INFORME TÉCNICO
MINIMO TÉCNICO
UNIDADES GENERADORAS
CENTRAL AGUAS BLANCAS

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USUARIO : CENTRAL AGUAS BLANCAS.

TABLA DE CONTENIDOS:

0. DEFINICIONES, NOMENCLATURAS Y REFERENCIAS

DEFINICIONES Y NOMENCLATURAS:

CEN: Consumo Específico Neto.
COORDINADO: Empresa sujeta a la coordinación de su operación por parte del COORDINADOR ELÉCTRICO NACIONAL.
COORDINADOR ELÉCTRICO NACIONAL: Organismo técnico e independiente, encargado de la coordinación de la operación del conjunto de instalaciones del Sistema Eléctrico Nacional que operen interconectadas entre sí.
ISO: Organización Internacional de Normalización.
POTENCIA MÁXIMA: Máximo valor de potencia activa bruta que puede sostener una unidad generadora, en un período mínimo de 5 horas continuas, en los bornes de salida del generador para cada una de las modalidades de operación informadas al Coordinador.
PMAX: Potencia Máxima Neta corregida.
PMIN: Potencia Neta corregida a mínimo técnico.
SI: Sistema Interconectado.

UNIDADES GENERADORAS: Equipos destinados a la Generación eléctrica en el SI.

DOCUMENTOS REFERENCIADOS:

El informe Técnico hace referencias a los siguientes documentos:

- 1073_Informe Pruebas CEN: Informe Técnico con resumen de valores CEN Rev D.
- Informe Técnico Prueba de Potencia Máxima Unidad AGB1 y AGB2.
- ISO 3046, ISO 8528, ISO 15550, ASME PTC 17.
- 1073 DATASHEET 3512B.

1. RESUMEN EJECUTIVO.

Conforme a la normativa y procedimientos establecidos por el COORDINADOR ELÉCTRICO NACIONAL se actualizan los parámetros de Mínimo Técnico por Unidad Generadora y tipo de combustible de la Central Aguas Blancas.

2. MÍNIMO TÉCNICO.

Se ha determinado que el Mínimo Técnico para la operación de las Unidades Generadoras es de 50% de su potencia máxima bruta corregida y que calculado respecto de ésta según pruebas protocolizadas, queda en los siguientes valores por Unidad Generadora:

Mínimo Técnico por Unidad Generadora y tipo de combustible.

Tabla 1 Mínimo Técnico

Tabla Mínimo Técnico por tipo Combustible				
Ítem	Descripción	Unidades	AGB1	AGB2
1	Mínimo Técnico Diésel	[kW]	456,88	456,50

3. ANTECEDENTES Y REFERENCIAS.

El fabricante Caterpillar para grupos generadores Diésel, recomienda no operar estos con baja carga debido a las bajas temperaturas en los gases de escape y bajas temperaturas para el enfriamiento de los componentes, lo que se traduce en emisiones altas y carbonización de la máquina (ver referencia artículo Caterpillar "The Impact of Generator Set Underloading[1]".

Para referencia y determinación del mínimo técnico se ha empleado la ficha técnica de las Unidades Generadoras:

Notar:

- Gráfico 1: bajo el 50% de la potencia nominal aumenta progresivamente el consumo específico de la máquina por unidad de potencia.
- Tabla 3: Bajo el 50% la temperatura de salida del turbo compresor se reduce significativamente.
- Las pruebas de consumo específico neto, se realizaron etapas de % de carga en el rango 50% al 100%.

Por otra parte, del informe "Pruebas de Potencia Máxima" se obtienen los valores de la Potencia Máxima Bruta corregida (ítem 2) y el mínimo técnico determinado se señala en ítem 3.

Tabla 2 Potencias por Unidades Generadoras

Tabla Resumen PMAX Bruta Medida por tipo Combustible				
Ítem	Descripción	Unidades	AGB1	AGB2
1	Potencia Máxima Diesel medida	[kW]	912,87	913,02

Tabla Resumen PMAX Bruta Corregida por tipo Combustible				
Ítem	Descripción	Unidades	AGB1	AGB2
2	Potencia Máxima Diesel corregida	[kW]	913,75	912,99

Tabla Mínimo Técnico por tipo Combustible				
Ítem	Descripción	Unidades	AGB1	AGB2
3	Mínimo Técnico Diésel	[kW]	456,88	456,50

[1] Recomendaciones fabricante Caterpillar.

Tabla 3 Consumos y temperaturas de Generadores en función de % de Carga.

