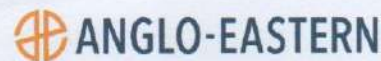


## ДОДАТОК А

### АКТИ ВПРОВАДЖЕННЯ РЕЗУЛЬТАТІВ ДОСЛІДЖЕННЯ



#### А К Т

впровадження результатів дисертаційної роботи  
здобувача кафедри «Суднові енергетичні установки та технічна експлуатація»  
Одеського національного морського університету  
Маулевича Владислава Олеговича

ТОВ «Anglo-Eastern Ukraine», в особі директора Лукьянченко О.М. справжнім актом підтверджує, що методи, які були розроблені та дослідженні у дисертаційній роботі Маулевича В.О. для визначення параметрів робочого процесу, були використані при індиціюванні головного двигуна MAN B&W 6S70MC-C на т/х «Mineral Maureen» і т/х «Mineral Charlie».

Аналіз розроблених Маулевичем В.О. методів показав, що вони значно уточнюють визначення параметрів робочого процесу та можуть бути використанні для підвищення ефективності експлуатації головної силової установки. Під час індиціювання більш детально було розглянуто і визначено наступне:

- Визначено фазу початку згоряння в циліндрі дизеля по максимуму другої похідної індикаторної діаграми тиску, згладженої фільтром низьких частот Butterworth;
- визначено фазу затримки самозаймання палива, з урахуванням фази підйому голки форсунки і фази початку згоряння;
- визначено частоту обертання колінчастого валу по періоду робочого циклу між центрами інтервалів фази закриття впускних клапанів і фазою початку згоряння;
- визначено середній індикаторний тиск в робочому циліндрі шляхом визначення площі елементарної ділянки, що не залежить від частоти обертання колінчастого валу і навантажувального режиму двигуна;
- визначено індикаторну потужність з використанням отриманих раніше значень частот обертання колінчастого валу і середніх індикаторних тисків.

Розроблені методи, які були впроваджені в новий алгоритм системи DEPAS D4.0H, значно покращують визначення основних діагностичних параметрів робочого процесу при проведенні діагностичних робіт суднових дизелів.

Директор «Anglo-Eastern Ukraine»

О.М. Лукьянченко

« 19 » 08 2019 р.





8, Marazlievskaya Street,  
Odessa, 65014, Ukraine

Phone: +38 (0482) 33-33-32  
Fax: +38 (0482) 34-74-07

www.transship.ua | transship@transship.ua

Україна, 65014, г. Одеса,  
ул. Маразлиевская 8

Тел: +38 (0482) 33-33-32  
Факс: +38 (0482) 34-74-07

ООО «Трансшип»

Технічний директор: Іванов С. І.

### А К Т

впровадження результатів дисертаційної роботи  
здобувача кафедри «Суднові енергетичні установки та технічна експлуатація»  
Одеського національного морського університету  
Маулевича Владислава Олеговича

Підприємство «Трансшип», в особі директора С. І. Іванов справжнім актом підтверджує, що розроблені у дисертаційній роботі Маулевича В.О. методи визначення основних параметрів робочого процесу для системи DEPAS D4.0H, були використані для проведення діагностичних робіт на т/х «Лимба», т/х «Дева Марія», т/х «Торнадо», т/х «Туман», на головних двигунах MAN B&W 6L23/30A.

За допомогою розроблених методів було виконано наступне:

- визначено фазу початку згоряння в циліндрі транспортного дизеля по максимуму другої похідної індикаторної діаграми тиску, згладженої фільтром низьких частот Butterworth;
- визначено фазу затримки самозаймання палива в робочому циліндрі, з урахуванням фази підйому голки форсунки і фази початку згоряння;
- визначено частоту обертання колінчастого валу по періоду робочого циклу між центрами інтервалів фази закриття впускних клапанів і фазою початку згоряння;
- визначено значення середнього індикаторного тиску в робочому циліндрі шляхом визначення площі елементарної ділянки, що не залежить від частоти обертання колінчастого валу і навантажувального режиму двигуна;
- підготовлено звіт і вироблені рекомендації для підвищення якості робочого процесу в циліндрах і рівномірному розподілу потужності по циліндрах головного двигуна.

Результати проведення діагностичних робіт були використані службою технічної експлуатації «Трансшип» для підвищення ефективності експлуатації головної силової установки. Аналіз розроблених Маулевичем В.О. методів показав, що вони можуть бути ефективно використані в практичній експлуатації суднових дизелів.

ООО «Трансшип»



Іванов С. І.



ООО «Трансшип» Код ОКПО 30256721  
Р/с 26002311681 в Акционерном Банке «Пивденний»  
г. Одеса. МФО 328209

«Затверджую»

Проректор

навчально-педагогічної роботи,

проф. В.В. Марков



## АКТ ВИКОРИСТАННЯ

РЕЗУЛЬТАТІВ ДИСЕРТАЦІЙНОГО ДОСЛІДЖЕННЯ  
 МАУЛЕВИЧА ВЛАДИСЛАВА ОЛЕГОВИЧА В НАВЧАЛЬНОМУ ПРОЦЕСІ  
 ОДЕСЬКОГО НАЦІОНАЛЬНОГО МОРСЬКОГО УНІВЕРСИТЕТУ

Цей акт підтверджує, що результати дисертаційного дослідження на тему: «Визначення основних діагностичних параметрів робочого процесу транспортних дизелів в експлуатації» здобувача кафедри «Суднові енергетичні установки та технічна експлуатація» Маулевича Владислава Олеговича, які представлені до захисту на здобуття наукового ступеня кандидата технічних наук за спеціальністю 05.22.20 – Експлуатація та ремонт засобів транспорту, використовуються при проведенні лабораторних і практичних занять з дисциплін: «Технічна експлуатація суднових енергетичних установок» і «Системи діагностування» на судномеханічному факультеті Одеського національного морського університету.

Узгоджено

Директор навчально-наукового

інституту морського флоту

к.т.н., доцент

О.М. Шумило

Зав.кафедрою «СЕУ та ТЕ»

д.т.н., професор

Р.А. Варбанець

## ДОДАТОК Б

## ДАНИ ЗДАВАЛЬНИХ ВИПРОБУВАНЬ ГД 6S70MC-C8



Official shop test result for Main Engine		Hull No.	P0050		Owner	BOCIMAR		
		Engine No.	AA4452		Class	ABS		
		Eng. Type	6S70MC-C8		Test Date	Oct. 03, 2011		
Summary Data of Load Test		Output(MCR)	17500 kW		Engineer	J.Y.PARK		
		Speed(MCR)	91 rpm		Operator	S.C.BACK		
DATA SHEET NO.		1	2	3	4	5	6	7
Load ( % )		25	50	75	90	100(I)	100(II)	110
Measuring Time		10:45	11:14	11:49	12:34	12:48	13:05	13:44
Speed ( rpm )		57.3	72.2	82.7	87.9	91.0	91.0	93.9
Brake Power (kW)		4375	8750	13125	15750	17500	17500	19250
Indicated Power (kW)		5006	9554	14062	16737	18535	18532	20316
Mech. Eff. ( % )		87.39	91.58	93.34	94.10	94.42	94.43	94.75
Pmax. ( bar )		75.0	110.0	140.5	159.8	159.8	160.2	160.0
Pcomp. ( bar )		50.3	80.0	110.0	130.3	145.5	146.3	156.5
Pi ( bar )		8.10	12.28	15.78	17.68	18.90	18.90	20.07
F.O Pump ( P0 )		48	64	80	88	95	95	103
Fuel Oil Consum.(g/kWh)	Measured	190.86	184.57	179.43	179.37	180.86	-	185.19
	Corrected	188.42	181.41	176.41	176.25	177.79	-	182.12
Exh.Gas Temp (°C)	Cyl. Out	268	297	306	322	345	347	380
	Bef. T/C	300	335	350	368	392	390	430
	Aft. T/C	240	230	210	215	228	225	251
T/C Speed (rpm)	NO. 1	4600	7390	8798	9385	9875	9878	10350
	NO. 2							
	NO. 3							
	NO. 4							
	Average	4600	7390	8798	9385	9875	9878	10350
Scavenging Air	°C	30	31	34	38	40	40	42
	kg/cm <sup>3</sup>	0.45	1.30	2.08	2.51	2.92	2.93	3.18
Cooling Water Inlet ( °C )		26	26	25	27	28	28	29
Test Room	°C	19.8	19.8	20.3	20.5	20.6	21.1	21.5
	mbar	1022	1022	1022	1022	1021	1021	1021

Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition



Official shop test result for Main Engine		Hull No.	P0050		Weather	FINE										
Data sheet of 25% Load Test		Engine No.	AA4452		Measuring Time	10:45										
		Eng. Type	6S70MC-C8		Test Date	Oct. 03, 2011										
		Owner	BOCIMAR		Engineer	J.Y.PARK										
		Class	ABS		Operator	S.C.BACK										
* Room Temperature : 19.8 °C				* Atmospheric Pressure : 1022 mbar												
Engine Speed	Water Brake	Brake Power	Indicated Power	Mech.Efficiency	Notch											
57.3 rpm	103.8 tonf·m	4375 kW	5006 kW	87.39 %	4.5											
System		Main L.O	P.C.O	Cam L.O	Fuel Oil	Cooling F.W										
Inlet	Press.(bar)	2.1			8.0	4.2										
	Temp.( °C )	44			39	67										
Cylinder NO.		Avg	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	75.0	75	75	75	75	75	75	BLANK							
Pcomp.	bar	50.3	50	51	50	51	50	50								
Pi	bar	8.10	8.04	8.12	8.09	8.25	8.10	8.02								
F.O Pump	Pθ	48	48	48	48	48	48	48								
	VIT	0.0	0.0	0.0	0.0	0.0	0.0	0.0								
Exh.Gas Out	°C	268	272	265	267	265	265	275								
C.F.W Out	°C	75	74	75	75	74	74	75								
Cam L.O Out	°C	43	43	-	-	-	-	-								
P.C.O Out	°C	50	50	50	50	51	51	50								
Air Cooler								Scavenging Air								
NO.		1	2	3	4	Avg	Pressure			Temperature						
Bef. Cooler Press	mmHg	280	BLANK			280	0.45 bar			30 °C						
Press. Drop	mmAq	80	BLANK			80	Air Receiver Pressure			330 mmHg						
Air In.	°C	55				55	Exhaust Manifold Pressure			0.34 bar						
Air Out.	°C	27				27	Specific Fuel Oil Consumption									
Cooling Water In	°C	26				26	Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)							
Cooling Water Out	°C	26				26	835.0	190.86	188.42							
TurboCharger																
Turbocharger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.( °C, bar)			F.W Temp				
	rpm	°C	mmAq	°C	mmHg	°C	mmAq	In	Out	Press	°C					
No.1	4600	20	27	3	300	240	240	5	44	44	1.4	-				
No.2		BLANK														
No.3																
No.4																
Avg.	4600	23.5	3		300	240	240	5	44	44	1.4	-				
* Pressure vit : 0.5 bar				*Governor Position 34.8				* Thrust Pad : 46 °C								
Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																



Official shop test result for Main Engine		Hull No.	P0050		Weather	FINE										
		Engine No.	AA4452		Measuring Time	11:14										
Data sheet of 50% Load Test		Eng. Type	6S70MC-C8		Test Date	Oct. 03, 2011										
		Owner	BOCIMAR		Engineer	J.Y.PARK										
		Class	ABS		Operator	S.C.BACK										
* Room Temperature : 19.8 °C				* Atmospheric Pressure : 1022 mbar												
Engine Speed	Water Brake	Brake Power	Indicated Power	Mech.Efficiency	Notch											
72.2 rpm	164.7 tonf·m	8750 kW	9554 kW	91.58 %	6.0											
System		Main L.O	P.C.O	Cam L.O	Fuel Oil	Cooling F.W										
Inlet	Press.(bar)	2.4			8.0	4.3										
	Temp.( °C )	44			38	67										
Cylinder NO.		Avg	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	110.0	110	110	110	110	110	110	BLANK							
Pcomp.	bar	80.0	80	80	80	80	80	80	BLANK							
Pi	bar	12.28	12.15	12.25	12.32	12.41	12.33	12.19	BLANK							
F.O Pump	P0	64	64	64	64	64	64	64	BLANK							
	VIT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	BLANK							
Exh.Gas Out	°C	297	307	295	300	285	293	300	BLANK							
C.F.W Out	°C	76	76	77	76	76	76	77	BLANK							
Cam L.O Out	°C	44	44	-	-	-	-	-	BLANK							
P.C.O Out	°C	52	52	52	52	53	53	52	BLANK							
Air Cooler					Scavenging Air											
NO.		1	2	3	4	Avg	Pressure		Temperature							
Bef. Cooler Press	mmHg	970	BLANK			970	1.30 bar		31 °C							
Press. Drop	mmAq	155	BLANK			155	Air Receiver Pressure		960 mmHg							
Air In.	°C	114	BLANK			114	Exhaust Manifold Pressure		1.11 bar							
Air Out.	°C	30	BLANK			30	Specific Fuel Oil Consumption									
Cooling Water In	°C	26	BLANK			26	Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)							
Cooling Water Out	°C	51	BLANK			51	1615.0	184.57	181.41							
TurboCharger																
Turbocharger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(°C, bar)			F.W Temp				
	rpm	°C	mmAq		°C	mmHg	°C	mmAq	In	Out	Press	°C				
No.1	7390	20	29	8	335	800	230	45	44	53	1.3	-				
No.2		BLANK														
No.3		BLANK														
No.4		BLANK														
Avg.	7390	24.5	8		335	800	230	45	44	53	1.3	-				
* Pressure vit : 0.5 bar				*Governor Position 47.9				* Thrust Pad : 46 °C								
Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																



Official shop test result for Main Engine		Hull No.	P0050		Weather	FINE										
		Engine No.	AA4452		Measuring Time	11:49										
Data sheet of 75% Load Test		Eng. Type	6S70MC-C8		Test Date	Oct. 03, 2011										
		Owner	BOCIMAR		Engineer	J.Y.PARK										
		Class	ABS		Operator	S.C.BACK										
* Room Temperature : 20.3 °C				* Atmospheric Pressure : 1022 mbar												
Engine Speed	Water Brake	Brake Power	Indicated Power	Mech.Efficiency	Notch											
82.7 rpm	215.8 tonf·m	13125 kW	14062 kW	93.34 %	7.1											
System		Main L.O	P.C.O	Cam L.O	Fuel Oil	Cooling F.W										
Inlet	Press.(bar)	2.1			8.0	4.3										
	Temp.( °C )	45			38	68										
Cylinder NO.		Avg	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	140.5	140	141	141	141	140	140	BLANK							
Pcomp.	bar	110.0	111	110	111	112	111	111	BLANK							
Pi	bar	15.78	15.69	15.79	15.72	15.91	15.82	15.77	BLANK							
F.O Pump	P0	80	80	80	80	80	80	80	BLANK							
	VIT	1.8	1.8	1.8	1.8	1.8	1.8	1.8	BLANK							
Exh.Gas Out	°C	306	320	300	310	300	300	308	BLANK							
C.F.W Out	°C	78	78	78	78	77	78	78	BLANK							
Cam L.O Out	°C	45	45	-	-	-	-	-	BLANK							
P.C.O Out	°C	54	54	54	54	55	55	54	BLANK							
Air Cooler						Scavenging Air										
NO.		1	2	3	4	Avg	Pressure			Temperature						
Bef. Cooler Press	mmHg	1570	BLANK			1570	2.08 bar			34 °C						
Press. Drop	mmAq	200	BLANK			200	Air Receiver Pressure			1550 mmHg						
Air In.	°C	154	BLANK			154	Exhaust Manifold Pressure			1.84 bar						
Air Out.	°C	32	BLANK			32	Specific Fuel Oil Consumption									
Cooling Water In	°C	25	BLANK			25	Meas.(kg/h)		Meas.(g/kWh)		Correct(g/kWh)					
Cooling Water Out	°C	38	BLANK			38	2355.0		179.43		176.41					
TurboCharger																
Turbocharger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(°C, bar)			F.W Temp				
	rpm	°C		mmAq	°C	mmHg	°C	mmAq	In	Out	Press	°C				
No.1	8798	21	31	13	350	1300	210	100	45	58	1.4	-				
No.2		BLANK														
No.3		BLANK														
No.4		BLANK														
Avg.	8798	26.0	13		350	1300	210	100	45	58	1.4	-				
* Pressure vit : 1.5 bar				*Governor Position 58.7				* Thrust Pad : 46 °C								
Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																



Official shop test result for Main Engine		Hull No.	P0050		Weather	FINE										
		Engine No.	AA4452		Measuring Time	12:34										
Data sheet of 90% Load Test		Eng. Type	6S70MC-C8		Test Date	Oct. 03, 2011										
		Owner	BOCIMAR		Engineer	J.Y.PARK										
		Class	ABS		Operator	S.C.BACK										
* Room Temperature : 20.5 °C				* Atmospheric Pressure : 1022 mbar												
Engine Speed	Water Brake	Brake Power	Indicated Power	Mech.Efficiency	Notch											
87.9 rpm	243.7 tonf·m	15750 kW	16737 kW	94.10 %	7.7											
System		Main L.O	P.C.O	Cam L.O	Fuel Oil	Cooling F.W										
Inlet	Press.(bar)	2.1			8.0	4.3										
	Temp.( °C )	45			38	68										
Cylinder NO.		Avg	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	159.8	160	159	160	160	160	160	BLANK							
Pcomp.	bar	130.3	131	131	130	130	131	129								
Pi	bar	17.68	17.55	17.80	17.73	17.58	17.74	17.67								
F.O Pump	P0	88	88	88	88	88	88	88								
	VIT	4.6	4.6	4.6	4.6	4.6	4.6	4.6								
Exh.Gas Out	°C	322	335	320	322	317	320	315								
C.F.W Out	°C	79	78	79	79	78	78	79								
Cam L.O Out	°C	45	45	-	-	-	-	-								
P.C.O Out	°C	54	54	54	54	55	55	54								
Air Cooler					Scavenging Air											
NO.		1	2	3	4	Avg	Pressure		Temperature							
Bef. Cooler Press	mmHg	1890	BLANK			1890	2.51 bar		38 °C							
Press. Drop	mmAq	215	BLANK			215	Air Receiver Pressure		1870 mmHg							
Air In.	°C	172				172	Exhaust Manifold Pressure		2.22 bar							
Air Out.	°C	35				35	Specific Fuel Oil Consumption									
Cooling Water In	°C	27				27	Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)							
Cooling Water Out	°C	42				42	2825.0	179.37	176.25							
TurboCharger																
Turbocharger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(°C, bar)			F.W Temp				
	rpm	°C	mmAq		°C	mmHg	°C	mmAq	In	Out	Press	°C				
No.1	9385	21	31	17	368	1630	215	120	45	60	1.4	-				
No.2		BLANK														
No.3																
No.4																
Avg.	9385	26.0	17		368	1630	215	120	45	60	1.4	-				
* Pressure vit : 2.0 bar			*Governor Position 66.5			* Thrust Pad : 47 °C										
Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																





Official shop test result for Main Engine		Hull No.	P0050		Weather	FINE										
		Engine No.	AA4452		Measuring Time	12:48										
Data sheet of 100%(I) Load Test		Eng. Type	6S70MC-C8		Test Date	Oct. 03, 2011										
		Owner	BOCIMAR		Engineer	J.Y.PARK										
		Class	ABS		Operator	S.C.BACK										
* Room Temperature : 20.6 ℃				* Atmospheric Pressure : 1021 mbar												
Engine Speed	Water Brake	Brake Power	Indicated Power	Mech.Efficiency	Notch											
91.0 rpm	261.5 tonf·m	17500 kW	18535 kW	94.42 %	8.0											
System		Main L.O	P.C.O	Cam L.O	Fuel Oil	Cooling F.W										
Inlet	Press.(bar)	2.1			7.8	4.2										
	Temp.( ℃ )	45			39	68										
Cylinder NO.		Avg	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	159.8	160	160	160	160	159	160	BLANK							
Pcomp.	bar	145.5	145	145	146	146	146	145								
Pi	bar	18.90	18.92	18.97	18.90	18.91	18.96	18.75								
F.O Pump	P0	95	95	95	95	95	95	95								
	VIT	1.8	1.8	1.8	1.8	1.8	1.8	1.8								
Exh.Gas Out	℃	345	361	345	350	338	337	340								
C.F.W Out	℃	80	80	80	80	79	79	80								
Cam L.O Out	℃	46	46	-	-	-	-	-								
P.C.O Out	℃	55	55	55	55	56	56	55								
Air Cooler					Scavenging Air											
NO.		1	2	3	4	Avg	Pressure		Temperature							
Bef. Cooler Press	mmHg	2220	BLANK			2220	2.92 bar		40 ℃							
Press. Drop	mmAq	235	BLANK			235	Air Receiver Pressure		2200 mmHg							
Air In.	℃	190				190	Exhaust Manifold Pressure		2.61 bar							
Air Out.	℃	39				39	Specific Fuel Oil Consumption									
Cooling Water In	℃	28				28	Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)							
Cooling Water Out	℃	46				46	3165.0	180.86	177.79							
TurboCharger																
Turbocharger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(℃, bar)			F.W Temp				
	rpm	℃	mmAq		℃	mmHg	℃	mmAq	In	Out	Press	℃				
No.1	9875	22	31	20	392	1930	228	140	45	62	1.4	-				
No.2		BLANK														
No.3																
No.4																
Avg.	9875	26.5	20		392	1930	228	140	45	62	1.4	-				
* Pressure vit : 1.2 bar				*Governor Position 72.5				* Thrust Pad : 47 ℃								
Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																



Official shop test result for Main Engine		Hull No.	P0050		Weather	FINE										
		Engine No.	AA4452		Measuring Time	13:44										
Data sheet of 110% Load Test		Eng. Type	6S70MC-C8		Test Date	Oct. 03, 2011										
		Owner	BOCIMAR		Engineer	J.Y.PARK										
		Class	ABS		Operator	S.C.BACK										
* Room Temperature : 21.5 °C				* Atmospheric Pressure : 1021 mbar												
Engine Speed	Water Brake	Brake Power	Indicated Power	Mech.Efficiency	Notch											
93.9 rpm	278.6 tonf·m	19250 kW	20316 kW	94.75 %	8.3											
System		Main L.O	P.C.O	Cam L.O	Fuel Oil	Cooling F.W										
Inlet	Press.(bar)	2.1			7.7	4.2										
	Temp.( °C )	45			39	68										
Cylinder NO.		Avg	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	160.0	160	160	160	160	160	160	BLANK							
Pcomp.	bar	156.5	157	156	157	156	157	156	BLANK							
Pi	bar	20.07	19.92	20.05	20.12	20.15	20.11	20.07	BLANK							
F.O Pump	P <sub>0</sub>	103	103	103	103	103	103	103	BLANK							
	VIT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	BLANK							
Exh.Gas Out	°C	380	400	385	380	370	370	375	BLANK							
C.F.W Out	°C	82	82	82	82	81	81	82	BLANK							
Cam L.O Out	°C	47	47	-	-	-	-	-	BLANK							
P.C.O Out	°C	56	56	56	56	57	57	56	BLANK							
Air Cooler						Scavenging Air										
NO.		1	2	3	4	Avg	Pressure			Temperature						
Bef. Cooler Press	mmHg	2420	BLANK			2420	3.18 bar			42 °C						
Press. Drop	mmAq	255	BLANK			255	Air Receiver Pressure			2400 mmHg						
Air In.	°C	211	BLANK			211	Exhaust Manifold Pressure			2.87 bar						
Air Out.	°C	42	BLANK			42	Specific Fuel Oil Consumption									
Cooling Water In	°C	29	BLANK			29	Meas.(kg/h)		Meas.(g/kWh)		Correct(g/kWh)					
Cooling Water Out	°C	51	BLANK			51	3565.0		185.19		182.12					
TurboCharger																
Turbocharger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(°C, bar)			F.W Temp				
	rpm	°C		mmAq	°C	mmHg	°C	mmAq	In	Out	Press	°C				
No.1	10350	23	32	26	430	2130	251	160	45	64	1.4	-				
No.2		BLANK														
No.3		BLANK														
No.4		BLANK														
Avg.	10350	27.5	26		430	2130	251	160	45	64	1.4	-				
* Pressure vit : 0.5 bar				*Governor Position 78.4				* Thrust Pad : 48 °C								
Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																



## ДАНІ ЗДАВАЛЬНИХ ВИПРОБУВАНЬ ГД 6G70ME-C9.2



<b>Official shop test result for Main Engine</b>		Hull No.	BC206K-01		Owner	TRAFIGURA				
		Engine No.	AA5856		Class	LR				
<b>Specification of Accessory</b>		Engine Type	6G70ME-C9.2		Test Date	May. 02, 2015				
		Output(MCR)	17106 kW		Engineer	M. K. HEO				
		Speed(MCR)	77.5 rpm		Operator	J. S. SONG				
Data Sheet No.		1	2	3	4	5	6	7	8	9
Load ( % )		25	50	73.6	75	100(1)	100(2)	110		
Measuring Time		10:30	11:00	11:30	12:00	12:30	13:00	13:30		
Speed ( rpm )		48.8	61.5	70.0	70.4	77.5	77.5	80.0		
Brake Power ( kW )		4277	8553	12590	12830	17106	17106	18817		
Pmax. ( bar )		104	142	163	164	181	179	185		
Pcomp. ( bar )		69	111	133	135	166	166	172		
Fuel Index ECU( % )		43	65	82	83	100	100	106		
Fuel Oil Consumption (g/kWh)	Measured	180.99	171.87	168.47	169.30	173.62	-	176.33		
	Corrected	177.87	168.52	165.30	165.92	170.24	-	172.87		
Exh. Gas Temp. ( °C )	Cyl. Out	204	257	314	320	376	380	414		
	Bef. T/C	274	338	374	386	452	461	488		
	Aft. T/C	205	213	212	214	240	242	273		
T/C Speed ( rpm )	NO. 1	6504	10030	12252	12424	13696	13786	14217		
	NO. 2									
	NO. 3									
	NO. 4									
	Average	6504	10030	12252	12424	13696	13786	14217		
Scavenging Air	°C	36	34	36	38	43	44	46		
	Mpa	0.04	0.13	0.23	0.24	0.32	0.32	0.35		
Fresh Water in	°C	26	28	30	32	28	31	32		
Test Room	°C	25.1	25.6	25.9	26.4	26.9	27.1	27.3		
	mbar	1011	1011	1011	1011	1011	1011	1011		
	Humidity(%)	58.9	57.2	49	45.3	43	42.8	40.7		

\* Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal/kg, and ISO condition



Official shop test result for Main Engine				Hull No.	BC206K-01	Weather	FINE									
Data sheet of 25 % Load test Engine Mode : Economy				Engine No.	AA5856	Measuring Time	10:30									
				Eng. Type	6G70ME-C9.2	Test Date	May. 02, 2015									
				Owner	TRAFIGURA	Engineer	M. K. HEO									
				Class	LR	Operator	J. S. SONG									
* Room Temperature :		25.1	°C	* Atmospheric Pressure :		1011	mbar	Humidity :	58.9 %							
Engine Speed	Water Brake	Brake Power	Fuel Index ECU	Swash Plate Pos.(%) (No.1,2,3)			Notch									
48.8 rpm	119.1 tonf-m	4277 kW	43 %	50	32	32	2.0									
System		Main L.O		P.C.O		Fuel Oil		Cooling F.W		Hydraulic Main						
In	Press. (MPa)	0.24				0.77		0.42		226 bar						
	Temp.(°C)	44				38		81		-						
Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	104.1	104.4	104.0	104.9	104.0	103.5	103.8								
Pcomp.	bar	69.4	69.2	69.5	69.4	69.3	69.9	69.3								
Exh.Gas Out.	°C	203.8	192	190	216	212	200	213								
Liner C.F.W Out.	°C	81.8	82	82	82	81	82	82								
Cover C.F.W Out.	°C	85.8	85	86	86	86	86	86								
P.C.O Out	°C	53.3	53	53	53	54	54	53								
Air Cooler						Scavenging Air										
NO.		1	2	3	4	Avg.	Pressure		Temperature							
Bef. Cooler Press	mmHg	340				340	0.04 MPa		36 °C							
Press. Drop	mmAq	84				84	Air receiver pressure		330 mmHg							
Air In.	°C	65				65	Exhaust Manifold Pressure		0.04 MPa							
Air Out.	°C	34				34	Specific Fuel Oil Consumption									
Fresh Water In.	°C	26				26	Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)							
Fresh Water Out.	°C	28				28	774.0	180.99	177.87							
TurboCharger																
Turbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.Inlet		L.O.(°C)					
	rpm	°C	mmAq	°C	mmHg	°C	mmAq	Press. (MPa)	In	Out						
NO. 1	6504	26	32	10	274	310	205	0	0.21	44	51					
NO. 2																
NO. 3																
NO. 4																
Avg.	6504	29.0	10	274	310	205	0	0.21	44	51						
* AVM : 0.95 mm						* Thrust Pad : 45 °C										
Note : 1) The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																



Official shop test result for Main Engine				Hull No.	BC206K-01	Weather	FINE									
Data sheet of 50 % Load test Engine Mode : Economy				Engine No.	AA5856	Measuring Time	11:00									
				Eng. Type	6G70ME-C9.2	Test Date	May. 02, 2015									
				Owner	TRAFIGURA	Engineer	M. K. HEO									
				Class	LR	Operator	J. S. SONG									
* Room Temperature :		25.6	°C	* Atmospheric Pressure :		1011	mbar	Humidity :	57.2 %							
Engine Speed	Water Brake	Brake Power	Fuel Index ECU	Swash Plate Pos. (%) (No.1,2,3)			Notch									
61.5 rpm	189.1 tonf.m	8553 kW	65 %	50	40	40	4.0									
System		Main L.O		P.C.O		Fuel Oil		Cooling F.W		Hydraulic Main						
In	Press. (MPa)	0.25				0.77		0.42		230 bar						
	Temp.(°C)	44				38		81		-						
Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	142.4	142.4	142.8	141.7	142.4	143.5	141.8								
Pcomp.	bar	110.6	109.7	112.3	110.3	110.4	110.1	110.6								
Exh.Gas Out.	°C	256.7	249	243	265	268	247	268								
Liner C.F.W Out.	°C	113.3	113	113	113	114	113	114								
Cover C.F.W Out.	°C	84.0	84	84	84	84	84	84								
P.C.O Out	°C	56.3	56	56	56	57	57	56								
Air Cooler						Scavenging Air										
NO.		1	2	3	4	Avg.	Pressure		Temperature							
Bef. Cooler Press	mmHg	1020				1020	0.13 MPa		34 °C							
Press. Drop	mmAq	130				130	Air receiver pressure		1000 mmHg							
Air In.	°C	125				125	Exhaust Manifold Pressure		0.12 MPa							
Air Out.	°C	30				30	Specific Fuel Oil Consumption									
Fresh Water In.	°C	28				28	Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)							
Fresh Water Out.	°C	33				33	1470.0	171.87	168.52							
TurboCharger																
Turbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.Inlet		L.O.(°C)					
	rpm	°C	mmAq	°C	mmHg	°C	mmAq	Press. (MPa)	In	Out						
NO. 1	10030	26	33	32	338	910	213	70	0.22	44	63					
NO. 2																
NO. 3																
NO. 4																
Avg.	10030	29.5	32	338	910	213	70	0.22	44	63						
* AVM : 1.04 mm						* Thrust Pad : 46 °C										
Note : 1) The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																



Official shop test result for Main Engine				Hull No.	BC206K-01	Weather	FINE										
Data sheet of 73.6 % Load test Engine Mode : Economy				Engine No.	AA5856	Measuring Time	11:30										
				Eng. Type	6G70ME-C9.2	Test Date	May. 02, 2015										
				Owner	TRAFIGURA	Engineer	M. K. HEO										
				Class	LR	Operator	J. S. SONG										
* Room Temperature : 25.9 ℃				* Atmospheric Pressure : 1011 mbar		Humidity : 49 %											
Engine Speed	Water Brake	Brake Power	Fuel Index ECU	Swash Plate Pos.(%) (No.1,2,3)			Notch										
70.0 rpm	244.6 tonf-m	12590 kW	82 %	50	49	49	5.0										
System		Main L.O		P.C.O		Fuel Oil	Cooling F.W	Hydraulic Main									
In	Press. (MPa)	0.25				0.77	0.42	263 bar									
	Temp.(℃)	44				38	81	-									
Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Pmax.	bar	162.8	161.8	161.8	162.4	163.8	164.1	162.8									
Pcomp.	bar	132.9	132.1	132.6	132.7	133.2	132.6	134.3									
Exh.Gas Out.	℃	313.7	310	298	335	319	310	310									
Liner C.F.W Out.	℃	108.8	109	109	108	110	108	109									
Cover C.F.W Out.	℃	85.5	85	86	85	86	86	85									
P.C.O Out	℃	58.3	58	58	58	59	59	58									
Air Cooler								Scavenging Air									
NO.		1	2	3	4	Avg.		Pressure				Temperature					
Bef. Cooler Press	mmHg	1810				1810		0.23 MPa				36 ℃					
Press. Drop	mmAq	164				164		Air receiver pressure				1780 mmHg					
Air In.	℃	172				172		Exhaust Manifold Pressure				0.23 MPa					
Air Out.	℃	34				34		Specific Fuel Oil Consumption									
Fresh Water In.	℃	30				30		Meas.(kg/h)		Meas.(g/kWh)		Correct(g/kWh)					
Fresh Water Out.	℃	41				41		2121.0		168.47		165.30					
TurboCharger																	
Turbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.Inlet		L.O.(℃)						
	rpm	℃	mmAq	℃	mmHg	℃	mmAq	Press. (MPa)	In	Out							
NO. 1	12252	26	35	60	374	1650	212	160	0.22	44	73						
NO. 2																	
NO. 3																	
NO. 4																	
Avg.	12252	30.5	60	374	1650	212	160	0.22	44	73							
* AVM : 1.06 mm      * Thrust Pad : 47 ℃																	
Note : 1) The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																	



Official shop test result for Main Engine				Hull No.	BC206K-01	Weather	FINE									
Data sheet of 75 % Load test				Engine No.	AA5856	Measuring Time	12:00									
				Engine Mode :	Economy <th>Eng. Type</th> <td>6G70ME-C9.2</td> <th>Test Date</th> <td>May. 02, 2015</td>	Eng. Type	6G70ME-C9.2	Test Date	May. 02, 2015							
				Owner	TRAFIGURA	Engineer	M. K. HEO									
				Class	LR	Operator	J. S. SONG									
* Room Temperature :				26.4	°C	* Atmospheric Pressure :		1011	mbar	Humidity :		45.3	%			
Engine Speed	Water Brake	Brake Power	Fuel Index ECU	Swash Plate Pos.(%) (No.1,2,3)			Notch									
70.4 rpm	247.7 tonf-m	12830 kW	83 %	50	50	50	5.2									
System		Main L.O		P.C.O		Fuel Oil		Cooling F.W		Hydraulic Main						
In	Press. (MPa)	0.25						0.77		0.42		265 bar				
	Temp.(°C)	44						38		81		-				
Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	164.3	164.1	162.7	165.1	164.9	166.1	162.8								
Pcomp.	bar	135.1	134.5	134.2	135.6	135.3	134.8	136.0								
Exh.Gas Out.	°C	320.0	327	300	331	322	311	329								
Liner C.F.W Out.	°C	111.2	110	110	111	112	112	112								
Cover C.F.W Out.	°C	87.3	88	88	87	87	87	87								
P.C.O Out	°C	58.3	58	58	58	59	59	58								
Air Cooler						Scavenging Air										
NO.		1	2	3	4	Avg.	Pressure			Temperature						
Bef. Cooler Press	mmHg	1820				1820	0.24 MPa			38 °C						
Press. Drop	mmAq	167				167	Air receiver pressure			1810 mmHg						
Air In.	°C	179				179	Exhaust Manifold Pressure			0.23 MPa						
Air Out.	°C	36				36	Specific Fuel Oil Consumption									
Fresh Water In.	°C	32				32	Meas.(kg/h)		Meas.(g/kWh)		Correct(g/kWh)					
Fresh Water Out.	°C	44				44	2172.0		169.30		165.92					
TurboCharger																
Turbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.Inlet		L.O.(°C)					
	rpm	°C	mmAq	°C	mmHg	°C	mmAq	Press. (MPa)	In	Out						
NO. 1	12424	26	36	75	386	1700	214	160	0.22	44	77					
NO. 2																
NO. 3																
NO. 4																
Avg.	12424	31.0	75	386	1700	214	160	0.22	44	77						
* AVM : 1.07 mm						* Thrust Pad : 47 °C										
Note : 1) The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																

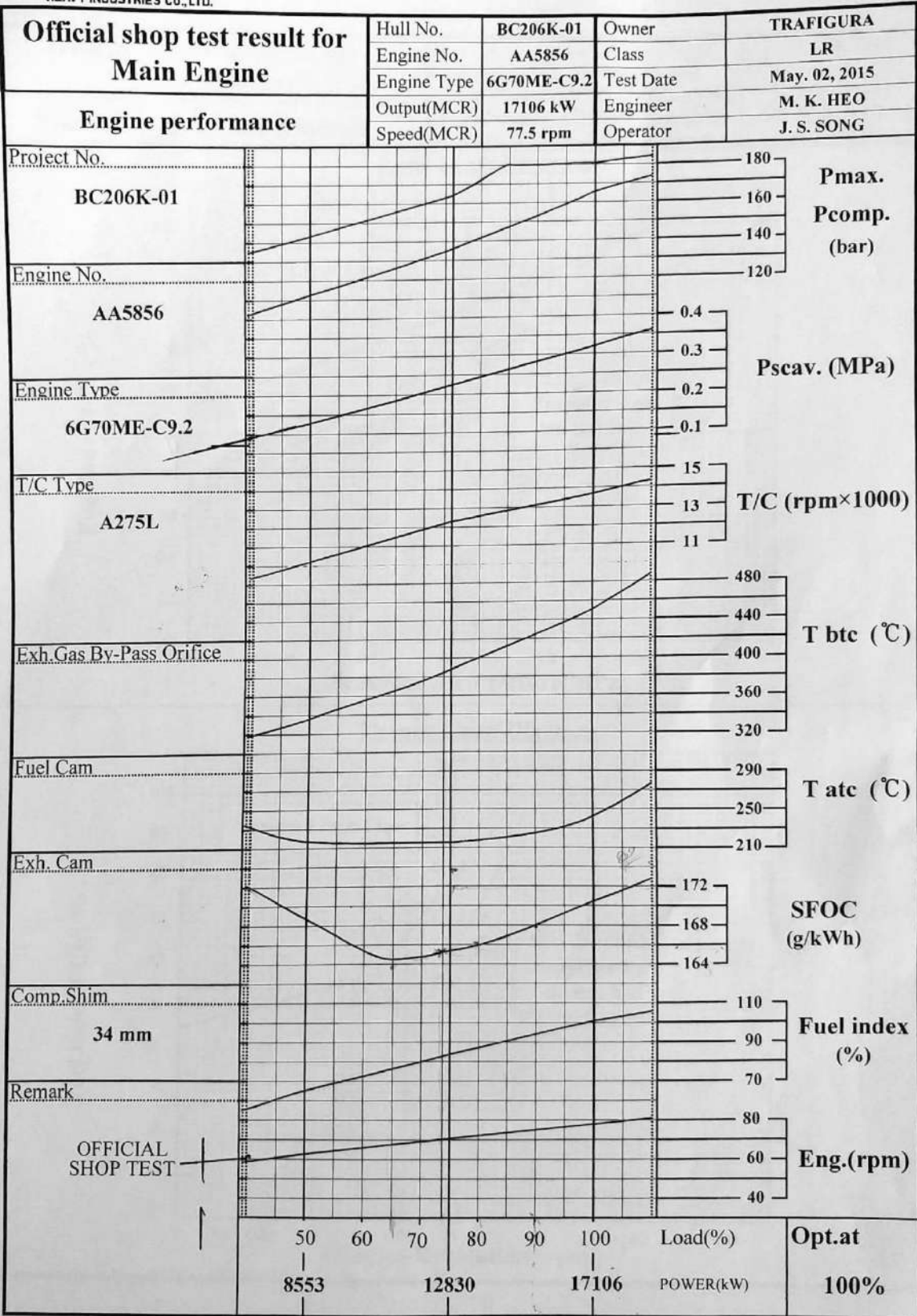




Official shop test result for Main Engine										Hull No.	BC206K-01		Weather	FINE			
Data sheet of 100(1) % Load test Engine Mode : Economy										Engine No.	AA5856		Measuring Time	12:30			
										Eng. Type	6G70ME-C9.2		Test Date	May. 02, 2015			
										Owner	TRAFIGURA		Engineer	M. K. HEO			
										Class	LR		Operator	J. S. SONG			
* Room Temperature : 26.9 °C										* Atmospheric Pressure : 1011 mbar			Humidity : 43 %				
Engine Speed		Water Brake		Brake Power		Fuel Index ECU		Swash Plate Pos.(%) (No.1,2,3)			Notch						
77.5 rpm		300.1 tonf-m		17106 kW		100 %		50 58 58			6.0						
System			Main L.O			P.C.O			Fuel Oil		Cooling F.W		Hydraulic Main				
In	Press. (MPa)		0.25						0.77		0.42		295 bar				
	Temp.(°C)		44						38		81		-				
Cyl. NO.			Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.		bar	180.5	179.8	181.1	181.3	181.5	179.9	179.6								
Pcomp.		bar	165.5	165.0	166.2	165.6	165.8	164.8	165.6								
Exh.Gas Out.		°C	376.3	373	360	388	379	375	383								
Liner C.F.W Out.		°C	84.3	84	84	84	84	85	85								
Cover C.F.W Out.		°C	88.2	88	88	88	88	89	88								
P.C.O Out		°C	59.7	60	60	60	59	59	60								
Air Cooler								Scavenging Air									
NO.			1	2	3	4	Avg.		Pressure				Temperature				
Bef. Cooler Press		mmHg	2420				2420		0.32 MPa				43 °C				
Press. Drop		mmAq	182				182		Air receiver pressure				2400 mmHg				
Air In.		°C	209				209		Exhaust Manifold Pressure				0.31 MPa				
Air Out.		°C	38				38		Specific Fuel Oil Consumption								
Fresh Water In.		°C	28				28		Meas.(kg/h)		Meas.(g/kWh)		Correct(g/kWh)				
Fresh Water Out.		°C	45				45		2970.0		173.62		170.24				
TurboCharger																	
Turbo Charger		Speed		Blower Inlet			Before Turbine		After Turbine		L.O.Inlet		L.O.(°C)				
		rpm		°C		mmAq	°C	mmHg	°C	mmAq	Press. (MPa)		In	Out			
NO. 1		13696		27	36	91	452	2310	240	230	0.22		45	84			
NO. 2																	
NO. 3																	
NO. 4																	
Avg.		13696		31.5	91	452	2310	240	230	0.22		45	84				
										* AVM : 1.11 mm			* Thrust Pad : 48 °C				
Note : 1) The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																	



Official shop test result for Main Engine				Hull No.	BC206K-01	Weather	FINE									
Data sheet of 110 % Load test Engine Mode : Economy				Engine No.	AA5856	Measuring Time	13:30									
				Eng. Type	6G70ME-C9.2	Test Date	May. 02, 2015									
				Owner	TRAFIGURA	Engineer	M. K. HEO									
				Class	LR	Operator	J. S. SONG									
* Room Temperature :		27.3	°C	* Atmospheric Pressure :		1011	mbar	Humidity :	40.7 %							
Engine Speed	Water Brake	Brake Power	Fuel Index ECU	Swash Plate Pos.(%) (No.1,2,3)			Notch									
80.0 rpm	319.8 tonf-m	18817 kW	106 %	50	61	61	6.5									
System		Main L.O		P.C.O		Fuel Oil		Cooling F.W		Hydraulic Main						
In	Press. (MPa)	0.25						0.77		0.42		295 bar				
	Temp.(°C)	44						38		81		-				
Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	185.1	185.5	186.0	184.2	184.7	186.6	183.8								
Pcomp.	bar	172.3	173.1	172.6	172.1	172.5	171.4	172.3								
Exh.Gas Out.	°C	413.5	410	408	425	408	408	422								
Liner C.F.W Out.	°C	86.5	87	86	86	87	87	86								
Cover C.F.W Out.	°C	85.5	86	85	86	85	86	85								
P.C.O Out	°C	60.3	60	60	60	61	61	60								
Air Cooler						Scavenging Air										
NO.		1	2	3	4	Avg.	Pressure			Temperature						
Bef. Cooler Press	mmHg	2710				2710	0.35 MPa			46 °C						
Press. Drop	mmAq	200				200	Air receiver pressure			2620 mmHg						
Air In.	°C	224				224	Exhaust Manifold Pressure			0.34 MPa						
Air Out.	°C	40				40	Specific Fuel Oil Consumption									
Fresh Water In.	°C	32				32	Meas.(kg/h)		Meas.(g/kWh)		Correct(g/kWh)					
Fresh Water Out.	°C	50				50	3318.0		176.33		172.87					
TurboCharger																
Turbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.Inlet		L.O.(°C)					
	rpm	°C		mmAq	°C	mmHg	°C	mmAq	Press. (MPa)		In	Out				
NO. 1	14217	27	37	96	488	2530	273	280	0.22		45	88				
NO. 2																
NO. 3																
NO. 4																
Avg.	14217	32.0		96	488	2530	273	280	0.22		45	88				
* AVM : 1.13 mm						* Thrust Pad : 49 °C										
Note : 1) The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition																



## ДОДАТОК В

### МОДЕЛЮВАННЯ РОБОЧОГО ПРОЦЕСУ ГД 6G70ME-C9.2 В ПРОГРАМНОМУ СЕРЕДОВИЩІ AVL BOOST

#### 6G70ME-C9.2 Навантаження 50 %

```

-----
AVL - B O O S T
Version : v2014.1.0.0.0
Build:   Mar 10 2015 22:02:38
System:  x86_64-unknown-winnt_i11
-----

```

#### LICENSE

```

-----
Boost Main 2014.0@ License will expire in 198 days

Boost Charging 2014.0@ License will expire in 198 days

```

#### PROJECT

```

-----
Preprocessor Version : 2014.1
Calculation date    : 09.02.2019
File               : MAN_G70ME-C.bst
Case Set           : "G70ME-C"
Case               : "Case 2_50"

Project ID: "Demo File 2-Stroke Diesel Large Engine"
Run ID:     ""
Model date: "25. Mar 2002 11:15:59"

```

#### ELEMENTS

```

-----
Element Name      Number
PIPE              29
SYSTEMBOUNDARY   3
PLENUM            1
VARIABLE_PLENUM  6
CYLINDER          6
MEASURINGPOINT   8
AIRCOOLER         1
TURBOCHARGER     1
JUNCTION          6
ENGINE            1

```

```

PIPE_END          60
ASSEMBLED         1
ALL_PIPES        30
ALL_PLENUMS      9
ALL_BOUNDARIES   3
ALL_CHARGERS     1
ALL_PIDS         1
PIPE_VAR_WALL_TEMP 30

```

## GLOBAL DATA

-----

```

Engine Speed :      61.5 rpm
Calculationmode:   BOOST Single
Cycle Duration:    360.00 degrees
Max. calc. period: 3600.00 degrees
Cycles calculated: 10 cycles
Calc. time steps:  0.07995 degrees (max)
                  0.04623 degrees
                  0.12528 ms
                  0.03735 degrees (short pipe)
                  0.10121 ms (short pipe)
Traces results step: 1.00000 degrees
User concentrations: 0
Ref. pressure:    98000.00 Pa
Ref. temperature: 298.000 K
Gas properties:   Variable
Gasproperties File: DIESEL.BGP
  bgp_build_version: v2013.0.0.0.0
  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

Warnings:         0
Convergence errors: 773

```

## PIPES

-----

Total number of pipe cells: 322

Pipe nr.	Cells	Cell size [mm]	W.Heat [kJ]	Wall T [K]	Fric. coeff. [-]	Lam. Fric. Coeff. [-]	Heat Factor [-]	Volume [dm3]
1	2	90.0	0.000	298.15	0.020000	64.000000	0.000000	63.461742
2	14	100.0	0.000	463.15	0.020000	64.000000	0.000000	332.616122
3	28	100.0	0.000	307.15	0.020000	64.000000	0.000000	1415.814603
4	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656

5	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656						
6	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656						
7	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656						
8	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656						
9	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656						
10	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340						
11	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340						
12	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340						
13	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340						
14	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340						
15	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340						
16	30	100.0	12.777	530.15	0.020000	64.000000	1.000000	452.412762						
17	30	100.0	12.873	530.15	0.020000	64.000000	1.000000	452.412762						
18	30	100.0	22.327	530.15	0.020000	64.000000	1.000000	452.412762						
19	30	100.0	17.306	530.15	0.020000	64.000000	1.000000	452.412762						
20	30	100.0	16.243	530.15	0.020000	64.000000	1.000000	452.412762						
21	30	100.0	16.216	530.15	0.020000	64.000000	1.000000	452.412762						
22	4	112.5	0.567	530.15	0.020000	64.000000	1.000000	127.234502						
23	9	100.0	2.652	530.15	0.020000	64.000000	1.000000	254.469005						
24	9	100.0	-7.990	530.15	0.020000	64.000000	1.000000	254.469005						
25	9	100.0	-15.620	530.15	0.020000	64.000000	1.000000	254.469005						
26	9	100.0	-22.426	530.15	0.020000	64.000000	1.000000	254.469005						
27	9	100.0	-26.172	530.15	0.020000	64.000000	1.000000	254.469005						
28	18	100.0	-49.279	530.15	0.020000	64.000000	1.000000	630.302025						
29	1	90.0	-0.914	501.15	0.020000	64.000000	1.000000	48.695472						
30	6	100.0	-1506.181	301.15	40.563344	38895391.111123	710.295426	1600.000000	COOLER_PIPE					1

MEASURINGPOINTS: Average Values

Mp. nr.	Pipe nr.	Location [mm]	Diameter [mm]	Pressure [bar]	Temp. [K]	Ms.Temp. [K]	Velo. [m/s]	Massflow [g/s]	Massflow [g/cycle]	To.Ent.f. [kJ/s]	To.Ent.f. [kJ/cyc.]	Mach. [-]	Wtemp. [K]	Converg. [-]
1	1	150.0000	670.0000	0.9540	295.7	295.7	67.3	26633.2171	25983.6264	-4.032	-3.9335	0.20	298.2	0.439E-04
2	2	0.0000	550.0000	1.7251	363.3	363.3	67.8	26633.7317	25984.1285	1814.428	1770.1738	0.18	463.2	0.437E-04
3	3	1400.0000	771.4286	1.7105	307.8	307.8	29.5	26640.7322	25990.9582	270.078	263.4905	0.08	307.2	0.513E-04
4	4	190.0000	820.0000	1.9982	321.1	307.8	4.6	4630.0612	4517.1329	46.048	44.9252	0.01	307.2	0.485E-03
5	10	75.0000	630.0000	1.9949	325.3	324.9	6.9	4635.8647	4522.7948	127.900	124.7802	0.02	307.2	0.314E-04
6	16	0.0000	380.0000	1.6048	401.5	541.3	45.3	4724.2406	4609.0152	1421.822	1387.1435	0.10	530.1	0.566E-03
7	28	1800.0000	750.0000	1.7006	605.5	593.9	61.4	27157.0368	26494.6700	8546.738	8338.2810	0.13	530.1	0.835E-03
8	29	0.0000	830.0000	0.9800	542.2	528.4	77.7	27163.7569	26501.2262	6675.956	6513.1274	0.17	501.1	0.865E-03

SYSTEMBOUNDARIES

Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
SYSTEMBOUNDARY	1	1	25983.0334
SYSTEMBOUNDARY	2	22	0.0000
SYSTEMBOUNDARY	3	29	26497.1726

