

Construction Industry (Overview)



What we have learned

- Fast paced environment
- Production Driven
- Many subcontractors
- Excessive wear on Equipment
- Abuse of equipment
- High turn over of personnel
- Reaction Based Maintenance programs
- Irregular preventative Maintenance Programs
- Little or no training of equipment operators (VDECS)
- Rumors turn to Fact and then become Legend

- Overall Condition
 - Observed Duty Cycle
 - Service Interval
 - Reported Challenges
 - Ability to service Equipment
 - Schedule and Hold Product Training session
- Opacity Test
 - Temperature Profile
 - Fuel Samples, oil samples if needed
 - Initial Data review with Maintenance Staff
 - Assign Tasks
 - Re - Opacity test after repairs
 - Final review with staff and Identify candidate list
 - Technical training prior to the install

Emission Reduction on Construction equipment.

1. Equipment Maintenance
2. Idle Reduction
3. Repowers
4. VDECS

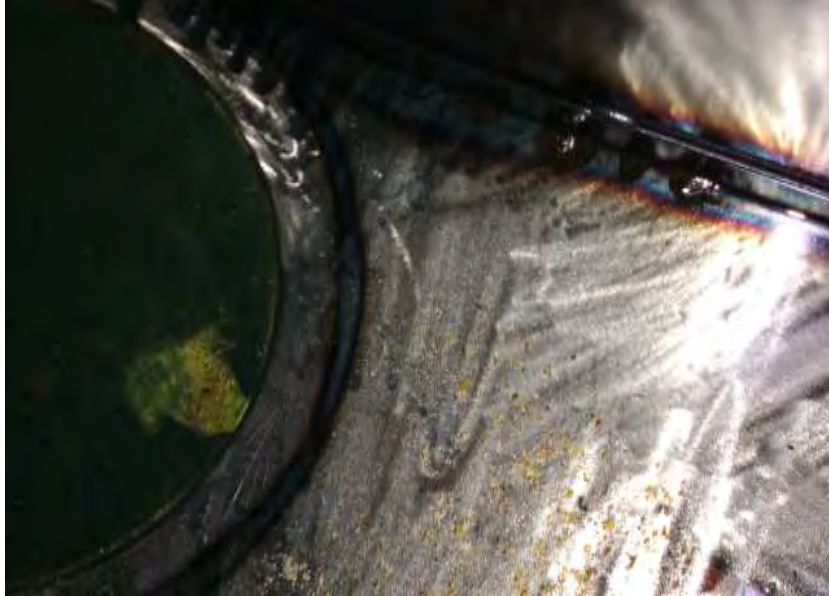
- It takes commitment to see the benefits.
- A warm engine will reduce pm output and reduce the burden on the VDEC
- Reduced Idling and duty cycle has a fuel savings which will offset the cost of after treatment.
- Repowers lower emissions and extend the life of the equipment.
- VDECS are proven to reduce PM

- Operating Error (Ignoring Warning Lights)
- Installation errors, Mis-application of VEDEC
- Oil contamination
- Fuel contamination
- Maintenance errors
- Cleaning errors
- Human error



One thing we did not know and was over looked

Fuel Handling and storage



Heat generated by hydraulics can lead to fuel contamination





A Perspective on Blow By

LHD01 8-30-10
IDLE

* ECOM - J2KN *

Date Time
08.30.10 01:31 PM

Gas analysis

Fuel type
Diesel Oil

T. Air	66	°F
T. Gas	355	°F
T. Sensor	65	°F
O2	17.6	%
CO 0%O2	1118	PPM
NO 0%O2	266	PPM
NO2 0%O2	266	PPM
NOx 0%O2	3521	PPM
CO2	2.5	%
Eff.	66.5	%
Losses	33.5	%
Exc. air	6.18	

ECOM America Ltd.
1628 Oakbrook Drive
Gainesville
Georgia 30507
Tel. 770-532-3280
Fax: 770-532-3620
Toll-Free 877-326-6411
www.ecomusa.com

LHD01 8-30-10
High Stall.

* ECOM - J2KN *

Date Time
08.30.10 01:36 PM

Gas analysis

Fuel type
Diesel Oil

T. Air	66	°F
T. Gas	806	°F
T. Sensor	65	°F
O2	9.7	%
CO 0%O2	223	PPM
NO 0%O2	920	PPM
NO2 0%O2	30	PPM
NOx 0%O2	950	PPM
CO2	8.3	%
Eff.	74.3	%
Losses	25.7	%
Exc. air	1.86	

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Gainesville

LHD01
Erg-Breather.

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Date Time
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Gas analysis

