

From the perspective of grease replenishment

How it normally works (in good systems)

- There is a plan (time-based, or “feelings-based” ...)
 - There is a Lube technician
 - There are some assets
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- Grease technician goes out, executes the plan on the assets
 - Comes back (normally with checkmarks on his work order)

Entire flow:

- It starts with
- It ends with

$$T = K \times \left[\left(\frac{14,000,000}{n \times (d^{0.5})} \right) - 4 \times d \right]$$

Where:

T = Time until next relubrication (hours)

K = Product of all correction factors
Ft x Fc x Fm x Fv x Fp x Fd
(see table)

n = Speed (RPM)

d = Bore diameter (mm)

Note:

ips = inches / second

0.2 inches / second = 5 mm / s

Grease Interval Correction Factors

Condition	Average Operating Range	Correction Factor
Temperature Ft	Housing below 150°F	1.0
	150 to 175°F	0.5
	175 to 200°F	0.2
	Above 200°F	0.1
Contamination Fc	Light, non-abrasive dust	1.0
	Heavy, nonabrasive dust	0.7
	Light, abrasive dust	0.4
	Heavy, abrasive dust	0.2
Moisture Fm	Humidity mostly below 80%	1.0
	Humidity between 80 and 90%	0.7
	Occasional condensation	0.4
	Occasional water on housing	0.1
Vibration Fv	Less than 0.2 ips velocity, peak	1.0
	0.2 to 0.4 ips	0.6
	Above 0.4 (see note)	0.3
Position Fp	Horizontal bore centerline	1.0
	45 degree bore centerline	0.5
	Vertical centerline	0.3
Bearing Design Fd	Ball bearings	10
	Cylindrical and needle roller bearings	5.0
	Tapered and spherical roller bearings	1.0



Ultrasound
Solutions

What happens at the beginning?

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(see table)

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- Can we trust calculations & plans?
 - There are too many variables, constantly changing
 - There is very little that we know for certain
 - Not to mention a start-stop regime, variable load, unbalance, misalignment, bad installation ...
- We simply assume a lot

What happens in the end?



- Can we trust the checkmark?
 - It certainly proves the green pencil was used (100%)
 - It does not prove that plan was executed properly
 - It does not prove that plan was executed at all
- It certainly says **NOTHING** about bearing condition
 - and that might be important ...

Something is missing

- There are three basic questions, quite common sense;
 - Does bearing need grease?
 - How much?
 - Is it better now?
- This resolves “*can we trust*” part, mentioned before
- But where are the answers?

Assumed, calculated or measured?

- Those three questions happen at different moments
 - They determine further action
 - So, we need answer right there, at that moment
- Trying to provide answers before the event is impossible
- Providing answer after the event is too late

The only way ...

- to provide those answers and guide the action:
 - Measurements determining “as found” condition
 - Measurements determining the response
 - Measurements confirming the outcome

The only person is ...

- At the end of the execution chain at end user site
 - **Lube technician**, aka grease guy

Digital tools ..

- In the context of greasing, certainly Ultrasound
- In hands of person directly involved with assets
 - Using high technology ...
 - With high level training ...
- Changes everything



- So much done in observing - **monitoring the condition**
- We forgot those who **create that condition**

Rapid transformation

- One that can cause the most damage,
- Becomes the one delivering highest benefit
- End user's competencies and capabilities make a difference

Thank you

