

ROCKY MOUNTAIN MASTER MECHANICS ASSOCIATION

May 5, 6, 2011 Sheridan, Wyoming

Scott Anderson Chairman Kelly Hardy Vice Chairman-Mobile

Mike Lucy Vice Chairman-Plant Miles Dockter Secretary/Treasurer

BUSINESS SESSION;

- Next meeting December 8th and 9th, Holiday Inn, Rapid City, SD
- Spring 2012 meeting May 3rd and 4th Holiday Inn, Sheridan, WY
- 2011 Scholarship recipients
 - Trapper Rieniets Gillette, Wyoming
 - Austin Smith Zap, ND
 - Nathaniel Tryon Gillette, WY
 - Lucas Schaaf Glen Ullin, ND
 - Seth Johnson Moorcroft, WY
 - Brian Alderin Center, ND
- Account balances as of May 1st
 - \$20,253.97 Checking
 - \$38,071.62 CD
- Safety Topic
 - Mick Velder spoke briefly regarding the use of hearing protection
 - Stated that as a young man he rarely used any protection
 - Showed the group the hearing aids he now must use because of lack of protection
- Scott ended the business portion with some general announcements

DONALDSON FILTERS www.Donaldson.com

Scott Grossbauer Greg Myers

- Methods of reducing component wear
 - Low initial fluid contamination level
 - Efficiency of filtration
 - Ratio of contamination to filtration
 - Cycles fluid passes through filtration
- Different components obviously require different filtration ratings

- Two methods of filter rating
 - Beta
 - Micron
- Bulk filtration is accomplished in a single pass of fluid through filter
- OEM specifications for newer high pressure common rail fuel systems require very clean fuel
- Problems with filtration
 - Vibration, the more vibration the less the efficiency
 - Sloughing, caused by starting and stopping
 - Erosion, caused by particles 4 microns or smaller
 - Contamination in delivered fuel
 - Inherent instability of bio-diesel
 - Various challenges associated with fuel additive usage
- Electrostatic discharge is a state where an electrostatic charge builds up as fuel passes through filter
- Proper breather on storage tank helps prevent water buildup and keeps tank clean
- Summary
 - Bulk filtration achieves reliable results in a single pass
 - Concentrate on results not micron rating
 - Bulk filtration is recommended to allow on board filters to meet OEM specifications
- Questions and Answers
 - What causes black material in filter?
 - Heating of fuel possibly from dieseling
 - Exact cause unknown
 - What does an Oil Renewal System do to a fuel filter
 - The effects are minimal
 - Ultra low sulfur fuel can experience free water issues

- Any filtration issues caused by fuel additives?
 - Additives from different sources can react adversely with one another to cause filter plugging problems
 - Cold weather may cause additives to drop out causing filtration problems

TIRE SAFETY

Mick Velder

- Mick showed pictures of massive damage resulting from right front scraper tire explosion
- Explosion can result from heat induced gas combustion inside of tire
- What can contribute to tire overheating
 - Load
 - Speed
 - Distance
 - Inflation
 - Brakes
 - Ambient temperatures
 - Welding on rims
- If you smell a hot tire stay away for a minimum of two hours
- Best practices
 - Do not weld wheel parts
 - Always deflate before performing maintenance
 - Use a stand off inflation device
 - Remove from service any defective tires or rims

SAFETY DISCUSSION

- Chains are no longer in use at many locations
- Keep an eye on tire lock rings
- If you have anything stuck between duals deflate tires before removal

- Could retain stored energy
- What methods are being used to inflate tires?
 - A long whip
- Be aware of harmful side effects of using cleaning products/solvents
 - Comment made that it is hard to find a product that cleans as well as older products

OPEN DISCUSSION

- How much weight is used on a 10T to balance machine?
 - 5,000 lbs
 - 7,200 lbs for D11
- Anyone using Power Steps on dozers?
 - Yes
 - How much maintenance?
 - Routine if done on PM's
 - Design is good
- Any solutions for oil filters coming loose on 3400&3500's?
 - Replaced all filter studs
 - Require new housings upon rebuild
 - Where finding that stud was not being replaced on rebuild
 - Make sure that filter is being installed properly
 - Read instructions
 - Some locations have went to all Cat filters
- Anyone seen uneven wear from one of dozer rails to the other and why?
 - Lots of discussion but no concrete solution
- Any problems with pivot shafts bending?
 - Only with re-man shafts which were found to be too soft

