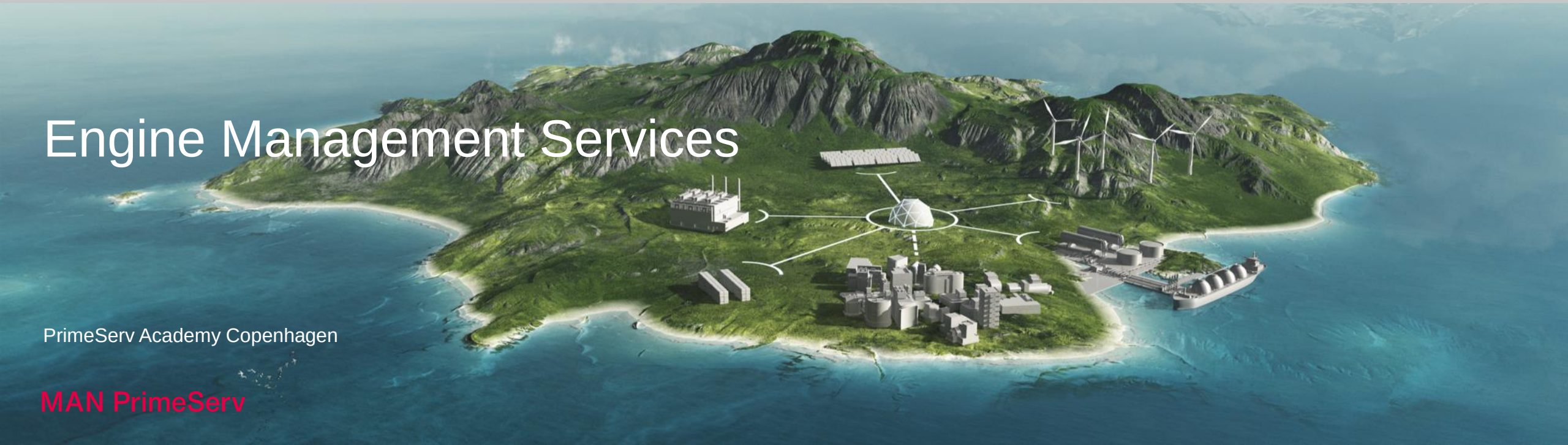
MAN Energy Solutions
Future in the making

EMS

Engine Management Services



PrimeServ Academy Copenhagen

MAN PrimeServ

Learning objectives

Upon completion of this module you …

– will be able to interpret and apply data from the EMS-PMI system.

– will be able to recognize the different components in the EMS-PMI system.

– will be able to apply data from the PMI system into the Auto-tuning system.

EMS – Engine Management Services

Agenda

1 EMS – Engine Management Services

2 PMI – Pressure Measurement Instrument

EMS – Engine Management Services

Description

Engine Management Services – EMS manages software, data and applications for engine operation and includes the existing PMI and CoCoS-EDS as “EMS applications”.

EMS – Engine Management Services

PMI and CoCoS - EDS included in EMS

EMS software:

- **PMI Auto - tuning**
- **CoCoS - EDS ME Basic**
- **Hardened Windows image (Win8.1 / Win10)**
- **EMS manager**
  - User Interface for installation & supervision of EMS applications & network
  - ECS and EMS data & configuration backup
  - Data exchange service with third party (AMS)

