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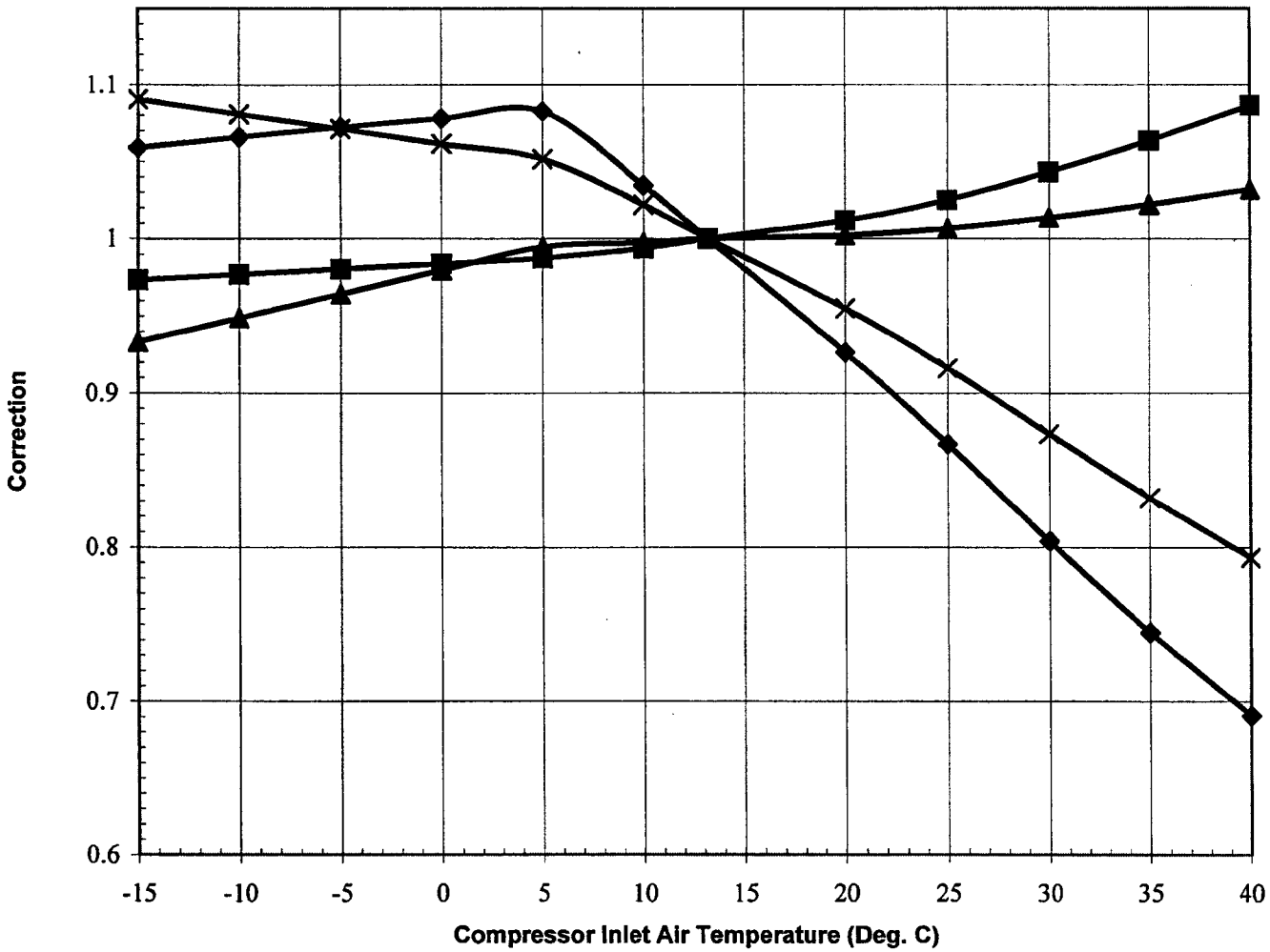
Comments to attached curves

- The attached curves replaces the typical ones transmitted by e-mail August 29.2001
- Attachment 6 is provided in order to show the effects of water injection rate on performance at a defined ambient air temperature of 13.2 deg.C. At different ambient temperatures different correction curves applies. These are not supplied and will only be issued if required for performance correction during testing.
- Every effort shall be made to conduct the test at external conditions as close to the guarantee point as possible. This means that the performance test should be performed with water and gas fuel temperature at 25 deg C.

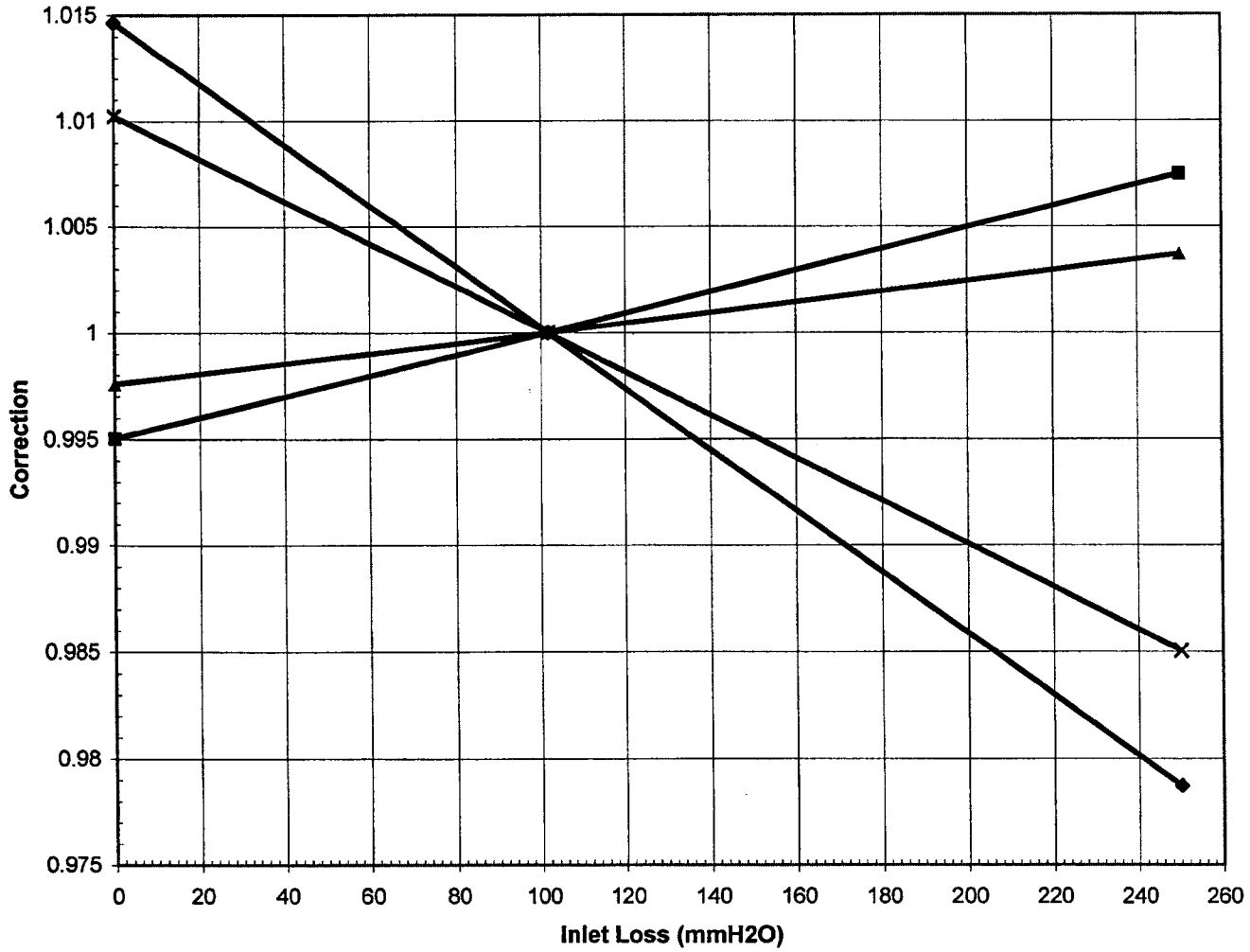
Performance correction for compressor inlet temperature for LM2500-PK generator set.
With Water Injection



100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @15% O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

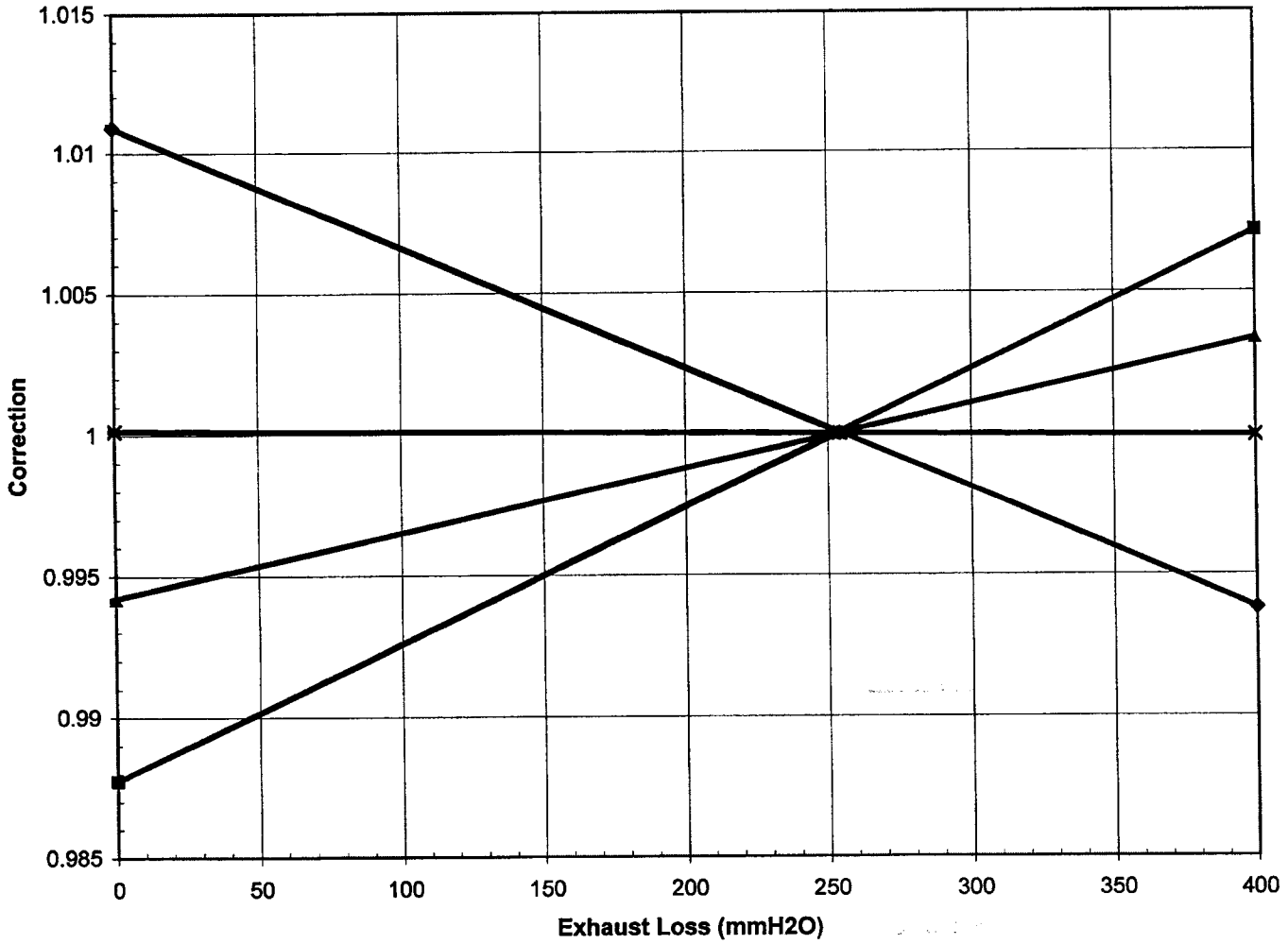
Performance correction for inlet loss for LM2500-PK generator set
With water injection



