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AVL - B O O S T
Version : v2013.2.0.0.0
Build:   Nov 11 2013 16:58:06
System:  ia32-unknown-winnt_i11
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LICENSE

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Boost Main 2013.0@ License will expire in 240 days

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PROJECT

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Preprocessor Version : 2013.2
Calculation date    : 05.06.2014
File               : AVL_5402.bst
Case Set          : Case Set
Case              : Case

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Project ID: "AVL5402"
Run ID:    "Conventional"
Model date: "13. Nov 2013"

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ELEMENTS

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Element Name      Number
PIPE              7
SYSTEMBOUNDARY    2
PLENUM            1
CYLINDER          1
RESTRICTION       3
MEASURINGPOINT    8
AIRCLEANER        1
ENGINE            1
PIPE_END          16
ASSEMBLED         1
ALL_PIPES         8
ALL_PLENUMS       3
ALL_BOUNDARIES    2
RESTRICTIONS      3
ALL_PIDS          1
PIPE_VAR_WALL_TEMP 8

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GLOBAL DATA

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Engine Speed :      2000.0 rpm
Calculationmode:    BOOST Single
Cycle Duration:    720.00 degrees
Max. calc. period: 10800.00 degrees
Cycles calculated:      15 cycles
Calc. time steps:    1.00000 degrees (max)
                   1.00000 degrees
                   0.08333 ms
                   0.50000 degrees (short pipe)
                   0.04167 ms (short pipe)
Traces results step: 3.00000 degrees
User concentrations:      0
Ref. pressure:    100000.00 Pa
Ref. temperature: 302.150 K
Gas properties:    Variable
Gasproperties File: DIESEL.BGP
bgp_build_version: v2013.0.0.0.0

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ketqua_diesel_case16.txt
bgp_build_host: boosthost
bgp_build_user: boost
bgp_build_date: 2012.03.23
bgp_build_time: 08:00:00
Lower calorific: 0.42800E+08 J/kg
Stoic. A/F-ratio: 14.700

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Warnings: 4
Convergence errors: 15

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PIPES

Total number of pipe cells: 9

Pipe Coeff. nr. [-]	Cells Heat Factor [-]	Cell size [mm] [dm3]	W.Heat Volume [kJ]	Wall T [K]	Fric. coeff. [-]	Lam. Fric.
1	1	110.0	0.000	298.00	0.019000	
64.000000	1.000000	1.460055	-0.001	298.00	0.019000	
2	1	120.0	0.887626	360.00	0.019000	
64.000000	1.000000	0.094483	-0.001	726.85	0.019000	
3	1	75.0	0.045897	298.00	0.019000	
64.000000	1.000000	0.145299	-0.002	666.85	0.019000	
4	1	55.0	0.173180	298.00	0.019000	
64.000000	1.000000	0.163559	0.000	666.85	0.019000	
5	1	100.0	0.000	300.00	15.949042	
64.000000	1.000000	0.100000	-0.038	FILTER_PIPE	1	
6	2	90.0	-0.007			
64.000000	1.000000		0.000			
7	2	85.0				
64.000000	1.000000					
8	1	65.0				
521489.062836	0.000000					

MEASURINGPOINTS: Average Values

Mp. To.Ent.f. nr.	Pipe nr.	Location To.Ent.f. [mm]	Diameter Mach. [mm]	Pressure Wtemp. [bar]	Temp. Converg. [K]	Ms.Temp. [K]	Velo. [m/s]	Massflow [g/s]	Massflow [g/cycle]
1	1	110.0000	130.0000	1.0000	302.0	302.1	0.5	8.3756	0.5025
0.034		0.0020	0.00	298.0	0.368E-06				
2	2	120.0000	44.0000	0.9882	303.8	299.8	5.0	8.4002	0.5040
0.026		0.0016	0.01	298.0	0.756E-06				
3	5	100.0000	42.0000	0.9879	305.0	299.5	5.5	8.3987	0.5039
0.016		0.0010	0.02	298.0	0.104E-05				
4	3	75.0000	38.0000	0.9874	319.1	299.6	6.8	8.3832	0.5030
0.015		0.0009	0.02	360.0	0.680E-06				
5	4	55.0000	35.0000	1.1150	789.9	922.7	20.6	8.8878	0.5333
6.414		0.3848	0.04	726.8	0.380E-06				
6	6	180.0000	35.0000	1.1107	821.9	865.4	19.7	8.8884	0.5333
6.041		0.3625	0.03	666.8	0.599E-06				
7	6	100.0000	35.0000	1.1126	795.5	888.9	20.1	8.8884	0.5333
6.008		0.3605	0.03	666.8	0.505E-06				
8	7	170.0000	35.0000	1.1042	861.9	852.9	20.1	8.8911	0.5335
5.678		0.3407	0.04	666.8	0.126E-05				

