Electric Motor Bearing Lubrication

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Objectives

- We will address the topic of bearing lubrication by breaking it down into the following categories:
  - Grease lubrication frequency and quantity
    - Ball and roller (rolling element) bearings
  - Oil lubrication frequency and level (quantity)
    - Ball, roller and sleeve bearings

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Relubrication intervals for ball and roller bearings

- Frequency of relubrication is application and product specific
- Depends on parameters such as:
  - Operating temperature
  - Motor shaft speed
  - Bearing size
  - Bearing load
  - Hours of operation
  - Environmental conditions/ contaminants
  - Vibration levels

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Determine grease relubrication intervals

- See figure on next slide
  - Use figure for motors under normal operating conditions
  - Reduce intervals in figure by 50% for conditions such as:
    - Vertical motors
    - Belt load
    - Use in hostile environments

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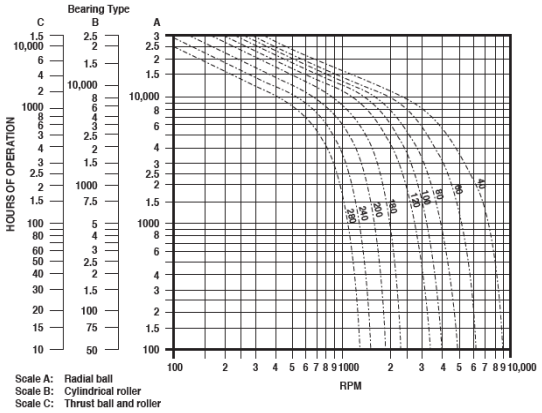
Ball and roller bearing relubrication intervals

Grease relubrication intervals for normal operating conditions can be read as a function of bearing speed and bore. This diagram is valid for bearings on horizontal shafts in stationary machines under normal conditions.



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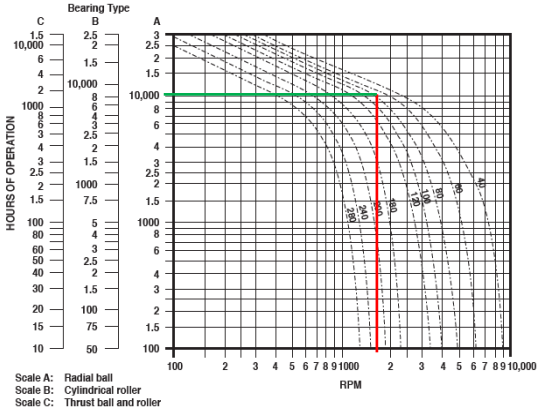
Ball and roller bearing relubrication intervals

FIGURE 10-18: RELUBRICATION INTERVALS FOR ROLLING ELEMENT BEARINGS

Grease relubrication intervals for normal operating conditions can be read as a function of bearing speed and bore. This diagram is valid for bearings on horizontal shafts in stationary machines under normal conditions.



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Ball and roller bearings lubrication steps

1. Relubricate with shaft stationary & warm motor
2. Locate grease inlet and clean around it
   - Replace pipe plugs at inlets with grease fittings
3. Remove relief plug & clean off any caked grease
4. Add recommended volume of recommended lubricant
5. Use hand operated grease gun
6. Run motor for 1/2 hour with relief plug removed
7. Replace pipe plugs and wipe off excess grease

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Shielded bearing lubrication

- Shielded bearings allow a “small” amount of relubrication
  - Empirical evidence shows some oil from lubricant will “find its way” into ball area
- Effect is small and depends on inner race to shield clearance
- Shield also limits amount of foreign material that can enter and cause damage

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Grease compatibility

- Mixing incompatible greases will result in rapid bearing failure
- Only sure way to prevent incompatibility issues is use the same grease
  - Unless BOTH grease manufacturers document that BOTH greases are compatible

Lube type	Manufacturer	Product
Polyurea	Chevron	SRI 2
	Exxon Mobil	Polyrex EM 103
	Shell	Dolium BRB
	Shell	Stamina RLS
Lithium	Exxon Mobil	Unirex N2
	Lubriplate	EMB
	Shell	Alvania RL3
	Shell	Gadus S5 (was Albida MPS)

Potential substitutes for Polyrex EM
Polyurea compatibility unknown
Lithium *not* compatible

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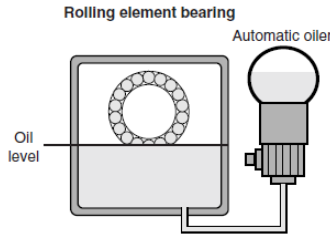
Ball and roller bearing oil level -- horizontal

- Horizontal shaft applications
  - Oil level should be maintained at approximate center of lowest rolling element when motor is not operating



