Benefits of WinGD Engines for Modern Merchant Vessels

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CUTTING-EDGE DESIGN INSPIRED LEADERSHIP

Advantages of WinGD engines in ship design

- Lower fuel consumption
- Lower LRM required
- Compact and lightweight

Better ship design

Lower fuel consumption – design case

Design case:

- X92 – 20600 TEU
- X82-B – VLCC
- X72 – SUEZMAX tanker
- X62 – AFRAMAX tanker
- X52 – MR tanker
- X40-B – asphalt carrier
- X35-B – small general cargo vessel

Lower fuel consumption – design case

X92 – 20600 TEU :

SMCR: 52,960 kW at 80 rpm, CSR: 90%

			W10X92 Low load tuning		10G90ME-C10.5 Low load EGB		Fuel consumption difference	
Power (%)	Power (kW)	Speed (rpm)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)
100	52960	80.0	165.1	209.85	163.2	207.43	1.9	2.41
95	50312	78.6	161.9	195.49	162	195.61	-0.1	-0.12
90	47664	77.2	158.8	181.66	161.1	184.29	-2.3	-2.63
85	45016	75.8	156.8	169.40	159.5	172.32	-2.7	-2.92
80	42368	74.3	155.8	158.42	158.2	160.86	-2.4	-2.44
75	39720	72.7	155.1	147.85	157.4	150.05	-2.3	-2.19
70	37072	71.0	153.1	136.22	155	137.91	-1.9	-1.69
60	31776	67.5	152.4	116.22	154.2	117.60	-1.8	-1.37
50	26480	63.5	154.8	98.38	156.3	99.33	-1.5	-0.95
40	21184	58.9	157.7	80.18	158.9	80.79	-1.2	-0.61

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X82-B – 320k dwt VLCC :

SMCR: 25,350 kW at 67 rpm, CSR: 79%

			W7X82-B Delta bypass		7G80ME-C9.5 Part load EGB		Fuel consumption difference	
Power (%)	Power (kW)	Speed (rpm)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)
100	25350	67.0	163.9	99.72	162.3	98.74	1.6	0.97
95	24082.5	65.9	160.9	93.00	161.1	93.11	-0.2	-0.12
90	22815	64.7	158.2	86.62	160.1	87.66	-1.9	-1.04
85	21547.5	63.5	156.6	80.98	158.1	81.76	-1.5	-0.78
80	20280	62.2	155.8	75.83	156.2	76.03	-0.4	-0.19
CSR	20027	61.9	155.7	74.84	156.1	75.03	-0.4	-0.19
75	19012.5	60.9	155.4	70.91	155.4	70.91	0	0.00
70	17745	59.5	155.4	66.18	154.5	65.80	0.9	0.38
60	15210	56.5	157	57.31	155.6	56.80	1.4	0.51
50	12675	53.2	159.2	48.43	158	48.06	1.2	0.37
40	10140	49.4	160.9	39.16	160.8	39.13	0.1	0.02

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X72 – SUEZMAX tanker:

SMCR: 15,000 kW at 71.8 rpm, CSR: 74.5%

			W6X72 Delta bypass		6G70ME-C9.5 Part load ECT		Fuel consumption difference	
Power (%)	Power (kW)	Speed (rpm)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)
100	15000	71.8	164.1	59.08	163.9	59.00	0.2	0.07
95	14250	70.6	161.1	55.10	161.9	55.37	-0.8	-0.27
90	13500	69.3	158.4	51.32	160.2	51.90	-1.8	-0.58
85	12750	68.0	156.8	47.98	158.2	48.41	-1.4	-0.43
80	12000	66.7	156	44.93	156.4	45.04	-0.4	-0.12
75	11250	65.2	155.6	42.01	156.1	42.15	-0.5	-0.13
CSR	11175	65.1	155.6	41.73	156.1	41.87	-0.5	-0.13
70	10500	63.8	155.6	39.21	156	39.31	-0.4	-0.10
60	9000	60.6	157.6	34.04	157.9	34.11	-0.3	-0.06
50	7500	57.0	160	28.80	160.5	28.89	-0.5	-0.09
40	6000	52.9	161.8	23.30	163.3	23.52	-1.5	-0.22

