ECO/AFS Bi-Fuel Instruction & Maintenance

Basics of System operation

- Power on, green light on, system is in operation between 13 -70% of load

- **Power On , No lights on. Unit is controlled out , Unit will turn itself back on when unit returns to correct parameter's. Listed below will be parameter settings set by ECO/AFS**

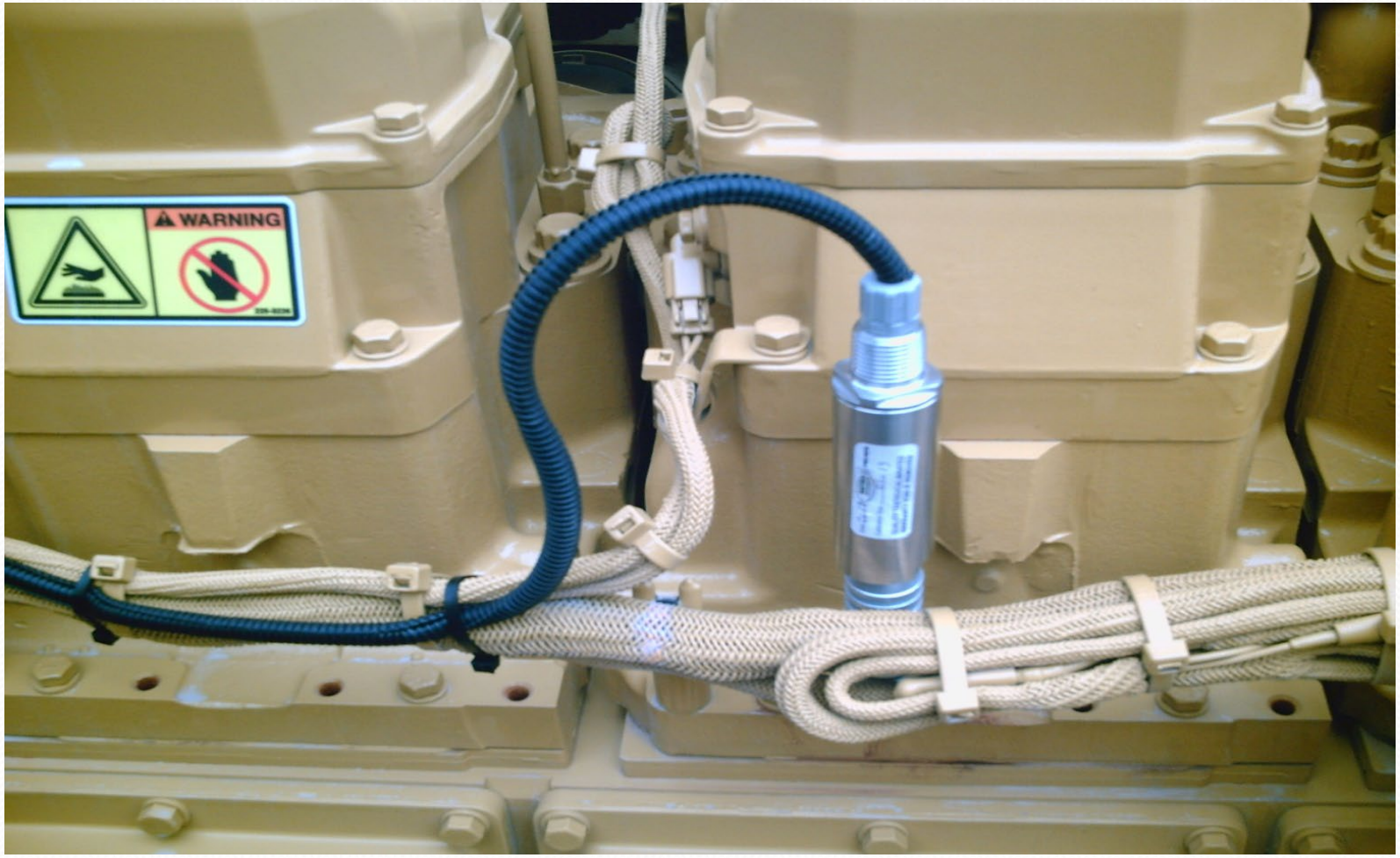
- **Power On Red Light On , Unit has Faulted Out and has Shut Down , Record Fault and Time , Push Reset If Fault Continues Turn Power Off , Close Ball Valve and Call ECO-AFS**