PERFORMANCE DATA[DM8203] CATERPILLAR

May 30, 2013

Performance Number: DM8203 | **Change Level: 01**

SALES MODEL:	3512B	COMBUSTION:	DI
ENGINE POWER (BKW):	1,470.0	ENGINE SPEED (RPM):	1,800
GEN POWER WITH FAN (EKW):	1,360.0	HERTZ:	60
COMPRESSION RATIO:	14	FAN POWER (KW):	44.4
APPLICATION:	PACKAGED GENSET	ASPIRATION:	TA
RATING LEVEL:	PRIME	AFTERCOOLER TYPE:	SCAC
SUB APPLICATION:	STANDARD	AFTERCOOLER CIRCUIT TYPE:	JW+OC, AC
PUMP QUANTITY:	2	AFTERCOOLER TEMP (C):	30
FUEL TYPE:	DIESEL	JACKET WATER TEMP (C):	99
MANIFOLD TYPE:	DRY	TURBO CONFIGURATION:	PARALLEL
GOVERNOR TYPE:	ADEM3	TURBO QUANTITY:	4
ELECTRONICS TYPE:	ADEM3	TURBOCHARGER MODEL:	BTVA7510-53T-0.96
CAMSHAFT TYPE:	STANDARD	COMBUSTION STRATEGY:	LOW BSFC
IGNITION TYPE:	CI	CRANKCASE BLOWBY RATE (M3/HR):	55.8
INJECTOR TYPE:	EUI	FUEL RATE (RATED RPM) NO LOAD (L/HR):	44.5
UNIT INJECTOR TIMING (MM):	64.34	PISTON SPD @ RATED ENG SPD (M/SEC):	11.4
REF EXH STACK DIAMETER (MM):	254		
MAX OPERATING ALTITUDE (M):	1,800		

General Performance Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	ENGINE OUTLET TEMP
EKW	%	BKW	KPA	G/BKW-HR	L/HR	KPA	DEG C	DEG C	DEG C
1,360.0	100	1,467	1,890	208.4	364.4	234.6	50.3	610.1	427.2
1,224.0	90	1,323	1,704	207.7	327.5	212.8	48.7	572.9	409.5
1,088.0	80	1,179	1,519	206.4	290.2	184.8	46.9	538.5	392.9
1,020.0	75	1,108	1,427	205.8	271.8	171.0	45.9	522.1	384.9
952.0	70	1,037	1,335	205.4	253.8	157.2	44.8	506.3	377.1
816.0	60	895	1,153	206.0	219.7	130.4	42.5	476.8	362.8
680.0	50	753	971	208.8	187.5	104.7	40.2	450.7	350.2
544.0	40	614	791	217.5	159.2	81.8	38.9	434.4	345.8
408.0	30	474	611	231.0	130.6	61.2	37.8	417.7	340.8
340.0	25	404	521	241.1	116.2	51.7	37.3	405.8	335.1
272.0	20	334	430	255.4	101.5	42.7	36.7	390.9	326.6
136.0	10	190	245	309.4	70.2	26.3	35.4	317.2	270.0

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	ENGINE OUTLET WET EXH VOL FLOW RATE (0 DEG C AND 101 KPA)	ENGINE OUTLET DRY EXH VOL FLOW RATE (0 DEG C AND 101 KPA)
EKW	%	BKW	KPA	DEG C	M3/MIN	M3/MIN	KG/HR	KG/HR	M3/MIN	M3/MIN
1,360.0	100	1,467	246	216.5	124.8	307.4	8,842.2	9,148.0	119.9	108.8
1,224.0	90	1,323	223	201.3	117.0	280.7	7,867.9	8,142.7	112.3	101.9
1,088.0	80	1,179	194	184.3	107.5	251.6	6,877.6	7,121.0	103.2	93.6
1,020.0	75	1,108	180	175.5	102.8	237.6	6,413.9	6,642.0	98.6	89.5
952.0	70	1,037	166	166.5	98.2	223.9	5,973.5	6,186.4	94.1	85.3
816.0	60	895	138	148.3	89.1	198.5	5,179.5	5,363.8	85.3	77.4
680.0	50	753	111	130.2	80.0	174.3	4,459.3	4,616.6	76.4	69.3
544.0	40	614	88	117.2	70.1	150.9	3,845.8	3,979.4	66.6	60.5
408.0	30	474	66	104.3	60.2	128.3	3,237.7	3,347.3	57.1	51.8
340.0	25	404	56	97.8	55.4	117.3	2,934.3	3,031.8	52.7	47.8
272.0	20	334	47	91.2	50.9	106.6	2,630.3	2,715.5	48.5	44.0
136.0	10	190	31	77.9	45.0	85.6	1,916.6	1,975.4	43.0	39.1

