AGENDA

• A little about our company
• Lubrication survey
• How to pay for a new piece of ultrasound equipment in one day
• Questions
HERMAN MILLER HISTORY

• Herman Miller began in 1923 as a manufacturer of traditional residential furniture.
• Became a leader in “modern” furniture in the 30’s, 40’s & 50’s
• 1960’s- Transformed to the Office industry with the first Panel System.
• Invented and refined ergonomic work seating in the 70’s, 80’s & 90’s
• 2000’s Reinvented the geometry of systems furniture, and now is the 3rd largest office furniture company in the world.
LUBRICATION SURVEY
SEARCHING FOR OPPORTUNITIES
TO IMPROVE
SYSTEM/EQUIPMENT NUMBER

• Common plant name
• What is it called?
• What does it do?
LUBRICATION TYPE AND BRAND NAME

• Grease
• Lube oil
• Hydraulic
• Etc.
VISCOSITY

• Oil grade (ISO VG-SAE-SSU)
• Grease type (include NLGI number and soap type)
• Obtain a copy of each product data sheet, available online. This will provide specific test results for comparison to application and/or other lubricants
GREASE

• Does the equipment have a tag identifying the proper grease type and the maximum amount to apply?
• Access bearing manufacturers’ data sheets for proper amounts and types of grease.
GENERAL RE-LUBRICATION AMOUNT

• The formula for determining re-lubrication grease amount is:

\[ G = 0.005 \times D \times B \]

where:

\[ G = \text{grams of grease} \]
\[ D = \text{bearing outside diameter in millimeters} \]
\[ B = \text{bearing width in millimeters} \]

• For nearly all bearing applications the bearing should never be more than 1/3 full. Over greasing is a significant cause of bearing failure.
OVERGREASING
GREASE WITH ULTRASOUND

• Using a grease caddy, or Ultraprobe 10,000 or 15,000 place probe on bearing and slowly add grease until db reading falls and starts to climb. Note the amount used.

• Use your CMMS to see when it was last greased and calculate amount used per week.

• Post at grease site the approximate amount used per week. You can use the manufacturers suggested amount and the ultrasound results to shorten or increase the time between servicing the equipment.

• Use ultrasound to grease every time and you will have a baseline amount to use as a guide from previous calculations.
GREASE CADDY
COLOR CODED GREASE ZEROKS AND CAPS

• Does a color coded grease cap exist identifying the required grease type?
• In addition to identifying the proper grease, the cap lessens the possibility of injecting dirt into the bearing while greasing
• The color coded zerks and caps also help to identify the location of the zerks
BEARING DRAIN PLUGS

• Is the bearing drain plug accessible and/or has the drain plug been replaced with a pressure release plug?

• The best practice is to remove the drain plug, apply grease slowly while the motor or shaft is turning, and allow excess grease to drain for about 1/2 hour. **SAFETY FIRST - THIS IS NOT ALWAYS POSSIBLE**

• Pressure release plugs or pressure release grease zerks help to avoid over greasing problems
PRESSURE RELIEF FITTING
BEARING NUMBER

• A bearing name plate at the site is extremely helpful. This helps in determining bearing size and re-lubrication volume. It is a good idea to have it documented.

• A plate at the bearing site stating the volume of grease required is helpful
GREASE GUNS

• Are dedicated and calibrated grease guns by lube type utilized?
• Are the grease guns color coded and the volume per stroke clearly marked on the gun?
• Grease guns with short handles that can be operated one handed create less pressure than others and may help lessen the chance of damaging the bearing seals
• Keep the applicator end covered to lessen possibility of contamination
GREASE GUNS
METERED GREASE GUN
OIL TYPE

• Is the oil type used clearly labeled on the equipment?
• Is the oil type color coded
• This is helpful if your makeup oil containers, used for refilling and topping off reservoirs, are also color coded - highly recommended
LABELING
RESERVOIR SIZE

• This is required to determine replacement value and oil analysis justification. If replacing the oil is less than the cost of extending oil replacement in the current schedule, there may not be value in performing the analysis.

• However, proper identification of oil type is required. You also need to consider your history for catastrophic failure of similar equipment. If in the past, wear analysis could have avoided an expensive repair, then analysis should be considered and may be cost effective.
RESERVOIR SIZE
GENERAL CONDITION OF RESERVOIR

• Rusted
• Corroded
• Leaking
• General state of disrepair
• If yes to any of the above, this will have to be addressed
IS THE RESERVOIR COMPLETELY SEALED AND VENTED

• It is extremely important to remove moisture and contaminants transported through the exchange of air during ventilation. This occurs during normal operation of a hydraulic system, and desiccant breathers help to keep the oil clean and dry.