EMS – Engine Management Services

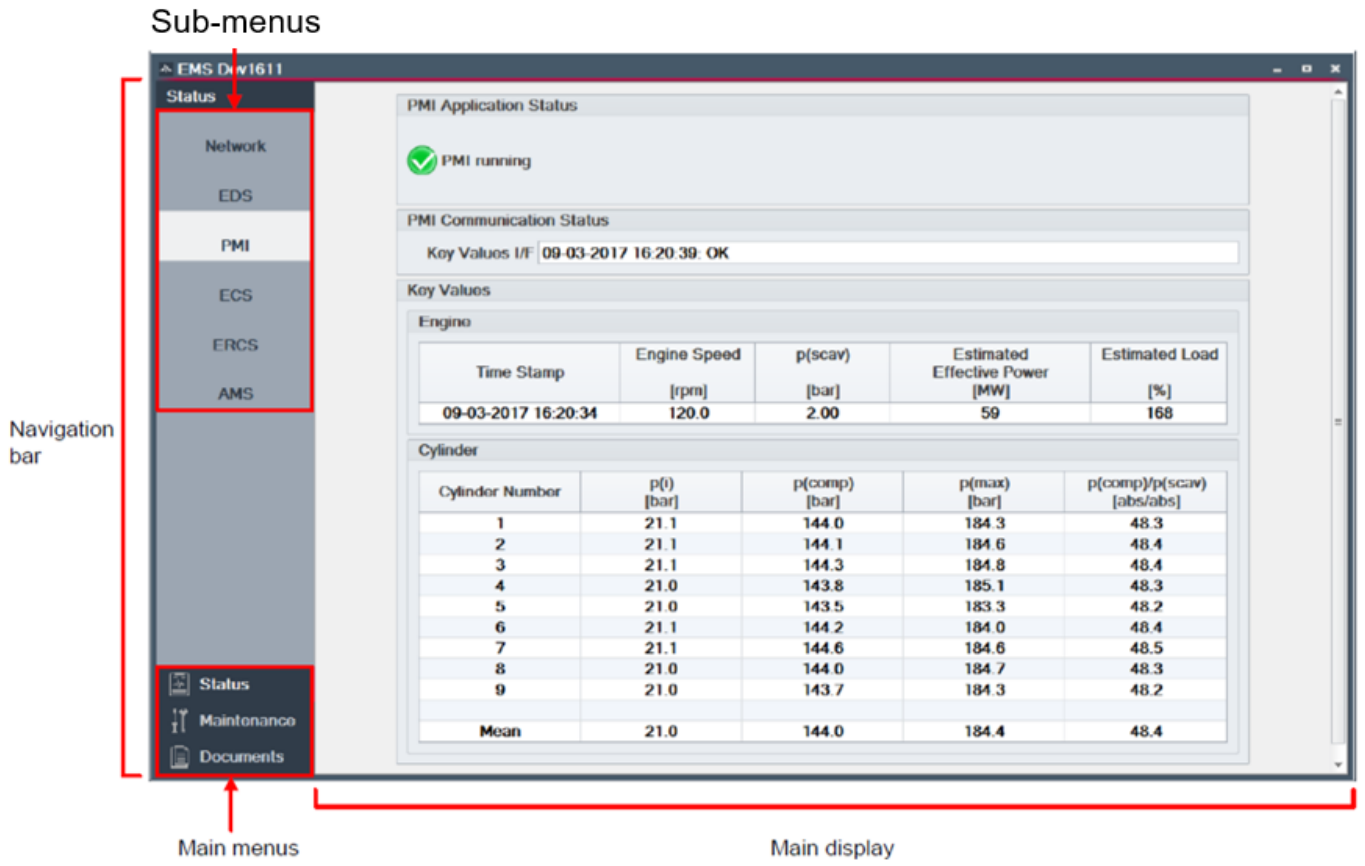
PMI and CoCoS - EDS included in EMS

EMS hardware:

- **Industrial type dedicated EMS MOP PC (replaces current PMI / CoCoS-EDS PC)**
- **Network components**
  - Managed switch
  - Firewall / VPN router (same as current)
- **PMI hardware (same as current)**