100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @ 15% O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

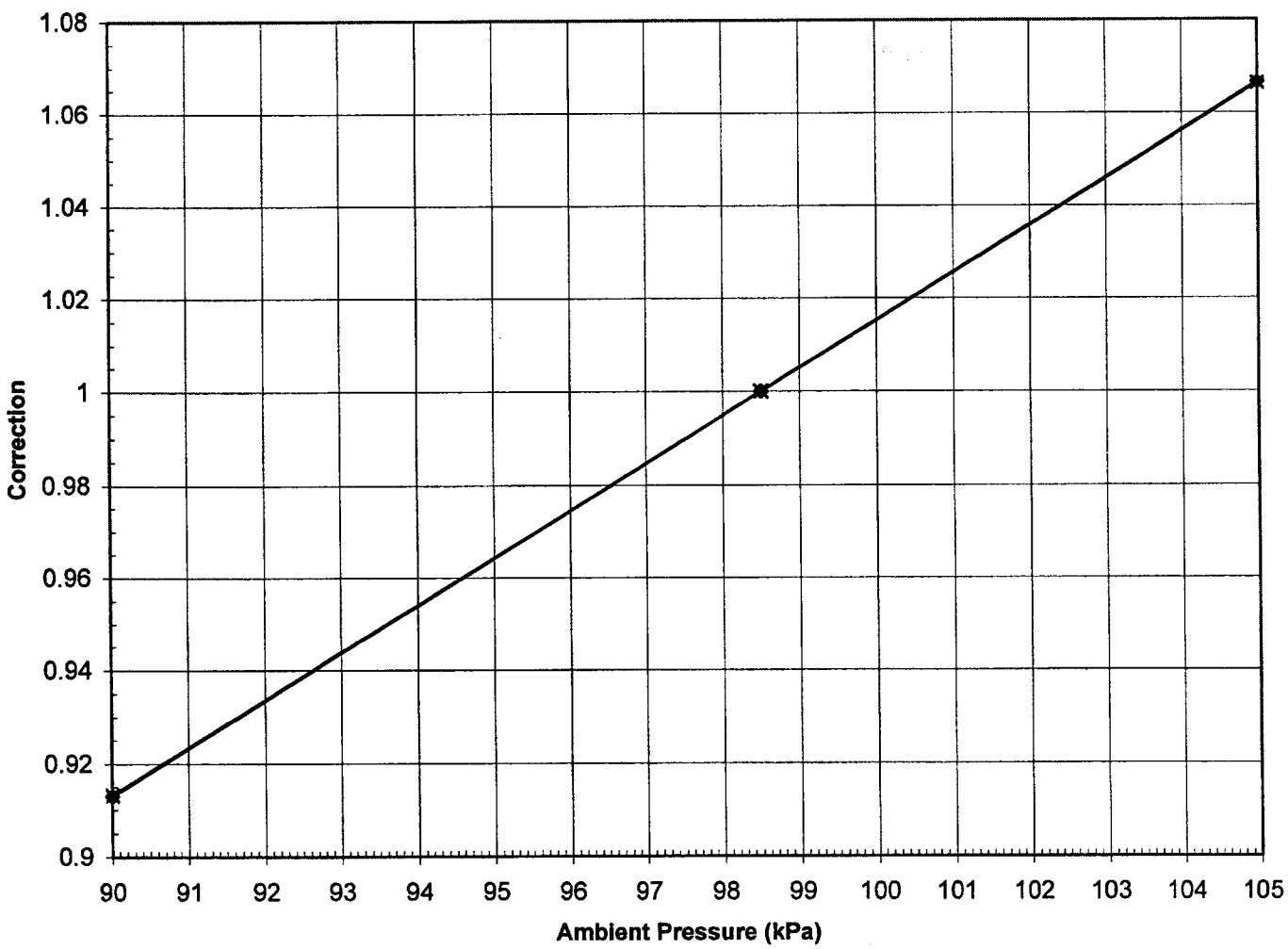
Performance correction for exhaust loss for LM2500-PK generator set
With water injection



100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @ 15% O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

Performance correction for ambient pressure for LM2500-PK generator set. With water injection

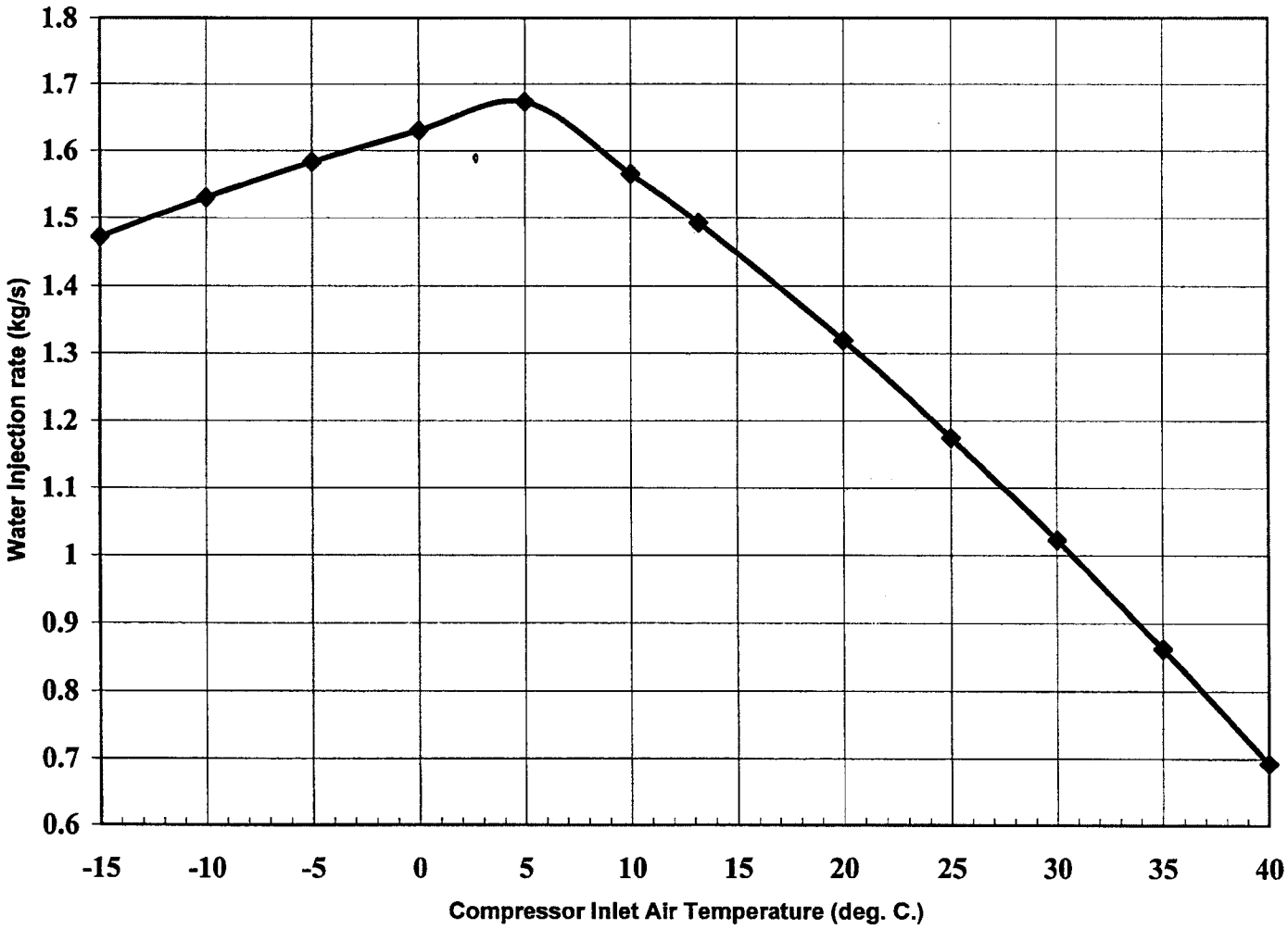


Minor effect on heat rate and exhaust temperature

<u>100% reference point:</u>
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @15% O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

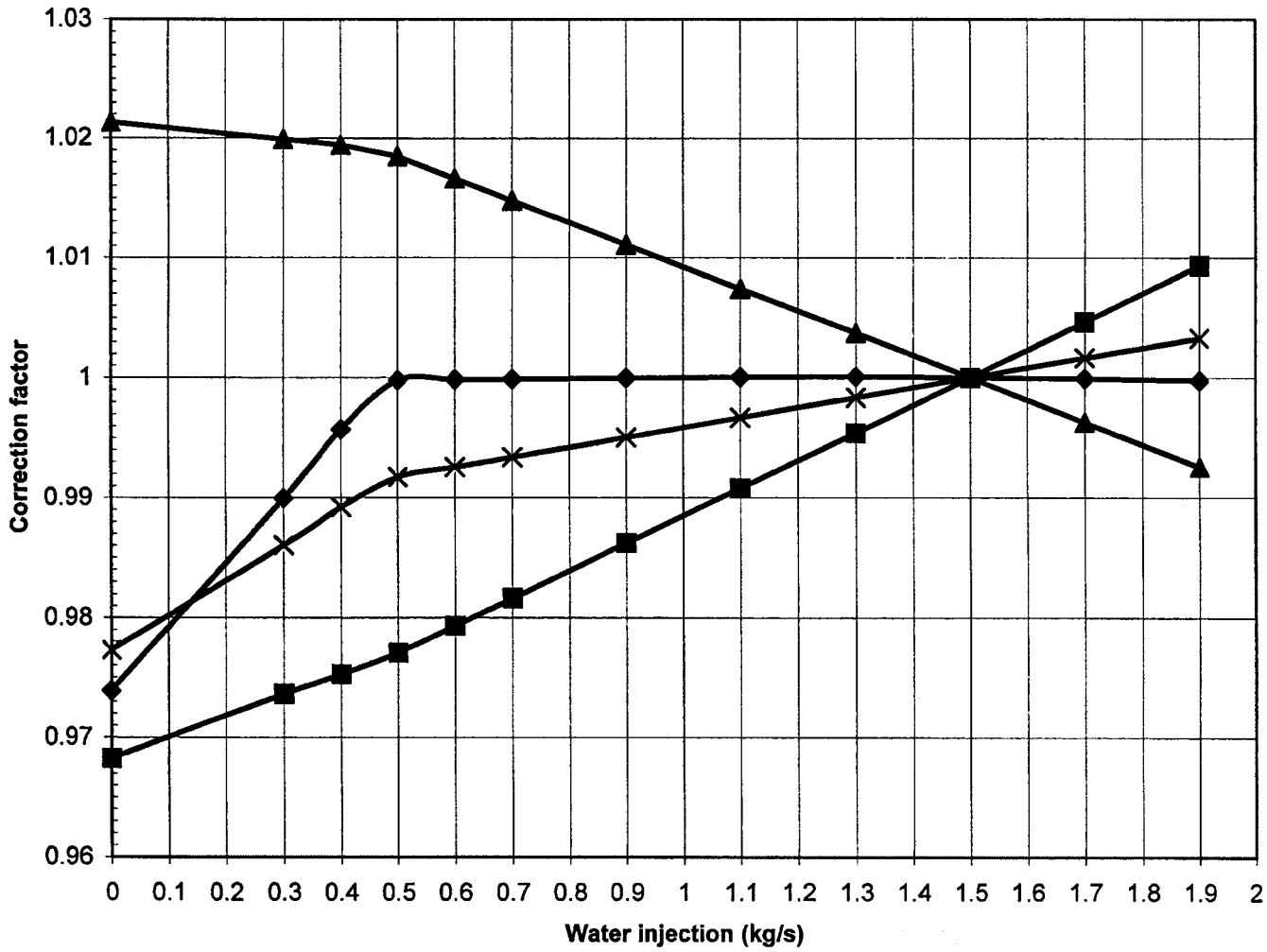
Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