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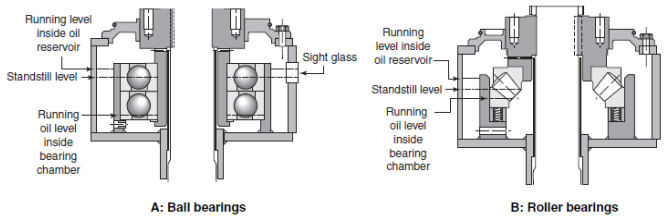
Ball and roller bearing oil level -- vertical

- Vertical shaft applications
  - Oil level should be maintained at approximately 50% submergence of rolling elements



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Rolling bearing lubricating oil change frequency

- Oil change interval depends on:
  - Operating conditions
  - Type and quantity of oil
- Effect of oil operating temperature
  - 50°C (120°F) or less: replace once a year
  - 80°C – 100°C (175°F – 210°F): replace at least quarterly
- Critical equipment: analyze oil at least every quarterly
  - To determine when oil replacement is needed

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Rolling bearing oil viscosity -- horizontal

ISO viscosity grades for light/normal load or [heavy/impact load]			
Operating temperature °C (°F)	$d^m n$ value		
	600,000 or higher	300,000 to 600,000	300,000 or lower
-30 ~ 0 (-22 ~ 32)	15, 22 or 46 (all loads)	15, 22 or 46 (all loads)	15, 22 or 46 (all loads)
0 ~ 60 (32 ~ 140)	7,10 or 22 [N/A]	32 [56 or 68]	56 [68]
60 ~ 100 (140 ~ 212)	22, 32 or 56 [N/A]	32 or 56 [56 or 68]	56 or 68 [68 or 100]
100 ~ 150 (212 ~ 302)	N/A (all loads)	56 or 68 [68 or 100]	56 or 68 [100 to 460]

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Rolling bearing oil viscosity -- horizontal

- Example:

  6210 bearing (ID 50 mm, OD 90 mm)

  3600 rpm [n] 90°C normal load

- Calculations:
  - Bearing pitch diameter (d_m) = (ID + OD)/2 = (50 + 90)/2 = 70
  - Speed factor ($d_m n$) = 70 x 3600 = 252,000
- From viscosity grade table select:
  - ISO VG 56 or VG 68 turbine oil

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Rolling bearing oil viscosity – vertical

- Use table below as a guide for selecting oil viscosity, regardless of bearing size and speed
  - If motor lubrication plate specifies synthetic oil, DON'T substitute another oil

Parameter	Angular contact ball thrust		Spherical roller thrust	
Ambient temperature range	Up to 38°C (100°F)	Above 38°C to 60°C (100°F to 140°F)	Up to 4°C (40°F)	Above 4°C to 60°C (40°F to 140°F)
ISO VG	32	68	68	150

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Oil lubrication frequency for sleeve bearings

- If available, use relubrication intervals based on manufacturer instructions, or as a guide:

Ambient starting and operating temperature range °C (°F)	Shaft speeds (rpm)	ISO Viscosity range	Lubrication interval
Below 10°C (50°F)	All	Consult manufacturer	---
10°C to 32°C (50°F to 90°F)	Above 1800	32 to 68	5000 operating hours or 1 year, whichever comes first
	Up to 1800	68 to 100	1 year
Above 32°C (90°F)	All	Consult manufacturer	---

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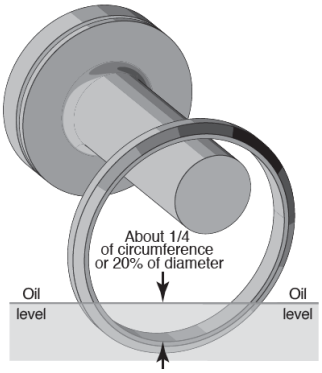
Sleeve bearing oil level

- If available, use manufacturer oil level
- If not, use general guideline: oil rings should be immersed
  - Approximately 1/4 of circumference
  - Or 20% of diameter



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Closing note: bearing temperature limits

- Suggested limits:
  - Normal operation 80°C (176°F)
  - Alarm 90°C (194°F)
  - Trip 100°C (212°F)
- These limits are applicable to all bearings
  - Ball
  - Roller
  - Sleeve

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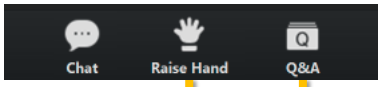
How to ask questions

Joined using web browser + Zoom plugin



Wait to be called on

Submit written question

Ask question verbally

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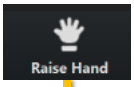

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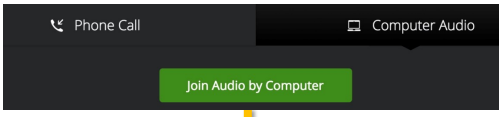

Ask question verbally

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Next webinar

Using EASA Internal Connection Diagrams

Wednesday, May 18, 2022

7:00 AM, 12:00 PM & 4:00 PM CST

Presented by Mike Howell

EASA Technical Support Specialist

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Survey / Recording

Tomorrow, you will be emailed:

- A link to a survey if you would like to provide feedback.
- A link to a recording of this presentation.

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