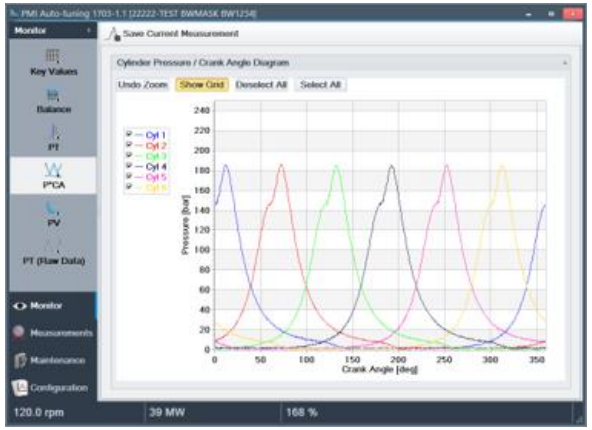
EMS – Engine Management Services

Display



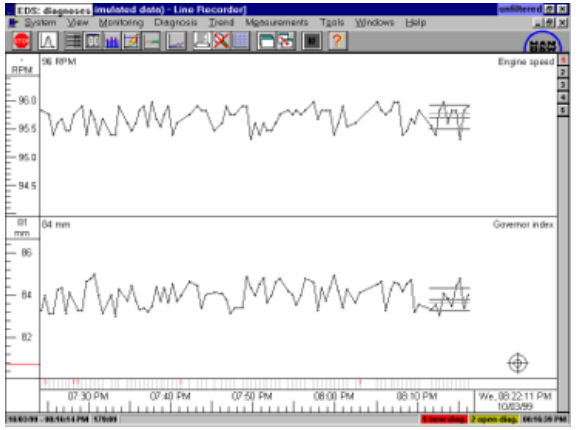
EMS – Engine Management Services

All – in - one



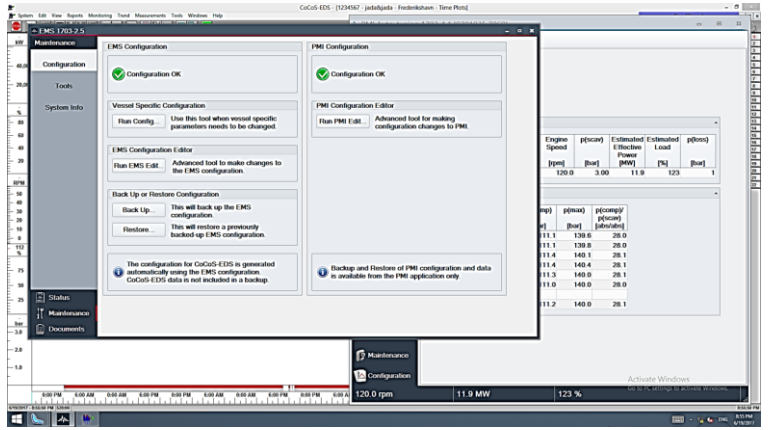
PMI Auto-tuning

(online cylinder pressure measuring)



CoCoS-EDS

(Trend view and performance-rapport)