## PLENUMS: Average Values

-----						
	Pl. nr.	Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	
PLENUM	1	1.7016	308.13	34623.257	0.000	
				Attached pipe 3:	25992.0136	g/cycle
				Attached pipe 4:	4517.5329	g/cycle
				Attached pipe 5:	4600.5507	g/cycle
				Attached pipe 6:	4420.3235	g/cycle
				Attached pipe 7:	4274.2910	g/cycle
				Attached pipe 8:	4059.1443	g/cycle
				Attached pipe 9:	4168.4345	g/cycle
VARIABLE_PLENUM	1	1.9982	322.29	4947.816	0.000	
				Attached pipe 4:	4517.5333	g/cycle
				Attached pipe 10:	4523.1848	g/cycle
VARIABLE_PLENUM	2	1.9959	322.42	4940.264	0.000	
				Attached pipe 5:	4600.2506	g/cycle
				Attached pipe 11:	4592.5599	g/cycle
VARIABLE_PLENUM	3	2.0014	322.64	4949.065	0.000	
				Attached pipe 6:	4420.4114	g/cycle
				Attached pipe 12:	4417.5838	g/cycle
VARIABLE_PLENUM	4	1.9930	322.27	4935.179	0.000	
				Attached pipe 7:	4273.0435	g/cycle
				Attached pipe 13:	4245.8844	g/cycle
VARIABLE_PLENUM	5	1.9976	322.71	4938.799	0.000	
				Attached pipe 8:	4059.7570	g/cycle
				Attached pipe 14:	4066.4354	g/cycle
VARIABLE_PLENUM	6	2.0011	322.15	4955.153	0.000	
				Attached pipe 9:	4168.8533	g/cycle
				Attached pipe 15:	4172.5946	g/cycle
AIRCOOLER	1	1.7230	365.66	1969.502	0.000	
				Attached pipe 2:	25983.8222	g/cycle
				Attached pipe 30:	25985.1591	g/cycle
AIRCOOLER	1	1.7192	308.24	2331.202	0.000	
				Attached pipe 3:	25989.0331	g/cycle
				Attached pipe 30:	25987.2628	g/cycle

## PLENUMS

## Attachments

-----			
Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
PLENUM	1	3	25992.0136
PLENUM	1	4	4517.5329
PLENUM	1	5	4600.5507
PLENUM	1	6	4420.3235
PLENUM	1	7	4274.2910
PLENUM	1	8	4059.1443







Trapped Fuelm.fl.[g/s]	522.750000	87.125000	87.125000	87.125000	87.125000	87.125000	87.125000
Trapp. Eff. Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

## Energy Balance Cylinder:

Fuel Energy [kJ]	21828.11714	3638.01996	3638.01888	3638.01989	3638.01946	3638.02003	3638.01891
Released Energy [kJ]	21806.05575	3634.34082	3634.34740	3634.33553	3634.34032	3634.33924	3634.35243
-> Brake Power [%]	37.703	37.632	37.675	37.590	37.600	37.616	38.104
-> Loss: Friction [%]	6.896	6.896	6.896	6.896	6.896	6.896	6.896
-> Loss: Piston [%]	5.739	5.735	5.736	5.742	5.744	5.760	5.718
-> Loss: Head [%]	7.088	7.081	7.098	7.094	7.088	7.109	7.058
-> Loss: Liner [%]	5.682	5.666	5.591	5.660	5.737	5.749	5.690
-> Loss: Int. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Gas [%]	34.677	34.710	34.578	34.756	34.614	34.672	34.730
Eff. Rel. Energy [kJ]	21806.03628	3634.33752	3634.34438	3634.33228	3634.33691	3634.33592	3634.34927
Gross Rel. Energy [kJ]	21806.04827	3634.34082	3634.33992	3634.33553	3634.34032	3634.33924	3634.35243
Eff.Gross Rel.Ener.[kJ]	21806.02861	3634.33752	3634.33671	3634.33228	3634.33691	3634.33592	3634.34927
Energy Balance [-]	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990
Eff. Energy Balance [-]	1.0000	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990

## Blowby:

Blowbymass [g]	-25.897778	-4.277909	-4.578720	-4.362583	-4.209136	-4.271278	-4.198151
Blowbymassfl. [g/s]	-26.545222	-4.384857	-4.693188	-4.471648	-4.314365	-4.378059	-4.303105
Blowby Heat Flow [kJ]	-26.209935	-4.339414	-4.576404	-4.408563	-4.285296	-4.345827	-4.254431

## Reference Values at Start of High Pressure:

Pressure at SHP[bar]	1.7547	1.7305	1.9263	1.7875	1.6867	1.7324	1.6644
Temperature [K]	334.58	333.52	345.18	337.10	329.96	334.16	327.54
Air Massfl. [g/s]	26248.499594	4563.057364	4632.679732	4456.825264	4283.151401	4102.873026	4209.912806
Fuel Massfl. [g/s]	522.750000	87.125000	87.125000	87.125000	87.125000	87.125000	87.125000
Trapp. Eff. Air [-]	0.4976	0.4723	0.5003	0.4941	0.4958	0.5249	0.5013
Trapp. Eff.Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
A/F-Ratio (Cmb.) [-]	24.97	24.72	26.58	25.26	24.36	24.70	24.20
Excess Air Ratio [-]	1.6985	1.6813	1.8082	1.7182	1.6568	1.6801	1.6466

## Reference Values at Start Of Combustion:

Pressure [bar]	110.7396	109.3427	120.3851	112.5555	106.9559	109.4053	105.7931
Temperature [K]	1027.90	1025.68	1049.99	1033.12	1018.31	1027.05	1013.23

## Residual Gas:

Res.gas content [-]	0.0157	0.0158	0.0158	0.0158	0.0156	0.0157	0.0159
External EGR [-]	0.0315	0.0332	0.0314	0.0317	0.0317	0.0299	0.0313
Internal EGR [-]	-0.0158	-0.0174	-0.0156	-0.0160	-0.0161	-0.0142	-0.0154
Com.Prod.Mass. at EO [g]	13446.246751	2221.474538	2275.853467	2261.589484	2183.350308	2213.163088	2290.815866

Res.gas mass at SHP [g]	203.832813	33.691439	36.261020	34.440380	32.728100	33.494073	33.217801
Res.gas aspirated IN [g]	408.152302	70.956462	72.033890	69.299656	66.629711	63.791555	65.441028
Res.gas from intake [g]	197.479926	33.691185	32.854816	32.857561	32.727777	32.131112	33.217475
Rel. to Total [-]	0.9688	1.0000	0.9061	0.9540	1.0000	0.9593	1.0000
Res.gas flow EX [g]	13647.362180	2258.722848	2311.587094	2296.982919	2213.627070	2243.449271	2322.992978
Res.gas from exhaust [g]	5.732640	0.000000	3.405885	1.000424	0.000000	1.326331	0.000000
Rel. to Total [-]	0.0281	0.0000	0.0939	0.0290	0.0000	0.0396	0.0000

## Gas Exchange:

Volumetric Eff. [-]	1.4798	1.4648	1.5754	1.4969	1.4435	1.4638	1.4345
Rel. to Ave. [-]		0.9898	1.0646	1.0116	0.9755	0.9892	0.9694
Rel. To PL 1 [-]	0.8812	0.8723	0.9381	0.8914	0.8596	0.8717	0.8542
Total Mass at SHP[g]	12947.6604	2136.0851	2297.3912	2183.0241	2104.5704	2134.4658	2092.1238
Mass Delivered [g]	26016.44459	4522.71974	4591.72143	4417.42187	4245.31400	4066.59451	4172.67303
Mass Delivered [g/s]	26666.85570	4635.78774	4706.51447	4527.85741	4351.44685	4168.25937	4276.98986
Delivery Ratio [-]	3.0210	3.1510	3.1991	3.0777	2.9578	2.8332	2.9071
Rel. to Ave. [-]		1.0430	1.0590	1.0188	0.9791	0.9379	0.9623
Rel. To PL 1 [-]	1.7990	1.8764	1.9051	1.8327	1.7613	1.6872	1.7312
Av.Airmass at SHP[g]	12744.2338	2102.4672	2261.2140	2148.6631	2071.8423	2100.9782	2059.0690
Air Delivered [g]	25608.29229	4451.76328	4519.68754	4348.12221	4178.68429	4002.80295	4107.23201
Air Delivered [g/s]	26248.49959	4563.05736	4632.67973	4456.82526	4283.15140	4102.87303	4209.91281
Airdeliveryratio [-]	2.9736	3.1016	3.1489	3.0294	2.9113	2.7888	2.8615
Rel. to Ave. [-]		1.0430	1.0590	1.0188	0.9791	0.9379	0.9623
Rel. To PL 1 [-]	1.7708	1.8470	1.8752	1.8040	1.7337	1.6607	1.7040
Airmass Trapped [g]	12743.82757	2102.39363	2261.13018	2148.58370	2071.84230	2100.97171	2058.90605
Airmass Trapped [g/s]	13062.42326	2154.95347	2317.65844	2202.29829	2123.63836	2153.49600	2110.37870
Trapp. Eff. Air [-]	0.4976	0.4723	0.5003	0.4941	0.4958	0.5249	0.5013
Rel. to Ave. [-]		0.9490	1.0053	0.9930	0.9963	1.0547	1.0073
Airpurity [-]	0.9843	0.9843	0.9843	0.9843	0.9844	0.9843	0.9842
Dyn. Swirl [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dyn. Tumble [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

## Wall Heatlosses:

Piston [kJ]	-1251.5355	-208.4394	-208.4761	-208.6935	-208.7647	-209.3434	-207.8185
Cylinderhead [kJ]	-1545.57065	-257.34295	-257.96574	-257.80884	-257.58420	-258.35940	-256.50952
Cylinderliner [kJ]	-1239.05326	-205.92480	-203.19493	-205.69100	-208.51224	-208.94391	-206.78638
Sum of Wallheat [kJ]	-4036.15945	-671.70715	-669.63677	-672.19331	-674.86114	-676.64673	-671.11436
Wall Heatlosses in High Pressure Phase:							
Piston HP [kJ]	-1283.29327	-213.83681	-213.91134	-214.08122	-213.96041	-214.50265	-213.00084
Cylinderhead HP [kJ]	-1568.81307	-261.34339	-261.98958	-261.78080	-261.36086	-262.08622	-260.25222
Cylinderliner HP [kJ]	-1338.70357	-223.71038	-221.02832	-223.08734	-224.39779	-224.32228	-222.15746
Sum of Wallheat HP [kJ]	-4190.80990	-698.89058	-696.92924	-698.94936	-699.71905	-700.91115	-695.41052
Wall Heatlosses Related to Heatinput:							
Piston [-]	-0.0573	-0.0573	-0.0573	-0.0574	-0.0574	-0.0575	-0.0571
Cylinderhead [-]	-0.0708	-0.0707	-0.0709	-0.0709	-0.0708	-0.0710	-0.0705
Cylinderliner [-]	-0.0568	-0.0566	-0.0559	-0.0565	-0.0573	-0.0574	-0.0568
Sum of Wallheat [-]	-0.1849	-0.1846	-0.1841	-0.1848	-0.1855	-0.1860	-0.1845

M. Eff. HTC [W/m2/K]	492.23	490.17	505.05	494.67	486.81	489.72	486.98
M. Eff. Temp. [K]	1220.44	1222.52	1204.30	1217.62	1227.76	1225.75	1224.71

Reference Values at EO:

Pressure [bar]	5.54	5.51	5.59	5.57	5.46	5.50	5.59
Temperature [K]	1002.12	1005.85	996.09	998.41	1013.76	1008.62	989.97
A/F-Ratio [-]	24.75	24.53	25.15	24.98	24.11	24.44	25.31
Com.Prod.Conc. [-]	0.99905	0.99905	0.99905	0.99905	0.99905	0.99905	0.99905
Fuel Concentr. [-]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Average Values of Pipeattachements:

Attached Pipe	10	11	12	13	14	15
Vlv/Prt.Op.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Eff.0mm[deg]	139.98	139.97	139.99	139.98	139.97	139.98
Vlv/Prt.Op.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Eff.0mm[deg]	220.03	220.05	220.04	220.00	220.01	220.01
Vlv/Prt.Cl.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	4522.719743	4591.721434	4417.421865	4245.314005	4066.594507	4172.673034
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Attached Pipe	16	17	18	19	20	21
Vlv/Prt.Op.Clr.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.1mm[deg]	127.10	127.10	127.10	127.10	127.10	127.10
Vlv/Prt.Op.Udef.mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Cl.Clr.0mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Vlv/Prt.Cl.Eff.0mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Vlv/Prt.Cl.Eff.1mm[deg]	229.98	229.98	229.98	229.98	229.98	229.98
Vlv/Prt.Cl.Udef.mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	4610.083482	4572.193391	4531.495411	4310.027870	4151.927251	4373.379159
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ASSEMBLED: Average Values

Type	Nr.	-----Inlet-----			-----Outlet-----			-----Core-----			
		Pressure [bar]	Temperat. [K]	Mass [g]	Pressure [bar]	Temperat. [K]	Mass [g]	Rej.Heat [kJ]	Rej.Heat [kW]	Fric. coeff. [-]	Heat Factor [-]
AIRCOOLER	1	1.7230	365.66	1969.502	1.7192	308.24	2331.202	-1506.1811	-1543.8356	40.563344	710.295426

ASSEMBLED Attachments

Type	Nr.	Pipe	Mass flow
------	-----	------	-----------

		Nr.	[g/cycle]
AIRCOOLER	1	2	25983.8222
AIRCOOLER	1	3	25989.0331

JUNCTIONS: Average Values

```

-----
Junction  1: Attached pipe 21: -4343.6918 g/cycle
           Attached pipe 22:   0.0067 g/cycle
           Attached pipe 23: -4344.0068 g/cycle
Junction  2: Attached pipe 20: -4129.7356 g/cycle
           Attached pipe 23: -4334.7999 g/cycle
           Attached pipe 24: -8464.4454 g/cycle
Junction  3: Attached pipe 19: -4316.3840 g/cycle
           Attached pipe 24: -8457.0370 g/cycle
           Attached pipe 25: -12774.4891 g/cycle
Junction  4: Attached pipe 18: -4516.5771 g/cycle
           Attached pipe 25: -12787.2682 g/cycle
           Attached pipe 26: -17307.4861 g/cycle
Junction  5: Attached pipe 17: -4578.5160 g/cycle
           Attached pipe 26: -17335.1833 g/cycle
           Attached pipe 27: -21917.3907 g/cycle
Junction  6: Attached pipe 16: -4541.0860 g/cycle
           Attached pipe 27: -21918.4032 g/cycle
           Attached pipe 28: -26459.8586 g/cycle
    
```

OVERALL ENGINE PERFORMANCE:

=====

```

Indicated Torque      :1623199.51 Nm
Indicated Power       : 9503.83 kW,
Auxiliary Drives Torque : 75391.88 Nm
Friction Torque       : 239316.00 Nm
Effective Torque      :1308491.63 Nm
Effective Power       : 8654.03 kW,
    
```

```

Required time for reading the inputfile and initialisation: 6.31 min
Required time for the calculation: ..... 1.71 min
Required time for writing the outputfile: ..... 0.00 min
Required total time: ..... 8.03 min
Required total CPU-time: ..... 83.42 sec
    
```

6G70ME-C9.2 Навантаження 75 %

```

-----
AVL - B O O S T
Version : v2014.1.0.0.0
Build:   Mar 10 2015 22:02:38
System:  x86_64-unknown-winnt_i11
-----

```

LICENSE

```

-----
Boost Main 2014.0@ License will expire in 198 days

Boost Charging 2014.0@ License will expire in 198 days

```

PROJECT

```

-----
Preprocessor Version : 2014.1
Calculation date    : 09.02.2019
File               : MAN_G70ME-C.bst
Case Set          : "G70ME-C"
Case              : "Case 3_75"

Project ID: "Demo File 2-Stroke Diesel Large Engine"
Run ID:    ""
Model date: "25. Mar 2002 11:15:59"

```

ELEMENTS

```

-----
Element Name      Number
-----
PIPE              29
SYSTEMBOUNDARY   3
PLENUM            1
VARIABLE_PLENUM  6
CYLINDER          6
MEASURINGPOINT   8
AIRCOOLER         1
TURBOCHARGER     1
JUNCTION          6
ENGINE            1
PIPE_END          60
ASSEMBLED        1
ALL_PIPES         30
ALL_PLENUMS       9
ALL_BOUNDARIES   3
ALL_CHARGERS      1

```

ALL\_PIDS 1  
 PIPE\_VAR\_WALL\_TEMP 30

## GLOBAL DATA

```

-----
Engine Speed :      70.4 rpm
Calculationmode:   BOOST Single
Cycle Duration:    360.00 degrees
Max. calc. period: 3600.00 degrees
Cycles calculated: 10 cycles
Calc. time steps:  0.08652 degrees (max)
                  0.05678 degrees
                  0.13442 ms
                  0.04534 degrees (short pipe)
                  0.10733 ms (short pipe)
Traces results step: 1.00000 degrees
User concentrations: 0
Ref. pressure:     98000.00 Pa
Ref. temperature:  298.000 K
Gas properties:    Variable
Gasproperties File: DIESEL.BGP
  bgp_build_version: v2013.0.0.0.0
  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

Warnings:          0
Convergence errors: 469
  
```

## PIPES

-----

Total number of pipe cells: 322

Pipe nr.	Cells	Cell size [mm]	W.Heat [kJ]	Wall T [K]	Fric. coeff. [-]	Lam. Fric. Coeff. [-]	Heat Factor [-]	Volume [dm3]
1	2	90.0	0.000	298.15	0.020000	64.000000	0.000000	63.461742
2	14	100.0	0.000	463.15	0.020000	64.000000	0.000000	332.616122
3	28	100.0	0.000	311.15	0.020000	64.000000	0.000000	1415.814603
4	4	95.0	0.000	311.15	0.020000	64.000000	0.000000	200.678656
5	4	95.0	0.000	311.15	0.020000	64.000000	0.000000	200.678656
6	4	95.0	0.000	311.15	0.020000	64.000000	0.000000	200.678656
7	4	95.0	0.000	311.15	0.020000	64.000000	0.000000	200.678656
8	4	95.0	0.000	311.15	0.020000	64.000000	0.000000	200.678656
9	4	95.0	0.000	311.15	0.020000	64.000000	0.000000	200.678656
10	1	75.0	0.000	311.15	0.020000	64.000000	0.000000	23.379340

11	1	75.0	0.000	311.15	0.020000	64.000000	0.000000	23.379340
12	1	75.0	0.000	311.15	0.020000	64.000000	0.000000	23.379340
13	1	75.0	0.000	311.15	0.020000	64.000000	0.000000	23.379340
14	1	75.0	0.000	311.15	0.020000	64.000000	0.000000	23.379340
15	1	75.0	0.000	311.15	0.020000	64.000000	0.000000	23.379340
16	30	100.0	29.477	593.15	0.020000	64.000000	1.000000	452.412762
17	30	100.0	32.490	593.15	0.020000	64.000000	1.000000	452.412762
18	30	100.0	46.051	593.15	0.020000	64.000000	1.000000	452.412762
19	30	100.0	22.742	593.15	0.020000	64.000000	1.000000	452.412762
20	30	100.0	23.934	593.15	0.020000	64.000000	1.000000	452.412762
21	30	100.0	29.670	593.15	0.020000	64.000000	1.000000	452.412762
22	4	112.5	0.469	593.15	0.020000	64.000000	1.000000	127.234502
23	9	100.0	5.483	593.15	0.020000	64.000000	1.000000	254.469005
24	9	100.0	4.451	593.15	0.020000	64.000000	1.000000	254.469005
25	9	100.0	1.297	593.15	0.020000	64.000000	1.000000	254.469005
26	9	100.0	0.217	593.15	0.020000	64.000000	1.000000	254.469005
27	9	100.0	0.283	593.15	0.020000	64.000000	1.000000	254.469005
28	18	100.0	1.804	593.15	0.020000	64.000000	1.000000	630.302025
29	1	90.0	-0.069	501.15	0.020000	64.000000	1.000000	48.695472
30	6	100.0	-1855.273	301.15	105.843361	101491112.897539	710.295426	1600.000000 COOLER_PIPE 1

MEASURINGPOINTS: Average Values

Mp. nr.	Pipe nr.	Location [mm]	Diameter [mm]	Pressure [bar]	Temp. [K]	Ms.Temp. [K]	Velo. [m/s]	Massflow [g/s]	Massflow [g/cycle]	To.Ent.f. [kJ/s]	To.Ent.f. [kJ/cyc.]	Mach. [-]	Wtemp. [K]	Converg. [-]
1	1	150.0000	670.0000	0.9516	295.5	295.5	70.3	27810.5081	23702.1375	-4.224	-3.5999	0.20	298.2	0.599E-04
2	2	0.0000	550.0000	2.0695	386.3	386.2	62.7	27810.6868	23702.2899	2528.663	2155.1104	0.16	463.1	0.590E-04
3	3	1400.0000	771.4286	2.0505	310.3	310.3	25.9	27822.8780	23712.6801	350.917	299.0769	0.07	311.2	0.741E-04
4	4	190.0000	820.0000	2.4036	323.5	310.1	3.9	4669.9944	3980.1088	57.013	48.5903	0.01	311.2	0.339E-03
5	10	75.0000	630.0000	2.3998	332.0	331.5	5.6	4683.6955	3991.7860	163.887	139.6766	0.02	311.2	0.558E-05
6	16	0.0000	380.0000	2.0768	388.6	549.1	35.7	4767.1003	4062.8696	1407.548	1199.6152	0.08	593.2	0.757E-04
7	28	1800.0000	750.0000	2.1400	593.1	590.8	51.0	28437.7566	24236.7244	8751.605	7458.7539	0.11	593.2	0.525E-04
8	29	0.0000	830.0000	0.9801	506.4	503.0	77.4	28436.9689	24236.0530	6138.929	5232.0418	0.17	501.2	0.450E-04

SYSTEMBOUNDARIES

Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
SYSTEMBOUNDARY	1	1	23701.2741
SYSTEMBOUNDARY	2	22	0.0000
SYSTEMBOUNDARY	3	29	24235.3897

PLENUMS: Average Values

PLENUM nr.	Pl. Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	
PLENUM	1	2.0424	310.27	41271.294	0.000



				Attached pipe 3:	23714.2259 g/cycle
				Attached pipe 4:	3980.4649 g/cycle
				Attached pipe 5:	3952.1196 g/cycle
				Attached pipe 6:	4359.6806 g/cycle
				Attached pipe 7:	3699.3353 g/cycle
				Attached pipe 8:	3825.9442 g/cycle
				Attached pipe 9:	3983.7178 g/cycle
VARIABLE_PLENUM	1	2.4036	325.11	5895.676	0.000
				Attached pipe 4:	3981.1939 g/cycle
				Attached pipe 10:	3992.2156 g/cycle
VARIABLE_PLENUM	2	2.4100	325.69	5899.735	0.000
				Attached pipe 5:	3953.5217 g/cycle
				Attached pipe 11:	3970.0630 g/cycle
VARIABLE_PLENUM	3	2.4042	324.04	5917.257	0.000
				Attached pipe 6:	4361.0029 g/cycle
				Attached pipe 12:	4377.7890 g/cycle
VARIABLE_PLENUM	4	2.4093	325.50	5901.355	0.000
				Attached pipe 7:	3700.1382 g/cycle
				Attached pipe 13:	3707.7480 g/cycle
VARIABLE_PLENUM	5	2.4085	325.34	5903.166	0.000
				Attached pipe 8:	3826.7312 g/cycle
				Attached pipe 14:	3836.8932 g/cycle
VARIABLE_PLENUM	6	2.4111	325.07	5913.635	0.000
				Attached pipe 9:	3984.6219 g/cycle
				Attached pipe 15:	3999.8460 g/cycle
AIRCOOLER	1	2.0675	388.23	2225.908	0.000
				Attached pipe 2:	23701.8441 g/cycle
				Attached pipe 30:	23703.7981 g/cycle
AIRCOOLER	1	2.0585	310.68	2769.407	0.000
				Attached pipe 3:	23709.9742 g/cycle
				Attached pipe 30:	23707.0694 g/cycle

## PLENUMS

## Attachments

-----

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
PLENUM	1	3	23714.2259
PLENUM	1	4	3980.4649
PLENUM	1	5	3952.1196
PLENUM	1	6	4359.6806
PLENUM	1	7	3699.3353
PLENUM	1	8	3825.9442
PLENUM	1	9	3983.7178
VARIABLE_PLENUM	1	4	3981.1939
VARIABLE_PLENUM	1	10	3992.2156
VARIABLE_PLENUM	2	5	3953.5217
VARIABLE_PLENUM	2	11	3970.0630
VARIABLE_PLENUM	3	6	4361.0029

VARIABLE_PLENUM	3	12	4377.7890
VARIABLE_PLENUM	4	7	3700.1382
VARIABLE_PLENUM	4	13	3707.7480
VARIABLE_PLENUM	5	8	3826.7312
VARIABLE_PLENUM	5	14	3836.8932
VARIABLE_PLENUM	6	9	3984.6219
VARIABLE_PLENUM	6	15	3999.8460
AIRCOOLER	1	2	23701.8441
AIRCOOLER	1	30	23703.7981
AIRCOOLER	1	3	23709.9742
AIRCOOLER	1	30	23707.0694

## VARIABLE PLENUMS: Average Values

Pl. nr.	Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	Vol.work [kJ]	Volume [l]					
1	2.4036	325.11	5895.676	0.000	-93.706	2334.57					
							Attached pipe	4:	3981.1939	g/cycle	
							Attached pipe	10:	3992.2156	g/cycle	
2	2.4100	325.69	5899.735	0.000	-94.704	2334.57					
							Attached pipe	5:	3953.5217	g/cycle	
							Attached pipe	11:	3970.0630	g/cycle	
3	2.4042	324.04	5917.257	0.000	-96.766	2334.57					
							Attached pipe	6:	4361.0029	g/cycle	
							Attached pipe	12:	4377.7890	g/cycle	
4	2.4093	325.50	5901.355	0.000	-93.897	2334.57					
							Attached pipe	7:	3700.1382	g/cycle	
							Attached pipe	13:	3707.7480	g/cycle	
5	2.4085	325.34	5903.166	0.000	-95.377	2334.57					
							Attached pipe	8:	3826.7312	g/cycle	
							Attached pipe	14:	3836.8932	g/cycle	
6	2.4111	325.07	5913.635	0.000	-95.393	2334.57					
							Attached pipe	9:	3984.6219	g/cycle	
							Attached pipe	15:	3999.8460	g/cycle	

## TURBOCHARGERS: Average Values

TCh. nr.	Work [kJ]	Compressor			Turbine				Efficiencies				Calculation mode
		Press.rat. [-]	Boostpres. [bar]	Work [kJ]	Press.rat. [-]	Dis.coeff. [-]	Turb./tot. [-]	VTG-pos [-]	Comp. [-]	Turb. mech. [-]	total [-]		
1	2158.4373	2.1500	2.1067	2226.2093	2.2300	0.1479	1.0000	1.000	0.800	0.765	0.980	0.600	Turbinesize
	Attached pipe	1:	23701.3357	g/cycle									
	Attached pipe	2:	23701.4779	g/cycle									
	Attached pipe	29:	24235.5377	g/cycle									
	Attached pipe	28:	24235.3104	g/cycle									