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X72 – SUEZMAX tanker:

Steam production

	W6X72 Delta bypass			6G70ME-C9.5 Part load ECT			Steam production difference		Total DFOC difference
Power (%)	Exhaust mass (kg/kWh)	Ex. Gas Temp. (°C)	Steam (kg/h)	Exhaust mass (kg/kWh)	Ex. Gas Temp. (°C)	Steam (kg/h)	Steam production difference (kg/h)	Equal to oil fired boiler FOC saving (kg/h)	(steam + BSFC) (t/d)
100	7.4	259	3716	8	227	2397	1319	103	-2.4
95	7.5	248	3123	8	220	1974	1149	89.6	-2.42
90	7.6	238	2597	8.1	214	1627	970	75.7	-2.4
85	7.7	231	2215	8.1	210	1392	823	64.2	-1.97
80	7.8	226	1942	8.2	208	1257	685	53.4	-1.4
75	8	223	1749	8.3	207	1179	570	44.5	-1.2
CSR	8	222	1749	8.3	207	1179	570	44.5	-1.2
70	8.1	222	1648	8.5	207	1138	510	39.8	-1.05
60	8.4	222	1480	8.7	212	1206	274	21.4	-0.57
50	8.6	228	1458	8.9	223	1373	85	6.6	-0.25
40	9.2	212	901	9.1	240	1544	-643	-50.2	0.98

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X62 – AFRAMAX tanker:

SMCR: 11,460 kW at 77 rpm, CSR: 85%

			W6X62 Delta bypass		6G60ME-C9.5 Part load EGB		Fuel consumption difference	
Power (%)	Power (kW)	Speed (rpm)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)
100	11460	77.0	167	45.93	165.4	45.49	1.6	0.44
95	10887	75.7	164	42.85	164.2	42.90	-0.2	-0.05
90	10314	74.3	161.3	39.93	163.3	40.42	-2	-0.50
85	9741	72.9	159.7	37.34	161.2	37.69	-1.5	-0.35
80	9168	71.5	158.9	34.96	159.4	35.07	-0.5	-0.11
75	8595	70.0	158.5	32.70	158.6	32.72	-0.1	-0.02
70	8022	68.4	158.5	30.52	157.7	30.36	0.8	0.15
60	6876	64.9	159.8	26.37	158.3	26.12	1.5	0.25
50	5730	61.1	161.9	22.26	160.5	22.07	1.4	0.19
40	4584	56.7	163.5	17.99	163	17.93	0.5	0.06

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X62 – AFRAMAX tanker:

Steam production

	W6X62 Delta bypass			6G60ME-C9.5 Part load EGB			Steam production difference		Total DFOC difference
Power (%)	Exhaust mass (kg/h)	Ex. Gas Temp. (°C)	Steam (kg/h)	Exhaust mass (kg/h)	Ex. Gas Temp. (°C)	Steam (kg/h)	Steam production difference (kg/h)	Equal to oil fired boiler FOC saving (kg/h)	(steam + BSFC) (t/d)
100	84919	260	2599	91800	244	2265	334	26.1	-0.19
95	82197	250	2159	87480	237	1902	257	20.0	-0.53
90	79005	241	1767	82800	231	1593	174	13.6	-0.83
85	75590	233	1460	81720	215	1025	435	33.9	-1.16
80	72336	228	1237	79920	200	501	736	57.4	-1.49
75	69104	225	1084	76320	199	447	637	49.7	-1.21
70	65620	223	985	72360	199	424	561	43.8	-0.9
60	58033	224	888	63720	203	480	408	31.8	-0.51
50	49794	229	868	54000	214	655	213	16.6	-0.21
40	42631	214	472	44280	231	852	-380	-29.6	0.77

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X52 – MR tanker:

SMCR: 6,900 kW at 81.7 rpm, CSR: 82.9%

			W6X52 Delta bypass		6G50ME-C9.5 Part load EGB		Fuel consumption difference	
Power (%)	Power (kW)	Speed (rpm)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)
100	6900	81.7	164.4	27.22	164	27.16	0.4	0.07
95	6555	80.3	161.4	25.39	162.8	25.61	-1.4	-0.22
90	6210	78.9	158.7	23.65	161.8	24.11	-3.1	-0.46
85	5865	77.4	157.1	22.11	159.8	22.49	-2.7	-0.38
CSR	5720	76.7	156.5	21.48	159	21.83	-2.5	-0.34
80	5520	75.8	156.3	20.71	158	20.93	-1.7	-0.23
75	5175	74.2	155.9	19.36	157.1	19.51	-1.2	-0.15
70	4830	72.5	155.9	18.07	156.3	18.12	-0.4	-0.05
60	4140	68.9	157.8	15.68	157.4	15.64	0.4	0.04
50	3450	64.8	160.3	13.27	159.8	13.23	0.5	0.04
40	2760	60.2	162	10.73	162.6	10.77	-0.6	-0.04

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X52 – MR tanker:

Steam production

	W6X52 Delta bypass			6G50ME-C9.5 Part load EGB			Steam production difference		Total DFOC difference
Power (%)	Exhaust mass (kg/h)	Ex. Gas Temp. (°C)	Steam (kg/h)	Exhaust mass (kg/h)	Ex. Gas Temp. (°C)	Steam (kg/h)	Steam production difference (kg/h)	Equal to oil fired boiler FOC saving (kg/h)	(steam + BSFC) (t/d)
100	50439	253	1429	53280	243	1288	142	11.04	-0.19
95	48900	241.7	1461	50760	237	1100	361	28.17	-0.90
90	47010	231.5	1205	48240	231	925	280	21.84	-0.98
85	44985	223.9	1010	47520	215	594	416	32.47	-1.16
CSR	44345	221.7	955	47160	208	452	503	39.26	-1.28
80	43608	219.5	627	46440	200	290	337	26.26	-0.86
75	42176	216.8	559	44280	198	240	319	24.88	-0.75
70	40041	214.1	485	42120	199	246	240	18.70	-0.50
60	35314	212	397	37080	203	278	119	9.30	-0.18
50	30395	215.5	386	31320	213	365	21	1.63	0.00
40	26054	198	141	25560	231	490	-349	-27.20	0.61

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X40-B – Asphalt carrier:

SMCR: 4,200 kW at 111 rpm, CSR: 85%

			W6X40-B Delta bypass		6S40ME-B9.5 High load only		Fuel consumption difference	
Power (%)	Power (kW)	Speed (rpm)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)
100	4200	111.0	171.3	17.27	172.3	17.37	-1	-0.10
95	3990	109.1	168.3	16.12	171.2	16.39	-2.9	-0.28
90	3780	107.2	165.6	15.02	170.3	15.45	-4.7	-0.43
85	3570	105.1	164	14.05	169.8	14.55	-5.8	-0.50
80	3360	103.0	163.2	13.16	169.5	13.67	-6.3	-0.51
75	3150	100.9	162.8	12.31	169.6	12.82	-6.8	-0.51
70	2940	98.6	162.8	11.49	169.7	11.97	-6.9	-0.49
60	2520	93.6	164.7	9.96	170.4	10.31	-5.7	-0.34
50	2100	88.1	167.2	8.43	171.8	8.66	-4.6	-0.23
40	1680	81.8	169	6.81	174.1	7.02	-5.1	-0.21

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Lower fuel consumption – design case

X35-B – small general cargo vessel:

SMCR: 3,600 kW at 142 rpm, CSR: 85%

			W6X35-B Delta bypass		6S35ME-B9.5 High load only		Fuel consumption difference	
Power (%)	Power (kW)	Speed (rpm)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)	BSFC (g/kWh)	DFOC (t/d)
100	3600	142.0	172.1	14.87	172.5	14.90	-0.4	-0.03
95	3420	139.6	169.1	13.88	171.4	14.07	-2.3	-0.19
90	3240	137.1	166.4	12.94	170.5	13.26	-4.1	-0.32
85	3060	134.5	164.8	12.10	169.9	12.48	-5.1	-0.37
80	2880	131.8	164	11.34	169.7	11.73	-5.7	-0.39
75	2700	129.0	163.6	10.60	169.7	11.00	-6.1	-0.40
70	2520	126.1	163.6	9.89	169.9	10.28	-6.3	-0.38
60	2160	119.8	165.6	8.58	170.6	8.84	-5	-0.26
50	1800	112.7	168	7.26	172	7.43	-4	-0.17
40	1440	104.6	169.8	5.87	174.3	6.02	-4.5	-0.16

Based on ISO conditions and fuel oil with LCV of 42,700 kJ/kg

Light Running Margin

MAN: LRM should be 7±3% (4-10%)

Light Running Margin (LRM)

- The relations between selected SMCR, selected light running margin of the propeller and engine, and the ship's capabilities for accelerating or sailing with increased resistance from heavy sea and/or fouling of the hull.
- New recommendation to increase the LRM from 3-7% to 4-10%.
- Valid as of 1 May 2015.
  - Example 1: Reducing SMCR power while maintaining available power for critical conditions.
  - Example 2: Increasing the LRM to improve ship manoeuvring performance.

Questions regarding this Market Update Note should be directed to our Promotion and Sales department, LSP, at lsp@mandieselturbo.com.

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Please not that, in future, new MUNs will be included in our Marine Update issues, and will not be emailed separately.

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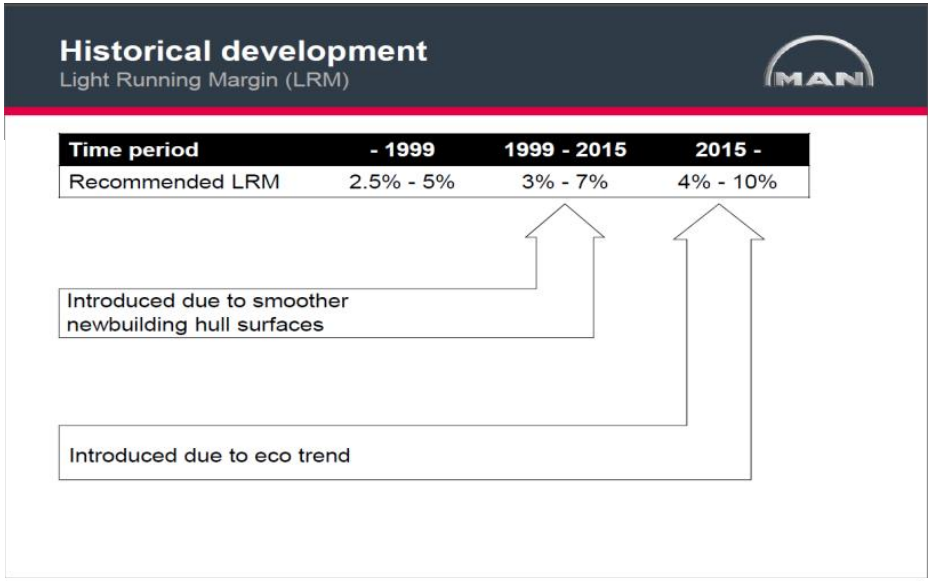
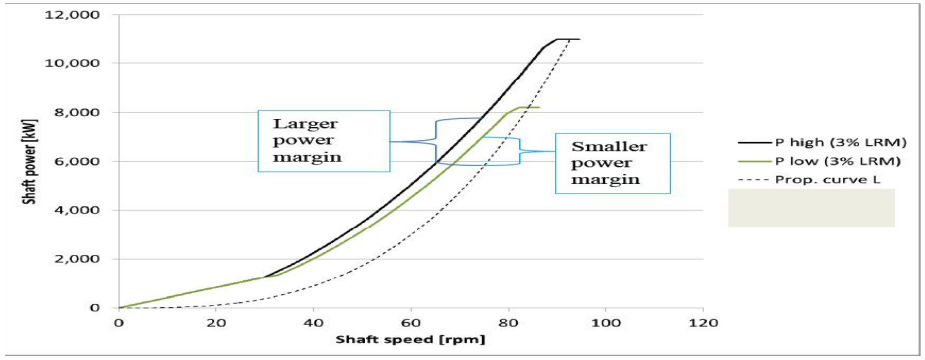
Best regards