LEL Detection on each Gas Train is in place to shut off incoming gas to the Motor Shed and Boiler, If the LEL gauge is tripped it will show warning lights and the Altronic Panel will show Ch. 14 Gas Detection. Any gas leaks MUST BE Repaired before resetting Fuel Valve

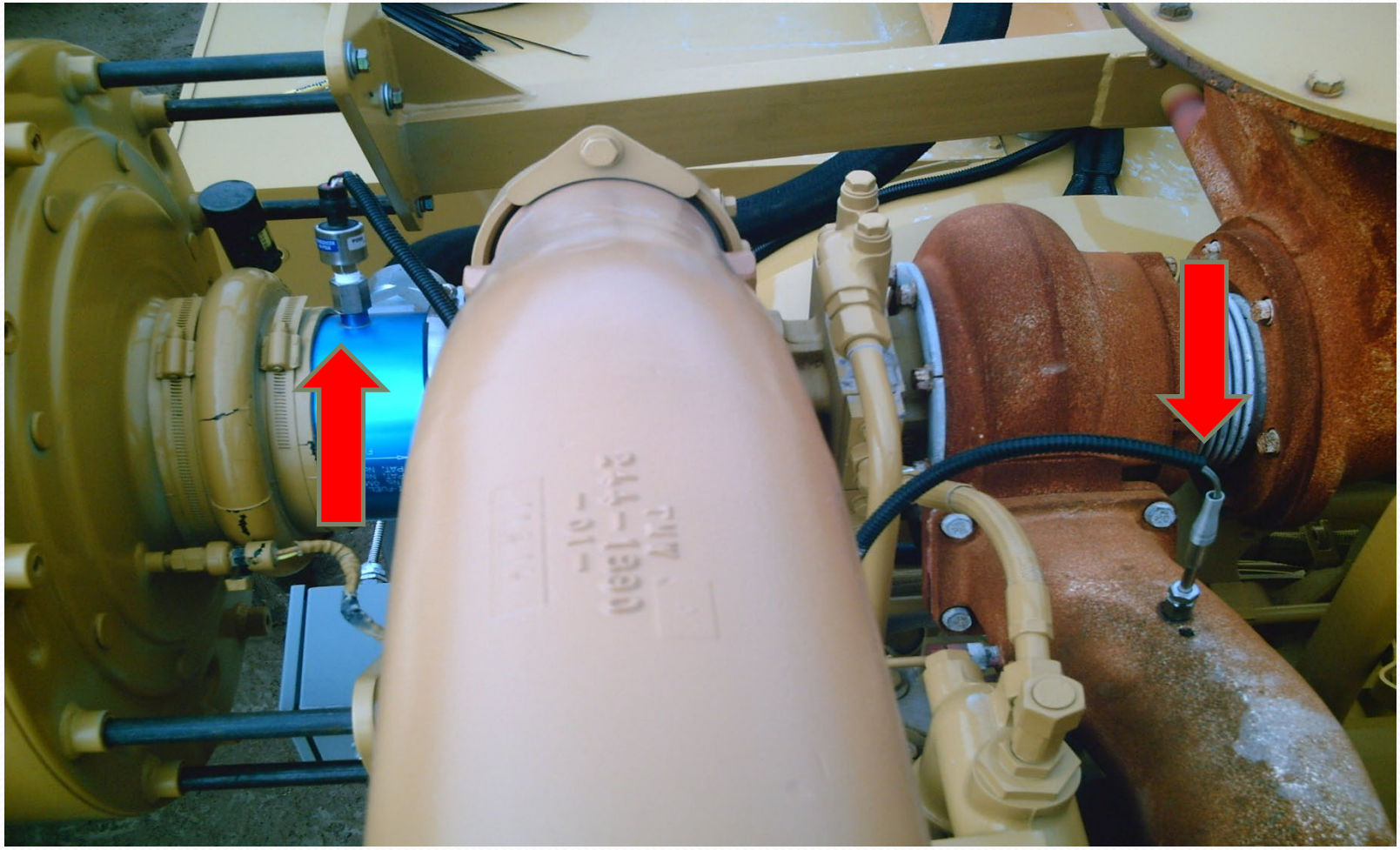
- Gas detection set at 10%

- Fuel Shut Down Valve

Sensor on both right and left bank of engine monitors Vibration, Knock or Detonation if to much Gas is being delivered.



Sensors below monitor air intake and exhaust temperatures on each bank of engine



System allows end user to scroll all settings and parameters set by ECO/AFS, for example if you notice Left and Right exhaust temperatures differ more than 100 degrees this is a warning that a Injector is going bad or valve settings may need to be addressed.

This helps catch issues before they become major problem and expense.

View channels

How to view channels

- Press VIEW CHAN then arrow up to go thru the list of channels listed in following slides to see where you might be controlling out which can help you find solution or problem with Bi-Fuel kicking out. Air Filters, plugged Radiators or inner coolers or plugged gas lines are common problems.

Bi Fuel Faults and Shutdowns

12,a

(ROP) Regulator Output Pressure

Loss of fuel to fuel shut off valve . Push Reset Button on Dungs Switch on side of valve, push firmly on red dot in center of yellow dial.

14,a

Gas Detection

LEL Has been detected and has shut the incoming fuel and the Bi Fuel off on specific unit.

21,a

(GSP) Gas Supply Pressure

Incoming gas has been interrupted in conex or from Fuel Source (Well Head) Controls out at-0.5

22 a,b

(VAC) Air Filter Vacuum

Air filters or pre filters may be restricted , (Service) controls out at below -0.8

23,a

(MAP) Manifold air pressure