## CYLINDERS: Average Values

-----  
Total

	Engine	Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4	Cyl. 5	Cyl. 6
Firing TDC [deg]		0.00	240.00	120.00	180.00	60.00	300.00
Bore [mm]		700.00	700.00	700.00	700.00	700.00	700.00
Stroke [mm]		3256.00	3256.00	3256.00	3256.00	3256.00	3256.00
Conrodl. [mm]		3270.00	3270.00	3270.00	3270.00	3270.00	3270.00
Piston pin offset [mm]		0.00	0.00	0.00	0.00	0.00	0.00
Swept Vol. [l]	7518.3339	1253.0556	1253.0556	1253.0556	1253.0556	1253.0556	1253.0556
Compression ratio [-]		20.80	20.80	20.80	20.80	20.80	20.80
Dyn. Comp. ratio [-]		18.77	18.77	18.76	18.76	18.77	18.77

Combustion Data:

		Vibe	Vibe	Vibe	Vibe	Vibe	Vibe
Combustion Char.		0.00	0.00	0.00	0.00	0.00	0.00
Comb.start [deg]		70.00	70.00	70.00	70.00	70.00	70.00
Comb.dur.1 [deg]		6.900	6.900	6.900	6.900	6.900	6.900
Vibe Parameter a [-]		0.200	0.200	0.200	0.200	0.200	0.200
Vibe Param. m 1 [-]		157.54	157.42	163.46	152.70	156.58	157.49
Peak Fir.Pres. [bar]	6.87	6.84	6.89	6.70	7.01	6.89	6.90
at Crankangle [deg]		6.48	6.45	6.47	6.44	6.53	6.47
Peak Pres.Rise[bar/deg]	1.12	1.22	1.22	1.06	1.07	0.93	1.21
at Crankangle [deg]		1538.48	1536.20	1538.57	1514.58	1558.14	1548.77
Peak Fir. Temp. [K]	17.49	17.52	17.53	17.18	17.61	17.54	17.56
at Crankangle [deg]							

Performance:

IMEP [bar]	15.7154	15.7410	15.7096	15.7488	15.6805	15.6824	15.7298
Rel. to Ave. [-]		1.0022	0.9995	1.0029	0.9970	0.9972	1.0012
FMEP [bar]	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
BMEP [bar]	8.9574	8.9932	8.9538	8.9766	8.9311	8.9212	8.9686
AMEP;SMEP [bar]	0.7579	0.7478	0.7558	0.7722	0.7493	0.7612	0.7613
ISFC [g/kWh]	170.6622	170.2866	170.7461	170.1734	170.1750	170.1470	170.4502
Rel. to Ave. [-]		0.9978	1.0005	0.9972	1.0030	1.0028	0.9988
Indicated Eff. [-]	0.4900	0.4911	0.4897	0.4914	0.4885	0.4886	0.4906
Iso vol. comb. Eff [-]	0.9014	0.9015	0.9014	0.9017	0.9013	0.9013	0.9015
Polytropic Coeff. [-]		1.3678	1.3677	1.3671	1.3680	1.3666	1.3682

Fuel Mass Balance:

Inj. Fuelmass [g]	420.000000	70.000000	70.000000	70.000000	70.000000	70.000000	70.000000
Asp.Trap. Fuelmass [g]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuelmassfl.(A+I) [g/s]	492.800000	82.133333	82.133333	82.133333	82.133333	82.133333	82.133333
Fuelmass tot.trap. [g]	420.000000	70.000000	70.000000	70.000000	70.000000	70.000000	70.000000
Trapped Fuelm.fl.[g/s]	492.800000	82.133333	82.133333	82.133333	82.133333	82.133333	82.133333
Trapp. Eff. Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Energy Balance Cylinder:

Fuel Energy [kJ]	17976.11535	2996.02033	2996.01874	2996.01885	2996.01948	2996.01845	2996.01949
------------------	-------------	------------	------------	------------	------------	------------	------------

Released Energy [kJ]	17957.94763	2992.98152	2992.99438	2992.99275	2992.99066	2992.99864	2992.98968
-> Brake Power [%]	37.501	37.651	37.486	37.582	37.391	37.350	37.548
-> Loss: Friction [%]	8.373	8.373	8.373	8.373	8.373	8.373	8.373
-> Loss: Piston [%]	4.998	4.984	4.994	4.973	5.020	5.047	4.972
-> Loss: Head [%]	6.347	6.331	6.342	6.333	6.360	6.399	6.318
-> Loss: Liner [%]	4.119	4.085	4.085	3.971	4.276	4.211	4.087
-> Loss: Int. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Gas [%]	35.403	35.397	35.391	35.390	35.311	35.551	35.380
Eff. Rel. Energy [kJ]	17957.94064	2992.98015	2992.99298	2992.99147	2992.98981	2992.99791	2992.98832
Gross Rel. Energy [kJ]	17957.95111	2992.98152	2992.99786	2992.99275	2992.99066	2992.99864	2992.98968
Eff.Gross Rel.Ener.[kJ]	17957.94412	2992.98015	2992.99647	2992.99147	2992.98981	2992.99791	2992.98832
Energy Balance [-]	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990
Eff. Energy Balance [-]	1.0000	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990

## Blowby:

-----

Blowbymass [g]	-26.669374	-4.445725	-4.441908	-4.633028	-4.292539	-4.405922	-4.450252
Blowbymassfl. [g/s]	-31.292065	-5.216318	-5.211839	-5.436086	-5.036579	-5.169615	-5.221629
Blowby Heat Flow [kJ]	-23.018423	-3.829955	-3.832959	-3.943166	-3.748328	-3.839399	-3.824616

## Reference Values at Start of High Pressure:

-----

Pressure at SHP[bar]	2.3736	2.3684	2.3706	2.4998	2.2717	2.3627	2.3681
Temperature [K]	354.02	353.27	353.82	355.90	352.09	356.72	352.32
Air Massfl. [g/s]	27585.765483	4610.893992	4585.324246	5056.249583	4282.204795	4431.713778	4619.379089
Fuel Massfl. [g/s]	492.800000	82.133333	82.133333	82.133333	82.133333	82.133333	82.133333
Trapp. Eff. Air [-]	0.6941	0.6946	0.6983	0.6636	0.7118	0.7053	0.6954
Trapp. Eff.Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
A/F-Ratio (Cmb.) [-]	38.92	38.98	38.96	40.83	37.34	38.32	39.09
Excess Air Ratio [-]	2.6476	2.6515	2.6505	2.7777	2.5400	2.6069	2.6591

## Reference Values at Start Of Combustion:

-----

Pressure [bar]	130.7297	130.5463	130.6265	137.4751	125.2719	129.7905	130.6680
Temperature [K]	1039.55	1038.20	1039.32	1043.59	1035.22	1044.67	1036.29

## Residual Gas:

-----

Res.gas content [-]	0.0195	0.0159	0.0157	0.0158	0.0268	0.0280	0.0157
External EGR [-]	0.0225	0.0226	0.0225	0.0236	0.0218	0.0220	0.0226
Internal EGR [-]	-0.0030	-0.0067	-0.0068	-0.0078	0.0050	0.0061	-0.0069
Com.Prod.Mass. at EO [g]	17037.221448	2842.671481	2840.373715	2968.436670	2732.527853	2803.636513	2849.575215
Res.gas mass at SHP [g]	325.312844	44.067234	43.420623	45.987448	71.428009	76.856620	43.552911
Res.gas aspirated IN [g]	374.689557	62.606521	62.306733	68.666569	58.145302	60.164567	62.799865
Res.gas from intake [g]	233.229026	38.638927	37.512224	41.640667	38.213958	38.383043	38.840206
Rel. to Total [-]	0.7169	0.8768	0.8639	0.9055	0.5350	0.4994	0.8918
Res.gas flow EX [g]	17119.218305	2861.158198	2859.208111	2991.032496	2723.398285	2815.648420	2868.772795
Res.gas from exhaust [g]	63.347245	5.427863	5.908065	4.376177	33.213181	9.709792	4.712167

Rel. to Total [-]	0.1947	0.1232	0.1361	0.0952	0.4650	0.1263	0.1082
Gas Exchange:							
-----							
Volumetric Eff. [-]	1.8948	1.9018	1.9013	1.9925	1.8100	1.8559	1.9075
Rel. to Ave. [-]		1.0037	1.0034	1.0515	0.9552	0.9794	1.0067
Rel. To PL 1 [-]	0.9466	0.9501	0.9499	0.9954	0.9042	0.9271	0.9529
Total Mass at SHP[g]	16643.3057	2773.7206	2772.4292	2905.8285	2669.3006	2740.6096	2781.4172
Mass Delivered [g]	23885.28514	3992.34572	3970.25353	4377.97019	3707.75166	3837.19335	3999.77068
Mass Delivered [g/s]	28025.40123	4684.35231	4658.43081	5136.81836	4350.42862	4502.30687	4693.06426
Delivery Ratio [-]	2.7735	2.7815	2.7661	3.0502	2.5832	2.6734	2.7867
Rel. to Ave. [-]		1.0029	0.9973	1.0997	0.9314	0.9639	1.0047
Rel. To PL 1 [-]	1.3856	1.3896	1.3819	1.5238	1.2905	1.3356	1.3922
Av.Airmass at SHP[g]	16357.3374	2730.1931	2729.2384	2860.1309	2615.3978	2684.3344	2738.0428
Air Delivered [g]	23510.59558	3929.73920	3907.94680	4309.30362	3649.60636	3777.02879	3936.97081
Air Delivered [g/s]	27585.76548	4610.89399	4585.32425	5056.24958	4282.20479	4431.71378	4619.37909
Airdeliveryratio [-]	2.7300	2.7379	2.7227	3.0023	2.5427	2.6315	2.7429
Rel. to Ave. [-]		1.0029	0.9973	1.0998	0.9314	0.9639	1.0047
Rel. To PL 1 [-]	1.3639	1.3678	1.3602	1.4999	1.2703	1.3146	1.3703
Airmass Trapped [g]	16317.99289	2729.65335	2729.00859	2859.84107	2597.87263	2663.75294	2737.86431
Airmass Trapped [g/s]	19146.44499	3202.79326	3202.03674	3355.54686	3048.17055	3125.47012	3212.42746
Trapp. Eff. Air [-]	0.6941	0.6946	0.6983	0.6636	0.7118	0.7053	0.6954
Rel. to Ave. [-]		1.0008	1.0061	0.9562	1.0256	1.0161	1.0020
Airpurity [-]	0.9828	0.9843	0.9844	0.9843	0.9798	0.9795	0.9844
Dyn. Swirl [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dyn. Tumble [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Wall Heatlosses:							
-----							
Piston [kJ]	-897.6271	-149.1670	-149.4798	-148.8526	-150.2520	-151.0518	-148.8238
Cylinderhead [kJ]	-1139.82248	-189.47395	-189.82578	-189.54606	-190.35721	-191.52315	-189.09633
Cylinderliner [kJ]	-739.74215	-122.27101	-122.25393	-118.86625	-127.99058	-126.04029	-122.32008
Sum of Wallheat [kJ]	-2777.19168	-460.91200	-461.55953	-457.26490	-468.59980	-468.61528	-460.24017
Wall Heatlosses in High Pressure Phase:							
Piston HP [kJ]	-938.58053	-156.05214	-156.41831	-155.92169	-156.77231	-157.76005	-155.65602
Cylinderhead HP [kJ]	-1171.76934	-194.86780	-195.27605	-195.12664	-195.35248	-196.71938	-194.42699
Cylinderliner HP [kJ]	-896.19691	-148.96346	-149.41715	-146.95321	-151.38907	-151.06409	-148.40993
Sum of Wallheat HP [kJ]	-3006.54677	-499.88341	-501.11151	-498.00154	-503.51386	-505.54352	-498.49294
Wall Heatlosses Related to Heatinput:							
Piston [-]	-0.0499	-0.0498	-0.0499	-0.0497	-0.0502	-0.0504	-0.0497
Cylinderhead [-]	-0.0634	-0.0632	-0.0634	-0.0633	-0.0635	-0.0639	-0.0631
Cylinderliner [-]	-0.0412	-0.0408	-0.0408	-0.0397	-0.0427	-0.0421	-0.0408
Sum of Wallheat [-]	-0.1545	-0.1538	-0.1541	-0.1526	-0.1564	-0.1564	-0.1536
M. Eff. HTC [W/m2/K]	557.13	557.24	557.07	569.90	546.78	554.15	557.66
M. Eff. Temp. [K]	1050.01	1048.53	1049.60	1037.64	1060.43	1056.71	1047.15
Reference Values at EO:							
-----							
Pressure [bar]	5.66	5.66	5.66	5.80	5.55	5.64	5.66

Temperature [K]	812.56	811.42	811.93	795.90	826.98	819.31	809.83
A/F-Ratio [-]	37.95	38.13	38.11	39.78	36.27	37.16	38.22
Com.Prod.Conc. [-]	0.99904	0.99903	0.99904	0.99904	0.99905	0.99905	0.99904
Fuel Concentr. [-]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Average Values of Pipeattachements:

Attached Pipe	10	11	12	13	14	15
Vlv/Prt.Op.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Eff.0mm[deg]	139.99	139.96	139.98	139.99	139.97	139.99
Vlv/Prt.Op.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Eff.0mm[deg]	220.02	220.06	220.03	220.04	220.06	220.03
Vlv/Prt.Cl.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	3992.345719	3970.253534	4377.970191	3707.751661	3837.193355	3999.770680
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Attached Pipe	16	17	18	19	20	21
Vlv/Prt.Op.Clr.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.1mm[deg]	127.10	127.10	127.10	127.10	127.10	127.10
Vlv/Prt.Op.Udef.mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Cl.Clr.0mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Vlv/Prt.Cl.Eff.0mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Vlv/Prt.Cl.Eff.1mm[deg]	229.98	229.98	229.98	229.98	229.98	229.98
Vlv/Prt.Cl.Udef.mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	4063.880017	4040.758275	4447.105781	3768.443270	3888.672109	4070.521761
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ASSEMBLED: Average Values

Type	Nr.	-----Inlet-----			-----Outlet-----			-----Core-----			
		Pressure [bar]	Temperat. [K]	Mass [g]	Pressure [bar]	Temperat. [K]	Mass [g]	Rej.Heat [kJ]	Rej.Heat [kW]	Fric. coeff. [-]	Heat Factor [-]
AIRCOOLER	1	2.0675	388.23	2225.908	2.0585	310.68	2769.407	-1855.2734	-2176.8542	105.843361	710.295426

ASSEMBLED Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
AIRCOOLER	1	2	23701.8441
AIRCOOLER	1	3	23709.9742

JUNCTIONS: Average Values

```

Junction  1: Attached pipe 21: -4054.7312 g/cycle
           Attached pipe 22:  -0.1776 g/cycle
           Attached pipe 23: -4055.5232 g/cycle
Junction  2: Attached pipe 20: -3882.2979 g/cycle
           Attached pipe 23: -4059.5719 g/cycle
           Attached pipe 24: -7942.5663 g/cycle
Junction  3: Attached pipe 19: -3775.6973 g/cycle
           Attached pipe 24: -7948.3018 g/cycle
           Attached pipe 25: -11724.6437 g/cycle
Junction  4: Attached pipe 18: -4418.7411 g/cycle
           Attached pipe 25: -11724.1592 g/cycle
           Attached pipe 26: -16145.2349 g/cycle
Junction  5: Attached pipe 17: -4020.7714 g/cycle
           Attached pipe 26: -16148.2052 g/cycle
           Attached pipe 27: -20170.0185 g/cycle
Junction  6: Attached pipe 16: -4054.0931 g/cycle
           Attached pipe 27: -20173.6662 g/cycle
           Attached pipe 28: -24228.7959 g/cycle

```

OVERALL ENGINE PERFORMANCE:

=====

```

Indicated Torque      :1401836.51 Nm
Indicated Power       : 13795.72 kW,
Auxiliary Drives Torque : 90693.38 Nm
Friction Torque       : 239316.00 Nm
Effective Torque      :1071827.14 Nm
Effective Power       : 12750.80 kW,

```

```

Required time for reading the inputfile and initialisation: 8.97 min
Required time for the calculation: ..... 1.46 min
Required time for writing the outputfile: ..... 0.00 min
Required total time: ..... 10.43 min
Required total CPU-time: ..... 71.09 sec

```

6G70ME-C9.2 Навантаження 100 %

```

-----
AVL - B O O S T
Version : v2014.1.0.0.0
Build:   Mar 10 2015 22:02:38
System:  x86_64-unknown-winnt_i11
-----

```

LICENSE

```

-----
Boost Main 2014.0@ License will expire in 198 days

Boost Charging 2014.0@ License will expire in 198 days

```

PROJECT

```

-----
Preprocessor Version : 2014.1
Calculation date    : 09.02.2019
File               : MAN_G70ME-C.bst
Case Set          : "G70ME-C"
Case              : "Case 4_100"

Project ID: "Demo File 2-Stroke Diesel Large Engine"
Run ID:    ""
Model date: "25. Mar 2002 11:15:59"

```

ELEMENTS

```

-----
Element Name      Number
PIPE              29
SYSTEMBOUNDARY   3
PLENUM           1
VARIABLE_PLENUM  6
CYLINDER         6
MEASURINGPOINT   8
AIRCOOLER        1
TURBOCHARGER     1
JUNCTION         6
ENGINE           1
PIPE_END         60
ASSEMBLED        1
ALL_PIPES        30
ALL_PLENUMS      9
ALL_BOUNDARIES   3
ALL_CHARGERS     1

```



ALL\_PIDS 1  
 PIPE\_VAR\_WALL\_TEMP 30

## GLOBAL DATA

```

-----
Engine Speed :      77.5 rpm
Calculationmode:   BOOST Single
Cycle Duration:    360.00 degrees
Max. calc. period: 3600.00 degrees
Cycles calculated: 10 cycles
Calc. time steps:  0.09105 degrees (max)
                  0.06278 degrees
                  0.13500 ms
                  0.05087 degrees (short pipe)
                  0.10939 ms (short pipe)
Traces results step: 1.00000 degrees
User concentrations: 0
Ref. pressure:     98000.00 Pa
Ref. temperature:  298.000 K
Gas properties:    Variable
Gasproperties File: DIESEL.BGP
  bgp_build_version: v2013.0.0.0.0
  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

Warnings:         0
Convergence errors: 364

```

## PIPES

-----

Total number of pipe cells: 322

Pipe nr.	Cells	Cell size [mm]	W.Heat [kJ]	Wall T [K]	Fric. coeff. [-]	Lam. Fric. Coeff. [-]	Heat Factor [-]	Volume [dm3]
1	2	90.0	0.000	298.15	0.020000	64.000000	0.000000	63.461742
2	14	100.0	0.000	463.15	0.020000	64.000000	0.000000	332.616122
3	28	100.0	0.000	317.15	0.020000	64.000000	0.000000	1415.814603
4	4	95.0	0.000	317.15	0.020000	64.000000	0.000000	200.678656
5	4	95.0	0.000	317.15	0.020000	64.000000	0.000000	200.678656
6	4	95.0	0.000	317.15	0.020000	64.000000	0.000000	200.678656
7	4	95.0	0.000	317.15	0.020000	64.000000	0.000000	200.678656
8	4	95.0	0.000	317.15	0.020000	64.000000	0.000000	200.678656
9	4	95.0	0.000	317.15	0.020000	64.000000	0.000000	200.678656
10	1	75.0	0.000	317.15	0.020000	64.000000	0.000000	23.379340

11	1	75.0	0.000	317.15	0.020000	64.000000	0.000000	23.379340
12	1	75.0	0.000	317.15	0.020000	64.000000	0.000000	23.379340
13	1	75.0	0.000	317.15	0.020000	64.000000	0.000000	23.379340
14	1	75.0	0.000	317.15	0.020000	64.000000	0.000000	23.379340
15	1	75.0	0.000	317.15	0.020000	64.000000	0.000000	23.379340
16	30	100.0	47.963	649.15	0.020000	64.000000	1.000000	452.412762
17	30	100.0	46.070	649.15	0.020000	64.000000	1.000000	452.412762
18	30	100.0	51.170	649.15	0.020000	64.000000	1.000000	452.412762
19	30	100.0	41.900	649.15	0.020000	64.000000	1.000000	452.412762
20	30	100.0	47.343	649.15	0.020000	64.000000	1.000000	452.412762
21	30	100.0	46.277	649.15	0.020000	64.000000	1.000000	452.412762
22	4	112.5	0.731	649.15	0.020000	64.000000	1.000000	127.234502
23	9	100.0	10.969	649.15	0.020000	64.000000	1.000000	254.469005
24	9	100.0	14.231	649.15	0.020000	64.000000	1.000000	254.469005
25	9	100.0	12.910	649.15	0.020000	64.000000	1.000000	254.469005
26	9	100.0	14.317	649.15	0.020000	64.000000	1.000000	254.469005
27	9	100.0	16.015	649.15	0.020000	64.000000	1.000000	254.469005
28	18	100.0	33.774	649.15	0.020000	64.000000	1.000000	630.302025
29	1	90.0	0.032	501.15	0.020000	64.000000	1.000000	48.695472
30	6	100.0	-2203.293	301.15	153.305834	147001943.112250	710.295426	1600.000000 COOLER_PIPE 1

MEASURINGPOINTS: Average Values

Mp. nr.	Pipe nr.	Location [mm]	Diameter [mm]	Pressure [bar]	Temp. [K]	Ms.Temp. [K]	Velo. [m/s]	Massflow [g/s]	Massflow [g/cycle]	To.Ent.f. [kJ/s]	To.Ent.f. [kJ/cyc.]	Mach. [-]	Wtemp. [K]	Converg. [-]
1	1	150.0000	670.0000	0.9445	294.9	294.9	78.8	30995.4944	23996.5118	-4.769	-3.6924	0.23	298.2	0.196E-03
2	2	0.0000	550.0000	2.3185	401.2	401.2	64.8	30995.6866	23996.6606	3289.897	2547.0167	0.16	463.2	0.191E-03
3	3	1400.0000	771.4286	2.2926	311.9	311.9	26.0	31035.1932	24027.2464	442.020	342.2094	0.07	317.1	0.254E-03
4	4	190.0000	820.0000	2.6979	324.8	311.2	3.9	5208.5280	4032.4088	69.044	53.4534	0.01	317.1	0.126E-02
5	10	75.0000	630.0000	2.6939	326.8	334.2	5.6	5306.1188	4107.9629	197.362	152.7961	0.02	317.1	0.207E-04
6	16	0.0000	380.0000	2.3473	435.6	550.2	36.2	5398.3379	4179.3584	1604.567	1242.2457	0.08	649.1	0.921E-04
7	28	1800.0000	750.0000	2.4202	602.4	601.2	51.5	31957.1790	24741.0418	10180.925	7882.0061	0.11	649.1	0.131E-03
8	29	0.0000	830.0000	0.9801	501.7	499.4	86.4	31952.0866	24737.0993	6793.983	5259.8575	0.19	501.2	0.140E-03

SYSTEMBOUNDARIES

Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
SYSTEMBOUNDARY	1	1	23995.7537
SYSTEMBOUNDARY	2	22	0.0000
SYSTEMBOUNDARY	3	29	24735.7228

PLENUMS: Average Values

PLENUM nr.	Pl. Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	
PLENUM	1	2.2834	311.26	45993.248	0.000

				Attached pipe 3:	24032.7560 g/cycle
				Attached pipe 4:	4031.8627 g/cycle
				Attached pipe 5:	4017.7863 g/cycle
				Attached pipe 6:	4457.8499 g/cycle
				Attached pipe 7:	3826.1994 g/cycle
				Attached pipe 8:	3979.9260 g/cycle
				Attached pipe 9:	3966.7873 g/cycle
VARIABLE_PLENUM	1	2.6979	325.37	6608.574	0.000
				Attached pipe 4:	4035.1599 g/cycle
				Attached pipe 10:	4105.7536 g/cycle
VARIABLE_PLENUM	2	2.6993	325.87	6601.349	0.000
				Attached pipe 5:	4020.2840 g/cycle
				Attached pipe 11:	4054.3548 g/cycle
VARIABLE_PLENUM	3	2.6941	324.40	6620.930	0.000
				Attached pipe 6:	4460.6579 g/cycle
				Attached pipe 12:	4494.6749 g/cycle
VARIABLE_PLENUM	4	2.7004	325.30	6615.727	0.000
				Attached pipe 7:	3827.1928 g/cycle
				Attached pipe 13:	3829.5336 g/cycle
VARIABLE_PLENUM	5	2.6921	324.91	6606.066	0.000
				Attached pipe 8:	3982.7578 g/cycle
				Attached pipe 14:	4030.7752 g/cycle
VARIABLE_PLENUM	6	2.7032	325.39	6619.703	0.000
				Attached pipe 9:	3968.9191 g/cycle
				Attached pipe 15:	4010.0582 g/cycle
AIRCOOLER	1	2.3161	403.23	2400.832	0.000
				Attached pipe 2:	23997.1513 g/cycle
				Attached pipe 30:	24001.8543 g/cycle
AIRCOOLER	1	2.3015	312.29	3080.385	0.000
				Attached pipe 3:	24019.7447 g/cycle
				Attached pipe 30:	24011.4167 g/cycle

## PLENUMS

## Attachments

-----

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
PLENUM	1	3	24032.7560
PLENUM	1	4	4031.8627
PLENUM	1	5	4017.7863
PLENUM	1	6	4457.8499
PLENUM	1	7	3826.1994
PLENUM	1	8	3979.9260
PLENUM	1	9	3966.7873
VARIABLE_PLENUM	1	4	4035.1599
VARIABLE_PLENUM	1	10	4105.7536
VARIABLE_PLENUM	2	5	4020.2840
VARIABLE_PLENUM	2	11	4054.3548
VARIABLE_PLENUM	3	6	4460.6579

VARIABLE_PLENUM	3	12	4494.6749
VARIABLE_PLENUM	4	7	3827.1928
VARIABLE_PLENUM	4	13	3829.5336
VARIABLE_PLENUM	5	8	3982.7578
VARIABLE_PLENUM	5	14	4030.7752
VARIABLE_PLENUM	6	9	3968.9191
VARIABLE_PLENUM	6	15	4010.0582
AIRCOOLER	1	2	23997.1513
AIRCOOLER	1	30	24001.8543
AIRCOOLER	1	3	24019.7447
AIRCOOLER	1	30	24011.4167

