-ft total = 168.65 lb-ft
- **Motor HP:**
  - Total Required: 23.99 HP
  - Motor Selection: 40 HP to allow for increased loading in future applications
- **Cooling Method:**
  - Custom designed oil cooled jacket to allow operating temperature to remain at or below 100 °F

**Results:**
- L10 Rating:
  - 14.75 million cycles
  - 1.1 months or 34.3 days