Water Injection to 49 ppmvd NOx @15% O2



100% reference point:
Fuel: Natural gas
Maximum power
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @ 15% O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm

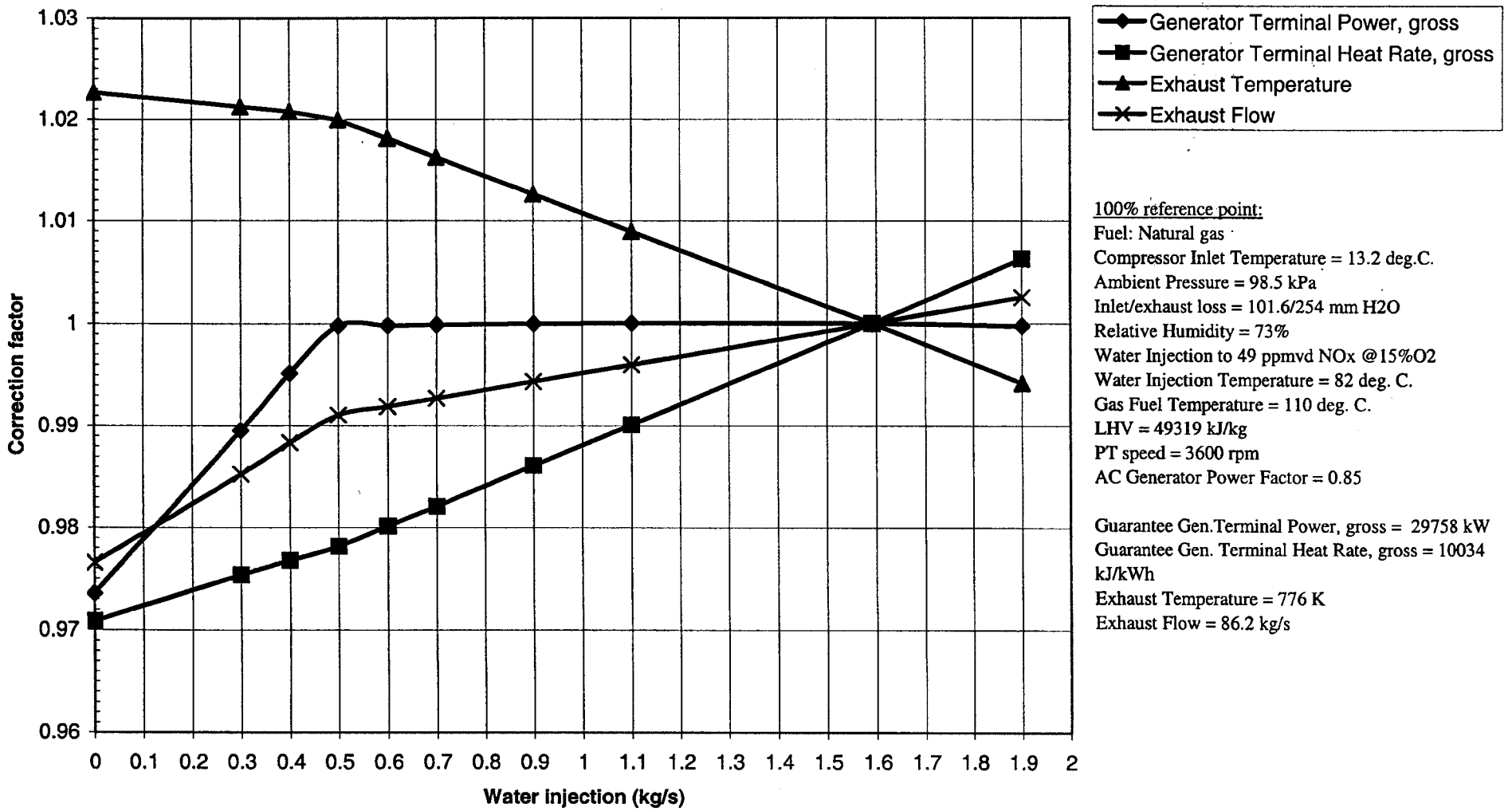
Performance correction for water injection rate for compressor inlet temperature of 13.2 deg. C.



100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @15%O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

Performance correction for water injection rate for compressor inlet temperature of 13.2 deg. C.



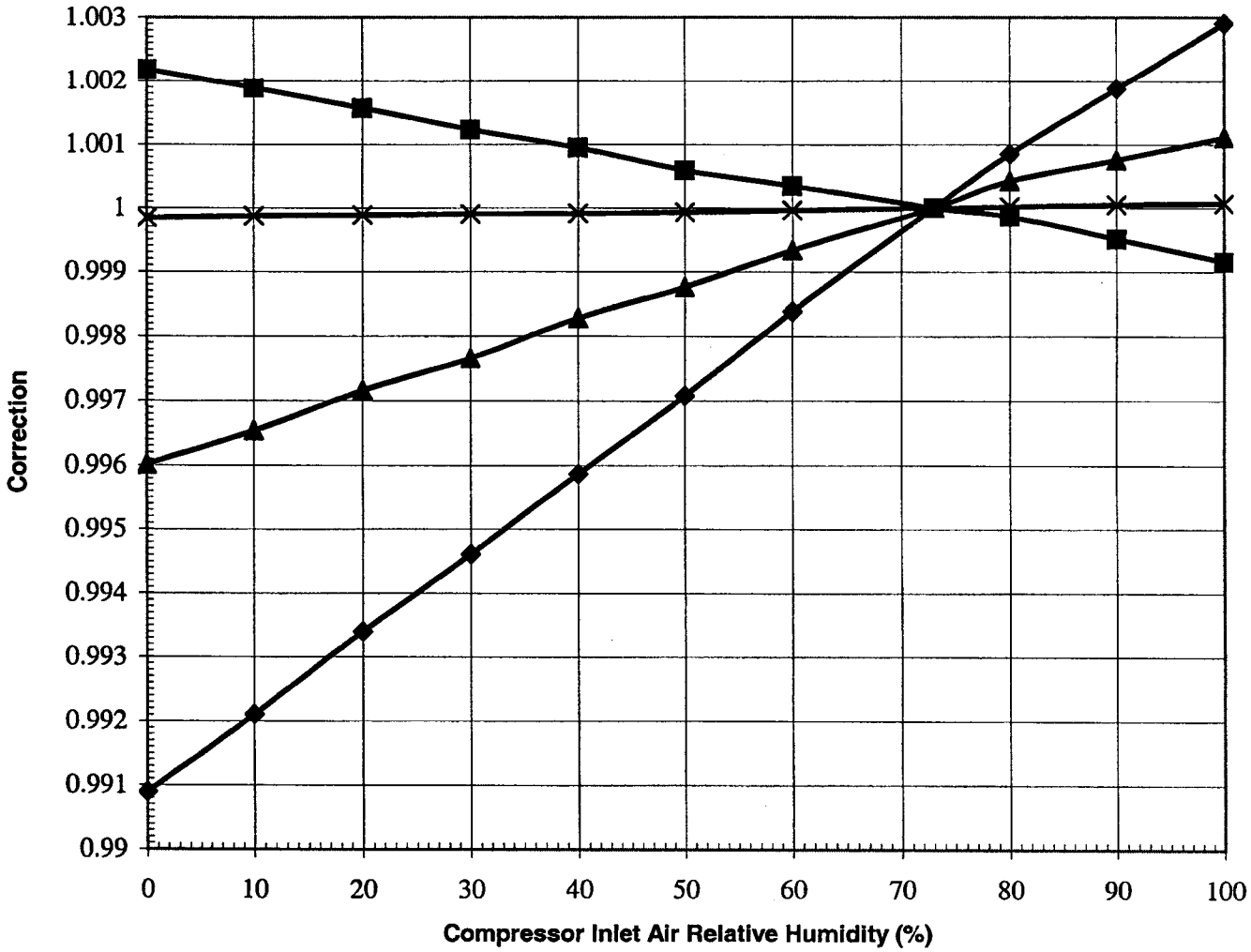
100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @15%O2
Water Injection Temperature = 82 deg. C.
Gas Fuel Temperature = 110 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

Q/operations 2/630118/performance/WaterRate.xls/waterinjection curve

JAL/November 12. 2003

Performance correction for compressor inlet relative humidity at the reference ambient temperature/pressure for LM2500-PK generator set. With Water Injection