MAN Diesel & Turbo

Ole Grøne **Niels B Clausen**





Light Running Margin

WinGD: LRM is kept at 4-7%

So the WinGD engines will have:

- The possibility to develop more efficient propellers
- No negative impact on propulsive efficiency and EEDI

WIN GD
Winterthur Gas & Diesel

Technical Information Note

001

Remarks:	Light running margin (LRM) for vessels equipped with Wärtsilä 2-stroke engines	Sheet: 1 / 3
Subject: **RT-flex and X-engines**	Date: June 2015	Our Reference: 21349/CCA029/TCtL 7418

Light running margin (LRM) for Wärtsilä low-speed engines is kept at 4-7%

Wärtsilä low-speed RT-flex and X-engines have proven good service experience including, ship acceleration, maintaining speed in heavy weather and with fouled hull conditions.
The currently recommended light running margin recommendations of 4-7% are sufficient for providing adequate ship acceleration.
Such margin provides sufficient torque reserve for Wärtsilä 2-stroke engines to cope with possible load fluctuations or increases due to adverse sea condition, acceleration or ageing conditions.

Compact & lightweight

- Easy maintenance
- Optimised engine room arrangement
- More deadweight

WinGD X engines			MAN G type engines			Data difference	
Engine type	Weight (t)	Normal lifting height (mm)	Engine type	Weight (t)	Normal lifting height (mm)	Weight (t)	Normal lifting height (mm)
W6X92	1120	15420	6G90ME-C10.5	1082	-	38	-
W6X82-B	805	14820	6G80ME-C9.5	945	16100	-140	-1280
W6X72	561	13560	6G70ME-C9.5	665	14225	-104	-665
W6X62	377	11670	6G60ME-C9.5	439	12175	-62	-505
W6X52	251	10150	6G50ME-C9.5	245	10750	6	-600
W6X40-B	125	7635	6S40ME-B9.5	131	7800	-6	-165
W6X35-B	84	6736	6S35ME-B9.5	90	6925	-6	-189

Compact & lightweight

- Smaller size

WinGD X engines			MAN G type engines			Data difference	
Engine type	Minimum length of engine (mm)	Bedplate width (mm)	Engine type	Minimum length of engine (mm)	Bedplate width (mm)	Minimum length of engine (mm)	Bedplate width (mm)
W6X92	11630	5550	6G90ME-C10.5	-	-	-	-
W6X82-B	11045	5320	6G80ME-C9.5	10735	5680	310	-360
W6X72	9375	4780	6G70ME-C9.5	9596	4900	-221	-120
W6X62	8110	4200	6G60ME-C9.5	8470	4220	-360	-20
W6X52	6850	3495	6G50ME-C9.5	7132	3776	-282	-281
W6X40-B	5807	2610	6S40ME-B9.5	5700	2650	107	-40
W6X35-B	5010	2284	6S35ME-B9.5	4990	2300	20	-16

Benefits of WinGD engines

- Lower fuel consumption
- More deadweight
- Optimised engine room arrangement due to compact and slim engine design
- High propulsion efficiency and EEDI in respect of LRM

SPECILISTIC

Developing

Attentive

Reliable

InnovatiVE

Thanks

Shanghai Merchant Ship Design & Research Institute

CUTTING-EDGE DESIGN INSPIRED LEADERSHIP