

# 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 8<sup>th</sup> and 9<sup>th</sup>, Holiday Inn, Rapid City, SD
- Spring 2012 meeting May 3<sup>rd</sup> and 4<sup>th</sup> 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 1<sup>st</sup>
  - \$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](http://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](http://www.fairmontsupply.com)    [www.cwestern.com](http://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](http://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](http://www.catminer.cat.com/emissions)      [www.cat.com/technology/tier-4](http://www.cat.com/technology/tier-4)

[www.emissions.catdealer.com/dealername](http://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](http://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](http://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/](http://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