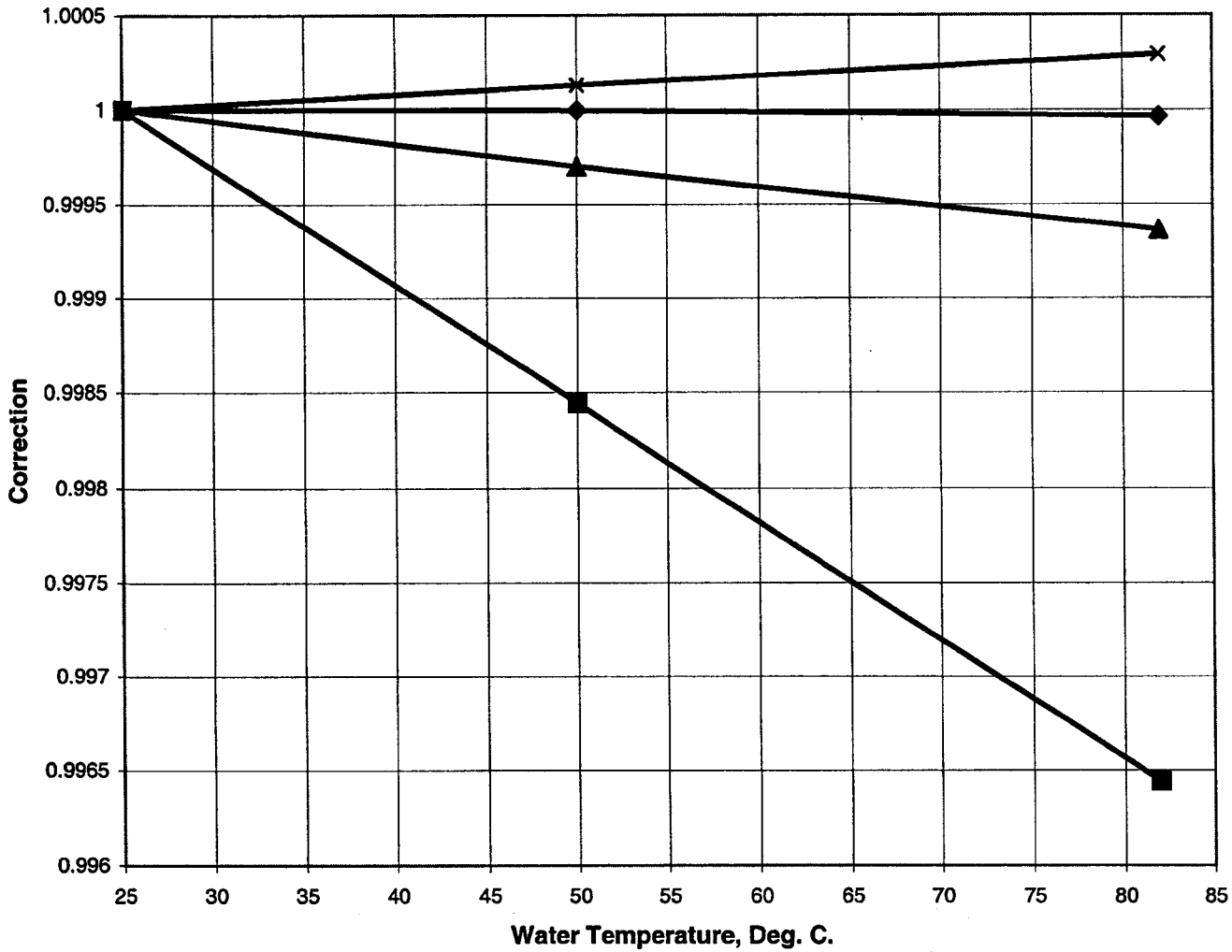


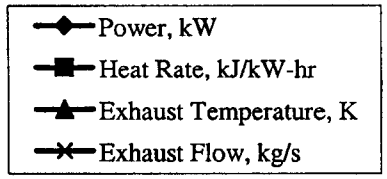
100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @15% O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Note: At other ambient temperatures/pressures the curves will have different slopes.

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

Performance Correction for Water Injection Temperature LM2500-PK Generator Set.

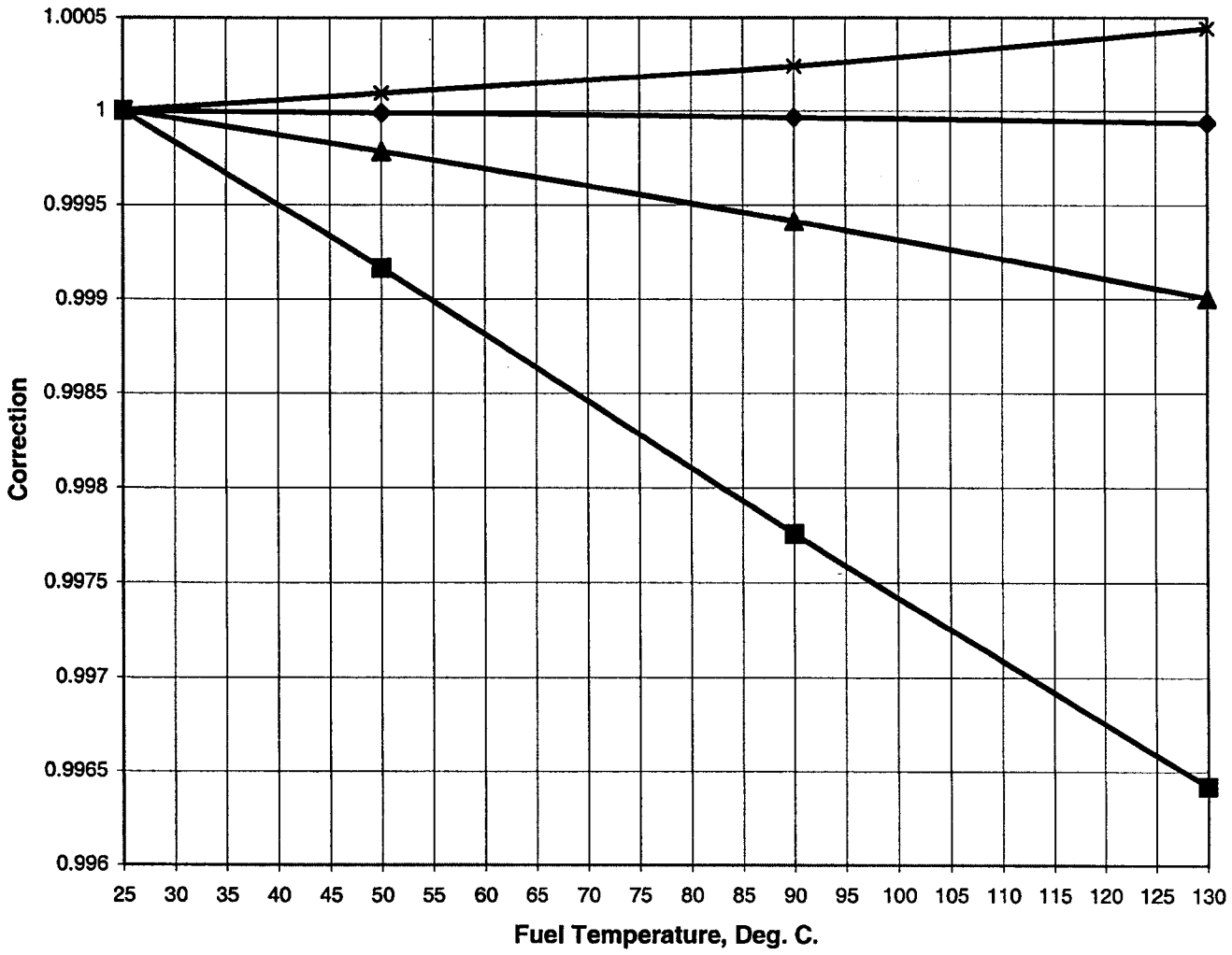




100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @ 15% O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

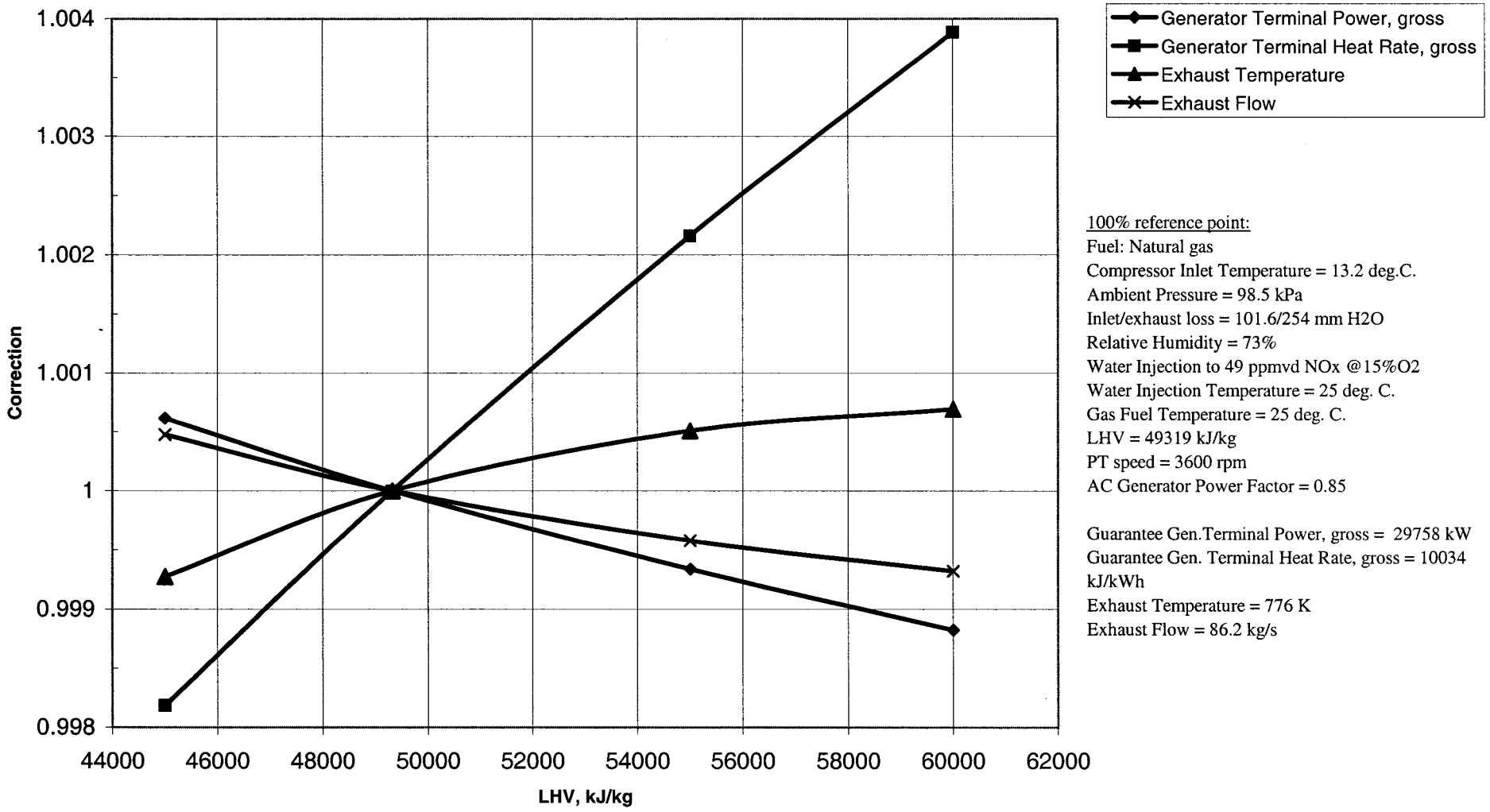
Performance Correction for Gas fuel Temperature LM2500-PK Generator Set. With Water Injection



100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @ 15% O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

