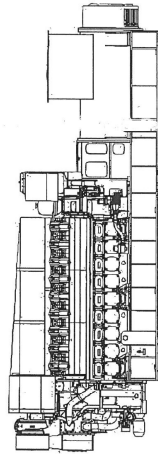
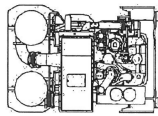




18V220 SG



TECHNICAL DATA

Version	HE	LN
Electric power	2800	2800
Heat Rate		
a. Hot water cogen 195/122 °F	8018	8611
KWh	2502	2661
mmBTU/h	8.54	9.08
Total efficiency	81%	77%
Total efficiency	4.3	4.7
a. Steam generation 130 psig sat. at cold 140 °F	4.47	4.89
mmBTU/h	82%	85%

GENERAL ENGINE DATA

	inch	inch
Bore	5.5	5.5
Stroke	18	18
Cylinder configuration	18	18
Cylinder displacement	18	18
Rated speed	1800	1800
Mean effective pressure	2.3	2.3
Genset length	2.3	2.3
Genset width	6.3	6.3
Genset height	6	6
Max. altitude before deration	31.3	31.3
Max. suction air temperature	482.1	482.1

Services conditions COP according to ISO 6529/1 and reference conditions according to ISO 3046/1.

HE: High efficient engine; LN: Low NOx engine
 Max. gens number: HE engine: 90; LN engine: 72.
 COP: 1 maintenance interval = no overhaul allowed.

- 1) COP Generator (variable at p.f. = 0.85)
- 2) Fuel is Natural gas. According to tolerance of +5%.
- 3) Tolerance ±10%.
- 4) Indicative value, the NMHC-emissions are highly dependent on gas composition and should be calculated case by case.
- 5) Tolerance ±5%.
- 6) Tolerance ±10°C.
- 7) Delivered inlet flange Gas Regulating Unit (GRU)
- 8) Natural gas LHV 980 BTU/lscf LHV
- 9) For information, with lubricating oil specific gravity = 0.82.
- 10) Conversion to gbp-hr: multiply given data by 0.72.
- 11) Flow rate is rated at maximum pump capacity, and includes normal recirculation.
- 12) Flow rate is rated at maximum pump capacity, and includes normal recirculation.

Derating
 If service conditions differ from the reference conditions, the engine may be derated.

	HE	LN
Heat balance		
Fuel input (LHV)	27.65	24.11
Mechanical	2683	2683
HT cooling circuit	2.82	2.83
LO cooling circuit	1.06	1.13
LT cooling circuit	1.06	1.13
Recoverable exhaust (>250°F)	4.66	5.12
Unrecoverable exhaust	2.53	3.53
Engine + alternator radiation	0.77	0.76
Electrical efficiency		
100% load	42.5%	39.6%
75% load	40.6%	37.4%
50% load	37.9%	34.5%
Emissions (at 15% O2 vol. dry)		
NOx (as NO2) max.	92	46
CO max. (untreated)	1.4	0.7
VOC	297	445
CO max. (treated)	3.8	6.2
CO max. (treated)	42	75
VOC	0.4	0.7
Cooling circuit		
HT water inlet temperature	197	197
HT water outlet temperature	212	212
HT water flow	572	572
LO inlet temperature	167	167
LO outlet temperature	167	167
LO flow	185	186
LT water inlet temperature	301	301
LT water outlet temperature	104	104
LT water flow	109	110
Air intake / exhaust gas		
Air intake flow	424	383
Exhaust gas flow	41,400	43,500
Maximum exhaust back pressure	42,700	44,800
Miscellaneous		
Min gas pressure to GRU	671	689
Lubricating oil consumption	20	20
	51	51
	0.5	0.5
	3.1	3.1

Scopes of supply and technical data are standard equipment for general purposes. They are superseded by any firm or budgetary quote rendered.

Engineering data subject to change without prior notice and are not contract values.



18V220 SG

SCOPE OF SUPPLY

Single Cycle Genset

- Generating set, including
 - Engine gas genset
 - Standard alternator, 13.8kV/60Hz - IP23
 - Lube oil heat exchanger engine mounted
 - Spare parts catalogue (2)
 - Operations and maintenance manual (2)
 - Engine preheating
- Mechanical equipment, including
 - Lube oil service tank, 500 L
 - Starting system, air start
 - Outdoor radiator, HT-LT, industrial noise level
 - Gas regulating unit
 - Charge air fillers
 - Flexible connections
 - Exhaust gas silencer
 - Exhaust bellows
 - Explosion venting device on genset exhaust pipe
- Electrical equipment, including
 - MV switchgear, paralleling breaker
 - GCP genset control system, includes WECS3000, for genset and genset auxiliaries
 - Motor control center (ACPX - auxiliaries control panel)
- Project delivery and commissioning, including
 - Genset FOB delivery
 - Startup and commissioning
 - One year warranty
 - Customer training