- Using double or single flange rollers?
 - Some doubles on D-10's
- Does anyone rotate rollers?
 - Yes, to extend life due to very abrasive material
 - Yes, on D-11's, 1,2,8 positions
- What hours are being seen on Drill undercarriage?
 - 1,300 to 2,000 hours lowest
 - Other locations seeing up to 20,000 hours
 - Have tried lesser quality components hoping softer metal will wear longer
 - Not very successful
- Any D-11 bevel gear problems?
 - Yes, found to be operational
 - Did operator training , saw increase in life
 - Caterpillar is having issues with finish on gear teeth
 - They recommend high viscosity oil if ambient temperature allows
- Starters leaking on 3500's?
 - One dealer recommends non-hardening RTV be used on gaskets
 - Use of viton rubber balls helps
- 3500 engine camshaft/valve train issues
 - Very common problem
 - Most replacing cams on rebuild
 - An increase in iron, brass and lead in oil sample an indicator of camshaft starting to fail
 - Most camshaft failures appear to be from edge loading
 - Design of follower one possible cause
 - Incorrect resurfacing of cylinder head another possible cause

- Most locations have reduced frequency of valve adjustments
 - Feeling is less disturbance is better
 - Initial and perhaps a mid-life adjustment common
 - Using specialized group
 - Several comments that problems decreased with reduction in frequency
 - Found that plained head and block cause valve clearance issues
- 24M overheating problems
 - Caterpillar is working on redesign of hood to help remove heat
- How are dirt entry problems being found?
 - Using ultra sonic testing machine
 - Finds leaks in cabs, air intakes, etc. uses are limitless
- Anyone using synthetic oil?
 - No, found it was not worth the cost
 - Be aware there is a new specification for Tier 4 engines
- MTU issues
 - 20V having to change injectors at 4000 hours
 - High soot levels in oil are causing problems
 - One location installing positive crank case ventilation systems

MSHA UPDATE

- Presented Rules To Live By
 - Work is not to be performed until equipment is locked out, tagged out and blocked against motion
 - A signal shall be given before putting equipment into motion(sound horn)
 - Wheels must be blocked/chocked or parked against berm to prevent motion
 - Fall protection must be in use when three points of contact cannot be maintained
 - Seat belts are to be utilized

- Reminded everyone to SLAM
 - Stop, Look, Analyze, Manage
- Common citations issued by Gillette office
 - Damaged welding leads (77.504)
 - Failure to maintain (77.404a)
 - Accumulation with ignition source (77.104)
 - Fire extinguisher maintenance (77.1110)
 - Improper storage of flammable cans (77.208b)
- There is currently a dust initiative going through stages of implementation
 - Would include mechanics working in dusty field conditions
 - Area would have to be watered down
 - May have to move equipment from dusty area
 - Individual may have to wear mask or respirator
- Discussed details of Fatalgrams involving mechanics
- Two most common types of injuries suffered by mechanics
 - Hand and finger
 - Injuries from flying objects
- Reminded everyone to remember two best practices
 - Be aware of surroundings and changing conditions
 - Maintain a clean work area

PUGET SOUND ROPE www.fairmontsupply.com www.cwestern.com

Zeke Mader & Jerrod Driskill, Fairmontsupply Elizabeth Erlenbeck, Continental Western Corp.

- Manufacturers of High Modulus Synthetic Fiber (HMPS) ropes
- Their PLASMA rope is manufactured from Honeywell Spectra Fiber
 - Use a patented recrystallization process to increase strength by as much as 50%

- Qualities of Spectra/Plasma rope
 - 10 times stronger than steel pound for pound
 - 3 times stronger than Poly or Nylon
 - Very low stretch
 - No stored energy, very good for towing operations
 - Abrasion resistant
 - Fatigue resistant
 - Floats
 - Low coefficient of drag
 - Can be repaired if cut or damaged and a usable length remains
 - UV resistant
- Aside from lifting applications can be used for tow lines, winch lines, and string lines
- Material can be dyed to designate between towing and lifting applications
- Would be excellent for wrapping dozer tracks

FUEL STANDARDS, FUTURE QUALITY, ADDITIVES

Mark Lauer, Innospec www.innospecinc.com

Paul Sivertson, Equitable Oil Purchasing Co.

- Ultra Low Sulfur Diesel (ULSD)
 - Prior to 1993 fuel contained 5000 ppm of sulfur
 - Fuel currently contains 15 ppm of sulfur
- Most common complaints
 - Lack of power
 - Injector problems due to lack of lubrication
 - Plugging filters
 - Injector fouling

- Another issue is entrained water
 - Fuel carrying large amount of water
- Problems caused from entrained water
 - Rapid filter plugging
 - Rust
 - Microbial contamination
 - Rapid increase of water in storage tanks

CATERPILLAR TIER 4 ENGINES

www.catminer.cat.com/emissions www.cat.com/technology/tier-4

www.emissions.catdealer.com/dealername

Contact your local Caterpillar dealer regarding any passwords needed to access these websites.