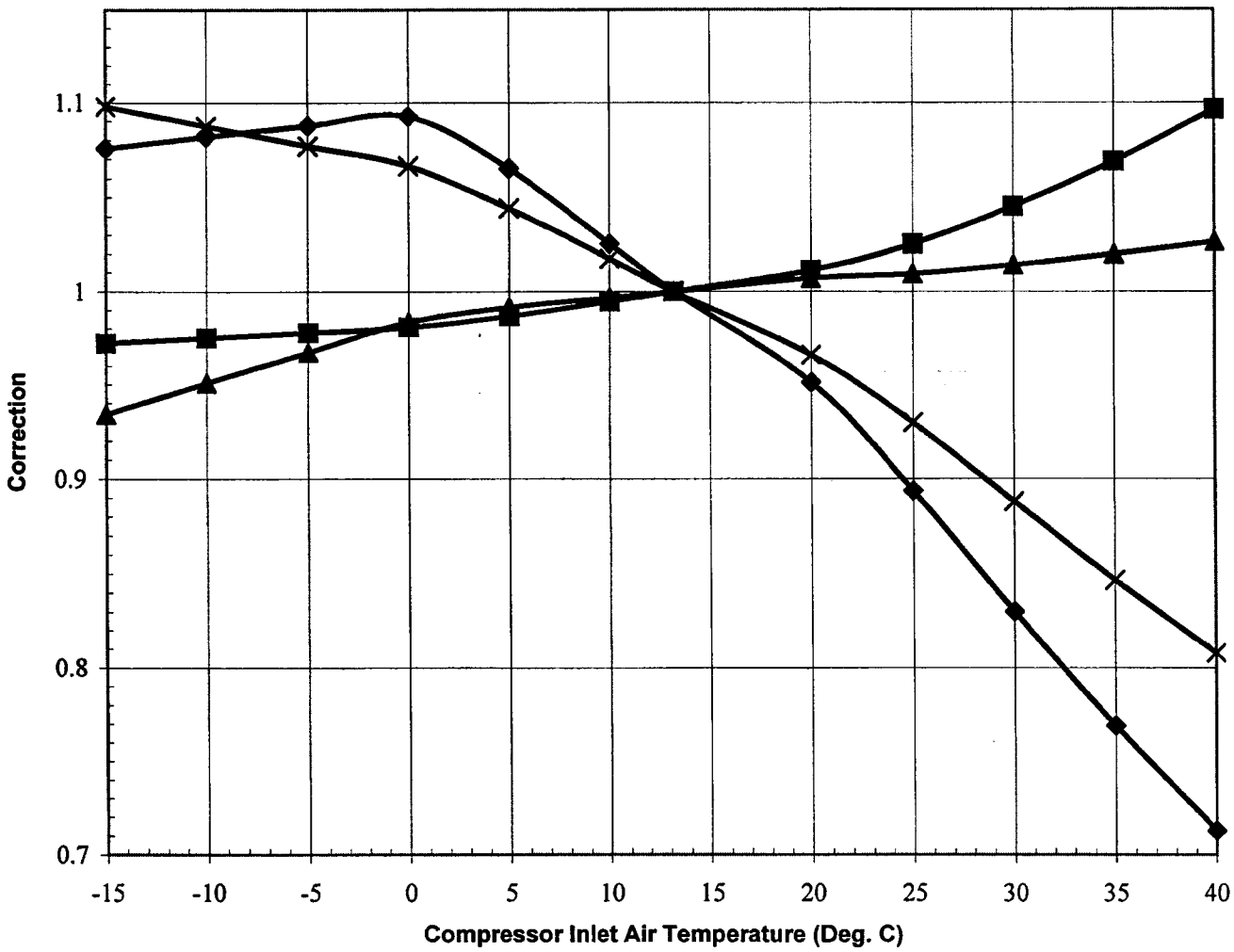
Performance correction for fuel LHV for LM2500-PK generator set. With Water Injection

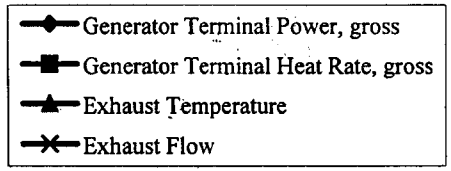


100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Water Injection to 49 ppmvd NOx @15%O2
Water Injection Temperature = 25 deg. C.
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 29758 kW
Guarantee Gen. Terminal Heat Rate, gross = 10034 kJ/kWh
Exhaust Temperature = 776 K
Exhaust Flow = 86.2 kg/s

Performance correction for compressor inlet temperature for LM2500-PK generator set.
Dry operation

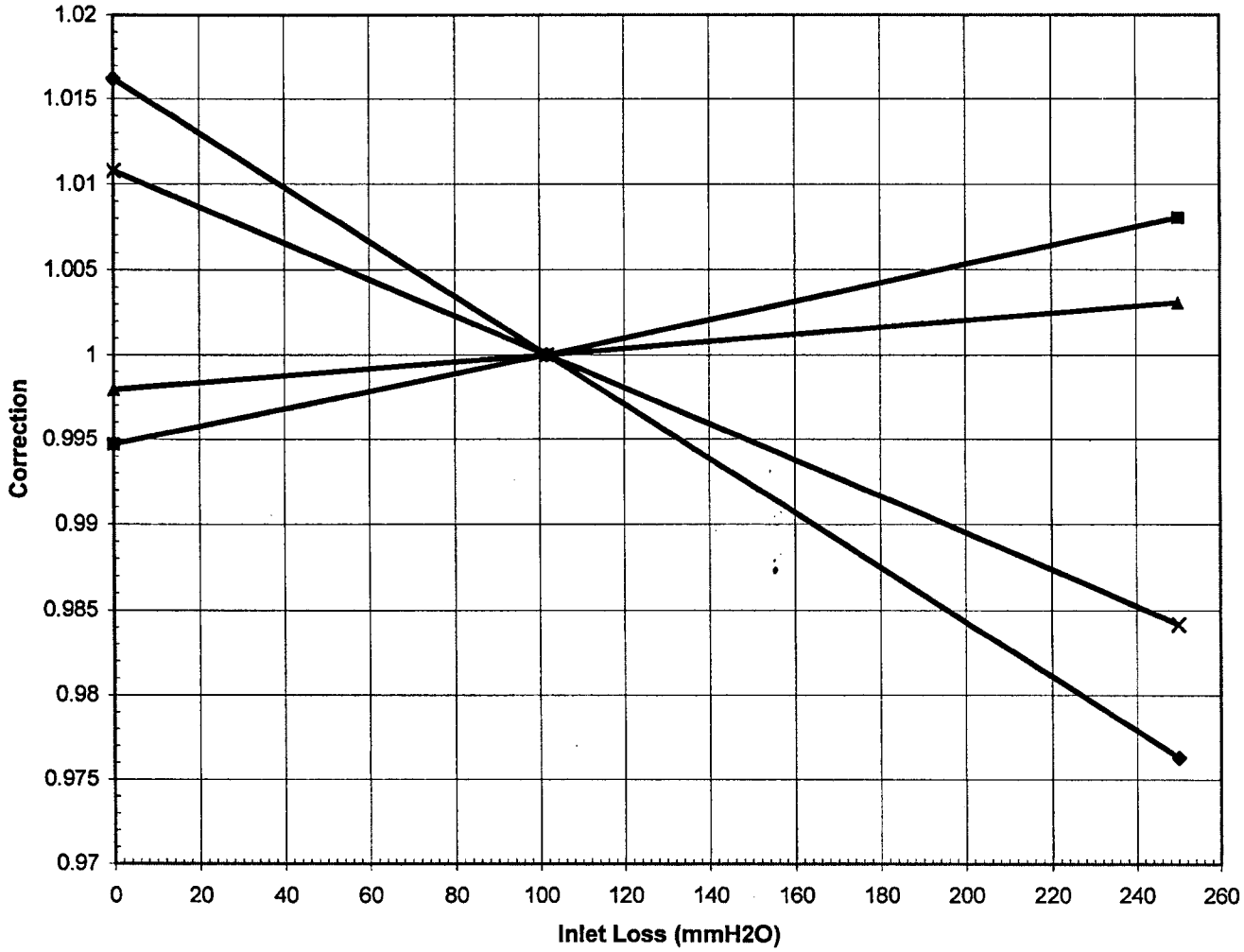




100% reference point:
Dry operation
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 28977 kW
Guarantee Gen. Terminal Heat Rate, gross = 9718 kJ/kWh
Exhaust Temperature = 793 K
Exhaust Flow = 84.3 kg/s

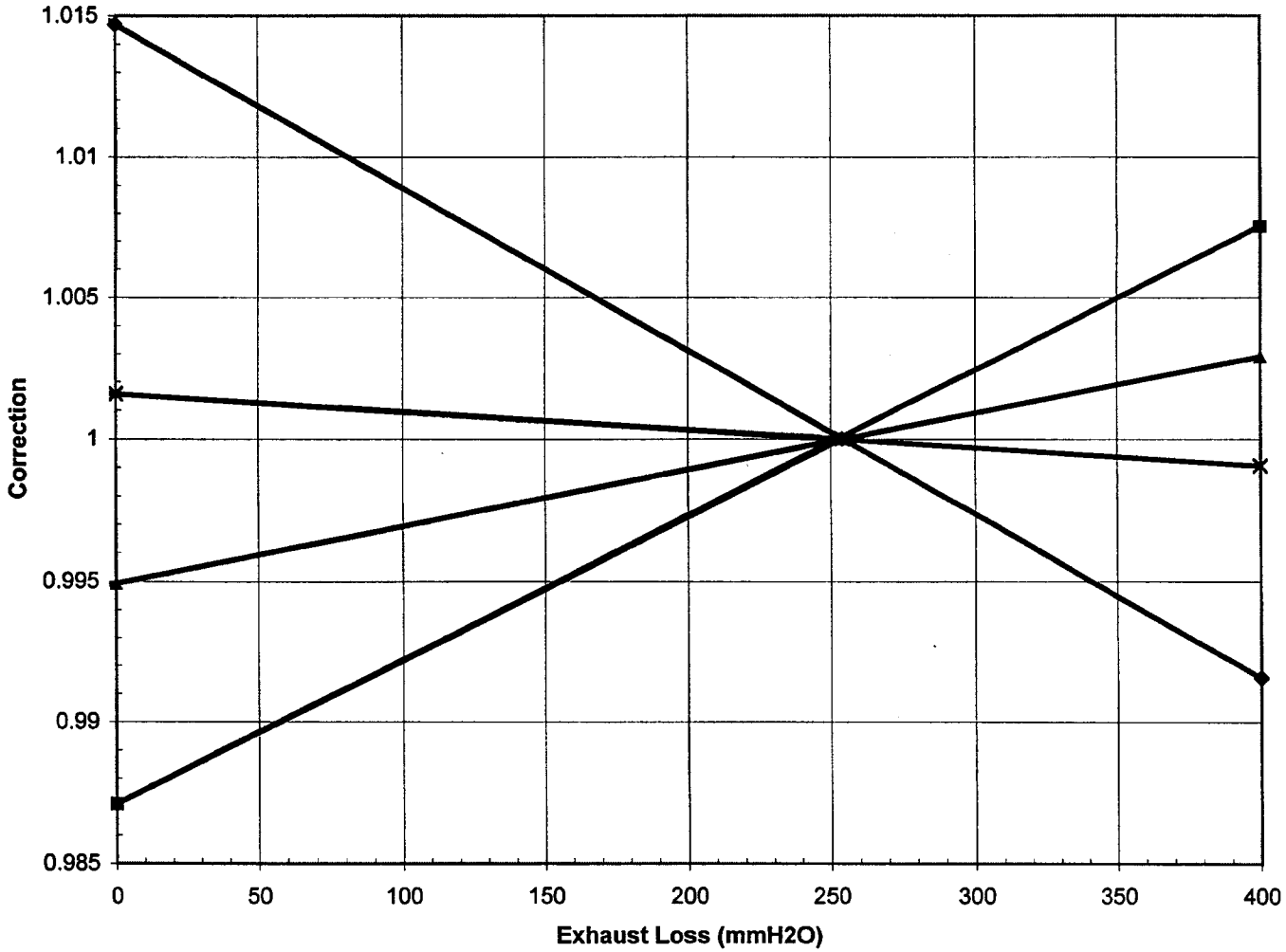
Performance correction for inlet loss for LM2500-PK generator set
Dry operation