Engine intake pressure has exceeded the high shutdown

System controls out at 25psi

24,a

(MAT) Manifold Air Temperature

Engine intake temperature has exceeded high shutdown, Plugged cooler ,

Fan has been reversed for Cold Temps. Hot Temps, Thermo-Couple Failure

System controls out at 140 degrees

25 a,b

(EGT) Exhaust Gas Temperature

High Load for extended time , Hot Temps, Thermo-Couple Failure

System controls out at 1150 degrees, it is best to operate in the 40-55% of load if possible. Radiators and inner coolers that are not cleaned regularly will cause engine to run at hotter temps.

26 a,b

(VIB) Engine Vibration

Gen Skid Vibration, Fast Load Swings, Detonation

System controls out at .80 and faults out at 1.2

27,a

(KW) Kilowatt Output of Gen.

Bi-fuel Turns On at 12 % KW and will Shutoff at 70% KW of Load

largest saving are in the 40-55% KW percent – make sure KW matches SCR

Rig move prepartion

- When getting close to end of well shut off gas at the fuel source and then allow engines and boiler to suck down piping in Motor Shed and Boiler before shutting system off.
- This will assure that all lines are empty of NG when breaking connections for rig move

When a rig move is taking place all that will be required to do is disconnect hose between each motor shed, and unplug LEL power cord between each motor shed, BI-fuel panel turned off and gas valve closed. Check for leaks before each start up after rig move before turning system on.

Start up after rig move

After rig move is complete, leak check all piping and connections, make sure NG pressure is around 80#s. Purge gas line and if no leaks are in piping open valve on system and turn on Bi-Fuel panel, system should take care of itself as long as BTU of gas has not changed.
Rig 531 was commissioned on 1100B.T.U. CNG
If B.T.U. has changed please call to discuss first.