CHP Options

- ALL equipment listed as single cycle genset, PLUS
 - Off engine Lube Oil heat exchanger
 - Hot water or steam heat recovery boiler
 - Exhaust gas bypass
 - HT circuit heat recovery heat exchanger
 - LT circuit heat recovery heat exchanger
 - Package boiler for additional heat recovery requirements
 - Absorption chiller

Installation Options

- Pretabricated steel building
 - Engine hall
 - Control Room
 - Switchgear room
 - Foundations
 - Lighting
- Installation
 - Building
 - Engine generators
 - Mechanical Equipment
 - Electrical Equipment
- Delivery
 - Commissioning
 - Engine generators
 - Heat recovery system
 - Performance testing
- Engineering

Scope of supply for standard equipment is for general information purposes. Design is subject to local regulations and product development.

To reach Wartsila North America call:
1-800-675-9945

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FerrA_6B

Generating set performance at site conditions

Project Name: **Wah Chang** Date: 9-Jan-01 Time: 9:29
 Handled by: **MF**

Genset: **Wärtsilä 220SG 18V 60Hz COP 500mg/Nm³ NOx - 1,200 rpm**
 Alternator: **LSA 54 VL85 - 4160 V - Power factor = 0.8**

ISO CONDITIONS, SHAFT

Output, ISO	2,902				
Load, engine	100	90	80	75	
Fuel consumption, shaft + 5 %	748.0	682.2	516.7	584.0	
Including engine driven pumps	8209	8319	£461	8546	
	kWm				
	%				
	Nm ³ /h				
	kJ/kWm.h				

ISO CONDITIONS, ALTERNATOR TERMINALS

Load, engine	100	90	80	75	
Alternator efficiency	96.5	96.4	96.4	96.3	
Output, terminals	2,800	2,519	2,238	2,097	
Fuel consumption, terminals + 5 %	8508	8,625	3,776	8,871	
	%				
	kWe				
	kJ/kWe.h				

DERATING RULES

Reference conditions

Reference altitude	1500
Reference air pressure	85
Reference intake air temperature	35
Reference charge air coolant temp.	40

Site conditions

Altitude	61
Air pressure	100.5
Intake air temperature to turbo	33.3333333
Charge air coolant temp.	40

Exhaust gas back pressure max.	500	500	500	500
Power adjustment factor	1,0000	1,0000	1,0000	1,0000
Fuel consumption adjustment	1,0000	1,0000	1,0000	1,0000
	mmWG			

SITE CONDITIONS, SHAFT

Load, engine	100	90	80	75	
Output, shaft	2,902	2,612	2,322	2,176	
BMEP	1,767	1,590	1,414	1,325	
	%				
	kWm				
	kPa				

SITE CONDITIONS, ALTERNATOR TERMINALS

Load, engine	100	90	80	75	
Alternator efficiency	96.5	96.4	96.4	96.3	
Output, terminals	2,800	2,519	2,238	2,097	
	%				
	kWe				

WahChang220perfplus.xls Page 2 of 3
PerfA_6B



WÄRTSILÄ
Power Plants -

Generating set performance at site conditions

Project Name : **Wah Chang** Date : 9-Jan-01 Time : 9:29
Handled by : **MF**

FUEL CONSUMPTION AND EFFICIENCY

Nett heating value, reference fuel kJ/Nm3 33,440
Nett heating value, site fuel kJ/Nm3 36,812
Engine driven water pumps (Y or N) Y
Engine driven lube oil pumps (Y or N) Y

FUEL CONSUMPTION AT SITE WITH 5 % TOLERANCE

	100	80	75
Load, engine %	100	80	75
Reference fuel Nm3/h	712.4	649.7	587.4
Site fuel Nm3/h	647.1	590.2	533.6
Shaft, heat rate kJ/KWh.h	8,209	8,319	8,461
Shaft, efficiency %	43.9	43.3	42.5

Alternator terminals, heat rate kJ/KWh 8,508
Alternator terminals, efficiency % 42.3

8,625 8,776 8,871
41.7 41.0 40.6

FUEL CONSUMPTION AT SITE WITH 0 % TOLERANCE

	100	90	80	75
Load, engine %	100	90	80	75
Reference fuel Nm3/h	748.0	682.2	616.7	584.0
Site fuel Nm3/h	679.5	619.7	560.3	530.5
Shaft, heat rate kJ/KWh.h	8,620	8,735	8,884	8,973
Shaft, efficiency %	41.8	41.2	40.5	40.1

Alternator terminals, heat rate kJ/KWh 8,933
Alternator terminals, efficiency % 40.3

9,056 9,215 9,314
39.8 39.1 38.6