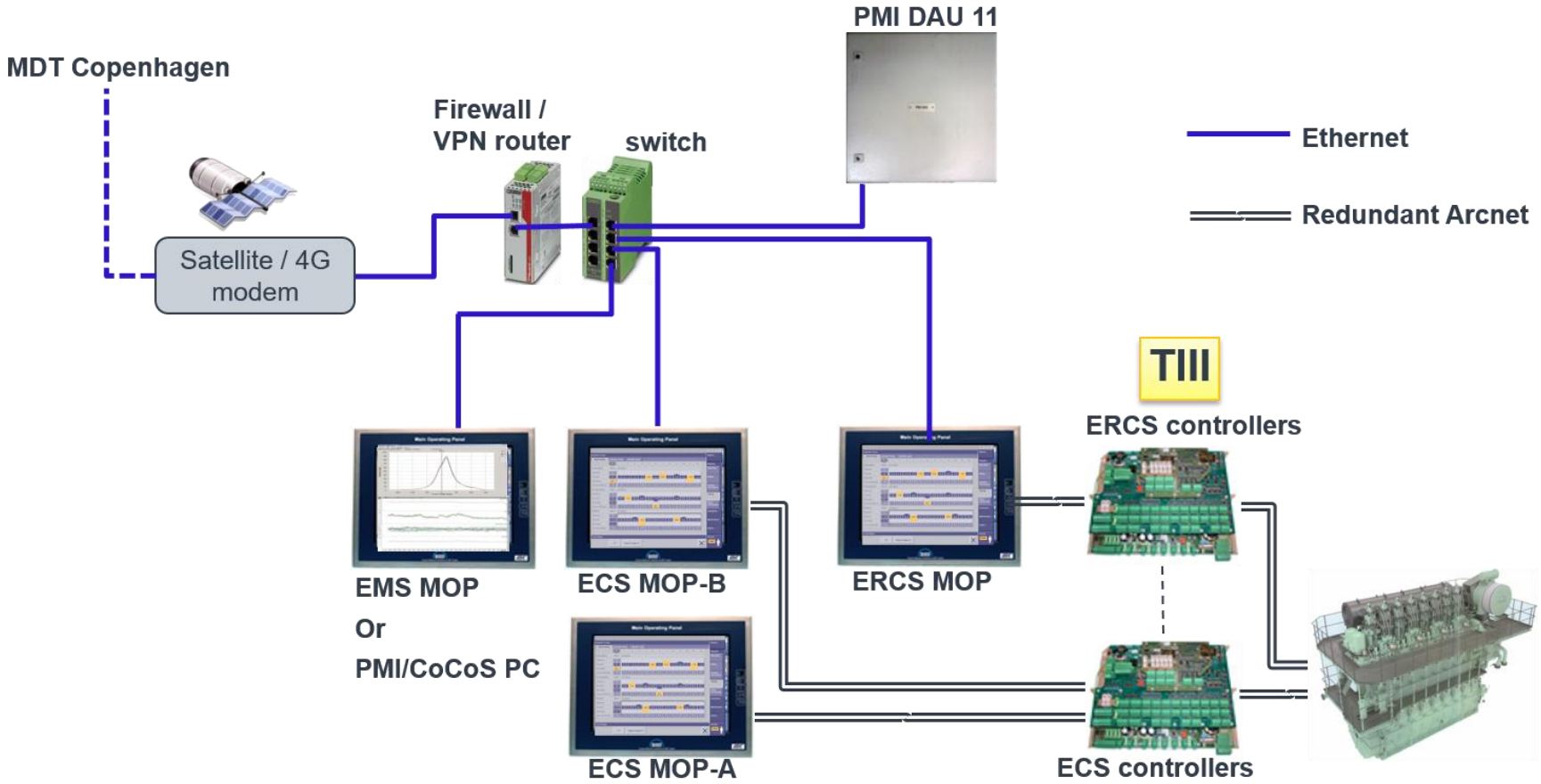
EMS user interface

- User interface for on-site configuration and trouble shooting - Handles (auto) configuration of CoCoS - EDS

- Integrated DatGat - to retrieve EMS data and ECS - spaf

EMS – Engine Management Services

Connections



EMS – Engine Management Services

Screen set - up

EMS – Engine Management Services

Data in EMS hard disk

Liner recorder:

– Al manual dumps

– Two hours average data of 30 days up to 200 lines

Trend:

– Seven days average data of five minutes

– 30 years long trend data of 24 hours

EMS – Engine Management Services

ECS software versions

EMS can currently be configured to exchange data with the following ECS versions:

- ME-ECS-SW-1304-2
- ME-ECS-SW-1312-1
- ME-ECS-SW-1312-2
- ME-ECS-SW-1312-3
- ME-ECS-SW-1312-4
- ME-ECS-SW-1312-5
- ME-ECS-SW-1312-7
- ME-ECS-SW-1506-1
- ME-ECS-SW-1601-2
- ME-ECS-SW-1601-3
- ME-ECS-SW-1603-1
- ME-ECS-SW-1603-2
- ME-ECS-SW-1603-3
- ME-ECS-SW-1609-1
- ME-ECS-SW-1609-2
- ME-ECS-SW-1609-3
- ME-ECS-SW-1609-4
- ME-B-ECS-SW-1403-1
- ME-B-ECS-SW-1403-2
- ME-B-ECS-SW-1403-3
- ME-B-ECS-SW-1403-4