SYSTEMBOUNDARIES

Attachments

ketqua_diesel_case16.txt

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
SYSTEMBOUNDARY	1	1	0.5025
SYSTEMBOUNDARY	2	7	0.5335

PLENUMS: Average Values

	Pl. nr.	Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	
PLENUM	1	1.1103	851.14	0.455	0.000	
				Attached pipe 6:		0.5333 g/cycle
				Attached pipe 7:		0.5335 g/cycle
AIRCLEANER	1	1.0000	301.81	2.077	0.000	
				Attached pipe 1:		0.5026 g/cycle
				Attached pipe 8:		0.5032 g/cycle
AIRCLEANER	1	0.9891	304.80	1.356	0.000	
				Attached pipe 2:		0.5040 g/cycle
				Attached pipe 8:		0.5033 g/cycle

PLENUMS Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
PLENUM	1	6	0.5333
PLENUM	1	7	0.5335
AIRCLEANER	1	1	0.5026
AIRCLEANER	1	8	0.5032
AIRCLEANER	1	2	0.5040
AIRCLEANER	1	8	0.5033

CYLINDERS: Average Values

	Total Engine	Cyl. 1
Firing TDC [deg]		0.00
Bore [mm]		85.00
Stroke [mm]		90.00
Conrod1. [mm]		148.00
Piston pin offset [mm]		0.01
Swept Vol. [l]	0.5107	0.5107
Compression ratio [-]		17.10
Dyn. Comp. ratio [-]		15.11

Combustion Data:

		AVL-MCC
Combustion Char.		-8.17
Comb.start [deg]		136.17
Comb.dur.1 [deg]		75.64
Peak Fir.Pres. [bar]	75.64	75.64
at Crankangle [deg]	8.00	8.00
Peak Pres.Rise [bar/deg]	4.09	4.09
at Crankangle [deg]	-1.50	-1.50
Peak Fir. Temp. [K]	2008.98	2008.98
at Crankangle [deg]	21.50	21.50
Peak T_burned [K]	2707.72	2707.72
at Crankangle [deg]	2.00	2.00
Res. Gascompr. [bar]	1.16	1.16
at Crankangle [deg]	335.50	335.50

Emissions (Classic Species Transport):

NOx: Calculated based on MTZ 34 1973 (12).

ketqua_diesel_case16.txt

CO: Calculated based on SAE 2002-01-0006.
 Soot: Calculated based on MTZ 5/2002 (63).

NOX	[g/kWh]	12.031001	12.031001
NOX	[g/h]	74.109301	74.109301
NOX	[ppm]	2238.66	2238.66
CO	[g/kWh]	0.048854	0.048854
CO	[g/h]	0.300934	0.300934
CO	[ppm]	9.74	9.74
Soot	[g/kWh]	3.786410	3.786410

Performance:

IMEP [bar]	9.0737	9.0737
Rel. to Ave. [-]		1.0000
IMEP Exh. [bar]	-1.1778	-1.1778
IMEP Int. [bar]	0.8914	0.8914
IMEP Gasex. [bar]	-0.2864	-0.2864
IMEP HP [bar]	9.3602	9.3602
FMEP [bar]	1.8368	1.8368
BMEP [bar]	7.2369	7.2369
AMEP;SMEP [bar]	0.0000	0.0000
ISFC [g/kWh]	233.0809	233.0809
Rel. to Ave. [-]		1.0000
ISFC (tr.f.) [g/kWh]	233.0809	233.0809
BSFC [g/kWh]	292.2406	292.2406
Indicated Eff. [-]	0.3609	0.3609
Iso vol. comb. Eff [-]	0.8802	0.8802
Polytropic Coeff. [-]		1.3545

Fuel Mass Balance:

Inj. Fuelmass [g]	0.029995	0.029995
Asp.Trap. Fuelmass [g]	0.000008	0.000008
Fuelmassfl.(A+I) [g/s]	0.500045	0.500045
Fuelmass tot.trap. [g]	0.030003	0.030003
Trapped Fuelm.fl.[g/s]	0.500045	0.500045
Trapp. Eff. Fuel [-]	1.0000	1.0000

Energy Balance Cylinder:

Fuel Energy [kJ]	1.27467	1.27467
Released Energy [kJ]	1.27467	1.27467
-> Brake Power [%]	28.995	28.995
-> Loss: Friction [%]	7.359	7.359
-> Loss: Piston [%]	14.839	14.839
-> Loss: Head [%]	11.923	11.923
-> Loss: Liner [%]	6.328	6.328
-> Loss: Int. Port [%]	-0.033	-0.014
-> Loss: Exh. Port [%]	0.407	-2.116
-> Loss: Exh. Gas [%]	30.080	30.080
Eff. Rel. Energy [kJ]	1.27465	1.27465
Gross Rel. Energy [kJ]	1.27467	1.27467
Eff.Gross Rel.Ener.[kJ]	1.27465	1.27465
Energy Balance [-]	1.0000	1.0000
Eff. Energy Balance [-]	1.0000	1.0000

Blowby:

Blowbymass [g]	0.000000	0.000000
Blowbymassfl. [g/s]	0.000000	0.000000
Blowby Heat Flow [kJ]	0.000000	0.000000

Reference Values at SHP:

ketqua_diesel_case16.txt

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-----
Pressure at SHP[bar]          1.1665          1.1665
Temperature [K]              374.00          374.00
Air Massfl. [g/s]           8.387560        8.387560
Fuel Massfl. [g/s]          0.500045        0.500045
Trapp. Eff. Air [-]          1.0000          1.0000
Trapp. Eff.Fuel [-]          1.0000          1.0000
A/F-Ratio (Cmb.) [-]         16.85          16.85
Excess Air Ratio [-]         1.1460          1.1460

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Residual Gas:

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-----
Res.gas content [-]          0.0365          0.0365
External EGR [-]             0.0000          0.0000
Internal EGR [-]             0.0365          0.0365
Com.Prod.Mass. at EO [g]     0.546312        0.546312
Res.gas mass at SHP [g]      0.019051        0.019051
Res.gas aspirated IN [g]     0.000000        0.000000
Res.gas from intake [g]      0.000944        0.000944
Rel. to Total [-]            0.0496          0.0496
Res.gas flow EX [g]          0.527267        0.527267
Res.gas from exhaust [g]     0.001740        0.001740
Rel. to Total [-]            0.0913          0.0913

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Gas Exchange:

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Volumetric Eff. [-]          0.8548          0.8548
Rel. to Ave. [-]             1.0000
Rel. To MP 3 [-]             0.8734          0.8734
Total Mass at SHP[g]         0.5223          0.5223
Mass Delivered [g]           0.50304         0.50304
Mass Delivered [g/s]         8.38407         8.38407
Delivery Ratio [-]           0.8545          0.8545
Rel. to Ave. [-]             1.0000
Rel. To MP 3 [-]             0.8730          0.8730
Av.Airmass at SHP[g]         0.5054          0.5054
Air Delivered [g]            0.50325         0.50325
Air Delivered [g/s]          8.38756         8.38756
Airdeliveryratio [-]         0.8548          0.8548
Rel. to Ave. [-]             1.0000
Rel. To MP 3 [-]             0.8734          0.8734
Airmass Trapped [g]          0.50325         0.50325
Airmass Trapped [g/s]        8.38756         8.38756
Trapp. Eff. Air [-]           1.0000          1.0000
Rel. to Ave. [-]             1.0000
Airpurity [-]                0.9676          0.9676
Dyn. Swirl [-]               0.0000          0.0000
Dyn. Tumble [-]              0.0000          0.0000

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Wall Heatlosses:

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-----
Piston [kJ]                  -0.1891         -0.1891
Cylinderhead [kJ]            -0.15198        -0.15198
Cylinderliner [kJ]           -0.08066        -0.08066
Sum of Wallheat [kJ]         -0.42179        -0.42179
Wall Heatlosses in High Pressure Phase:
Piston HP [kJ]               -0.17895        -0.17895
Cylinderhead HP [kJ]         -0.14209        -0.14209
Cylinderliner HP [kJ]        -0.04851        -0.04851
Sum of Wallheat HP [kJ]      -0.36955        -0.36955
Wall Heatlosses Related to Heatinput:
Piston [-]                   -0.1473         -0.1473
Cylinderhead [-]             -0.1184         -0.1184