VARIABLE PLENUMS: Average Values

Pl. nr.	Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	Vol.work [kJ]	Volume [l]			
1	2.6979	325.37	6608.574	0.000	-106.816	2334.57	Attached pipe 4:	4035.1599	g/cycle
							Attached pipe 10:	4105.7536	g/cycle
2	2.6993	325.87	6601.349	0.000	-106.332	2334.57	Attached pipe 5:	4020.2840	g/cycle
							Attached pipe 11:	4054.3548	g/cycle
3	2.6941	324.40	6620.930	0.000	-108.738	2334.57	Attached pipe 6:	4460.6579	g/cycle
							Attached pipe 12:	4494.6749	g/cycle
4	2.7004	325.30	6615.727	0.000	-106.488	2334.57	Attached pipe 7:	3827.1928	g/cycle
							Attached pipe 13:	3829.5336	g/cycle
5	2.6921	324.91	6606.066	0.000	-107.282	2334.57	Attached pipe 8:	3982.7578	g/cycle
							Attached pipe 14:	4030.7752	g/cycle
6	2.7032	325.39	6619.703	0.000	-107.246	2334.57	Attached pipe 9:	3968.9191	g/cycle
							Attached pipe 15:	4010.0582	g/cycle

TURBOCHARGERS: Average Values

TCh. nr.	Compressor			Turbine				Efficiencies				Calculation mode	
	Work [kJ]	Press.rat. [-]	Boostpres. [bar]	Work [kJ]	Press.rat. [-]	Dis.coeff. [-]	Turb./tot. [-]	VTG-pos [-]	Comp. [-]	Turb. mech. [-]	total [-]		
1	2550.3860	2.4100	2.3613	2623.1985	2.5152	0.1483	1.0000	1.000	0.800	0.765	0.980	0.600	Turbinesize
	Attached pipe	1:	23996.0120	g/cycle									
	Attached pipe	2:	23996.1178	g/cycle									
	Attached pipe	29:	24736.6923	g/cycle									
	Attached pipe	28:	24736.5297	g/cycle									

CYLINDERS: Average Values

-----  
Total

	Engine	Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4	Cyl. 5	Cyl. 6
Firing TDC [deg]		0.00	240.00	120.00	180.00	60.00	300.00
Bore [mm]		700.00	700.00	700.00	700.00	700.00	700.00
Stroke [mm]		3256.00	3256.00	3256.00	3256.00	3256.00	3256.00
Conrodl. [mm]		3270.00	3270.00	3270.00	3270.00	3270.00	3270.00
Piston pin offset [mm]		0.00	0.00	0.00	0.00	0.00	0.00
Swept Vol. [l]	7518.3339	1253.0556	1253.0556	1253.0556	1253.0556	1253.0556	1253.0556
Compression ratio [-]		21.90	21.90	21.90	21.90	21.90	21.90
Dyn. Comp. ratio [-]		19.75	19.75	19.75	19.75	19.75	19.75

Combustion Data:

		Vibe	Vibe	Vibe	Vibe	Vibe	Vibe
Combustion Char.							
Comb.start [deg]		-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
Comb.dur.1 [deg]		70.00	70.00	70.00	70.00	70.00	70.00
Vibe Parameter a [-]		6.900	6.900	6.900	6.900	6.900	6.900
Vibe Param. m 1 [-]		0.400	0.400	0.400	0.400	0.400	0.400
Peak Fir.Pres. [bar]	173.73	176.30	172.99	176.66	168.99	172.18	175.28
at Crankangle [deg]	5.50	5.42	5.56	5.40	5.62	5.56	5.42
Peak Pres.Rise[bar/deg]	6.03	6.12	6.01	6.16	5.84	5.97	6.10
at Crankangle [deg]	-10.88	-10.79	-10.78	-10.88	-10.72	-11.02	-11.11
Peak Fir. Temp. [K]	1447.92	1439.95	1446.99	1438.06	1461.30	1455.46	1445.76
at Crankangle [deg]	19.14	18.97	19.19	18.95	19.41	19.23	19.11

Performance:

IMEP [bar]	18.7340	18.7966	18.7293	18.7319	18.7016	18.7247	18.7199
Rel. to Ave. [-]		1.0053	0.9996	0.9998	0.9972	0.9992	0.9988
FMEP [bar]	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
BMEP [bar]	8.8789	8.9441	8.8807	8.8641	8.8518	8.8686	8.8640
AMEP;SMEP [bar]	0.8551	0.8524	0.8486	0.8678	0.8498	0.8562	0.8559
ISFC [g/kWh]	173.3896	173.4802	173.4586	173.4206	173.8642	173.5251	173.5958
Rel. to Ave. [-]		0.9947	1.0004	1.0002	1.0028	1.0008	1.0012
Indicated Eff. [-]	0.4908	0.4934	0.4906	0.4907	0.4894	0.4904	0.4902
Iso vol. comb. Eff [-]	0.8829	0.8830	0.8829	0.8830	0.8828	0.8828	0.8829
Polytropic Coeff. [-]		1.3648	1.3651	1.3646	1.3650	1.3642	1.3641

Fuel Mass Balance:

Inj. Fuelmass [g]	420.000000	70.000000	70.000000	70.000000	70.000000	70.000000	70.000000
Asp.Trap. Fuelmass [g]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuelmassfl.(A+I) [g/s]	542.500000	90.416667	90.416667	90.416667	90.416667	90.416667	90.416667
Fuelmass tot.trap. [g]	420.000000	70.000000	70.000000	70.000000	70.000000	70.000000	70.000000
Trapped Fuelm.fl.[g/s]	542.500000	90.416667	90.416667	90.416667	90.416667	90.416667	90.416667
Trapp. Eff. Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Energy Balance Cylinder:

Fuel Energy [kJ]	17976.16232	2996.02662	2996.02597	2996.02654	2996.02805	2996.02773	2996.02742
------------------	-------------	------------	------------	------------	------------	------------	------------

Released Energy [kJ]	17957.94957	2993.00001	2993.00239	2992.99503	2992.98569	2992.98392	2992.98254
-> Brake Power [%]	37.173	37.446	37.180	37.111	37.059	37.129	37.110
-> Loss: Friction [%]	8.373	8.373	8.373	8.373	8.373	8.373	8.373
-> Loss: Piston [%]	4.648	4.638	4.624	4.638	4.649	4.669	4.672
-> Loss: Head [%]	5.965	5.958	5.937	5.960	5.956	5.984	5.995
-> Loss: Liner [%]	3.898	3.825	3.846	3.799	4.027	3.952	3.938
-> Loss: Int. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Gas [%]	36.422	36.389	36.416	36.859	36.001	36.578	36.290
Eff. Rel. Energy [kJ]	17957.94913	2992.99992	2993.00215	2992.99495	2992.98565	2992.98392	2992.98254
Gross Rel. Energy [kJ]	17957.94443	2993.00001	2992.99724	2992.99503	2992.98569	2992.98392	2992.98254
Eff.Gross Rel.Ener.[kJ]	17957.94416	2992.99992	2992.99718	2992.99495	2992.98565	2992.98392	2992.98254
Energy Balance [-]	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990
Eff. Energy Balance [-]	1.0000	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990

## Blowby:

-----

Blowbymass [g]	-27.432445	-4.635224	-4.558618	-4.654170	-4.447823	-4.525550	-4.611061
Blowbymassfl. [g/s]	-35.433575	-5.987164	-5.888215	-6.011636	-5.745105	-5.845502	-5.955953
Blowby Heat Flow [kJ]	-22.844278	-3.840657	-3.786200	-3.851334	-3.730616	-3.792794	-3.842677

## Reference Values at Start of High Pressure:

-----

Pressure at SHP[bar]	2.6901	2.7273	2.6737	2.7474	2.5998	2.6669	2.7257
Temperature [K]	361.77	361.38	360.22	362.11	360.35	363.06	363.50
Air Massfl. [g/s]	31184.857498	5220.888247	5155.326070	5715.077391	4868.915793	5125.800861	5098.849137
Fuel Massfl. [g/s]	542.500000	90.416667	90.416667	90.416667	90.416667	90.416667	90.416667
Trapp. Eff. Air [-]	0.7295	0.7430	0.7392	0.6770	0.7519	0.7243	0.7486
Trapp. Eff.Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
A/F-Ratio (Cmb.) [-]	42.68	43.44	42.71	43.59	41.31	42.03	43.02
Excess Air Ratio [-]	2.9037	2.9553	2.9053	2.9656	2.8105	2.8592	2.9263

## Reference Values at Start Of Combustion:

-----

Pressure [bar]	157.0079	159.2299	156.2821	160.3123	151.9141	155.4534	158.8555
Temperature [K]	1071.67	1071.24	1068.80	1072.54	1068.37	1073.89	1075.19

## Residual Gas:

-----

Res.gas content [-]	0.0435	0.0355	0.0367	0.0433	0.0485	0.0522	0.0453
External EGR [-]	0.0209	0.0207	0.0208	0.0225	0.0202	0.0208	0.0203
Internal EGR [-]	0.0226	0.0148	0.0160	0.0208	0.0283	0.0313	0.0250
Com.Prod.Mass. at EO [g]	18800.544504	3184.664107	3126.141075	3193.782014	3041.543568	3095.326096	3159.087644
Res.gas mass at SHP [g]	801.677034	110.560496	112.523246	135.710833	144.466684	158.162146	140.253630
Res.gas aspirated IN [g]	384.805508	64.451552	63.612806	70.524104	60.055475	63.220021	62.941550
Res.gas from intake [g]	261.772481	43.247537	41.977344	46.470939	42.962600	43.629528	43.484534
Rel. to Total [-]	0.3265	0.3912	0.3731	0.3424	0.2974	0.2759	0.3100
Res.gas flow EX [g]	18487.278387	3138.496216	3077.173118	3212.754189	2934.810231	3042.329486	3081.715147
Res.gas from exhaust [g]	413.661549	67.312689	70.541163	5.016722	101.496840	72.529859	96.764275

Rel. to Total [-]	0.5160	0.6088	0.6269	0.0370	0.7026	0.4586	0.6899
Gas Exchange:							
-----							
Volumetric Eff. [-]	2.0452	2.0924	2.0556	2.0871	1.9747	2.0027	2.0587
Rel. to Ave. [-]	1.0231	1.0051	1.0051	1.0205	0.9655	0.9792	1.0066
Rel. To PL 1 [-]	0.9168	0.9380	0.9215	0.9356	0.8852	0.8978	0.9229
Total Mass at SHP[g]	18414.6177	3113.7805	3063.0137	3131.3205	2978.7222	3032.6168	3095.1640
Mass Delivered [g]	24527.92099	4106.42955	4054.83299	4495.10015	3829.53867	4031.58198	4010.43766
Mass Delivered [g/s]	31681.89795	5304.13817	5237.49261	5806.17103	4946.48745	5207.46005	5180.14864
Delivery Ratio [-]	2.8481	2.8610	2.8250	3.1318	2.6681	2.8088	2.7941
Rel. to Ave. [-]	1.0045	0.9919	0.9919	1.0996	0.9368	0.9862	0.9810
Rel. To PL 1 [-]	1.2768	1.2826	1.2664	1.4039	1.1961	1.2592	1.2526
Av.Airmass at SHP[g]	17938.4695	3042.8467	2991.4127	3053.4658	2893.7447	2943.9488	3013.0508
Air Delivered [g]	24143.11548	4041.97800	3991.22018	4424.57604	3769.48319	3968.36196	3947.49611
Air Delivered [g/s]	31184.85750	5220.88825	5155.32607	5715.07739	4868.91579	5125.80086	5098.84914
Airdeliveryratio [-]	2.8035	2.8161	2.7807	3.0826	2.6262	2.7648	2.7503
Rel. to Ave. [-]	1.0045	0.9919	0.9919	1.0996	0.9368	0.9862	0.9810
Rel. To PL 1 [-]	1.2568	1.2624	1.2466	1.3819	1.1773	1.2394	1.2329
Airmass Trapped [g]	17612.94062	3003.22002	2950.49044	2995.60963	2834.25552	2874.45465	2954.91037
Airmass Trapped [g/s]	22750.04830	3879.15919	3811.05015	3869.32910	3660.91338	3712.83726	3816.75923
Trapp. Eff. Air [-]	0.7295	0.7430	0.7392	0.6770	0.7519	0.7243	0.7486
Rel. to Ave. [-]	1.0185	1.0133	1.0133	0.9281	1.0307	0.9929	1.0261
Airpurity [-]	0.9741	0.9772	0.9766	0.9751	0.9715	0.9708	0.9735
Dyn. Swirl [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dyn. Tumble [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Wall Heatlosses:							
-----							
Piston [kJ]	-834.6942	-138.8023	-138.4038	-138.8097	-139.1306	-139.7299	-139.8180
Cylinderhead [kJ]	-1071.22185	-178.33217	-177.70033	-178.39678	-178.25126	-179.11316	-179.42814
Cylinderliner [kJ]	-700.01767	-114.48683	-115.11764	-113.71104	-120.53868	-118.28844	-117.87504
Sum of Wallheat [kJ]	-2605.93375	-431.62128	-431.22179	-430.91751	-437.92050	-437.13150	-437.12116
Wall Heatlosses in High Pressure Phase:							
Piston HP [kJ]	-878.09439	-146.17485	-145.74197	-146.23933	-146.07933	-146.87142	-146.98750
Cylinderhead HP [kJ]	-1104.87873	-184.09213	-183.42749	-184.21734	-183.55334	-184.62827	-184.96016
Cylinderliner HP [kJ]	-861.93218	-142.69323	-143.13566	-142.38393	-145.02282	-144.55326	-144.14327
Sum of Wallheat HP [kJ]	-2844.90530	-472.96021	-472.30512	-472.84060	-474.65550	-476.05295	-476.09093
Wall Heatlosses Related to Heatinput:							
Piston [-]	-0.0464	-0.0463	-0.0462	-0.0463	-0.0464	-0.0466	-0.0467
Cylinderhead [-]	-0.0596	-0.0595	-0.0593	-0.0595	-0.0595	-0.0598	-0.0599
Cylinderliner [-]	-0.0389	-0.0382	-0.0384	-0.0380	-0.0402	-0.0395	-0.0393
Sum of Wallheat [-]	-0.1450	-0.1441	-0.1439	-0.1438	-0.1462	-0.1459	-0.1459
M. Eff. HTC [W/m2/K]	631.21	636.16	630.46	637.98	621.44	627.13	634.06
M. Eff. Temp. [K]	1006.56	1002.46	1004.93	1001.33	1012.96	1010.96	1006.74
Reference Values at EO:							
-----							
Pressure [bar]	6.10	6.15	6.08	6.16	6.00	6.06	6.13

Temperature [K]	790.80	784.43	790.89	783.12	801.32	796.05	789.01
A/F-Ratio [-]	40.66	41.50	40.68	41.67	39.39	39.98	40.75
Com.Prod.Conc. [-]	0.99906	0.99906	0.99906	0.99906	0.99906	0.99907	0.99907
Fuel Concentr. [-]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Average Values of Pipeattachements:

Attached Pipe	10	11	12	13	14	15
Vlv/Prt.Op.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Eff.0mm[deg]	139.97	139.96	139.97	139.99	139.96	139.98
Vlv/Prt.Op.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Eff.0mm[deg]	220.06	220.05	220.06	220.06	220.01	220.04
Vlv/Prt.Cl.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	4106.429550	4054.832989	4495.100149	3829.538670	4031.581978	4010.437656
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Attached Pipe	16	17	18	19	20	21
Vlv/Prt.Op.Clr.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.1mm[deg]	127.10	127.10	127.10	127.10	127.10	127.10
Vlv/Prt.Op.Udef.mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Cl.Clr.0mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Vlv/Prt.Cl.Eff.0mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Vlv/Prt.Cl.Eff.1mm[deg]	229.98	229.98	229.98	229.98	229.98	229.98
Vlv/Prt.Cl.Udef.mm[deg]	230.00	230.00	230.00	230.00	230.00	230.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	4180.101360	4120.711093	4437.747507	3907.858691	4096.480659	4077.121129
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ASSEMBLED: Average Values

Type	Nr.	-----Inlet-----			-----Outlet-----			-----Core-----			
		Pressure [bar]	Temperat. [K]	Mass [g]	Pressure [bar]	Temperat. [K]	Mass [g]	Rej.Heat [kJ]	Rej.Heat [kW]	Fric. coeff. [-]	Heat Factor [-]
AIRCOOLER	1	2.3161	403.23	2400.832	2.3015	312.29	3080.385	-2203.2931	-2845.9202	153.305834	710.295426

ASSEMBLED Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
AIRCOOLER	1	2	23997.1513
AIRCOOLER	1	3	24019.7447

JUNCTIONS: Average Values



```

Junction  1: Attached pipe 21: -4068.9833 g/cycle
           Attached pipe 22:   3.7623 g/cycle
           Attached pipe 23: -4065.6907 g/cycle
Junction  2: Attached pipe 20: -4075.2810 g/cycle
           Attached pipe 23: -4056.7906 g/cycle
           Attached pipe 24: -8132.5829 g/cycle
Junction  3: Attached pipe 19: -3920.0372 g/cycle
           Attached pipe 24: -8130.5594 g/cycle
           Attached pipe 25: -12052.1137 g/cycle
Junction  4: Attached pipe 18: -4394.7777 g/cycle
           Attached pipe 25: -12056.0099 g/cycle
           Attached pipe 26: -16456.8387 g/cycle
Junction  5: Attached pipe 17: -4125.9240 g/cycle
           Attached pipe 26: -16456.1094 g/cycle
           Attached pipe 27: -20582.5960 g/cycle
Junction  6: Attached pipe 16: -4174.9479 g/cycle
           Attached pipe 27: -20579.4562 g/cycle
           Attached pipe 28: -24755.6982 g/cycle

```

OVERALL ENGINE PERFORMANCE:

=====

```

Indicated Torque      :1404065.39 Nm
Indicated Power       : 18393.09 kW,
Auxiliary Drives Torque : 102321.04 Nm
Friction Torque       : 239316.00 Nm
Effective Torque      :1062428.35 Nm
Effective Power       : 17158.44 kW,

```

```

Required time for reading the inputfile and initialisation: 0.05 min
Required time for the calculation: ..... 0.98 min
Required time for writing the outputfile: ..... 0.00 min
Required total time: ..... 1.03 min
Required total CPU-time: ..... 52.62 sec

```

# МОДЕЛЮВАННЯ РОБОЧОГО ПРОЦЕСУ ГД 6S70MC-C8 В ПРОГРАМНОМУ СЕРЕДОВИЩІ AVL BOOST

## 6S70MC-C8 Навантаження 50 %

```

-----
AVL - B O O S T
Version : v2014.1.0.0.0
Build:   Mar 10 2015 22:02:38
System:  x86_64-unknown-winnt_ill
-----

```

### LICENSE

```

-----
Boost Main 2014.0@ License will expire in 197 days

Boost Charging 2014.0@ License will expire in 197 days

```

### PROJECT

```

-----
Preprocessor Version : 2014.1
Calculation date    : 10.02.2019
File                : MAN_S70MC_Ba.bst
Case Set           : "S70MC-C"
Case               : "Case 2_50"

Project ID: "Demo File 2-Stroke Diesel Large Engine"
Run ID:      ""
Model date: "25. Mar 2002 11:15:59"

```

### ELEMENTS

```

-----
Element Name      Number

PIPE              29
SYSTEMBOUNDARY   3
PLENUM           1
VARIABLE_PLENUM  6
CYLINDER         6
MEASURINGPOINT   8
AIRCOOLER        1
TURBOCHARGER     1
JUNCTION         6
ENGINE           1
PIPE_END         60
ASSEMBLED        1
ALL_PIPES        30

```

```

ALL_PLENUMS          9
ALL_BOUNDARIES       3
ALL_CHARGERS         1
ALL_PIDS             1
PIPE_VAR_WALL_TEMP   30

```

## GLOBAL DATA

-----

```

Engine Speed :      72.2 rpm
Calculationmode:    BOOST Single
Cycle Duration:     360.00 degrees
Max. calc. period:  3600.00 degrees
Cycles calculated:  10 cycles
Calc. time steps:   0.09051 degrees (max)
                   0.05152 degrees
                   0.11894 ms
                   0.03966 degrees (short pipe)
                   0.09156 ms (short pipe)
Traces results step: 1.00000 degrees
User concentrations: 0
Ref. pressure:      98000.00 Pa
Ref. temperature:   298.000 K
Gas properties:     Variable
Gasproperties File: DIESEL.BGP
  bgp_build_version: v2013.0.0.0.0
  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

Warnings:           27
Convergence errors: 1044

```

## PIPES

-----

Total number of pipe cells: 322

Pipe nr.	Cells	Cell size [mm]	W.Heat [kJ]	Wall T [K]	Fric. coeff. [-]	Lam. Fric. Coeff. [-]	Heat Factor [-]	Volume [dm <sup>3</sup> ]
1	2	90.0	0.000	293.75	0.020000	64.000000	0.000000	63.461742
2	14	100.0	0.000	463.15	0.020000	64.000000	0.000000	332.616122
3	28	100.0	0.000	304.15	0.020000	64.000000	0.000000	1415.814603
4	4	95.0	0.000	304.15	0.020000	64.000000	0.000000	200.678656
5	4	95.0	0.000	304.15	0.020000	64.000000	0.000000	200.678656
6	4	95.0	0.000	304.15	0.020000	64.000000	0.000000	200.678656
7	4	95.0	0.000	304.15	0.020000	64.000000	0.000000	200.678656

8	4	95.0	0.000	304.15	0.020000	64.000000	0.000000	200.678656											
9	4	95.0	0.000	304.15	0.020000	64.000000	0.000000	200.678656											
10	1	75.0	0.000	304.15	0.020000	64.000000	0.000000	23.379340											
11	1	75.0	0.000	304.15	0.020000	64.000000	0.000000	23.379340											
12	1	75.0	0.000	304.15	0.020000	64.000000	0.000000	23.379340											
13	1	75.0	0.000	304.15	0.020000	64.000000	0.000000	23.379340											
14	1	75.0	0.000	304.15	0.020000	64.000000	0.000000	23.379340											
15	1	75.0	0.000	304.15	0.020000	64.000000	0.000000	23.379340											
16	30	100.0	-46.645	570.15	0.020000	64.000000	1.000000	452.412762											
17	30	100.0	-46.356	570.15	0.020000	64.000000	1.000000	452.412762											
18	30	100.0	-48.464	570.15	0.020000	64.000000	1.000000	452.412762											
19	30	100.0	-48.161	570.15	0.020000	64.000000	1.000000	452.412762											
20	30	100.0	-35.785	570.15	0.020000	64.000000	1.000000	452.412762											
21	30	100.0	-37.637	570.15	0.020000	64.000000	1.000000	452.412762											
22	4	112.5	-0.828	570.15	0.020000	64.000000	1.000000	127.234502											
23	9	100.0	-11.750	570.15	0.020000	64.000000	1.000000	254.469005											
24	9	100.0	-19.435	570.15	0.020000	64.000000	1.000000	254.469005											
25	9	100.0	-27.768	570.15	0.020000	64.000000	1.000000	254.469005											
26	9	100.0	-33.608	570.15	0.020000	64.000000	1.000000	254.469005											
27	9	100.0	-37.723	570.15	0.020000	64.000000	1.000000	254.469005											
28	18	100.0	-73.089	570.15	0.020000	64.000000	1.000000	630.302025											
29	1	90.0	-3.290	501.15	0.020000	64.000000	1.000000	48.695472											
30	6	100.0	21.194	301.15	40.563344	38895391.111123	710.295426	1600.000000	COOLER_PIPE										1

MEASURINGPOINTS: Average Values

Mp. nr.	Pipe nr.	Location [mm]	Diameter [mm]	Pressure [bar]	Temp. [K]	Ms.Temp. [K]	Velo. [m/s]	Massflow [g/s]	Massflow [g/cycle]	To.Ent.f. [kJ/s]	To.Ent.f. [kJ/cyc.]	Mach. [-]	Wtemp. [K]	Converg. [-]
1	1	150.0000	670.0000	0.9772	297.8	297.8	21.9	8844.1260	7349.6892	-1.305	-1.0847	0.06	293.8	0.175E-03
2	2	0.0000	550.0000	0.9739	297.5	297.5	32.6	8844.0680	7349.6410	-1.309	-1.0881	0.09	463.2	0.176E-03
3	3	1400.0000	771.4286	0.9711	300.6	300.6	16.8	8854.9950	7358.7216	23.150	19.2379	0.05	304.2	0.515E-03
4	4	190.0000	820.0000	1.1438	310.3	297.6	2.6	1549.7256	1287.8606	-0.714	-0.5933	0.01	304.2	0.433E-03
5	10	75.0000	630.0000	1.1423	310.9	319.3	3.6	1576.8968	1310.4405	36.179	30.0658	0.01	304.2	0.166E-04
6	16	0.0000	380.0000	1.0348	737.4	869.4	36.4	1534.2715	1275.0179	1400.130	1163.5429	0.06	570.2	0.700E-03
7	28	1800.0000	750.0000	1.0684	873.6	870.6	46.7	9203.2124	7648.0990	8260.940	6865.0470	0.08	570.2	0.144E-03
8	29	0.0000	830.0000	0.9800	859.6	845.5	42.7	9201.4427	7646.6283	7990.034	6639.9174	0.07	501.2	0.157E-03

SYSTEMBOUNDARIES

Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
SYSTEMBOUNDARY	1	1	7349.5387
SYSTEMBOUNDARY	2	22	0.0000
SYSTEMBOUNDARY	3	29	7645.7060

PLENUMS: Average Values

	Pl. nr.	Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	
PLENUM	1	0.9694	297.57	20424.610	0.000	
						Attached pipe 3: 7362.0259 g/cycle
						Attached pipe 4: 1287.3455 g/cycle
						Attached pipe 5: 1244.3237 g/cycle
						Attached pipe 6: 1342.2637 g/cycle
						Attached pipe 7: 1334.3483 g/cycle
						Attached pipe 8: 1144.0528 g/cycle
						Attached pipe 9: 1201.5065 g/cycle
VARIABLE_PLENUM	1	1.1438	309.59	2535.880	0.000	
						Attached pipe 4: 1288.6346 g/cycle
						Attached pipe 10: 1310.8731 g/cycle
VARIABLE_PLENUM	2	1.1441	311.23	2522.542	0.000	
						Attached pipe 5: 1246.1250 g/cycle
						Attached pipe 11: 1259.6564 g/cycle
VARIABLE_PLENUM	3	1.1478	310.00	2540.669	0.000	
						Attached pipe 6: 1344.3842 g/cycle
						Attached pipe 12: 1365.7562 g/cycle
VARIABLE_PLENUM	4	1.1414	308.82	2536.642	0.000	
						Attached pipe 7: 1335.8463 g/cycle
						Attached pipe 13: 1336.6352 g/cycle
VARIABLE_PLENUM	5	1.1449	309.32	2540.396	0.000	
						Attached pipe 8: 1146.2602 g/cycle
						Attached pipe 14: 1178.2289 g/cycle
VARIABLE_PLENUM	6	1.1419	309.71	2530.091	0.000	
						Attached pipe 9: 1203.6836 g/cycle
						Attached pipe 15: 1229.2121 g/cycle
AIRCOOLER	1	0.9735	297.97	1365.585	0.000	
						Attached pipe 2: 7349.7540 g/cycle
						Attached pipe 30: 7351.5750 g/cycle
AIRCOOLER	1	0.9728	300.77	1351.914	0.000	
						Attached pipe 3: 7356.2021 g/cycle
						Attached pipe 30: 7353.9883 g/cycle