• Open vents are generally not acceptable, especially when particle and water contamination is a problem. What does your oil analysis indicate?
SEALED AND VENTED RESERVOIR
OIL ANALYSIS RESULTS

Machine Condition: NORMAL
Lubricant Condition: CRITICAL
2205 PAN FORMER

Tel: 216-251-2510, Fax: 216-251-2515

Analysis Report

Lube Type: SHELL TELLUS 46
Machine MFG: UNKNOWN
Machine MOD: CUSTOM
Machine Type: Hydraulic System

Problems:
*** Low VISCOSITY 40C.

The viscosity result (32.2 cSt) is out of range due to introduction of oil with lower viscosity. The viscosity specification for this fluid is 46 cSt.

HERMAN MILLER assumes sole responsibility for the application of and reliance upon results and recommendations reported by Insight Services, whose obligation is limited to good faith performance.
LEAKS?

• Are there any leaks in the system?
• You must develop the mindset that no leaks are acceptable. Small leaks become big leaks and **if fluid can leak out, contaminates can be sucked in.**
LEAKS?
OIL SAMPLING

• Is there a sampling valve installed in a primary location? The spot where the most representative sample can be obtained is the return line just prior to the reservoir is optimum.

• Sampling at any other location is only useful in isolating problems.

• The primary sampling location must be clearly marked to ensure the correct location is used.

• If vacuum pumps are used to obtain a sample, care must be taken not to draw the sample from the bottom. Mid sampling is ideal.

• **Never utilize drain plugs/valves for samples.** Everything heavy settles to the bottom, including water, and you will not get a representative sample of the systems fluid.
SAMPLING PROCEDURES
FUNNELS AND OIL CONTAINERS

• Are there any dirty, rusted funnels?
• How about containers that are not labeled?
• THROW THEM AWAY - - - - - NOW
FUNNELS?
OIL DRUMS

- Are oil drum containers stored, at a minimum, in a designated area?
- Ideally lubricants should be stored in an environmentally controlled area. If this is not an option, ensure drums are stored horizontally. If left vertical, there is a possibility of water being sucked into the drum during temperature changes.
- This also applies to drums taken out into the production areas. Try to find a location away from traffic areas and avoid dusty locations.
- Keep containers loosely covered. Drum covers/lids may also be helpful. Never completely cover drums or oil transfer filter equipment in plastic wrap. Moisture will develop.
- All makeup oil containers must be kept sealed in a relatively clean environment. Particles as small as one micron or .0000394 inches can cause damage to components. A grain of salt is about 40 microns in size.
OIL DRUM STORAGE AREA
OIL DRUM BUNGHOLEs

• Are bungholes tightly capped when not in use?

• Contamination of moisture, dust and dirt particles will happen if bungholes are not kept tightly sealed.

• Are air breathers used during lubricant removal from supply drums? This will remove another source of contamination.
OIL DRUM BUNGHOLES
IS EVERYTHING CLEARLY LABELED?

• Non-labeled containers must be disposed of properly.
• Are transfer pumps clearly labeled by oil type?
• Are waste oil drums clearly marked?
• Are empty drums removed and recycled in a timely manner?
PROCEDURES

• Are transfer procedures posted in the oil storage/supply transfer area?
• There is less chance for someone to say “I didn't know" when procedures are posted
FILTERED TRANSFER SYSTEMS?

• Are filtered transfer systems used during the refilling and makeup oil process? This is a must.
• Any time oil is being transferred from the original container to a clean makeup oil container or to a reservoir, the oil must be filtered to a level of 6 microns or less.
• Oils from suppliers are typically not delivered to this standard.
• “Clean" means microscopically clean, not just visually clean. Damaging particles cannot be seen by the un-aided eye.
• Always use lint free rags when handling lubricants. Fibers can also present problems.
OIL ANALYSIS RESULTS

Analysis Report

Lube Type: ROYAL PURPLE SYNDALIC 46  
Machine MFG: N/A  
Machine MOD:  
Machine Type: Storage Tank  
Problems: *** EXCESSIVE PARTICLE COUNT.  
The particulate contamination exceeds our limits for a storage tank (21/18/16). High particulate contamination will lead to abrasive wear and damage internal components. Reducing particle levels will significantly extend component life.