Commissioning sheet showing operation of engine on diesel only in white column and with Bi-Fuel on in blue column at same load. Engine operates under same parameters in either mode .

Location	PA	Panel S/N	1370	Zero Gas Reg.	7771	19 dwn
Rig or Unit #	531 #1	Display S/N	2278	GTI By pass	7765	2 3/8
Dealer/ Installer	ECO Alternative Fuels	Terminal S/N	2311	Step-Con-1		2 5/8
Master Dist.	ECO Alternative Fuels	Display Firmware Date	04/13/2011	Step-Con-2		2 3/4
Eng. Model /SN	Cat 3512 LLA01389	Terminal Firmware Date	04/01/2011	Step-Con-3		3 1/4
Gen. Model /SN	Kato 21437-10	Generator Rating (KW)	1225	Power Valve-L	7702	6 out
Engine Hours		Generator Ser. Rating		Power Valve-R	7786	6 out

KW %	Fuel	21A-GSP	22A-VAC-1	23A MAP-1	24A MAT-1	25A EGT-1	26A VIB-L	22B VAC-2	25B EGT-2	26B VIB-R	ECM F.C.	ECM C.T.	ECM O.P.	Actual KW %	Ambient Temp.	% Subst.
0	Diesel Only															
13	Diesel Only		-0.2	2.9	105	578	0.19	-0.3	530	0.19	11.5	183	68	11.2		
13	***BI***	***3***	***-0.2***	***3***	***115***	***618***	***0.19***	***-0.3***	***558***	***0.21***	***9.2***	***183***	***68***	***11.2***		***20%***
20	Diesel Only		-0.2	4.7	105	751	0.2	-0.3	700	0.19	18.0	192	67	21.7		
20	***BI***	***2.9***	***-0.2***	***5.3***	***115***	***762***	***0.21***	***-0.3***	***704***	***0.21***	***12.6***	***190***	***64***	***21.7***		***30%***
30	Diesel Only		-0.2	7.4	117	866	0.23	-0.3	814	0.21	25.0	194	66	32		
30	***BI***	***2.8***	***-0.2***	***8.3***	***115***	***925***	***0.23***	***-0.3***	***834***	***0.22***	***14.0***	***199***	***64***	***32***		***44%***
40	Diesel Only		-0.3	9.7	114	930	0.24	-0.3	876	0.22	30.0	196	65	39.9		
40	***BI***	***2.7***	***-0.3***	***11.2***	***115***	***1014***	***0.23***	***-0.3***	***917***	***0.24***	***12.5***	***199***	***64***	***39.9***		***58%***
50	Diesel Only		-0.3	13	115	1017	0.26	-0.4	959	0.24	36.6	194	64	50.2		
50	***BI***	***2.6***	***-0.3***	***15.6***	***117***	***1067***	***0.25***	***-0.4***	***985***	***0.27***	***16.5***	***194***	***63***	***50.3***		***56%***
60	Diesel Only		-0.3	16.3	118	1042	0.27	-0.4	984	0.26	41.5	199	63	59.3		
60	***BI***	***2.7***	***-0.4***	***18.3***	***125***	***1130***	***0.27***	***-0.4***	***1060***	***0.29***	***20.0***	***199***	***63***	***59.3***		***51%***

Safety Low	-0.5	-1.2	0	0	0	0	-1.2	0	0			
Safety High	5	2	28	180	1200	1.2	2	1200	1.2			
Control Low	0.5	-0.8	0	0	500	0	-0.8	500	0			
Control High	4.5	1.5	25	150	1150	0.8	1.5	1150	0.8			
Cal. Low	0.5	1.61	0.49			0.8	1.615		0.8			
Cal. High	4.5	4.5	4.5			4	4.5					
Vibe Time	3	Bi Fuel Delay		5	Kw Low	0.795	Kw High	3.6		Commision Date :	Wednesday, October 16, 2013	

ECO AFS
ALTERNATIVE FUEL SYSTEMS INC

Please feel free to contact me with any questions.