PLENUMS  
Attachments  
-----

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
PLENUM	1	3	7362.0259
PLENUM	1	4	1287.3455
PLENUM	1	5	1244.3237
PLENUM	1	6	1342.2637
PLENUM	1	7	1334.3483
PLENUM	1	8	1144.0528
PLENUM	1	9	1201.5065
VARIABLE_PLENUM	1	4	1288.6346
VARIABLE_PLENUM	1	10	1310.8731





## Energy Balance Cylinder:

-----							
Fuel Energy [kJ]	15473.93280	2591.38125	2545.10255	2553.60142	2553.65557	2615.09600	2615.09600
Released Energy [kJ]	15458.06079	2588.73222	2542.45474	2550.96309	2551.00945	2612.45010	2612.45120
-> Brake Power [%]	29.339	27.780	32.374	30.871	30.991	24.696	29.461
-> Loss: Friction [%]	8.365	8.325	8.477	8.448	8.448	8.249	8.249
-> Loss: Piston [%]	5.584	5.441	5.888	5.839	5.822	5.008	5.522
-> Loss: Head [%]	6.779	6.615	7.143	7.082	7.060	6.093	6.704
-> Loss: Liner [%]	6.751	6.549	7.214	7.123	7.219	5.944	6.484
-> Loss: Int. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Gas [%]	44.863	43.773	44.386	41.162	40.931	50.088	48.634
Eff. Rel. Energy [kJ]	14176.92116	2353.33473	2542.35123	2477.36003	2477.77475	2123.72311	2202.37731
Gross Rel. Energy [kJ]	15506.52092	2588.73222	2590.91486	2550.96309	2551.00945	2612.45010	2612.45120
Eff.Gross Rel.Ener.[kJ]	13980.68477	2353.33473	2346.11484	2477.36003	2477.77475	2123.72311	2202.37731
Energy Balance [-]	1.0021	0.9990	1.0180	0.9990	0.9990	0.9990	0.9990
Eff. Energy Balance [-]	0.9044	0.9081	0.9218	0.9701	0.9703	0.8121	0.8422

## Blowby:

-----							
Blowbymass [g]	-11.468474	-1.924689	-1.960612	-1.954208	-1.935798	-1.806992	-1.886176
Blowbymassfl. [g/s]	-13.800397	-2.316042	-2.359270	-2.351563	-2.329410	-2.174413	-2.269698
Blowby Heat Flow [kJ]	-15.033067	-2.485984	-2.428286	-2.517650	-2.509087	-2.649946	-2.442114

## Reference Values at Start of High Pressure:

-----							
Pressure at SHP[bar]	1.0032	1.0135	0.9939	1.0367	1.0133	1.0142	0.9477
Temperature [K]	360.28	341.64	347.62	369.82	363.01	397.48	342.13
Air Massfl. [g/s]	9094.252976	1552.919296	1489.329551	1617.959837	1583.154423	1395.826078	1455.063791
Fuel Massfl. [g/s]	441.142000	73.523667	73.523667	73.523667	73.523667	73.523667	73.523667
Trapp. Eff. Air [-]	0.7002	0.7449	0.7418	0.6541	0.6685	0.6612	0.7332
Trapp. Eff.Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
A/F-Ratio (Cmb.) [-]	14.08	13.67	15.01	14.38	14.38	12.54	14.50
Excess Air Ratio [-]	0.9580	0.9303	1.0214	0.9785	0.9784	0.8532	0.9864

## Reference Values at Start Of Combustion:

-----							
Pressure [bar]	54.2123	53.4021	54.7798	56.0310	55.0889	53.5036	52.4682
Temperature [K]	1046.76	1054.31	1015.23	1056.58	1044.09	1106.04	1004.31

## Residual Gas:

-----							
Res.gas content [-]	0.0658	0.0413	0.0505	0.0742	0.0690	0.1132	0.0524
External EGR [-]	0.0219	0.0205	0.0229	0.0226	0.0222	0.0214	0.0216
Internal EGR [-]	0.0439	0.0208	0.0276	0.0515	0.0468	0.0918	0.0308
Com.Prod.Mass. at EO [g]	5800.706587	966.123011	965.421023	1008.294650	1002.944600	923.441611	934.481692
Res.gas mass at SHP [g]	372.822434	41.433124	48.803817	70.450468	65.172888	97.901884	49.060253
Res.gas aspirated IN [g]	123.956790	20.583667	22.165050	21.496808	20.993215	18.518926	20.199123
Res.gas from intake [g]	117.127550	20.583667	22.165050	16.810123	18.850660	18.518926	20.199123



Rel. to Total [-]	0.3142	0.4968	0.4542	0.2386	0.2892	0.1892	0.4117
Res.gas flow EX [g]	5650.576564	945.260928	938.761782	1000.304337	984.494695	876.152070	905.602753
Res.gas from exhaust [g]	92.234516	18.693277	15.971451	12.652624	12.348678	24.501246	8.067240
Rel. to Total [-]	0.2474	0.4512	0.3273	0.1796	0.1895	0.2503	0.1644

Gas Exchange:

Volumetric Eff. [-]	0.7146	0.7788	0.7438	0.7126	0.7125	0.6214	0.7183
Rel. to Ave. [-]		1.0899	1.0409	0.9972	0.9971	0.8696	1.0052
Rel. To PL 1 [-]	0.7214	0.7862	0.7509	0.7193	0.7193	0.6273	0.7251
Total Mass at SHP[g]	5664.8356	1002.7176	966.9109	949.9888	944.6455	864.8857	935.6871
Mass Delivered [g]	7681.50774	1311.09832	1259.83504	1366.06177	1336.63401	1178.48520	1229.39341
Mass Delivered [g/s]	9243.41431	1577.68831	1516.00149	1643.82766	1608.41626	1418.11052	1479.37007
Delivery Ratio [-]	1.0372	1.0622	1.0207	1.1067	1.0829	0.9548	0.9960
Rel. to Ave. [-]		1.0241	0.9841	1.0670	1.0440	0.9205	0.9603
Rel. To PL 1 [-]	1.0471	1.0723	1.0304	1.1172	1.0932	0.9638	1.0055
Av.Airmass at SHP[g]	5292.0132	961.2845	918.1071	879.5383	879.4726	766.9838	886.6269
Air Delivered [g]	7557.55095	1290.51465	1237.66999	1344.56496	1315.64080	1159.96627	1209.19429
Air Delivered [g/s]	9094.25298	1552.91930	1489.32955	1617.95984	1583.15442	1395.82608	1455.06379
Airdeliveryratio [-]	1.0205	1.0455	1.0027	1.0893	1.0659	0.9398	0.9797
Rel. to Ave. [-]		1.0245	0.9826	1.0675	1.0445	0.9209	0.9600
Rel. To PL 1 [-]	1.0302	1.0555	1.0122	1.0997	1.0760	0.9487	0.9890
Airmass Trapped [g]	5292.01319	961.28449	918.10706	879.53835	879.47259	766.98381	886.62689
Airmass Trapped [g/s]	6368.05587	1156.74567	1104.78883	1058.37781	1058.29868	922.93718	1066.90769
Trapp. Eff. Air [-]	0.7002	0.7449	0.7418	0.6541	0.6685	0.6612	0.7332
Rel. to Ave. [-]		1.0638	1.0594	0.9342	0.9547	0.9443	1.0471
Airpurity [-]	0.9342	0.9587	0.9495	0.9258	0.9310	0.8868	0.9476
Dyn. Swirl [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dyn. Tumble [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Wall Heatlosses:

Piston [kJ]	-863.1165	-140.8585	-149.6926	-148.9531	-148.5248	-130.8410	-144.2466
Cylinderhead [kJ]	-1047.94323	-171.24067	-181.61571	-180.66352	-180.10835	-159.18559	-175.12939
Cylinderliner [kJ]	-1043.50110	-169.52917	-183.42045	-181.69733	-184.16509	-155.28839	-169.40068
Sum of Wallheat [kJ]	-2954.56084	-481.62833	-514.72872	-511.31393	-512.79823	-445.31497	-488.77666
Wall Heatlosses in High Pressure Phase:							
Piston HP [kJ]	-874.32941	-142.91899	-151.58045	-150.89862	-150.03199	-132.73451	-146.16484
Cylinderhead HP [kJ]	-1053.15528	-172.31950	-182.50916	-181.59302	-180.57582	-160.09106	-176.06673
Cylinderliner HP [kJ]	-1032.73187	-169.23422	-181.83233	-180.20449	-179.54752	-153.78031	-168.13299
Sum of Wallheat HP [kJ]	-2960.21655	-484.47270	-515.92195	-512.69613	-510.15533	-446.60589	-490.36456
Wall Heatlosses Related to Heatinput:							
Piston [-]	-0.0550	-0.0539	-0.0572	-0.0570	-0.0568	-0.0500	-0.0552
Cylinderhead [-]	-0.0668	-0.0655	-0.0694	-0.0691	-0.0689	-0.0609	-0.0670
Cylinderliner [-]	-0.0665	-0.0648	-0.0701	-0.0695	-0.0704	-0.0594	-0.0648
Sum of Wallheat [-]	-0.1883	-0.1842	-0.1968	-0.1955	-0.1961	-0.1703	-0.1869
M. Eff. HTC [W/m2/K]	308.48	308.64	317.07	313.83	311.82	290.38	309.15
M. Eff. Temp. [K]	1400.94	1384.25	1411.31	1415.66	1418.43	1374.25	1401.77

Reference Values at EO:

Pressure [bar]	3.73	3.73	3.73	3.93	3.91	3.48	3.56
Temperature [K]	1322.38	1329.89	1327.64	1353.44	1353.26	1274.98	1295.06
A/F-Ratio [-]	13.59	13.71	13.68	14.34	14.30	12.58	12.92
Com.Prod.Conc. [-]	0.99914	0.99913	0.99913	0.99913	0.99912	0.99917	0.99915
Fuel Concentr. [-]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Average Values of Pipeattachments:

Attached Pipe	10	11	12	13	14	15
Vlv/Prt.Op.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Eff.0mm[deg]	139.99	140.00	140.00	139.98	139.99	139.97
Vlv/Prt.Op.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Eff.0mm[deg]	220.02	220.05	220.01	220.00	220.04	220.02
Vlv/Prt.Cl.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	1311.098318	1259.835037	1366.061769	1336.634010	1178.485196	1229.393410
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Attached Pipe	16	17	18	19	20	21
Vlv/Prt.Op.Clr.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.1mm[deg]	127.08	127.08	127.08	127.08	127.08	127.08
Vlv/Prt.Op.Udef.mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Cl.Clr.0mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Vlv/Prt.Cl.Eff.0mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Vlv/Prt.Cl.Eff.1mm[deg]	239.98	239.98	239.98	239.98	239.98	239.98
Vlv/Prt.Cl.Udef.mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	1275.265586	1259.088689	1351.844389	1322.729588	1175.274700	1228.891379
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ASSEMBLED: Average Values

Type	Nr.	-----Inlet-----			-----Outlet-----			-----Core-----			
		Pressure [bar]	Temperat. [K]	Mass [g]	Pressure [bar]	Temperat. [K]	Mass [g]	Rej.Heat [kJ]	Rej.Heat [kW]	Fric. coeff. [-]	Heat Factor [-]
AIRCOOLER	1	0.9735	297.97	1365.585	0.9728	300.77	1351.914	21.1936	25.5030	40.563344	710.295426

ASSEMBLED Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
AIRCOOLER	1	2	7349.7540
AIRCOOLER	1	3	7356.2021

JUNCTIONS: Average Values

```

-----
Junction  1: Attached pipe 21: -1236.1949 g/cycle
           Attached pipe 22:   3.6582 g/cycle
           Attached pipe 23: -1232.7189 g/cycle
Junction  2: Attached pipe 20: -1166.6661 g/cycle
           Attached pipe 23: -1228.8459 g/cycle
           Attached pipe 24: -2395.3386 g/cycle
Junction  3: Attached pipe 19: -1326.8599 g/cycle
           Attached pipe 24: -2392.8802 g/cycle
           Attached pipe 25: -3719.9014 g/cycle
Junction  4: Attached pipe 18: -1371.3846 g/cycle
           Attached pipe 25: -3711.0911 g/cycle
           Attached pipe 26: -5083.1965 g/cycle
Junction  5: Attached pipe 17: -1276.0195 g/cycle
           Attached pipe 26: -5081.0323 g/cycle
           Attached pipe 27: -6352.3147 g/cycle
Junction  6: Attached pipe 16: -1296.7337 g/cycle
           Attached pipe 27: -6346.3048 g/cycle
           Attached pipe 28: -7643.4118 g/cycle

```

OVERALL ENGINE PERFORMANCE:

```

=====
Indicated Torque      : 961413.43 Nm
Indicated Power       : 9551.23 kW,
Auxiliary Drives Torque : 33817.87 Nm
Friction Torque       : 205800.00 Nm
Effective Torque      : 721795.56 Nm
Effective Power       : 8710.33 kW,

```

```

Required time for reading the inputfile and initialisation: 1.88 min
Required time for the calculation: ..... 0.97 min
Required time for writing the outputfile: ..... 0.00 min
Required total time: ..... 2.85 min
Required total CPU-time: ..... 50.62 sec

```

6S70MC-C8 Навантаження 75 %

```

-----
AVL - B O O S T
Version : v2014.1.0.0.0
Build:   Mar 10 2015 22:02:38
System:  x86_64-unknown-winnt_i11
-----

```

```

LICENSE
-----

```

```

Boost Main 2014.0@ License will expire in 197 days

Boost Charging 2014.0@ License will expire in 197 days

```

```

PROJECT
-----

```

```

Preprocessor Version : 2014.1
Calculation date    : 10.02.2019
File               : MAN_S70MC_Ba.bst
Case Set          : "S70MC-C"
Case              : "Case 3_75"

```

```

Project ID: "Demo File 2-Stroke Diesel Large Engine"
Run ID:    ""
Model date: "25. Mar 2002 11:15:59"

```

```

ELEMENTS
-----

```

Element Name	Number
PIPE	29
SYSTEMBOUNDARY	3
PLENUM	1
VARIABLE_PLENUM	6
CYLINDER	6
MEASURINGPOINT	8
AIRCOOLER	1
TURBOCHARGER	1
JUNCTION	6
ENGINE	1
PIPE_END	60
ASSEMBLED	1
ALL_PIPES	30
ALL_PLENUMS	9
ALL_BOUNDARIES	3
ALL_CHARGERS	1

```

ALL_PIDS          1
PIPE_VAR_WALL_TEMP 30

```

## GLOBAL DATA

```

-----
Engine Speed :      82.7 rpm
Calculationmode:   BOOST Single
Cycle Duration:    360.00 degrees
Max. calc. period: 3600.00 degrees
Cycles calculated: 10 cycles
Calc. time steps:  0.10286 degrees (max)
                  0.05855 degrees
                  0.11800 ms
                  0.04771 degrees (short pipe)
                  0.09615 ms (short pipe)
Traces results step: 1.00000 degrees
User concentrations: 0
Ref. pressure:     98000.00 Pa
Ref. temperature:  298.000 K
Gas properties:    Variable
Gasproperties File: DIESEL.BGP
  bgp_build_version: v2013.0.0.0.0
  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

Warnings:          44
Convergence errors: 935

```

## PIPES

-----

```
Total number of pipe cells: 322
```

Pipe nr.	Cells	Cell size [mm]	W.Heat [kJ]	Wall T [K]	Fric. coeff. [-]	Lam. Fric. Coeff. [-]	Heat Factor [-]	Volume [dm3]
1	2	90.0	0.000	293.75	0.020000	64.000000	0.000000	63.461742
2	14	100.0	0.000	463.15	0.020000	64.000000	0.000000	332.616122
3	28	100.0	0.000	307.15	0.020000	64.000000	0.000000	1415.814603
4	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656
5	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656
6	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656
7	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656
8	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656
9	4	95.0	0.000	307.15	0.020000	64.000000	0.000000	200.678656
10	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340

11	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340
12	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340
13	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340
14	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340
15	1	75.0	0.000	307.15	0.020000	64.000000	0.000000	23.379340
16	30	100.0	-29.662	579.15	0.020000	64.000000	1.000000	452.412762
17	30	100.0	-28.582	579.15	0.020000	64.000000	1.000000	452.412762
18	30	100.0	-28.204	579.15	0.020000	64.000000	1.000000	452.412762
19	30	100.0	-27.266	579.15	0.020000	64.000000	1.000000	452.412762
20	30	100.0	-26.463	579.15	0.020000	64.000000	1.000000	452.412762
21	30	100.0	-25.654	579.15	0.020000	64.000000	1.000000	452.412762
22	4	112.5	-0.707	579.15	0.020000	64.000000	1.000000	127.234502
23	9	100.0	-9.475	579.15	0.020000	64.000000	1.000000	254.469005
24	9	100.0	-15.705	579.15	0.020000	64.000000	1.000000	254.469005
25	9	100.0	-21.575	579.15	0.020000	64.000000	1.000000	254.469005
26	9	100.0	-25.506	579.15	0.020000	64.000000	1.000000	254.469005
27	9	100.0	-26.743	579.15	0.020000	64.000000	1.000000	254.469005
28	18	100.0	-49.204	579.15	0.020000	64.000000	1.000000	630.302025
29	1	90.0	-2.300	501.15	0.020000	64.000000	1.000000	48.695472
30	6	100.0	13.790	301.15	86.856339	83284831.316732	710.295426	1600.000000 COOLER_PIPE 1

MEASURINGPOINTS: Average Values

Mp. nr.	Pipe nr.	Location [mm]	Diameter [mm]	Pressure [bar]	Temp. [K]	Ms.Temp. [K]	Velo. [m/s]	Massflow [g/s]	Massflow [g/cycle]	To.Ent.f. [kJ/s]	To.Ent.f. [kJ/cyc.]	Mach. [-]	Wtemp. [K]	Converg. [-]
1	1	150.0000	670.0000	0.9784	297.9	297.9	16.6	6679.7137	4846.2252	-0.984	-0.7139	0.05	293.7	0.105E-03
2	2	0.0000	550.0000	0.9765	297.7	297.7	24.6	6679.6159	4846.1542	-0.986	-0.7151	0.07	463.1	0.106E-03
3	3	1400.0000	771.4286	0.9746	300.7	300.7	12.7	6679.4133	4846.0072	17.846	12.9472	0.04	307.1	0.727E-04
4	4	190.0000	820.0000	1.1659	288.2	278.5	1.9	1236.7604	897.2869	-24.230	-17.5789	0.01	307.1	0.761E-03
5	10	75.0000	630.0000	1.1644	280.0	292.8	2.4	1331.1453	965.7645	-4.785	-3.4718	0.01	307.1	0.453E-04
6	16	0.0000	380.0000	1.1250	634.1	825.0	29.7	1417.8095	1028.6405	1899.536	1378.1398	0.05	579.1	0.139E-03
7	28	1800.0000	750.0000	1.1531	831.0	831.2	39.9	8415.6200	6105.6493	10914.517	7918.6338	0.07	579.1	0.651E-04
8	29	0.0000	830.0000	0.9800	806.4	801.6	37.9	8414.4967	6104.8344	10607.076	7695.5813	0.07	501.2	0.746E-05

SYSTEMBOUNDARIES

Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
SYSTEMBOUNDARY	1	1	4846.3401
SYSTEMBOUNDARY	2	22	0.0000
SYSTEMBOUNDARY	3	29	6104.8327

PLENUMS: Average Values

PLENUM nr.	Pl. Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	
PLENUM	1	0.9736	277.74	21979.334	0.000

				Attached pipe 3:	4845.9314 g/cycle
				Attached pipe 4:	894.9632 g/cycle
				Attached pipe 5:	874.6142 g/cycle
				Attached pipe 6:	871.9945 g/cycle
				Attached pipe 7:	868.5580 g/cycle
				Attached pipe 8:	873.5471 g/cycle
				Attached pipe 9:	863.6223 g/cycle
VARIABLE_PLENUM	1	1.1659	278.02	2872.619 0.000	
				Attached pipe 4:	899.7020 g/cycle
VARIABLE_PLENUM	2	1.1669	277.91	2873.674 0.000	
				Attached pipe 10:	965.8702 g/cycle
				Attached pipe 5:	882.0917 g/cycle
VARIABLE_PLENUM	3	1.1666	277.50	2880.571 0.000	
				Attached pipe 11:	944.9610 g/cycle
				Attached pipe 6:	879.6107 g/cycle
VARIABLE_PLENUM	4	1.1704	277.42	2887.569 0.000	
				Attached pipe 12:	942.3293 g/cycle
				Attached pipe 7:	875.3852 g/cycle
VARIABLE_PLENUM	5	1.1678	277.67	2881.915 0.000	
				Attached pipe 13:	929.0447 g/cycle
				Attached pipe 8:	878.3002 g/cycle
VARIABLE_PLENUM	6	1.1689	278.13	2876.334 0.000	
				Attached pipe 14:	936.4962 g/cycle
				Attached pipe 9:	869.5167 g/cycle
AIRCOOLER	1	0.9763	297.99	1369.426 0.000	
				Attached pipe 15:	935.5437 g/cycle
				Attached pipe 2:	4846.2926 g/cycle
AIRCOOLER	1	0.9755	300.80	1355.520 0.000	
				Attached pipe 30:	4846.2520 g/cycle
				Attached pipe 3:	4846.2107 g/cycle
				Attached pipe 30:	4846.2396 g/cycle

PLENUMS  
Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
PLENUM	1	3	4845.9314
PLENUM	1	4	894.9632
PLENUM	1	5	874.6142
PLENUM	1	6	871.9945
PLENUM	1	7	868.5580
PLENUM	1	8	873.5471
PLENUM	1	9	863.6223
VARIABLE_PLENUM	1	4	899.7020
VARIABLE_PLENUM	1	10	965.8702
VARIABLE_PLENUM	2	5	882.0917
VARIABLE_PLENUM	2	11	944.9610
VARIABLE_PLENUM	3	6	879.6107

VARIABLE_PLENUM	3	12	942.3293
VARIABLE_PLENUM	4	7	875.3852
VARIABLE_PLENUM	4	13	929.0447
VARIABLE_PLENUM	5	8	878.3002
VARIABLE_PLENUM	5	14	936.4962
VARIABLE_PLENUM	6	9	869.5167
VARIABLE_PLENUM	6	15	935.5437
AIRCOOLER	1	2	4846.2926
AIRCOOLER	1	30	4846.2520
AIRCOOLER	1	3	4846.2107
AIRCOOLER	1	30	4846.2396

VARIABLE PLENUMS: Average Values

Pl. nr.	Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	Vol.work [kJ]	Volume [l]			
1	1.1659	278.02	2872.619	0.000	-33.992	2009.22			
							Attached pipe 4:	899.7020	g/cycle
							Attached pipe 10:	965.8702	g/cycle
2	1.1669	277.91	2873.674	0.000	-33.375	2009.22			
							Attached pipe 5:	882.0917	g/cycle
							Attached pipe 11:	944.9610	g/cycle
3	1.1666	277.50	2880.571	0.000	-33.424	2009.22			
							Attached pipe 6:	879.6107	g/cycle
							Attached pipe 12:	942.3293	g/cycle
4	1.1704	277.42	2887.569	0.000	-33.252	2009.22			
							Attached pipe 7:	875.3852	g/cycle
							Attached pipe 13:	929.0447	g/cycle
5	1.1678	277.67	2881.915	0.000	-33.486	2009.22			
							Attached pipe 8:	878.3002	g/cycle
							Attached pipe 14:	936.4962	g/cycle
6	1.1689	278.13	2876.334	0.000	-33.298	2009.22			
							Attached pipe 9:	869.5167	g/cycle
							Attached pipe 15:	935.5437	g/cycle

TURBOCHARGERS: Average Values

TCh. nr.	Compressor			Turbine				Efficiencies				Calculation mode	
	Work [kJ]	Press.rat. [-]	Boostpres. [bar]	Work [kJ]	Press.rat. [-]	Dis.coeff. [-]	Turb./tot. [-]	VTG-pos [-]	Comp. [-]	Turb. mech. [-]	total [-]		
1	0.0016	1.0000	0.9800	219.6597	1.2216	0.1414	1.0000	1.000	0.800	0.765	0.980	0.600	Turbinesize
	Attached pipe 1:	4846.3458	g/cycle										
	Attached pipe 2:	4846.2739	g/cycle										
	Attached pipe 29:	6104.6477	g/cycle										
	Attached pipe 28:	6104.6260	g/cycle										

CYLINDERS: Average Values

-----  
Total



	Engine	Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4	Cyl. 5	Cyl. 6
Firing TDC [deg]		0.00	240.00	120.00	180.00	60.00	300.00
Bore [mm]		700.00	700.00	700.00	700.00	700.00	700.00
Stroke [mm]		2800.00	2800.00	2800.00	2800.00	2800.00	2800.00
Conrodl. [mm]		2871.00	2871.00	2871.00	2871.00	2871.00	2871.00
Piston pin offset [mm]		0.00	0.00	0.00	0.00	0.00	0.00
Swept Vol. [l]	6465.3977	1077.5663	1077.5663	1077.5663	1077.5663	1077.5663	1077.5663
Compression ratio [-]		22.00	22.00	22.00	22.00	22.00	22.00
Dyn. Comp. ratio [-]		18.76	18.76	18.76	18.76	18.76	18.76