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<th>Lab No.</th>
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SPECTROSCOPIC ANALYSIS (ppm) ASTM D 518

Iron: 0  
Copper: 0  
Lead: 0  
Aluminum: 0  
Silicon: 0  
Nickel: 0  
Chromium: 0  
Vanadium: 0  
Boron: 0  
Phosphorus: 0  
Calcium: 0  
Magnesium: 0  
Potassium: 0  

VISCOSITY (centistokes) ASTM D 445

<table>
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<th>SAE Grade</th>
<th>Viscosity</th>
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FTIR SPECTROSCOPY (indexing numbers) JCPD Method

Ind. Wear: 32  
Viscosity: 3  
Other Fluid: 34  
Oxidation: 34  

PARTICLE COUNT (particles per ml) ISO 4406:99

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SINGLE COMPONENT TESTS

Water %: Neg

Machine Condition: UNKNOWN  
Lubricant Condition: MARGINAL

New Royal Purple Syndallic 46
OIL TRANSFER SYSTEM
NEW OIL - - - OLDER OIL

• Is oil managed so that the older oil is utilized first?
• Oil has a shelf life. You should always try to keep it fresh.
GREASE

• Are greases adequately stored? Are they stored in a cool clean environment?
• What do the ends of the grease guns look like? When was the last time they were wiped clean?
• Are the grease guns marked with the volume available per pump of the handle?
• Is the type of grease present in the grease gun readily discernable?
• Is the grease gun stored in a clean environment?
GREASE STORAGE
TRAINING

• Find a technician. Pick a work center and ask how he determines which type of grease to apply. How does he complete the lube process?

• If you get the answer, "whatever is in my grease gun," you have some training to do.

• Does he wipe off the end of the grease gun and the zerk before re-lube? Does he wipe off the grease zerk after re-lube and replace the zerk cap? If not, you have some training to do.
GREASE GUNS

• Are dedicated and color coded grease guns for each type of grease used?
• Either the color should match the color of the grease zerk or some markings should be present on the equipment to note what type of grease should be used.
• Is each grease gun etched or labeled in strokes per ounce or grams?
• Procedures that state "four strokes" mean nothing when all grease guns are not created equal. The amount needed must be stated in grams or ounces to prevent under or over greasing.
GREASE GUN STORAGE
GREASE GUN STORAGE
GREASE ZERKS

• Are the grease zerks color coded or in some way clearly marked for type of grease?
• Are relief zerks used to prevent over greasing?
• Is old grease present on and around the grease zerks? This will lend itself to contamination entering the bearing.
• Color coded grease zerks remove the mystery of which grease to be used. It also helps a technician easily recognize where the grease zerks are located.
• Grease zerks must be wiped off and covers should be put in place to avoid bearing contamination.
• Always wipe off grease zerks before re-lubrication of the bearing to avoid particulate contamination of the bearing. Particles as small as one micron; which is .0000394 inches, can cause damage to a bearing.
ZERKS
GREASE ZERKS AND GUNS

1) Clean off each Grease fitting with a clean rag.
2) Remove the Grease Fitting from its component.
3) Using the proper grease, pump the Fitting: 2 pumps.
4) The Cap “donut” goes under the Grease Fitting shoulder.
5) Screw the Grease Fitting back into the component.
6) Pump fitting 1X more, clean the excess off Fitting, then Cap.
   Note: Color Coordinate your Caps to Grease gun sleeves!
CHALLENGE

Use excellent lubrication practices to eliminate all lubrication related equipment breakdowns

START TODAY
REFERENCES

• MAINTENANCE AND RELIABILITY LUBRICATION 101, keeping it simple. By RICKY SMITH CMRP AND DAVID A. MARTIN CMRP
ULTRASOUND AND COMPRESSED AIR LEAKS

• Compressed air leaks are huge energy hogs
• Finding them, repairing them, and most of all changing old habits to prevent them will impact your bottom line
POTENTIAL SAVINGS

• YEAR ONE: $200,000
• YEAR TWO: $150,000
• YEAR THREE: $100,000

• Year three was impacted with higher than expected results due to one facility of equipment being moved into two others. Anytime equipment is moved new leaks are found.
PAID FOR ULTRAPROBE 10,000

• Two days after getting our Ultraprobe 10000 it was paid for by finding and repairing one leak
• ROI has never been easier
First leak found with the Ultraprobe 10000 was an Argon gas leak. 30 dB leak @ 75 p.s.i. line pressure = $13,182 potential annual savings
AIR LEAKS 1
AIR LEAKS 2
AIR LEAKS 3
REASONS FOR LEAKS

1. 60% of all leaks are due to “no thread sealant on joints”
2. Training – non-maintenance personnel completing equipment installs
3. Swivel and push lock fittings
4. Air lines that become brittle and or take a set in a push lock fitting
5. Air valve seals – probable due to equipment vibration
6. Only 10 to 15 percent of all compressed air leaks are due to things like worn gland seals on cylinders, equipment reaching the end of its’ life cycle, etc
YOUR BEST FRIENDS TO PREVENT AIR LEAKS
QUESTIONS??