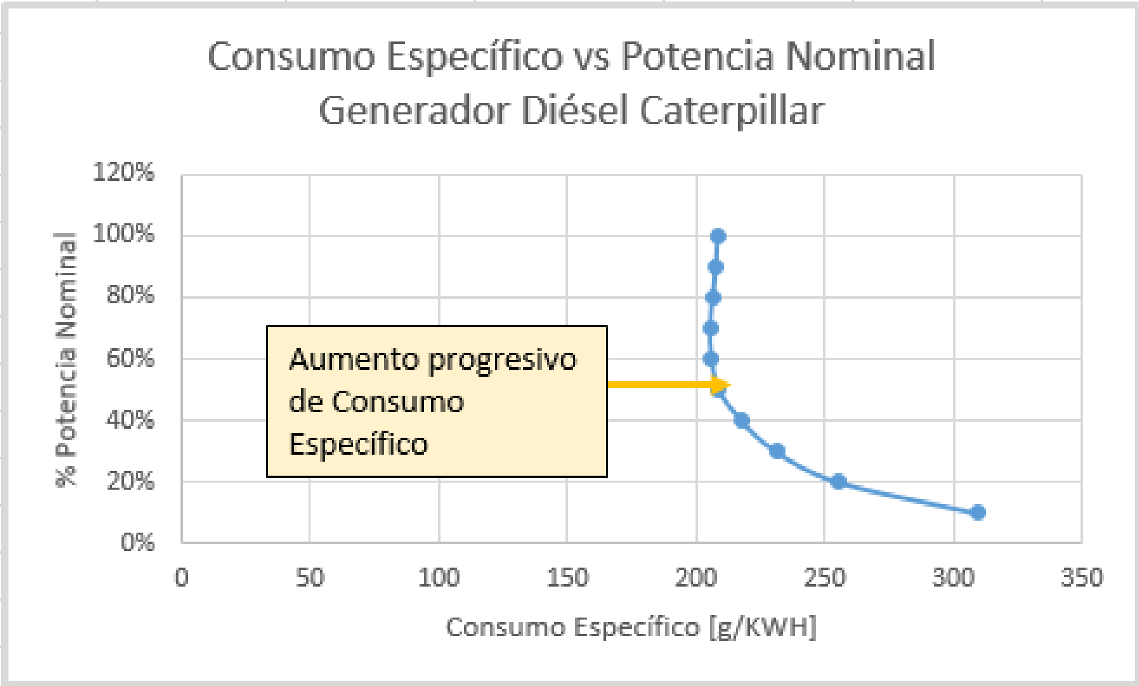

Gráfico 1 : Comportamiento Consumo específico respecto a % carga.

INTRODUCTION

System health and reliability are critical to backup and prime power solutions for every facility, from mission critical data centers to neighborhood grocery stores. A generator set is a key piece of the power system, and proper operation and maintenance are essential to long-term system reliability that ensures availability and uptime.

While power systems vary in operation, application and load profile depending on the purpose and complexity, all power systems are designed with common goals: providing reliable power and maximizing system efficiency. To achieve these design goals, it is important to understand system operation, load profile and schemes, and required maintenance. This paper will focus on the operation of generator sets in low-load scenarios and what can result if they are used outside of these parameters.

GENERATOR SET RATED LOADS

First, it is important to understand that generator sets are designed to run and, to be specific, they are designed to run with load. This may seem trivial, but loading a generator set properly is essential to availability, healthy engine operation and long engine life.

The ideal operation targets of each generator set will depend on the application and rating. Generally speaking, standby- and prime-rated diesel generator sets are designed to operate between 50 and 85 percent of the full nameplate, while continuous-rated diesel generator sets are optimized between 70 and 100 percent load. Natural gas and biogas generator sets, independent of application and rating, are designed for operation between 70 and 100 percent of the nameplate rating.

Manufacturer service intervals and projected component life are based on operation in these ranges to deliver an ideal mix of product performance, power density and long-term operational life. This makes the design phase critical to ensure that the power generation system is sized to operate within the manufacturer's recommended load levels while meeting the facility requirements. Misapplying generator sets by underloading them for extended runs will impact product health, operation and uptime while increasing the opportunity for unplanned events and shutdowns.

DIESEL GENERATOR SETS

Operating a diesel generator set at load levels less than 30 percent of rated output for extended time periods impacts the unit negatively. The most prevalent consequence is engine exhaust slobber, which is also known as exhaust manifold slobber or wet stacking. Engine slobber is a black, oily liquid that can leak from exhaust manifold joints due to extended low- or no-load scenarios. Running at high idle with little or no load reduces the heat in the cylinder, allowing unburned fuel and oil deposits to leak through the exhaust slip joints.

Visible slobber does not necessarily indicate a problem with an engine, but it signals possible underloading concerns, low ambient temperatures or low jacket water temperature. In most circumstances, engine slobber alone, while unsightly, will not immediately harm an engine. However, slobber is a sign of underloading and could be an indication of other underloading effects. Long periods of light loading can lead to deposit build-up behind the piston rings, deposits developing inside the cylinders and, in extreme cases, cylinder liner polishing can occur. These conditions can lead to power losses, poor performance and accelerated wear of components, which can cause increased maintenance costs and unplanned downtime or failure.

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[2] Recomendaciones del fabricante.