#### Combustion Data:

		Vibe	Vibe	Vibe	Vibe	Vibe	Vibe
Combustion Char.		0.00	0.00	0.00	0.00	0.00	0.00
Comb.start [deg]		70.00	70.00	70.00	70.00	70.00	70.00
Comb.dur.1 [deg]		6.900	6.900	6.900	6.900	6.900	6.900
Vibe Parameter a [-]		0.500	0.500	0.500	0.500	0.500	0.500
Vibe Param. m 1 [-]		66.66	66.40	65.36	67.65	67.22	66.53
Peak Fir.Pres. [bar]	66.66	9.07	9.16	9.13	9.15	8.98	9.04
at Crankangle [deg]		2.09	2.06	2.07	2.04	2.13	2.09
Peak Pres.Rise[bar/deg]		-10.90	-10.87	-10.91	-10.90	-10.89	-10.92
at Crankangle [deg]		1969.35	1971.27	1973.18	1967.59	1967.63	1964.19
Peak Fir. Temp. [K]	1969.35	26.25	26.46	26.39	26.47	26.05	26.06
at Crankangle [deg]							

#### Performance:

IMEP [bar]	15.6923	15.8267	15.6933	15.6185	15.7200	15.6075	15.6277
Rel. to Ave. [-]		1.0188	1.0014	0.9917	1.0049	0.9903	0.9929
FMEP [bar]	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
BMEP [bar]	5.3716	5.5112	5.3836	5.3083	5.4114	5.2967	5.3187
AMEP;SMEP [bar]	0.3106	0.3155	0.3097	0.3102	0.3086	0.3108	0.3090
ISFC [g/kWh]	172.3369	172.0936	172.8519	172.1705	172.6833	172.6631	172.7585
Rel. to Ave. [-]		0.9815	0.9986	1.0084	0.9951	1.0098	1.0072
Indicated Eff. [-]	0.2486	0.2533	0.2490	0.2465	0.2498	0.2462	0.2468
Iso vol. comb. Eff [-]	0.8564	0.8564	0.8564	0.8564	0.8564	0.8564	0.8564
Polytropic Coeff. [-]		1.3515	1.3495	1.3506	1.3474	1.3458	1.3482

#### Fuel Mass Balance:

Inj. Fuelmass [g]	361.117388	61.269317	60.251010	59.554815	60.532575	59.570942	59.938729
Asp.Trap. Fuelmass [g]	105.682612	16.530683	17.548990	18.245185	17.267425	18.229058	17.861271
Fuelmassfl.(A+I) [g/s]	643.406000	107.234333	107.234333	107.234333	107.234333	107.234333	107.234333
Fuelmass tot.trap. [g]	466.800000	77.800000	77.800000	77.800000	77.800000	77.800000	77.800000
Trapped Fuelm.fl.[g/s]	643.406000	107.234333	107.234333	107.234333	107.234333	107.234333	107.234333
Trapp. Eff. Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

#### Energy Balance Cylinder:

Fuel Energy [kJ]	15392.67136	2595.62861	2578.76285	2548.96503	2590.81415	2549.65539	2528.84533
------------------	-------------	------------	------------	------------	------------	------------	------------

Released Energy [kJ]	15377.09652	2593.00140	2576.15217	2546.39191	2588.19377	2547.07738	2526.27990
-> Brake Power [%]	22.585	22.903	22.519	22.463	22.530	22.408	22.686
-> Loss: Friction [%]	8.409	8.311	8.366	8.463	8.327	8.461	8.531
-> Loss: Piston [%]	4.451	4.406	4.433	4.412	4.456	4.481	4.518
-> Loss: Head [%]	5.438	5.384	5.415	5.393	5.443	5.474	5.519
-> Loss: Liner [%]	5.136	5.092	5.102	5.105	5.160	5.163	5.198
-> Loss: Int. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Gas [%]	53.128	53.274	52.917	53.233	52.828	53.235	53.287
Eff. Rel. Energy [kJ]	11492.97767	1937.86211	1925.22813	1903.02487	1934.50476	1903.93661	1888.42119
Gross Rel. Energy [kJ]	15350.02226	2593.00140	2549.07791	2546.39191	2588.19377	2547.07738	2526.27990
Eff.Gross Rel.Ener.[kJ]	11473.13901	1937.86211	1905.38948	1903.02487	1934.50476	1903.93661	1888.42119
Energy Balance [-]	0.9972	0.9990	0.9885	0.9990	0.9990	0.9990	0.9990
Eff. Energy Balance [-]	0.7461	0.7466	0.7389	0.7466	0.7467	0.7467	0.7468

## Blowby:

Blowbymass [g]	-9.470408	-1.577364	-1.573088	-1.551849	-1.602096	-1.590577	-1.575433
Blowbymassfl. [g/s]	-13.053379	-2.174134	-2.168240	-2.138965	-2.208222	-2.192346	-2.171472
Blowby Heat Flow [kJ]	-15.252010	-2.527033	-2.529718	-2.485302	-2.590251	-2.578858	-2.540847

## Reference Values at Start of High Pressure:

Pressure at SHP[bar]	1.0557	1.0329	1.0473	1.0244	1.0833	1.0877	1.0587
Temperature [K]	413.32	404.63	411.50	406.83	418.13	422.95	415.88
Air Massfl. [g/s]	7676.295203	1311.137466	1282.689596	1279.525110	1261.568200	1271.276816	1270.098016
Fuel Massfl. [g/s]	643.406000	107.234333	107.234333	107.234333	107.234333	107.234333	107.234333
Trapp. Eff. Air [-]	0.7631	0.7580	0.7619	0.7550	0.7783	0.7601	0.7655
Trapp. Eff.Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
A/F-Ratio (Cmb.) [-]	11.76	11.76	11.76	11.76	11.76	11.76	11.76
Excess Air Ratio [-]	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000

## Reference Values at Start Of Combustion:

Pressure [bar]	55.0271	54.2717	54.6960	53.6738	56.2340	56.2068	55.0806
Temperature [K]	1134.83	1119.59	1131.71	1122.69	1143.48	1151.94	1139.59

## Residual Gas:

Res.gas content [-]	0.1770	0.1626	0.1736	0.1742	0.1837	0.1900	0.1778
External EGR [-]	0.0173	0.0176	0.0177	0.0174	0.0167	0.0170	0.0171
Internal EGR [-]	0.1598	0.1450	0.1559	0.1568	0.1669	0.1731	0.1607
Com.Prod.Mass. at EO [g]	5522.314043	922.869971	922.932493	906.034991	930.875536	922.853524	916.747529
Res.gas mass at SHP [g]	914.070106	139.968805	148.971528	147.852546	160.265950	164.498662	152.512615
Res.gas aspirated IN [g]	89.134999	15.161707	15.201102	14.795556	14.587779	14.701349	14.687507
Res.gas from intake [g]	89.287393	15.161707	15.201102	14.795556	14.740172	14.701349	14.687507
Rel. to Total [-]	0.0977	0.1083	0.1020	0.1001	0.0920	0.0894	0.0963
Res.gas flow EX [g]	4725.855187	798.046682	789.145716	783.579929	791.570144	784.612916	778.899801
Res.gas from exhaust [g]	216.379872	35.739540	39.474128	33.166476	33.562520	35.607849	38.829359

Rel. to Total [-]	0.2367	0.2553	0.2650	0.2243	0.2094	0.2165	0.2546
Gas Exchange:							
-----							
Volumetric Eff. [-]	0.5738	0.5842	0.5745	0.5678	0.5771	0.5680	0.5715
Rel. to Ave. [-]	1.0180	1.0011	0.9895	1.0058	0.9898	0.9959	0.9959
Rel. To PL 1 [-]	0.5383	0.5480	0.5389	0.5327	0.5414	0.5328	0.5361
Total Mass at SHP[g]	5163.8607	861.0080	858.0395	848.7148	872.6410	865.5580	857.8994
Mass Delivered [g]	5658.39391	966.41017	945.81024	943.10882	929.87305	937.03036	936.16128
Mass Delivered [g/s]	7799.15294	1332.03535	1303.64178	1299.91832	1281.67502	1291.54018	1290.34230
Delivery Ratio [-]	0.7640	0.7830	0.7663	0.7641	0.7534	0.7592	0.7585
Rel. to Ave. [-]	1.0248	1.0029	1.0000	0.9860	0.9936	0.9927	0.9927
Rel. To PL 1 [-]	0.7168	0.7345	0.7188	0.7168	0.7067	0.7122	0.7115
Av.Airmass at SHP[g]	4249.7906	721.0392	709.0680	700.8623	712.3750	701.0593	705.3868
Air Delivered [g]	5569.25891	951.24846	930.60914	928.31326	915.28527	922.32901	921.47377
Air Delivered [g/s]	7676.29520	1311.13747	1282.68960	1279.52511	1261.56820	1271.27682	1270.09802
Airdeliveryratio [-]	0.7520	0.7707	0.7540	0.7521	0.7415	0.7472	0.7466
Rel. to Ave. [-]	1.0248	1.0026	1.0001	0.9861	0.9937	0.9927	0.9927
Rel. To PL 1 [-]	0.7055	0.7230	0.7073	0.7055	0.6956	0.7010	0.7003
Airmass Trapped [g]	4249.79062	721.03922	709.06797	700.86228	712.37500	701.05933	705.38682
Airmass Trapped [g/s]	5857.62808	993.83239	977.33202	966.02184	981.89021	966.29345	972.25816
Trapp. Eff. Air [-]	0.7631	0.7580	0.7619	0.7550	0.7783	0.7601	0.7655
Rel. to Ave. [-]	0.9933	0.9985	0.9894	1.0200	0.9961	1.0032	1.0032
Airpurity [-]	0.8230	0.8374	0.8264	0.8258	0.8163	0.8100	0.8222
Dyn. Swirl [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dyn. Tumble [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Wall Heatlosses:							
-----							
Piston [kJ]	-684.3982	-114.2548	-114.1970	-112.3569	-115.3241	-114.1323	-114.1332
Cylinderhead [kJ]	-836.13730	-139.59889	-139.50606	-137.32036	-140.87064	-139.42534	-139.41602
Cylinderliner [kJ]	-789.80850	-132.02413	-131.42965	-129.98083	-133.54126	-131.51138	-131.32125
Sum of Wallheat [kJ]	-2310.34402	-385.87779	-385.13270	-379.65811	-389.73599	-385.06900	-384.87043
Wall Heatlosses in High Pressure Phase:							
Piston HP [kJ]	-694.79746	-116.01207	-116.00634	-114.09581	-116.99955	-115.83506	-115.84863
Cylinderhead HP [kJ]	-840.48503	-140.35196	-140.31646	-138.05951	-141.52327	-140.11465	-140.11918
Cylinderliner HP [kJ]	-772.90396	-129.43018	-129.26350	-127.32037	-130.14000	-128.42699	-128.32292
Sum of Wallheat HP [kJ]	-2308.18645	-385.79421	-385.58630	-379.47569	-388.66282	-384.37670	-384.29072
Wall Heatlosses Related to Heatinput:							
Piston [-]	-0.0343	-0.0343	-0.0343	-0.0337	-0.0346	-0.0343	-0.0343
Cylinderhead [-]	-0.0419	-0.0419	-0.0419	-0.0412	-0.0423	-0.0419	-0.0419
Cylinderliner [-]	-0.0395	-0.0396	-0.0395	-0.0390	-0.0401	-0.0395	-0.0394
Sum of Wallheat [-]	-0.1156	-0.1159	-0.1157	-0.1140	-0.1170	-0.1156	-0.1156
M. Eff. HTC [W/m <sup>2</sup> /K]	309.94	310.88	309.95	307.14	312.59	309.72	309.35
M. Eff. Temp. [K]	1324.37	1323.37	1325.17	1320.11	1326.15	1325.29	1326.14
Reference Values at EO:							
-----							
Pressure [bar]	3.30	3.32	3.31	3.26	3.34	3.31	3.28

Temperature [K]	1195.35	1199.45	1192.97	1197.07	1196.50	1193.54	1192.58
A/F-Ratio [-]	11.79	11.79	11.79	11.79	11.79	11.79	11.79
Com.Prod.Conc. [-]	0.99923	0.99922	0.99924	0.99923	0.99923	0.99924	0.99924
Fuel Concentr. [-]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Average Values of Pipeattachements:

Attached Pipe	10	11	12	13	14	15
Vlv/Prt.Op.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Eff.0mm[deg]	140.00	139.99	139.98	139.96	139.98	139.96
Vlv/Prt.Op.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Eff.0mm[deg]	220.04	220.03	220.00	220.01	220.03	220.00
Vlv/Prt.Cl.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	966.410170	945.810241	943.108816	929.873050	937.030357	936.161279
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Attached Pipe	16	17	18	19	20	21
Vlv/Prt.Op.Clr.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.1mm[deg]	127.08	127.08	127.08	127.08	127.08	127.08
Vlv/Prt.Op.Udef.mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Cl.Clr.0mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Vlv/Prt.Cl.Eff.0mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Vlv/Prt.Cl.Eff.1mm[deg]	239.98	239.98	239.98	239.98	239.98	239.98
Vlv/Prt.Cl.Udef.mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	1028.914643	1011.340897	1019.200521	1007.109766	1001.858166	995.629836
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ASSEMBLED: Average Values

Type	Nr.	-----Inlet-----			-----Outlet-----			-----Core-----			
		Pressure [bar]	Temperat. [K]	Mass [g]	Pressure [bar]	Temperat. [K]	Mass [g]	Rej.Heat [kJ]	Rej.Heat [kW]	Fric. coeff. [-]	Heat Factor [-]
AIRCOOLER	1	0.9763	297.99	1369.426	0.9755	300.80	1355.520	13.7903	19.0076	86.856339	710.295426

ASSEMBLED Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
AIRCOOLER	1	2	4846.2926
AIRCOOLER	1	3	4846.2107

JUNCTIONS: Average Values

```

Junction  1: Attached pipe 21: -1000.3661 g/cycle
           Attached pipe 22:   -1.1191 g/cycle
           Attached pipe 23: -1001.2014 g/cycle
Junction  2: Attached pipe 20: -1006.1927 g/cycle
           Attached pipe 23: -1003.3678 g/cycle
           Attached pipe 24: -2009.4078 g/cycle
Junction  3: Attached pipe 19: -1008.6109 g/cycle
           Attached pipe 24: -2008.9219 g/cycle
           Attached pipe 25: -3017.6038 g/cycle
Junction  4: Attached pipe 18: -1020.4099 g/cycle
           Attached pipe 25: -3020.4032 g/cycle
           Attached pipe 26: -4040.2071 g/cycle
Junction  5: Attached pipe 17: -1020.4797 g/cycle
           Attached pipe 26: -4040.1361 g/cycle
           Attached pipe 27: -5063.4844 g/cycle
Junction  6: Attached pipe 16: -1033.9811 g/cycle
           Attached pipe 27: -5064.3067 g/cycle
           Attached pipe 28: -6102.1148 g/cycle

```

OVERALL ENGINE PERFORMANCE:

=====

```

Indicated Torque      : 790504.05 Nm
Indicated Power       : 14001.8 kW,
Auxiliary Drives Torque : 31962.79 Nm
Friction Torque       : 205800.00 Nm
Effective Torque      : 552741.26 Nm
Effective Power       : 13090.92 kW,

```

```

Required time for reading the inputfile and initialisation: 6.45 min
Required time for the calculation: ..... 0.92 min
Required time for writing the outputfile: ..... 0.00 min
Required total time: ..... 7.37 min
Required total CPU-time: ..... 47.30 sec

```

## 6S70MC-C8 Навантаження 100 %

```

-----
AVL - B O O S T
Version : v2014.1.0.0.0
Build:   Mar 10 2015 22:02:38
System:  x86_64-unknown-winnt_i11
-----

```

### LICENSE

```

-----
Boost Main 2014.0@ License will expire in 197 days

Boost Charging 2014.0@ License will expire in 197 days

```

### PROJECT

```

-----
Preprocessor Version : 2014.1
Calculation date    : 10.02.2019
File                : MAN_S70MC_Ba.bst
Case Set           : "S70MC-C"
Case               : "Case 5_100"

Project ID: "Demo File 2-Stroke Diesel Large Engine"
Run ID:     ""
Model date: "25. Mar 2002 11:15:59"

```

### ELEMENTS

```

-----
Element Name      Number

PIPE              29
SYSTEMBOUNDARY   3
PLENUM           1
VARIABLE_PLENUM  6
CYLINDER         6
MEASURINGPOINT   8
AIRCOOLER        1
TURBOCHARGER     1
JUNCTION         6
ENGINE           1
PIPE_END         60
ASSEMBLED        1
ALL_PIPES        30
ALL_PLENUMS      9
ALL_BOUNDARIES   3
ALL_CHARGERS     1
ALL_PIDS         1

```

PIPE\_VAR\_WALL\_TEMP 30

GLOBAL DATA

```

-----
Engine Speed :          91.0 rpm
Calculationmode:       BOOST Single
Cycle Duration:        360.00 degrees
Max. calc. period:    3600.00 degrees
Cycles calculated:     10 cycles
Calc. time steps:      0.10956 degrees (max)
                      0.06371 degrees
                      0.11669 ms
                      0.05302 degrees (short pipe)
                      0.09710 ms (short pipe)
Traces results step:  1.00000 degrees
User concentrations:   0
Ref. pressure:        98000.00 Pa
Ref. temperature:     298.000 K
Gas properties:       Variable
Gasproperties File:   DIESEL.BGP
  bgp_build_version:  v2013.0.0.0.0
  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

Warnings:             40
Convergence errors:   655

```

PIPES

-----  
Total number of pipe cells: 322

Pipe nr.	Cells	Cell size [mm]	W.Heat [kJ]	Wall T [K]	Fric. coeff. [-]	Lam. Fric. Coeff. [-]	Heat Factor [-]	Volume [dm3]
1	2	90.0	0.000	293.75	0.020000	64.000000	0.000000	63.461742
2	14	100.0	0.000	463.15	0.020000	64.000000	0.000000	332.616122
3	28	100.0	0.000	313.15	0.020000	64.000000	0.000000	1415.814603
4	4	95.0	0.000	313.15	0.020000	64.000000	0.000000	200.678656
5	4	95.0	0.000	313.15	0.020000	64.000000	0.000000	200.678656
6	4	95.0	0.000	313.15	0.020000	64.000000	0.000000	200.678656
7	4	95.0	0.000	313.15	0.020000	64.000000	0.000000	200.678656
8	4	95.0	0.000	313.15	0.020000	64.000000	0.000000	200.678656
9	4	95.0	0.000	313.15	0.020000	64.000000	0.000000	200.678656
10	1	75.0	0.000	313.15	0.020000	64.000000	0.000000	23.379340
11	1	75.0	0.000	313.15	0.020000	64.000000	0.000000	23.379340

12	1	75.0	0.000	313.15	0.020000	64.000000	0.000000	23.379340													
13	1	75.0	0.000	313.15	0.020000	64.000000	0.000000	23.379340													
14	1	75.0	0.000	313.15	0.020000	64.000000	0.000000	23.379340													
15	1	75.0	0.000	313.15	0.020000	64.000000	0.000000	23.379340													
16	30	100.0	-22.779	618.15	0.020000	64.000000	1.000000	452.412762													
17	30	100.0	-21.345	618.15	0.020000	64.000000	1.000000	452.412762													
18	30	100.0	-21.690	618.15	0.020000	64.000000	1.000000	452.412762													
19	30	100.0	-19.215	618.15	0.020000	64.000000	1.000000	452.412762													
20	30	100.0	-19.058	618.15	0.020000	64.000000	1.000000	452.412762													
21	30	100.0	-16.820	618.15	0.020000	64.000000	1.000000	452.412762													
22	4	112.5	-0.484	618.15	0.020000	64.000000	1.000000	127.234502													
23	9	100.0	-7.789	618.15	0.020000	64.000000	1.000000	254.469005													
24	9	100.0	-13.612	618.15	0.020000	64.000000	1.000000	254.469005													
25	9	100.0	-19.409	618.15	0.020000	64.000000	1.000000	254.469005													
26	9	100.0	-21.958	618.15	0.020000	64.000000	1.000000	254.469005													
27	9	100.0	-23.046	618.15	0.020000	64.000000	1.000000	254.469005													
28	18	100.0	-41.443	618.15	0.020000	64.000000	1.000000	630.302025													
29	1	90.0	-2.223	501.15	0.020000	64.000000	1.000000	48.695472													
30	6	100.0	11.790	301.15	136.694555	131073714.611050	710.295426	1600.000000	COOLER_PIPE												1

MEASURINGPOINTS: Average Values

Mp. nr.	Pipe nr.	Location [mm]	Diameter [mm]	Pressure [bar]	Temp. [K]	Ms.Temp. [K]	Velo. [m/s]	Massflow [g/s]	Massflow [g/cycle]	To.Ent.f. [kJ/s]	To.Ent.f. [kJ/cyc.]	Mach. [-]	Wtemp. [K]	Converg. [-]
1	1	150.0000	670.0000	0.9785	297.9	297.9	16.3	6566.2940	4329.4246	-0.966	-0.6371	0.05	293.8	0.729E-05
2	2	0.0000	550.0000	0.9766	297.7	297.7	24.2	6566.2289	4329.3817	-0.968	-0.6380	0.07	463.1	0.716E-05
3	3	1400.0000	771.4286	0.9743	300.8	300.7	12.5	6563.3707	4327.4972	17.750	11.7036	0.04	313.2	0.455E-04
4	4	190.0000	820.0000	1.1883	255.0	247.7	1.8	1325.3417	873.8516	-67.088	-44.2338	0.01	313.2	0.164E-02
5	10	75.0000	630.0000	1.1866	253.9	263.3	2.3	1423.4600	938.5451	-47.659	-31.4235	0.01	313.2	0.213E-04
6	16	0.0000	380.0000	1.1882	618.5	818.0	29.2	1498.6581	988.1262	1998.653	1317.7932	0.05	618.2	0.956E-04
7	28	1800.0000	750.0000	1.2178	836.0	832.3	41.3	9132.7095	6021.5667	11939.524	7872.2134	0.07	618.2	0.111E-03
8	29	0.0000	830.0000	0.9800	803.4	795.6	40.8	9132.7106	6021.5674	11527.559	7600.5880	0.07	501.2	0.104E-03

SYSTEMBOUNDARIES

Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
SYSTEMBOUNDARY	1	1	4329.4699
SYSTEMBOUNDARY	2	22	0.0000
SYSTEMBOUNDARY	3	29	6021.8697

PLENUMS: Average Values

PLENUM nr.	Pl. nr.	Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]
PLENUM	1	0.9734	246.10	24802.163	0.000
					Attached pipe 3: 4327.8939 g/cycle



				Attached pipe 4:	868.6855 g/cycle
				Attached pipe 5:	882.1192 g/cycle
				Attached pipe 6:	858.2588 g/cycle
				Attached pipe 7:	923.8286 g/cycle
				Attached pipe 8:	864.8681 g/cycle
				Attached pipe 9:	886.8516 g/cycle
VARIABLE_PLENUM	1	1.1882	249.60	3255.123 0.000	
				Attached pipe 4:	879.3604 g/cycle
				Attached pipe 10:	938.0532 g/cycle
VARIABLE_PLENUM	2	1.1852	248.83	3255.481 0.000	
				Attached pipe 5:	895.8612 g/cycle
				Attached pipe 11:	949.0184 g/cycle
VARIABLE_PLENUM	3	1.1893	248.83	3267.569 0.000	
				Attached pipe 6:	868.9333 g/cycle
				Attached pipe 12:	895.0463 g/cycle
VARIABLE_PLENUM	4	1.1853	248.48	3260.837 0.000	
				Attached pipe 7:	935.5767 g/cycle
				Attached pipe 13:	969.6595 g/cycle
VARIABLE_PLENUM	5	1.1920	249.11	3271.953 0.000	
				Attached pipe 8:	875.7307 g/cycle
				Attached pipe 14:	914.8863 g/cycle
VARIABLE_PLENUM	6	1.1880	249.36	3255.870 0.000	
				Attached pipe 9:	899.0019 g/cycle
				Attached pipe 15:	957.4161 g/cycle
AIRCOOLER	1	0.9765	298.08	1369.261 0.000	
				Attached pipe 2:	4329.4227 g/cycle
				Attached pipe 30:	4328.3314 g/cycle
AIRCOOLER	1	0.9752	300.84	1354.977 0.000	
				Attached pipe 3:	4327.3566 g/cycle
				Attached pipe 30:	4327.3609 g/cycle

PLENUMS  
Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
PLENUM	1	3	4327.8939
PLENUM	1	4	868.6855
PLENUM	1	5	882.1192
PLENUM	1	6	858.2588
PLENUM	1	7	923.8286
PLENUM	1	8	864.8681
PLENUM	1	9	886.8516
VARIABLE_PLENUM	1	4	879.3604
VARIABLE_PLENUM	1	10	938.0532
VARIABLE_PLENUM	2	5	895.8612
VARIABLE_PLENUM	2	11	949.0184
VARIABLE_PLENUM	3	6	868.9333
VARIABLE_PLENUM	3	12	895.0463

VARIABLE_PLENUM	4	7	935.5767
VARIABLE_PLENUM	4	13	969.6595
VARIABLE_PLENUM	5	8	875.7307
VARIABLE_PLENUM	5	14	914.8863
VARIABLE_PLENUM	6	9	899.0019
VARIABLE_PLENUM	6	15	957.4161
AIRCOOLER	1	2	4329.4227
AIRCOOLER	1	30	4328.3314
AIRCOOLER	1	3	4327.3566
AIRCOOLER	1	30	4327.3609

VARIABLE PLENUMS: Average Values

Pl. nr.	Pressure [bar]	Temp. [K]	Mass [g]	Wallheat [kJ]	Vol.work [kJ]	Volume [l]			
1	1.1882	249.60	3255.123	0.000	-31.790	2009.22	Attached pipe 4:	879.3604	g/cycle
							Attached pipe 10:	938.0532	g/cycle
2	1.1852	248.83	3255.481	0.000	-31.767	2009.22	Attached pipe 5:	895.8612	g/cycle
							Attached pipe 11:	949.0184	g/cycle
3	1.1893	248.83	3267.569	0.000	-30.657	2009.22	Attached pipe 6:	868.9333	g/cycle
							Attached pipe 12:	895.0463	g/cycle
4	1.1853	248.48	3260.837	0.000	-32.505	2009.22	Attached pipe 7:	935.5767	g/cycle
							Attached pipe 13:	969.6595	g/cycle
5	1.1920	249.11	3271.953	0.000	-31.418	2009.22	Attached pipe 8:	875.7307	g/cycle
							Attached pipe 14:	914.8863	g/cycle
6	1.1880	249.36	3255.870	0.000	-32.223	2009.22	Attached pipe 9:	899.0019	g/cycle
							Attached pipe 15:	957.4161	g/cycle