100% reference point:
Dry operation
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 28977 kW
Guarantee Gen. Terminal Heat Rate, gross = 9718 kJ/kWh
Exhaust Temperature = 793 K
Exhaust Flow = 84.3 kg/s

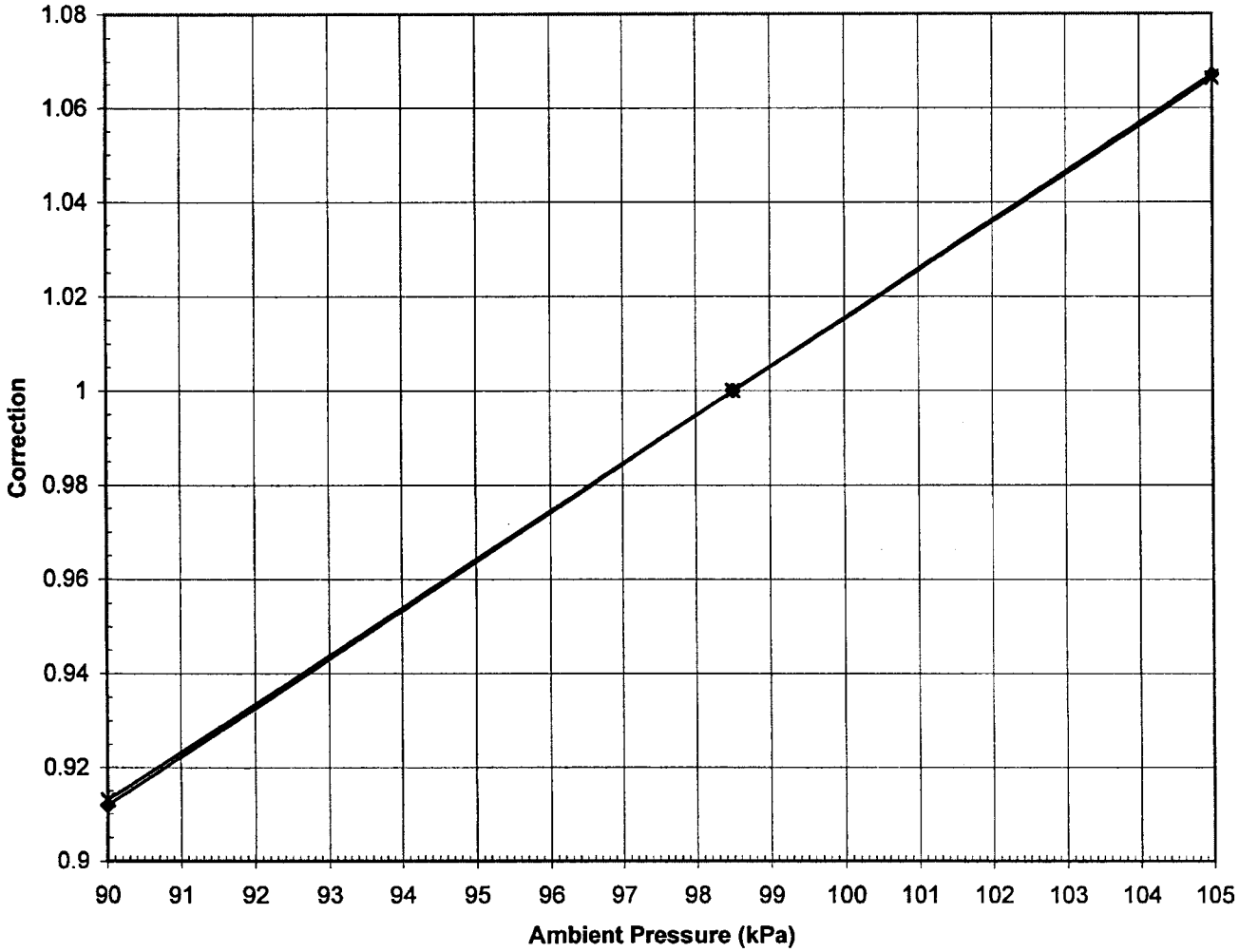
Performance correction for exhaust loss for LM2500-PK generator set
Dry operation



100% reference point:
Dry operation
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 28977 kW
Guarantee Gen. Terminal Heat Rate, gross = 9718 kJ/kWh
Exhaust Temperature = 793 K
Exhaust Flow = 84.3 kg/s

Performance correction for ambient pressure for LM2500-PK generator set. Dry operation

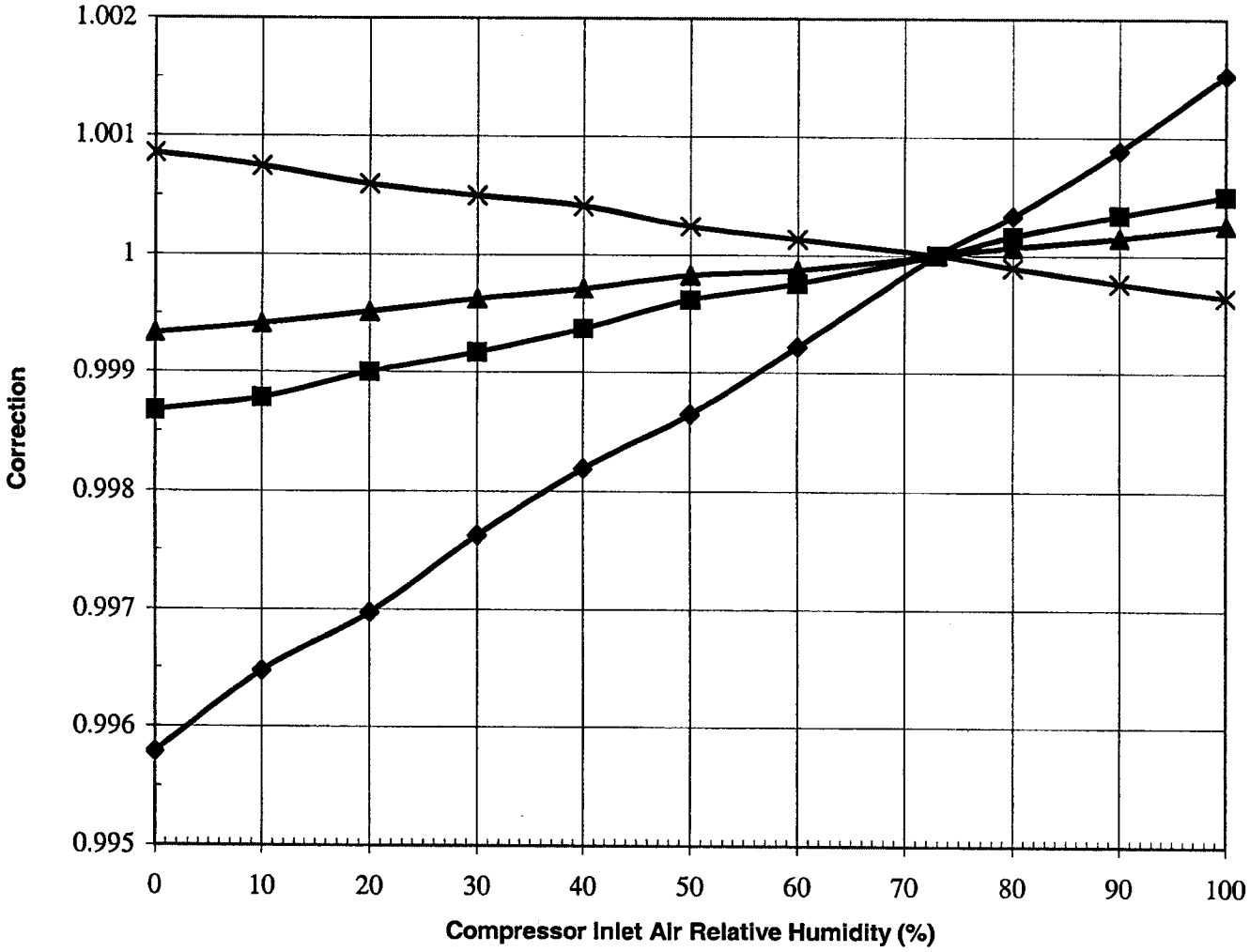


Minor effect on heat rate and exhaust temperature

100% reference point:
Dry operation
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 28977 kW
Guarantee Gen. Terminal Heat Rate, gross = 9718 kJ/kWh
Exhaust Temperature = 793 K
Exhaust Flow = 84.3 kg/s

Performance correction for compressor inlet relative humidity at the reference ambient temperature/pressure for LM2500-PK generator set. Dry operation



Generator Terminal Power, kW, gross
Generator Terminal Heat Rate, kJ/kW-hr, gross
Exhaust Temperature, K
Exhaust Flow, kg/s

100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

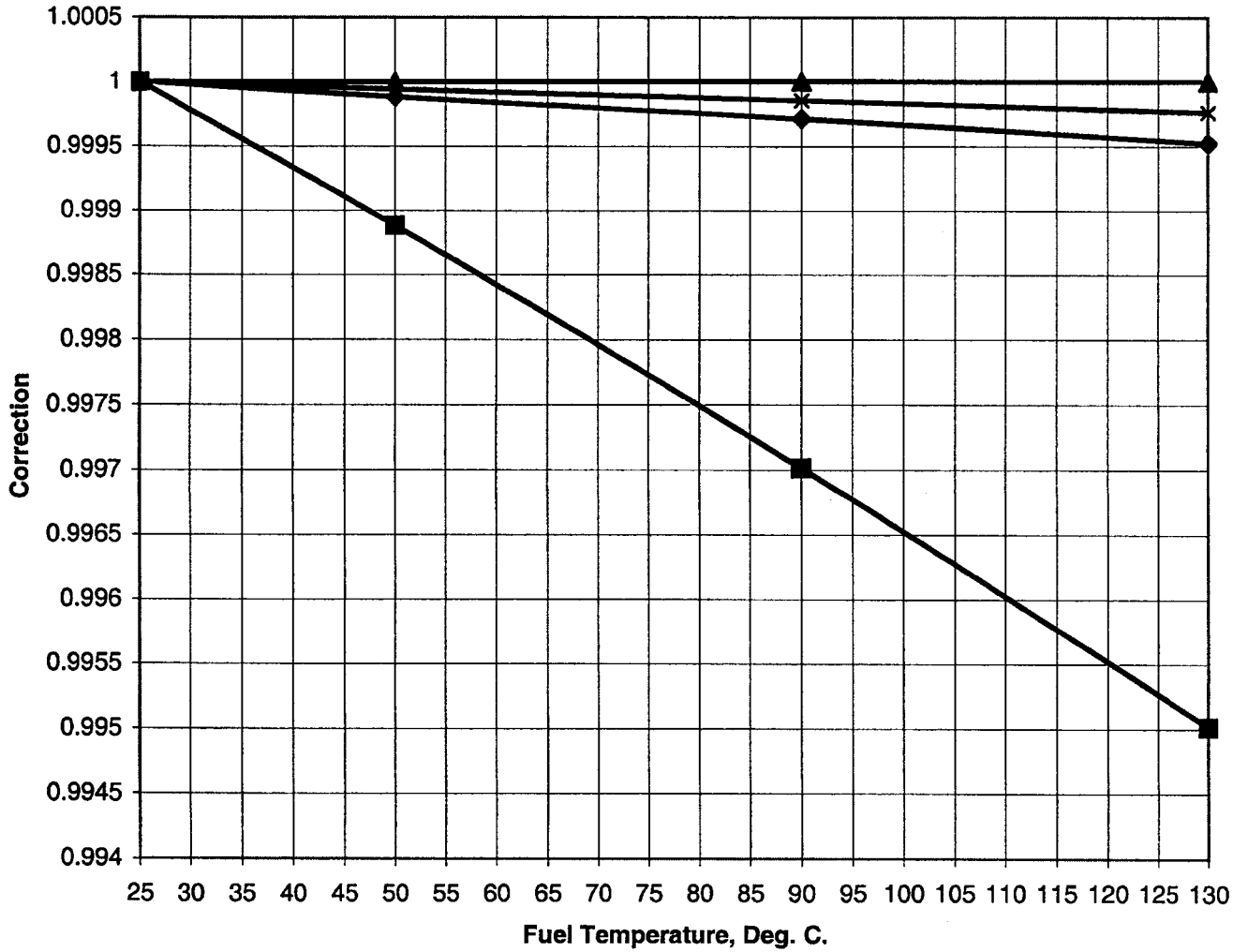
Note: At other ambient temperatures/pressures the curves will have different slopes.