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Cylinderliner [-]	-0.0628	-0.0628
Sum of Wallheat [-]	-0.3285	-0.3285
M. Eff. HTC [W/m ² /K]	360.38	360.38
M. Eff. Temp. [K]	1220.82	1220.82

Reference Values at E0:

Pressure [bar]	4.25	4.25
Temperature [K]	1260.22	1260.22
A/F-Ratio [-]	16.70	16.70
Com.Prod.Conc. [-]	0.98875	0.98875
Fuel Concentr. [-]	0.000400	0.000400

Average Values of Pipeattachements:

Attached Pipe	3
Vlv/Prt.Op.Clr.0mm[deg]	304.88
Vlv/Prt.Op.Eff.0mm[deg]	351.26
Vlv/Prt.Op.Eff.1mm[deg]	376.20
Vlv/Prt.Op.Udef.mm[deg]	351.26
Vlv/Prt.Cl.Clr.0mm[deg]	633.12
Vlv/Prt.Cl.Eff.0mm[deg]	587.56
Vlv/Prt.Cl.Eff.1mm[deg]	561.60
Vlv/Prt.Cl.Udef.mm[deg]	587.56
Cam Phasing [deg]	0.00
Massflow [g/cycle]	0.503044
Wallheat [kJ/cycle]	0.000425
rel.to Heatinp.[-]	0.0003
Attached Pipe	4
Vlv/Prt.Op.Clr.0mm[deg]	80.88
Vlv/Prt.Op.Eff.0mm[deg]	128.00
Vlv/Prt.Op.Eff.1mm[deg]	153.26
Vlv/Prt.Op.Udef.mm[deg]	128.00
Vlv/Prt.Cl.Clr.0mm[deg]	425.12
Vlv/Prt.Cl.Eff.0mm[deg]	380.37
Vlv/Prt.Cl.Eff.1mm[deg]	352.79
Vlv/Prt.Cl.Udef.mm[deg]	380.37
Cam Phasing [deg]	0.00
Massflow [g/cycle]	0.533268
Wallheat [kJ/cycle]	-0.005194
rel.to Heatinp.[-]	-0.0040

FLOWRESTRICTIONS: Average Values

Flr. nr.	Att.Pi. number	Massflow [g/cycle]	Att.Pi. number	Massflow [g/cycle]
1	2	0.5045	5	0.5039
2	3	0.5030	5	0.5040
3	4	0.5333	6	0.5333

ASSEMBLED: Average Values

Type	Nr.	-----Inlet-----			-----Outlet-----			
		-----Core-----						
Rej.Heat	Rej.Heat	Pressure	Temperat.	Mass	Pressure	Temperat.	Mass	
[kW]	[kW]	[bar]	[K]	Factor	[bar]	[K]	[g]	[kJ]
		[bar]	[K]	[g]	[bar]	[K]	[g]	
AIRCLEANER	1	1.0000	301.81	2.077	0.9891	304.80	1.356	
0.0000	0.0000	15.949042		0.000000				

ASSEMBLED
Attachments

ketqua_diesel_case16.txt

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
AIRCLEANER	1	1	0.5026
AIRCLEANER	1	2	0.5040

OVERALL ENGINE PERFORMANCE:

Indicated Torque	:	36.88 Nm		Indicated Specific
Torque :		72.21 Nm/l		
Indicated Power	:	7.72 kW,	10.50 PS	Indicated Specific Power
:		15.12 kW/l,	20.56 PS/l	
Friction Torque	:	7.47 Nm		Friction Power
:		1.56 kW		
Effective Torque	:	29.41 Nm		Effective Specific
Torque :		57.59 Nm/l		
Effective Power	:	6.16 kW,	8.38 PS	Effective Specific Power
:		12.06 kW/l,	16.40 PS/l	

Required time for reading the inputfile and initialisation:	0.02 min
Required time for the calculation:	0.27 min
Required time for writing the outputfile:	0.02 min
Required total time:	0.30 min
Required total CPU-time:	13.31 sec