TURBOCHARGERS: Average Values

TCh. nr.	Compressor			Turbine				Efficiencies				Calculation mode	
	Work [kJ]	Press.rat. [-]	Boostpres. [bar]	Work [kJ]	Press.rat. [-]	Dis.coeff. [-]	Turb./tot. [-]	VTG-pos [-]	Comp. [-]	Turb. mech. [-]	total [-]		
1	0.0013	1.0000	0.9800	268.8504	1.2846	0.1291	1.0000	1.000	0.800	0.765	0.980	0.600	Turbinesize
	Attached pipe 1:	4329.4697	g/cycle										
	Attached pipe 2:	4329.4270	g/cycle										
	Attached pipe 29:	6021.2088	g/cycle										
	Attached pipe 28:	6021.1551	g/cycle										

CYLINDERS: Average Values

Total Engine	Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4	Cyl. 5	Cyl. 6
--------------	--------	--------	--------	--------	--------	--------

Firing TDC [deg]		0.00	240.00	120.00	180.00	60.00	300.00
Bore [mm]		700.00	700.00	700.00	700.00	700.00	700.00
Stroke [mm]		2800.00	2800.00	2800.00	2800.00	2800.00	2800.00
Conrodl. [mm]		2871.00	2871.00	2871.00	2871.00	2871.00	2871.00
Piston pin offset [mm]		0.00	0.00	0.00	0.00	0.00	0.00
Swept Vol. [l]	6465.3977	1077.5663	1077.5663	1077.5663	1077.5663	1077.5663	1077.5663
Compression ratio [-]		22.00	22.00	22.00	22.00	22.00	22.00
Dyn. Comp. ratio [-]		18.76	18.76	18.76	18.76	18.76	18.76

Combustion Data:

Combustion Char.		Vibe	Vibe	Vibe	Vibe	Vibe	Vibe
Comb.start [deg]		0.00	0.00	0.00	0.00	0.00	0.00
Comb.dur.1 [deg]		70.00	70.00	70.00	70.00	70.00	70.00
Vibe Parameter a [-]		6.900	6.900	6.900	6.900	6.900	6.900
Vibe Param. m 1 [-]		0.500	0.500	0.500	0.500	0.500	0.500
Peak Fir.Pres. [bar]	69.96	67.96	69.97	69.73	72.35	70.60	69.14
at Crankangle [deg]	8.80	8.71	8.92	8.67	8.97	8.63	8.92
Peak Pres.Rise[bar/deg]	2.23	2.16	2.22	2.24	2.28	2.28	2.19
at Crankangle [deg]	-10.89	-10.83	-10.90	-10.91	-10.90	-10.90	-10.89
Peak Fir. Temp. [K]	1942.68	1935.40	1948.82	1937.60	1950.93	1935.43	1947.89
at Crankangle [deg]	26.20	26.04	26.19	26.04	26.43	26.05	26.44

Performance:

IMEP [bar]	18.2857	18.5813	18.9463	18.7333	18.3536	18.7305	18.7984
Rel. to Ave. [-]		0.9649	1.0113	0.9842	1.0632	0.9839	0.9925
FMEP [bar]	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
BMEP [bar]	5.5628	5.2863	5.6515	5.4488	6.0519	5.4389	5.4994
AMEP;SMEP [bar]	0.2944	0.2950	0.2948	0.2845	0.3017	0.2916	0.2990
ISFC [g/kWh]	173.8361	173.8386	173.4097	173.4068	173.9360	173.5603	173.9808
Rel. to Ave. [-]		1.0364	0.9888	1.0160	0.9406	1.0164	1.0075
Indicated Eff. [-]	0.2082	0.2009	0.2106	0.2049	0.2214	0.2049	0.2067
Iso vol. comb. Eff [-]	0.8564	0.8564	0.8564	0.8564	0.8564	0.8564	0.8564
Polytropic Coeff. [-]		1.3480	1.3478	1.3449	1.3495	1.3428	1.3479

Fuel Mass Balance:

Inj. Fuelmass [g]	367.445521	60.304330	61.578057	60.033304	64.436426	59.991923	61.101481
Asp.Trap. Fuelmass [g]	202.554479	34.695670	33.421943	34.966696	30.563574	35.008077	33.898519
Fuelmassfl.(A+I) [g/s]	864.500000	144.083333	144.083333	144.083333	144.083333	144.083333	144.083333
Fuelmass tot.trap. [g]	570.000000	95.000000	95.000000	95.000000	95.000000	95.000000	95.000000
Trapped Fuelm.fl.[g/s]	864.500000	144.083333	144.083333	144.083333	144.083333	144.083333	144.083333
Trapp. Eff. Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Energy Balance Cylinder:

Fuel Energy [kJ]	15528.85651	2498.94480	2635.56319	2569.44766	2757.90315	2567.67617	2499.32153
Released Energy [kJ]	15513.10473	2496.40600	2632.89080	2566.83763	2755.10169	2565.07415	2496.79445

-> Brake Power [%]	23.184	22.818	23.130	22.874	23.670	22.848	23.734
-> Loss: Friction [%]	8.335	8.633	8.185	8.396	7.822	8.402	8.632
-> Loss: Piston [%]	4.209	4.207	4.161	4.220	4.104	4.247	4.328
-> Loss: Head [%]	5.156	5.156	5.095	5.169	5.025	5.201	5.302
-> Loss: Liner [%]	4.874	4.856	4.785	4.930	4.804	4.930	4.950
-> Loss: Int. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Port [%]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-> Loss: Exh. Gas [%]	53.199	54.036	51.772	52.917	53.083	53.364	54.116
Eff. Rel. Energy [kJ]	11600.62381	1866.95847	1968.55940	1919.58503	2059.75544	1918.44937	1867.31610
Gross Rel. Energy [kJ]	15373.17107	2496.40600	2492.95714	2566.83763	2755.10169	2565.07415	2496.79445
Eff.Gross Rel.Ener.[kJ]	11496.77307	1866.95847	1864.70866	1919.58503	2059.75544	1918.44937	1867.31610
Energy Balance [-]	0.9900	0.9990	0.9459	0.9990	0.9990	0.9990	0.9990
Eff. Energy Balance [-]	0.7411	0.7471	0.7075	0.7471	0.7469	0.7472	0.7471

## Blowby:

-----

Blowbymass [g]	-9.089543	-1.473561	-1.514848	-1.510604	-1.566948	-1.526888	-1.496694
Blowbymassfl. [g/s]	-13.785806	-2.234901	-2.297519	-2.291083	-2.376537	-2.315780	-2.269986
Blowby Heat Flow [kJ]	-14.684884	-2.368016	-2.444911	-2.453165	-2.520907	-2.492693	-2.405193

## Reference Values at Start of High Pressure:

-----

Pressure at SHP[bar]	1.1343	1.0977	1.1262	1.1462	1.1499	1.1765	1.1094
Temperature [K]	418.62	415.22	416.28	425.37	409.15	432.30	413.40
Air Massfl. [g/s]	8399.311958	1400.805492	1417.558320	1336.659461	1448.151821	1366.202787	1429.934077
Fuel Massfl. [g/s]	864.500000	144.083333	144.083333	144.083333	144.083333	144.083333	144.083333
Trapp. Eff. Air [-]	0.7808	0.7683	0.7753	0.8016	0.7941	0.7837	0.7627
Trapp. Eff.Fuel [-]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
A/F-Ratio (Cmb.) [-]	11.76	11.76	11.76	11.76	11.76	11.76	11.76
Excess Air Ratio [-]	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000

## Reference Values at Start Of Combustion:

-----

Pressure [bar]	58.7771	57.0810	58.5244	59.0692	60.0509	60.2566	57.6806
Temperature [K]	1143.04	1137.02	1139.05	1154.78	1126.35	1167.28	1133.75

## Residual Gas:

-----

Res.gas content [-]	0.2092	0.2026	0.2044	0.2203	0.1979	0.2277	0.2028
External EGR [-]	0.0161	0.0165	0.0164	0.0155	0.0161	0.0157	0.0167
Internal EGR [-]	0.1931	0.1861	0.1880	0.2048	0.1818	0.2119	0.1861
Com.Prod.Mass. at EO [g]	5780.086940	939.487389	954.551034	963.879029	1007.480123	971.812835	942.876530
Res.gas mass at SHP [g]	1144.140473	180.322130	186.140860	199.597699	187.097786	208.088286	182.893711
Res.gas aspirated IN [g]	88.298992	14.726182	14.906502	14.048568	15.222870	14.361545	15.033325
Res.gas from intake [g]	88.631619	14.726182	14.906502	14.048568	15.555496	14.361545	15.033325
Rel. to Total [-]	0.0775	0.0817	0.0801	0.0704	0.0831	0.0690	0.0822
Res.gas flow EX [g]	4729.372553	773.886618	783.295543	778.027141	834.607177	784.551064	775.005009
Res.gas from exhaust [g]	265.320166	46.855314	51.846226	57.377675	31.066133	42.539522	35.635295
Rel. to Total [-]	0.2319	0.2598	0.2785	0.2875	0.1660	0.2044	0.1948

## Gas Exchange:

-----								
Volumetric Eff. [-]	0.5839	0.5749	0.5871	0.5724	0.6143	0.5720	0.5825	
Rel. to Ave. [-]		0.9847	1.0055	0.9803	1.0522	0.9796	0.9977	
Rel. To PL 1 [-]	0.4854	0.4780	0.4881	0.4759	0.5108	0.4755	0.4843	
Total Mass at SHP[g]	5468.1456	889.9628	910.7767	906.0518	945.3586	914.0639	901.9318	
Mass Delivered [g]	5626.30688	938.33420	949.56034	895.36250	970.04825	915.15459	957.84700	
Mass Delivered [g/s]	8533.23210	1423.14020	1440.16651	1357.96646	1471.23984	1387.98446	1452.73462	
Delivery Ratio [-]	0.7597	0.7602	0.7693	0.7254	0.7859	0.7414	0.7760	
Rel. to Ave. [-]		1.0007	1.0126	0.9548	1.0345	0.9759	1.0215	
Rel. To PL 1 [-]	0.6316	0.6321	0.6396	0.6031	0.6534	0.6164	0.6452	
Av.Airmass at SHP[g]	4324.0051	709.6406	724.6358	706.4541	758.2608	705.9756	719.0381	
Air Delivered [g]	5538.00788	923.60802	934.65384	881.31393	954.82538	900.79305	942.81368	
Air Delivered [g/s]	8399.31196	1400.80549	1417.55832	1336.65946	1448.15182	1366.20279	1429.93408	
Airdeliveryratio [-]	0.7478	0.7483	0.7572	0.7140	0.7736	0.7298	0.7638	
Rel. to Ave. [-]		1.0007	1.0126	0.9548	1.0345	0.9759	1.0215	
Rel. To PL 1 [-]	0.6217	0.6221	0.6296	0.5936	0.6432	0.6068	0.6351	
Airmass Trapped [g]	4324.00510	709.64063	724.63583	706.45407	758.26080	705.97563	719.03813	
Airmass Trapped [g/s]	6558.07440	1076.28829	1099.03101	1071.45534	1150.02887	1070.72971	1090.54117	
Trapp. Eff. Air [-]	0.7808	0.7683	0.7753	0.8016	0.7941	0.7837	0.7627	
Rel. to Ave. [-]		0.9841	0.9930	1.0266	1.0171	1.0038	0.9768	
Airpurity [-]	0.7908	0.7974	0.7956	0.7797	0.8021	0.7723	0.7972	
Dyn. Swirl [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Dyn. Tumble [-]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

## Wall Heatlosses:

-----								
Piston [kJ]	-652.9894	-105.0161	-109.5590	-108.3281	-113.0822	-108.9407	-108.0633	
Cylinderhead [kJ]	-799.77909	-128.72434	-134.15891	-132.66910	-138.44920	-133.40282	-132.37471	
Cylinderliner [kJ]	-756.16234	-121.21593	-125.99192	-126.55319	-132.34955	-126.45109	-123.60066	
Sum of Wallheat [kJ]	-2208.93085	-354.95633	-369.70987	-367.55043	-383.88090	-368.79464	-364.03868	
Wall Heatlosses in High Pressure Phase:								
Piston HP [kJ]	-664.56541	-106.99743	-111.64927	-110.09747	-114.97378	-110.79373	-110.05373	
Cylinderhead HP [kJ]	-805.22315	-129.69903	-135.25204	-133.40105	-139.29811	-134.22199	-133.35093	
Cylinderliner HP [kJ]	-745.92977	-120.06187	-125.68206	-123.62572	-130.09750	-124.09462	-122.36801	
Sum of Wallheat HP [kJ]	-2215.71832	-356.75832	-372.58336	-367.12424	-384.36939	-369.11035	-365.77267	
Wall Heatlosses Related to Heatinput:								
Piston [-]	-0.0268	-0.0258	-0.0269	-0.0266	-0.0278	-0.0268	-0.0266	
Cylinderhead [-]	-0.0328	-0.0317	-0.0330	-0.0326	-0.0341	-0.0328	-0.0326	
Cylinderliner [-]	-0.0310	-0.0298	-0.0310	-0.0311	-0.0326	-0.0311	-0.0304	
Sum of Wallheat [-]	-0.0905	-0.0873	-0.0909	-0.0904	-0.0944	-0.0907	-0.0895	
M. Eff. HTC [W/m2/K]	338.12	330.11	339.29	336.19	349.31	337.40	336.45	
M. Eff. Temp. [K]	1297.03	1288.99	1299.32	1297.95	1301.12	1299.23	1295.59	

## Reference Values at EO:

-----								
Pressure [bar]	3.42	3.33	3.37	3.42	3.61	3.44	3.33	
Temperature [K]	1181.51	1179.95	1175.37	1182.15	1193.88	1180.00	1177.70	

A/F-Ratio [-]	11.79	11.79	11.79	11.79	11.79	11.79	11.79
Com.Prod.Conc. [-]	0.99927	0.99927	0.99928	0.99926	0.99924	0.99927	0.99927
Fuel Concentr. [-]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Average Values of Pipeattachements:

Attached Pipe	10	11	12	13	14	15
Vlv/Prt.Op.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Eff.0mm[deg]	139.99	140.00	139.98	139.99	139.98	139.97
Vlv/Prt.Op.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Op.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Clr.0mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Eff.0mm[deg]	220.06	220.03	220.04	220.03	220.05	220.00
Vlv/Prt.Cl.Eff.1mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Vlv/Prt.Cl.Udef.mm[deg]	0.00	0.00	0.00	0.00	0.00	0.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	938.334199	949.560339	895.362498	970.048246	915.154592	957.847002
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Attached Pipe	16	17	18	19	20	21
Vlv/Prt.Op.Clr.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.0mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Op.Eff.1mm[deg]	127.08	127.08	127.08	127.08	127.08	127.08
Vlv/Prt.Op.Udef.mm[deg]	127.00	127.00	127.00	127.00	127.00	127.00
Vlv/Prt.Cl.Clr.0mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Vlv/Prt.Cl.Eff.0mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Vlv/Prt.Cl.Eff.1mm[deg]	239.98	239.98	239.98	239.98	239.98	239.98
Vlv/Prt.Cl.Udef.mm[deg]	240.00	240.00	240.00	240.00	240.00	240.00
Cam Phasing [deg]	0.00	0.00	0.00	0.00	0.00	0.00
Massflow [g/cycle]	988.490821	993.952109	974.778756	1048.969015	985.360190	999.431988
Wallheat [kJ/cycle]	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ASSEMBLED: Average Values

Type	Nr.	-----Inlet-----			-----Outlet-----			-----Core-----			
		Pressure [bar]	Temperat. [K]	Mass [g]	Pressure [bar]	Temperat. [K]	Mass [g]	Rej.Heat [kJ]	Rej.Heat [kW]	Fric. coeff. [-]	Heat Factor [-]
AIRCOOLER	1	0.9765	298.08	1369.261	0.9752	300.84	1354.977	11.7903	17.8820	136.694555	710.295426

ASSEMBLED Attachments

Type	Nr.	Pipe Nr.	Mass flow [g/cycle]
AIRCOOLER	1	2	4329.4227
AIRCOOLER	1	3	4327.3566

JUNCTIONS: Average Values

Junction 1: Attached pipe 21: -998.6974 g/cycle

	Attached pipe	22:	-0.4124 g/cycle
	Attached pipe	23:	-998.8981 g/cycle
Junction 2:	Attached pipe	20:	-986.3411 g/cycle
	Attached pipe	23:	-998.4471 g/cycle
	Attached pipe	24:	-1984.5651 g/cycle
Junction 3:	Attached pipe	19:	-1052.7327 g/cycle
	Attached pipe	24:	-1985.7491 g/cycle
	Attached pipe	25:	-3038.5828 g/cycle
Junction 4:	Attached pipe	18:	-983.6188 g/cycle
	Attached pipe	25:	-3040.8647 g/cycle
	Attached pipe	26:	-4024.9175 g/cycle
Junction 5:	Attached pipe	17:	-995.7160 g/cycle
	Attached pipe	26:	-4026.3842 g/cycle
	Attached pipe	27:	-5022.6610 g/cycle
Junction 6:	Attached pipe	16:	-992.5555 g/cycle
	Attached pipe	27:	-5023.4816 g/cycle
	Attached pipe	28:	-6019.0070 g/cycle

## OVERALL ENGINE PERFORMANCE:

=====

Indicated Torque	:	808508.84 Nm
Indicated Power	:	18532.68 kW,
Auxiliary Drives Torque	:	30296.73 Nm
Friction Torque	:	205800.00 Nm
Effective Torque	:	572412.11 Nm
Effective Power	:	17418.80 kW,

Required time for reading the inputfile and initialisation:	8.87 min
Required time for the calculation: .....	0.86 min
Required time for writing the outputfile: .....	0.00 min
Required total time: .....	9.73 min
Required total CPU-time: .....	43.34 sec

## ДОДАТОК Г

## СПИСОК ОПУБЛІКОВАНИХ ПРАЦЬ ЗА ТЕМОЮ ДИСЕРТАЦІЇ

*Наукові праці, в яких опубліковані основні наукові результати дисертації:*

1. Neumann S. Marine diesels working cycle monitoring on the base of IMES GMBH pressure sensors data / S. Neumann, R. Varbanets, O. Kyrylash, V. Maulevych, O. Yeryganov // Diagnostyka. Polish society of technical diagnostics. – 2019. – №20(2). – P. 19–26. (*Наукометричні бази: SCOPUS [CiteScore (2017): 1,01; SJR(SCImago Journal Rank) (2017): 0.356; SNIP(Source Normalized Impact per Paper) (2017): 0.864], Crossref, IndexCopernicus (ICV): 121.41, EBSCO, BazTech, WorldWideScience.org*)).

2. Ерыганов А. В. Влияние протечек рабочего тела на координату точки максимального роста давления сжатия / А. В. Ерыганов, Р. А. Варбанец, В. О. Маулевич // Авиационно-космическая техника и технология. Научно-технический журнал. Харьков, Национальный аэрокосмический университет им. Н. Е. Жуковского «ХАИ» – 2019. – №1(153). – С. 59–64. (*Наукометричні бази: eLIBRARY.RU, Index Copernicus, CiteFactor, AcademicKeys, Infobase Index, WordCat, Google Scholar*).

3. Варбанець Р. А. Застосування методу безградієнтної оптимізації при синхронізації даних моніторингу робочого процесу двигунів внутрішнього згоряння / Р. А. Варбанець, Є. В. Белоусов, О. В. Єриганов, В. І. Кирнац, В. О. Маулевич, Н. І. Александровська // Авиационно-космическая техника и технология. Научно-технический журнал. Харьков, Национальный аэрокосмический университет им. Н. Е. Жуковского «ХАИ» – 2018. – №5(149). – С. 9–18. (*Наукометричні бази: eLIBRARY.RU, Index Copernicus, CiteFactor, AcademicKeys, Infobase Index, WordCat, Google Scholar*).

4. Ивановский В. Г. Исследование пусковых качеств и экономичности дизеля при установке гидрозатворных и механических форсунок / В. Г. Ивановский, Р. А. Варбанец, В. П. Губанов, Е. И. Жолтиков, Ю. Н. Кучеренко, В. О. Маулевич



// Вестник Астраханского государственного технического университета. Серия: Морская техника и технология. Астрахань. – 2018. – № 1. – С. 60–66. (*Наукометричні бази: Ulrich's Periodicals Directory, DOAJ (Швеція), Academic Search Research & Development, Applied Science & Technology Source, BSCO Publishing (США)*).

5. Варбанец Р. А. Метод безградиентной минимизации Powell'64 в задачах мониторинга рабочего процесса судовых дизелей / Р. А. Варбанец, В. Г. Ивановский, А. В. Ерыганов, Ю. Н. Кучеренко, Е. И. Жолтиков, В. О. Маулевич // Вестник Астраханского государственного технического университета. Серия: Морская техника и технология. Астрахань. – 2017. – № 4. – С. 49–61. (*Наукометричні бази: Ulrich's Periodicals Directory, DOAJ (Швеція), Academic Search Research & Development, Applied Science & Technology Source, BSCO Publishing (США)*).

6. Варбанец Р. А. Застосування методу безградієнтної оптимізації при синхронізації даних моніторингу робочого процесу суднових двигунів / Р. А. Варбанець, Ю. М. Кучеренко, Є. І. Жолтіков, В. О. Маулевич, І. П. Кріжановська // Суднові енергетичні установки. Науково-технічний збірник. Одеса, Національний університет «Одеська морська академія». – 2019. – № 38. – С. 40–53.

7. Варбанец Р. А. Застосування методу оптимізації в задачах робочого процесу суднових двигунів / Р. А. Варбанець, Є. В. Белоусов, О. В. Єриганов, В. О. Маулевич, Н. І. Александровська, І. П. Кріжановська // Розвиток транспорту. Науковий журнал. Одеса, Одеський національний морський університет. – 2018. – № 2 (3). – С. 90–103.

*Наукові праці, які засвідчують апробацію матеріалів дисертації:*

8. Ю. Н. Кучеренко, Р. А. Варбанец, В. О. Маулевич. Определение эффективных показателей судовой дизельной энергетической установки // Матеріали ХХІІ міжнародного конгреса двигунобудівників, Національний аерокосмічний університет ім. Н.С. Жуковського «ХАІ» – Харків – Коблево, 4–9 вересня 2017 р.

9. Маулевич В. О. Моделирование рабочего процесса дизеля в среде AVL BOOST // Матеріали VIII міжнародної науково-практичної конференції «Сучасні

енергетичні установки на транспорті, технології та обладнання для їх обслуговування», Херсонська державна морська академія – Херсон, 28–29 вересня 2017 р. – С. 356.

10. В. О. Маулевич. Создание детализированной математической модели рабочего процесса дизеля в среде AVL BOOST // Матеріали VIII міжнародної науково-технічної конференції «Суднова енергетика, стан і проблеми», НУК ім. адмірала Макарова. – Миколаїв, 8–10 листопада 2017 р. – С. 243–244.

11. Р. А. Варбанец, Е. В. Белоусов, А. В. Ерыганов, В. О. Маулевич, Н. И. Александровская. Методы вибродиагностики судовых дизелей с наддувом // Матеріали XXIII міжнародного конгреса двигунобудівників, Національний аерокосмічний університет ім. М. Є. Жуковського «ХАІ» – Харків – Коблево, 4–9 вересня 2018 р. – С. 57.

12. Varbanets R. A., Yeryganov O. V., Shumilo O. M., Loginov O.V., Kurnats V.I., Maulevych V.O. Marine diesel engines vibration diagnostics methods // Матеріали IX міжнародної науково-практичної конференції «Сучасні енергетичні установки на транспорті, технології та обладнання для їх обслуговування», Херсонська державна морська академія. – Херсон, 13–14 вересня 2018 р. – С. 202.

13. S. Neumann, R. Varbanets, O. Kyrylash, V. Maulevych, O. Yeryganov. Marine diesel working cycle monitoring on the base of IMES pressure sensors data // Матеріали міжнародної науково-практичної конференції, присвяченій пам'яті професорів Фомина Ю. Я. і Семенова В. С. (FS - 2019). – Одеський національний морський університет – Одеса – Стамбул – Одеса (пором «Kaunas»), 24–28 квітня 2019 р. – С. 158–168.

14. S. Neumann, R. Varbanets, O. Kyrylash, V. Maulevych, O. Yeryganov. Marine diesel working cycle monitoring on the base of IMES pressure sensors data // Матеріали міжнародної науково-практичної конференції «Водний транспорт: Сучасний стан та перспективи розвитку», Державний університет інфраструктури та технологій, Київський інститут водного транспорту ім. гетьмана Петра Конашевича-Сагайдачного – Київ, 16–17 травня 2019 р. – С. 106–115.

15. Varbanets R., Kyrylash O., Maulevych V., Yeryganov O. Marine diesel working cycle monitoring on the base of IMES pressure sensors data // Матеріали XI міжнародної науково-практичної конференції «Сучасні інформаційні та інноваційні технології на транспорті (MINTT-2019)», Херсонська державна морська академія – Херсон, 28–30 травня 2019 р. – С. 394–399.

16. Р. А. Варбанец, В. О. Маулевич, Ю. Н. Кучеренко, В. И. Кырнац, Н. И. Александровская. Методы определения основных диагностических параметров рабочего процесса транспортных дизелей в эксплуатации // Матеріали XXIV міжнародного конгреса двигунобудівників, Національний аерокосмічний університет ім. Н.С. Жуковського «ХАІ» – Харків - Коблево, 2–7 вересня 2019 р.

17. Варбанець Р. А., Маулевич В. О., Кирнац В. І., Кучеренко Ю. М., Губін В. С. Визначення основних діагностичних параметрів робочого процесу транспортних дизелів в експлуатації // Матеріали X міжнародної науково-практичної конференції «Сучасні енергетичні установки на транспорті, технології та обладнання для їх обслуговування», Херсонська державна морська академія – Херсон, 12–13 вересня 2019 р. – С. 152.

18. В. О. Маулевич, Р. А. Варбанець, І. П. Крижановська. Визначення основних діагностичних параметрів робочого процесу транспортних дизелів в експлуатації / В. І. Кирнац, В. О. Маулевич, В. І. Холденко, Р. А. Варбанець, Р. О. Брусник. Моделювання робочого процесу двигуна 6S70MC-C8 по даним Sea Trials в середовищі AVL Boost // Матеріали IX міжнародної науково-технічної конференції «Суднова енергетика, стан і проблеми», НУК ім. адмірала Макарова. – Миколаїв, 7–8 листопада 2019 р. – С. 135, 202–206.