Guarantee Gen.Terminal Power, gross = 28977 kW
Guarantee Gen. Terminal Heat Rate, gross = 9718 kJ/kWh
Exhaust Temperature = 793 K
Exhaust Flow = 84.3 kg/s

Q/operations 2/630118/performance/RH-dry.xls/Relative Humidity

JAL/December 03.2001

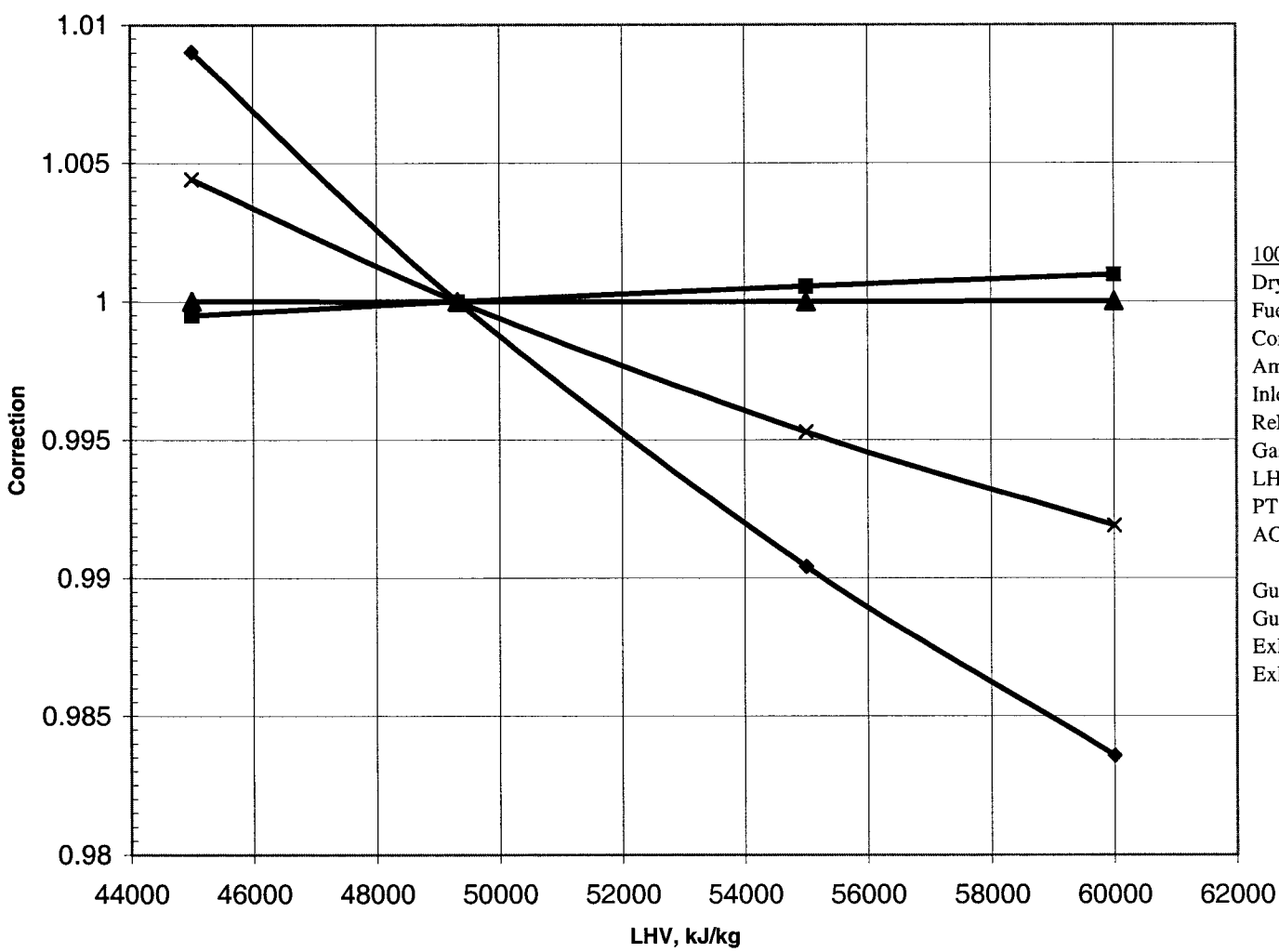
Performance Correction for Gas fuel Temperature LM2500-PK Generator Set. Dry operation



100% reference point:
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

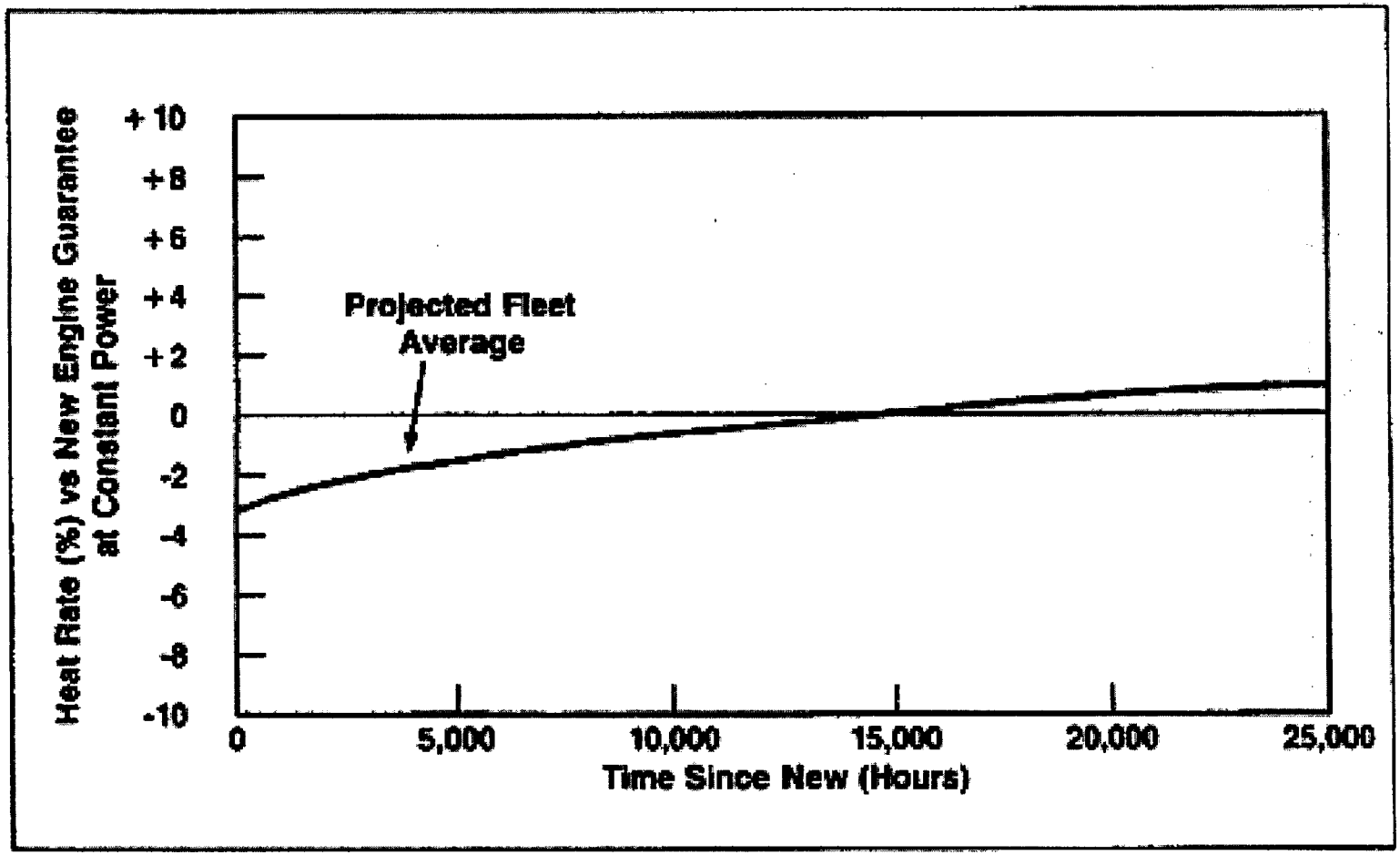
Guarantee Gen.Terminal Power, gross = 28977 kW
Guarantee Gen. Terminal Heat Rate, gross = 9718 kJ/kWh
Exhaust Temperature = 793 K
Exhaust Flow = 84.3 kg/s