Fuel type
Diesel Oil

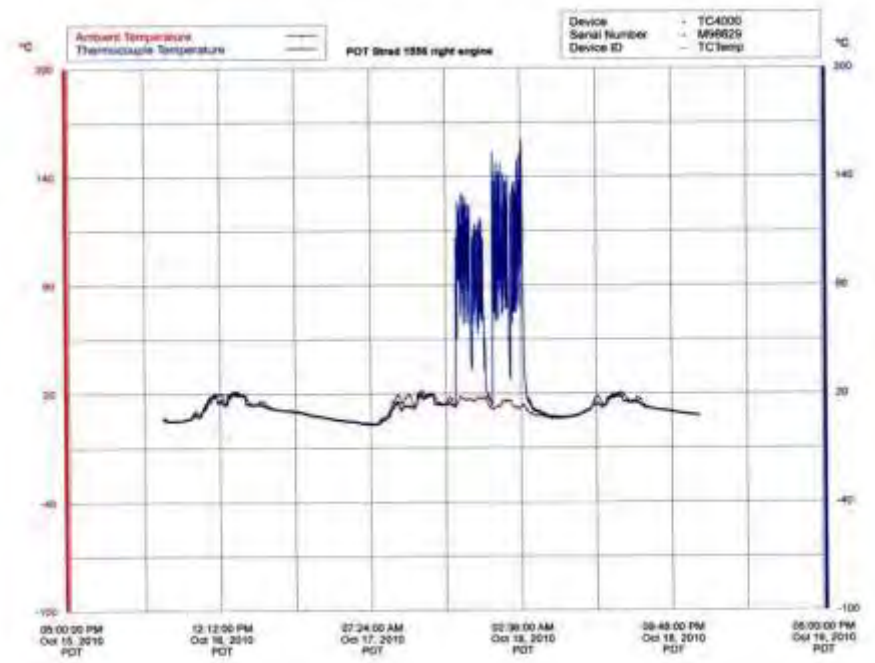
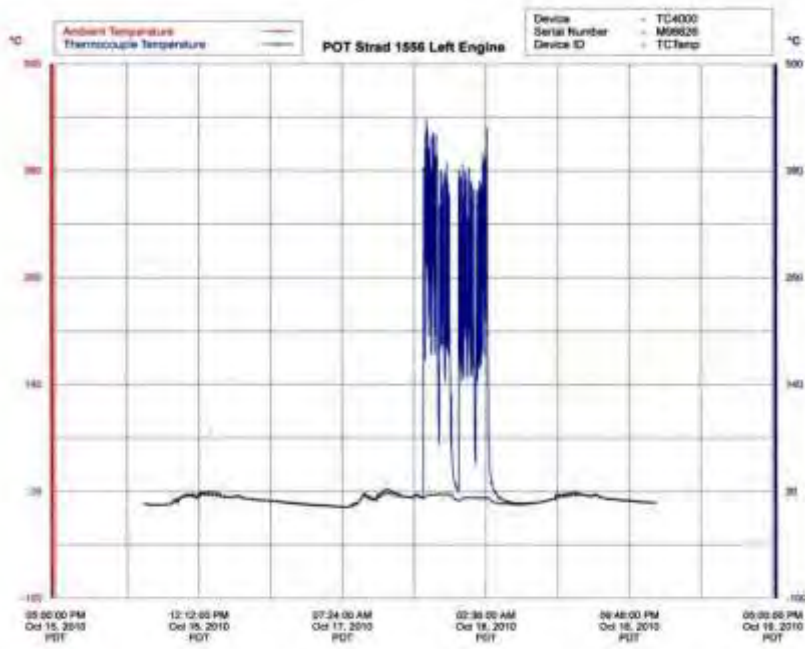
T. Air	66	°F
T. Gas	89	°F
T. Sensor	65	°F
O2	19.7	%
CO 0%O2	3215	PPM
NO 0%O2	1486	PPM
NO2 0%O2	16	PPM
NOx 0%O2	1502	PPM
CO2	1.0	%
Eff.	93.0	%
Losses	7.0	%
Exc. air	16.15	

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Another Perspective on Blow By



Temperature issues



Opacity and Engine Repairs (misunderstood)

██████████ Top pick #26

Engine: Cummins QSM11 330HP

Complaint: High opacities seen at all levels of operation

Original Opacity: ~85%

Repairs made:

New turbo

1 injector (questionable only replacing one IMO)

Overhead adjustments made

Total Opacity Reduction: ~10%

**Cracked Air Cooler
Opacity now at 18%**



██████████ - Reach Stacker #18

Engine: Cummins M11 290HP

Complaint: High opacities seen only at initial throttle snap

Original Opacity: ~65%

Repairs Made:

6 new injectors = 10% opacity gain; Total opacity 75%

Reset overhead adjustments tighter = 10% opacity reduction; Total opacity 65%

New Turbocharger= 5% opacity reduction; Total opacity 60%

Found STC solenoid ground to be bad= 14% opacity reduction; Total opacity 46%

Rebuilt Fuel Pump= 33% opacity reduction; Total opacity 13%

Tyler Brady

Diesel Emission/Idle reduction Team

- Have many technical challenges if applied improperly.
- Mechanically controlled engines and Electronically controlled engines have different characteristics.
- Make sure that the new engine has the right programming in the ECU if a DPF is applied.
- Adapters may be needed to connect the engine to the drive train.
- You may need to update the cooling system.
- Mounting modifications may need to be done.
- If done properly There is a huge emission benefit.
- Gives an old piece of equipment a new life cycle.
- Educate yourself.
- Ask for references
- Look at a few repowered pieces of equipment.

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- Education is Key
 - Pre assessment of the equipment and the end users operation is critical
 - Pre- maintenance of the equipment is crucial
 - Maintenance procedures may need to be modified
 - Fuel contamination limit is established by the VDEC manufacturer
 - VDECS in most cases will have a cleaning interval relative to your equipment's condition and duty cycle. Not the manufacturers recommendation.
 - VDECS will be more costly to your operation if equipment maintenance is not addressed.
 - Construction equipment provides a higher PM reduction for the same investment.
 - Don't base your investment on what the salesman tells you. "Trust But Verify"

- In the construction industry there is a huge opportunity to reduce particulate matter and emissions.
- If applied properly
- Education addressed
- Follow up is done
- If the equipment is maintained properly
- With Minimal risks and great cost savings