- Regulation history
 - Tiers 1-4 in USA started in 1993
 - Tier 4 interim starts in 2011
 - Tier 4 final 2015
 - Three categories
 - Under 175 horsepower
 - 175-750 horsepower
 - 750 – up horsepower
 - EPA flex program allows manufacturers to transition to Tier 4
- Caterpillar aftertreatment technology
 - Diesel Oxidation Catalyst (DOC)
 - Uses a chemical process to transform pollutants in the exhaust stream
 - Diesel Particulate Filter (DPF)
 - Traps additional particulate matter in the exhaust stream

- Caterpillar Regeneration System (CRS)
 - Elevates exhaust gas temperature to promote oxidation and burn off soot in the DPF
- Caterpillar NOx Reduction System (NRS)
 - Captures and cools exhaust gas which is used to cool combustion temperature
- Caterpillar Clean Emissions Module (CEM)
 - Flexible modular system that can include the DOC,DPF, CRS, muffler & air cleaner
- Fluid requirements
 - Ultra low sulfur diesel fuel
 - Low ash engine oil
 - Capable of burning up to B20 Bio-fuel
- Additional items
 - Service kits and exchange components will be available
 - Over 1,000,000 hours of system testing have been done
 - Dealers required to have factory trained technicians
 - Machines with Tier 4 will start to be released in 2011
 - Release will be staggered until 2015
 - Oil Renewal System (ORS) will not be available on Tier 4 engines

Caterpillar Undercarriage

www.cat.com

- Conditions that effect track life
 - Track adjustment
 - Moisture
 - High loads
 - Abrasive materials
 - Packing

- Products available or soon to be available to increase life
 - High abrasion rails
 - Taller links, deeper hardened
 - Scallop resistant track links
 - Hardened in areas prone to scalloping
 - ARM track shoes
 - Grousers are hard surfaced
- Cat uses three types of track frame mounting
 - Straight
 - Camber
 - Camber and toe out
 - Accomplished by different equalizer bar lengths, use specific minor bogies and rear major bogie
 - Mismatching of components will cause increased wear
- Sprocket teeth failures were determined to be caused by problems at steel mill
- Structural life in hard rock applications
 - New master links currently under development
- Possible causes for bogie pin plugs blowing out during periods of high ambient temperatures
 - Improper oil level
 - Internal conditions causing high heat
 - Have added a groove to plug to improve retention
- Polygon idlers
 - Developed due to some idlers developing flat spots on their own
 - Currently in test phase only
 - Cost / hour prohibitive

- Tractor balance
 - A number of locations installing weights to balance machine in effort to reduce wear
- Dirt entry and packing can be reduced with installation of idler guards
- Spending the time to analyze specific sight conditions is a major key to optimizing undercarriage life

Caterpillar 3500 Engine Balancing

B&G Machine www.bandgmachine.com

John C. Bianchi, David Bianchi, Johnny Bianchi

- Definition of unbalance
 - Balance is a zero you can only measure unbalance
 - Is measured in ounce-inches or gram-inches
 - Weight multiplied by radius
- All blocks are inspected thoroughly before machining
 - The main line dimension is very critical
- Crankshafts & connecting rods also inspected for all critical tolerances
 - Fretting between rod and cap very common problem
- Bob weights are attached to bearing surface when balancing crankshaft to simulate assembled engine
- At 2200 RPM in a 3508 an unbalance weight will strike 37 times a second or 2.4 billion times in 18,000 hours
- Benefits of engine balancing
 - Longer-smoother running
 - Reduces torsional fatigue
 - Reduces vibration minimizing wear
 - Better fuel economy
 - Minimizes vibration fatigue associated with gear train wear
 - More efficient horsepower

Empire Training

www.empire-cat.com/CM/

Steve Brady Tony Smith

- They are a certified Caterpillar regional training center
 - The only one in North America
 - Located in Mesa, Arizona
- Provide training on
 - General machine systems
 - Diesel, hydraulic, electrical, powertrain, etc.
 - Machine specific training also available
- Facility has 8 classrooms capable of training up to 188 students
- They are also a certified Caterpillar failure analysis facility
 - One of three in North America
- They also provide onsite training
 - Will custom design training to fit customers needs
- E-train test
 - An electronic test used to determine an individual's training needs
- What E-train will do
 - Determine individual training deficiencies and strengths
 - Determines amount of training required
 - Reduces overall training costs by pinpointing specific needs
 - Cost of test is \$75.00 per individual