Performance correction for fuel LHV for LM2500-PK generator set. Dry operation



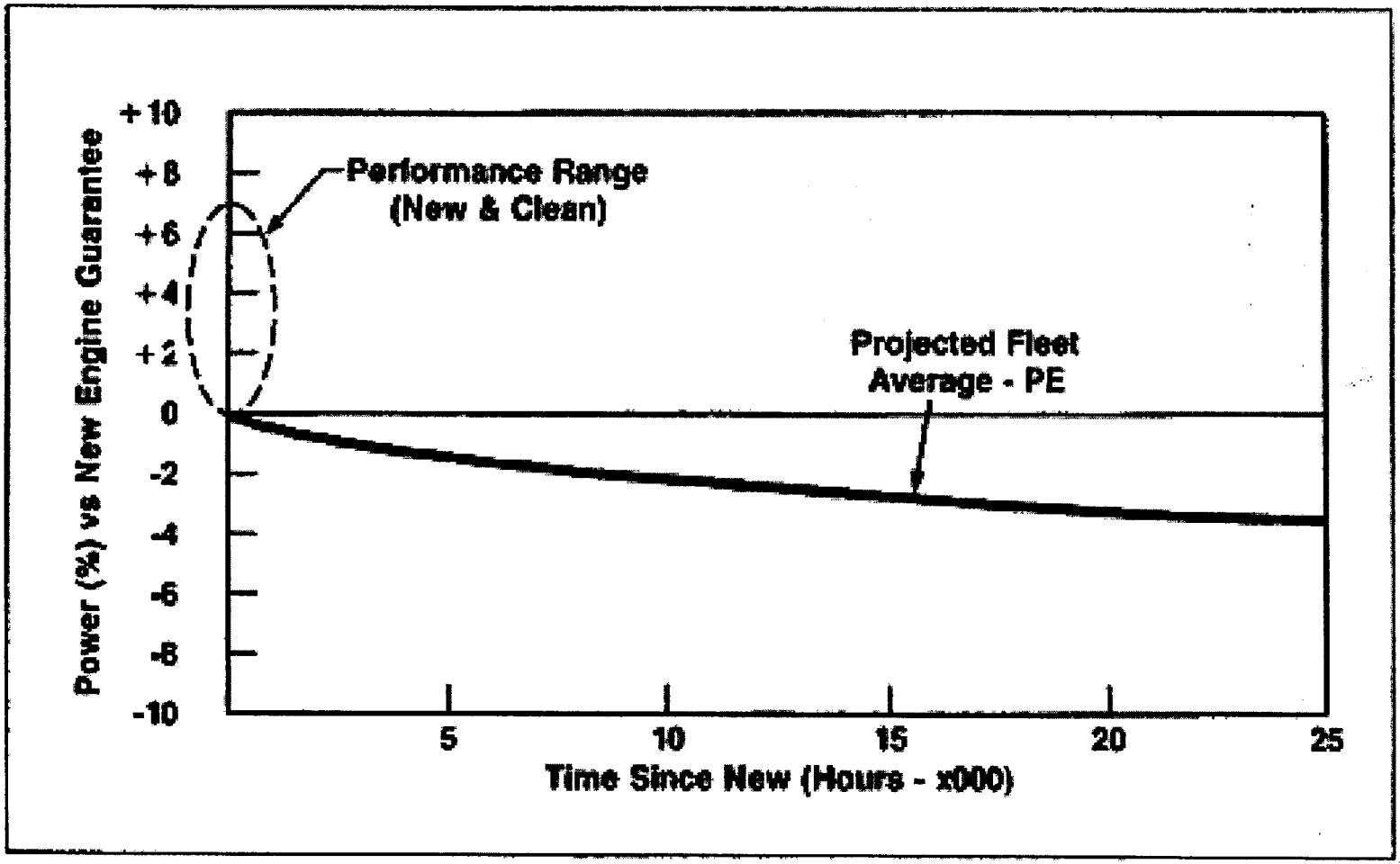
100% reference point:
Dry operation
Fuel: Natural gas
Compressor Inlet Temperature = 13.2 deg.C.
Ambient Pressure = 98.5 kPa
Inlet/exhaust loss = 101.6/254 mm H2O
Relative Humidity = 73%
Gas Fuel Temperature = 25 deg. C.
LHV = 49319 kJ/kg
PT speed = 3600 rpm
AC Generator Power Factor = 0.85

Guarantee Gen.Terminal Power, gross = 28977 kW
Guarantee Gen. Terminal Heat Rate, gross = 9718 kJ/kWh
Exhaust Temperature = 793 K
Exhaust Flow = 84.3 kg/s



GT22434

LM field trends – heat rate deterioration

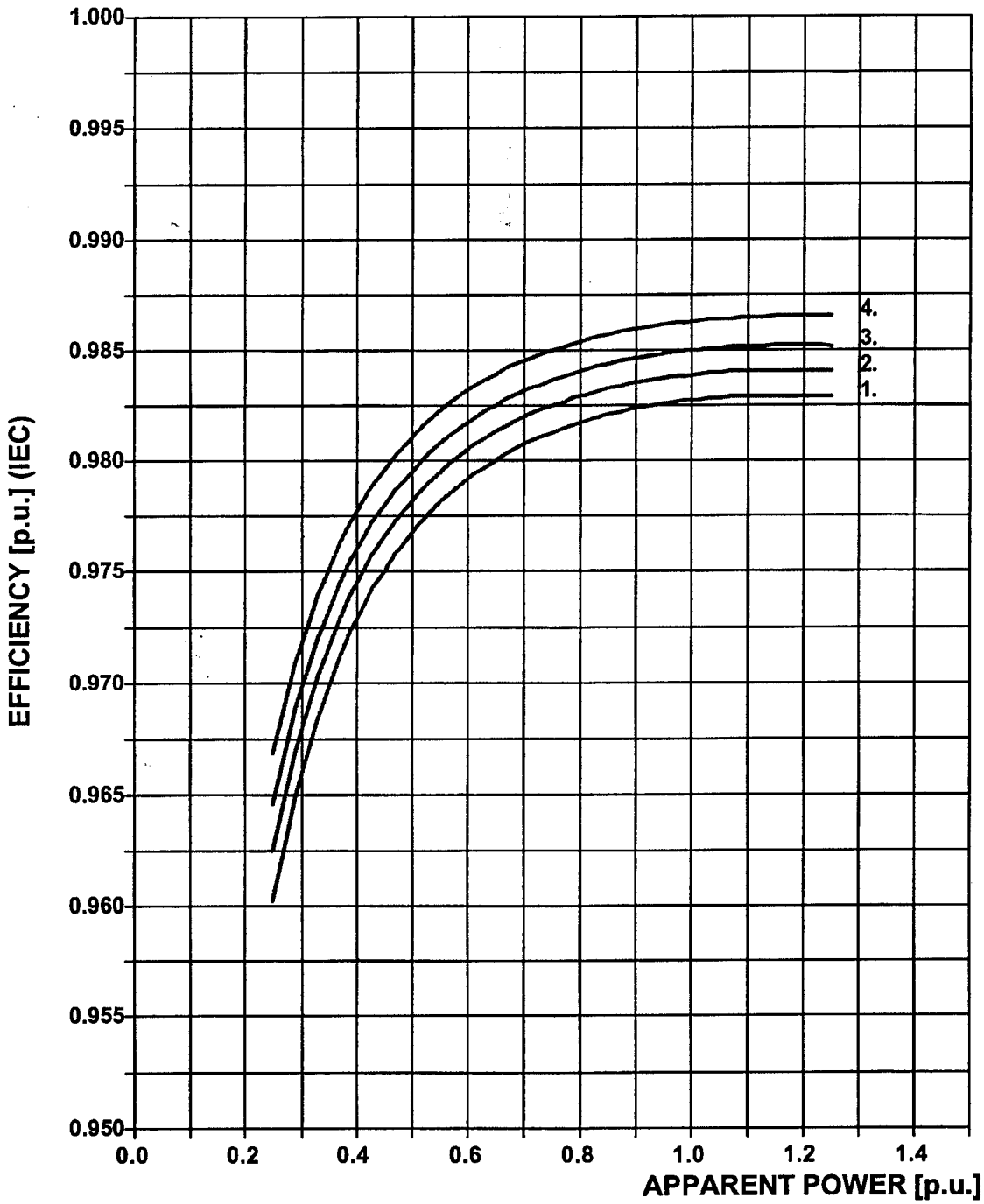


GT21862

LM field trends – power deterioration

EFFICIENCY CURVES

GBA 1250SF 37800 kVA 50 Hz 0.85 PF 11000 V 1984 A 1500 rpm

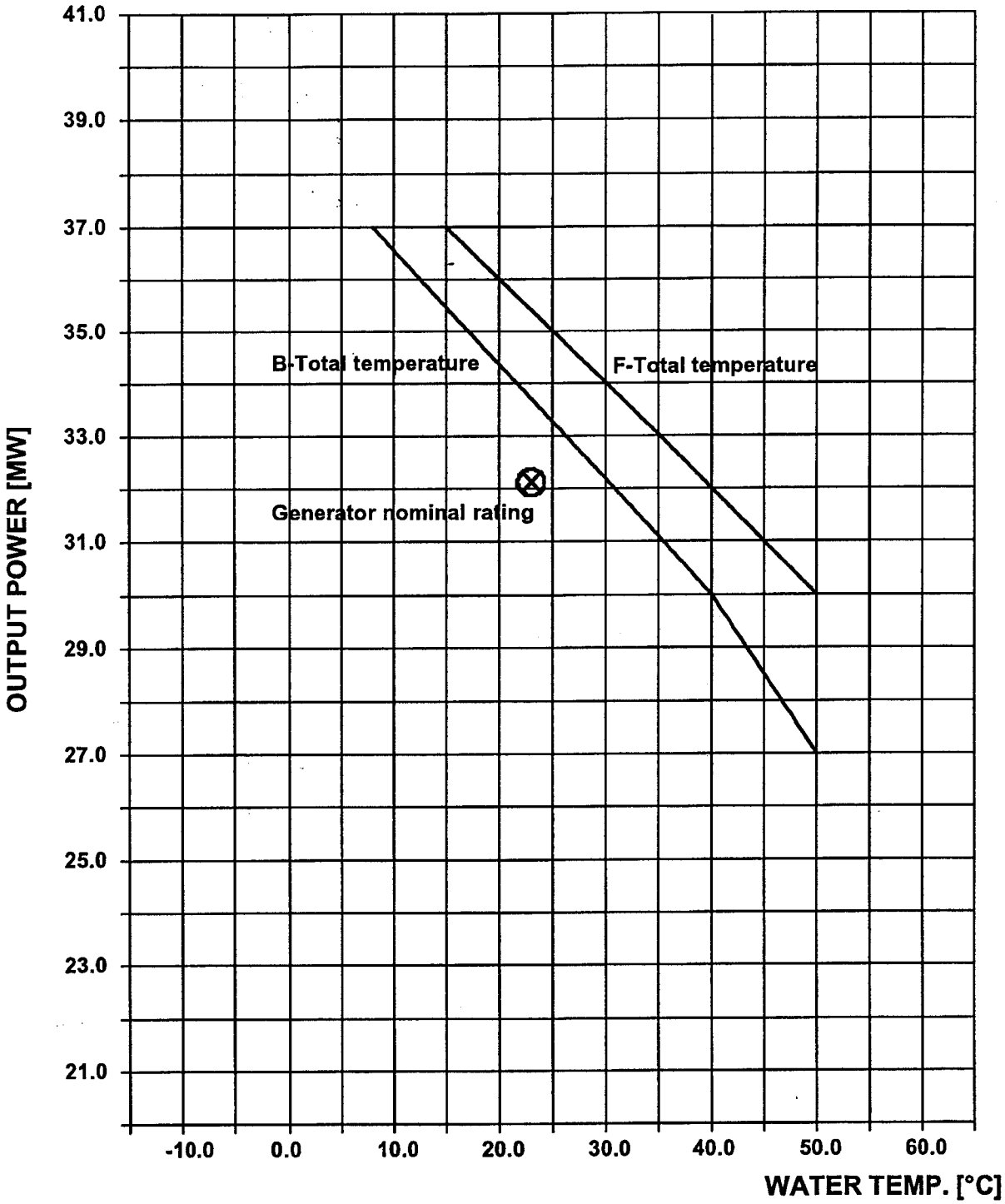


1. PF = 0.85 U = 1.00 OUTPUT 1 p.u. = 37800 kVA
2. PF = 0.90 U = 1.00
3. PF = 0.95 U = 1.00
4. PF = 1.00 U = 1.00

USP&E
POWERING BUSINESS. EMPOWERING PEOPLE.

GENERATOR OUTPUT VS. COOLING WATER TEMP.

GBA 1250SF 37800 kVA 50 Hz 0.85 PF 11000 V 1984 A 1500 rpm



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POWERING BUSINESS. EMPOWERING PEOPLE.