EMS – Engine Management Services

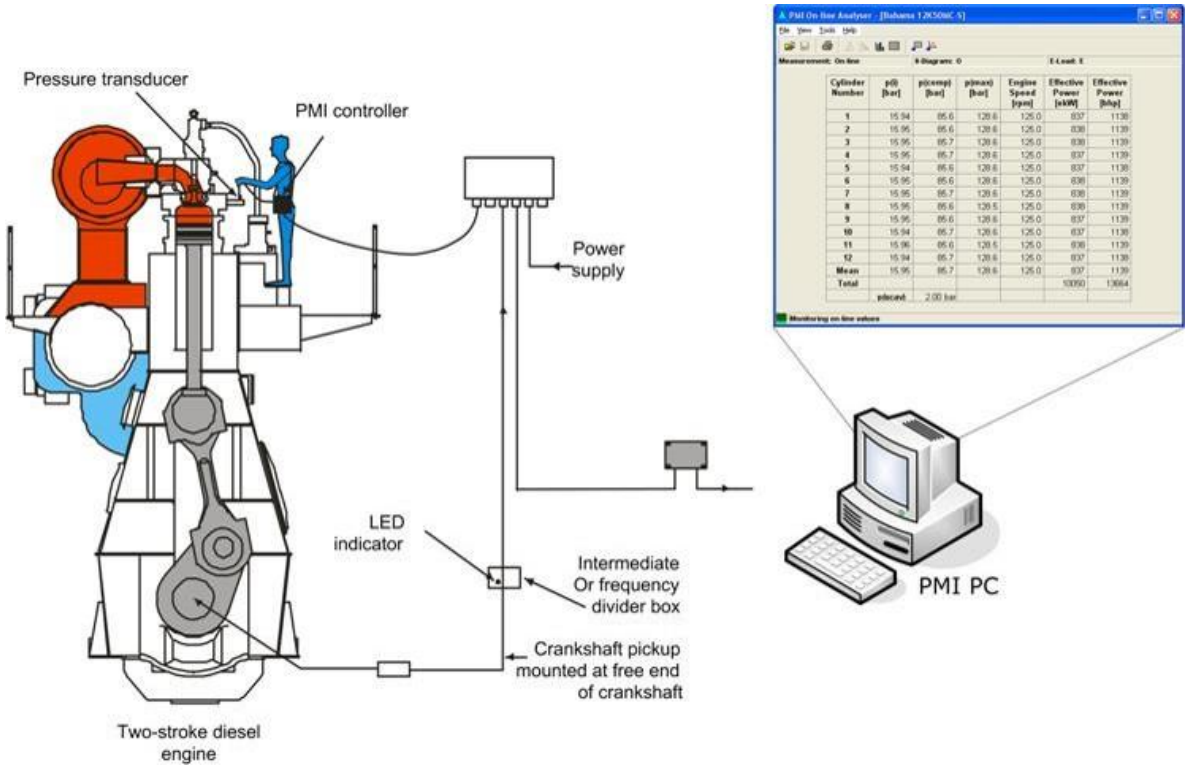
Agenda

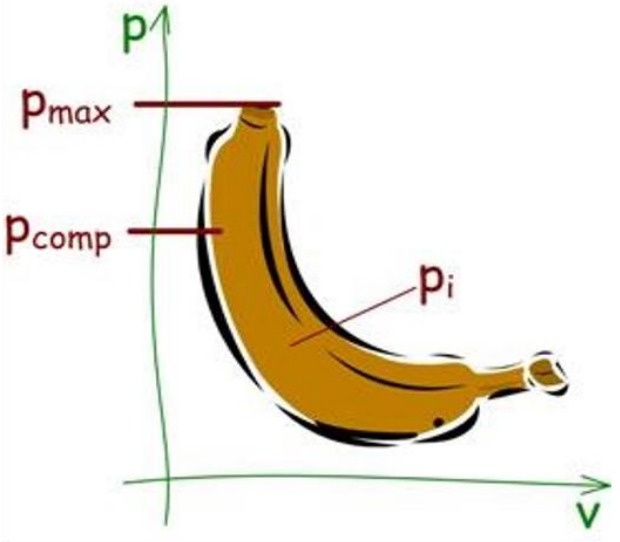
1 EMS – Engine Management Services

2 PMI – Pressure Measurement Instrument

EMS – Engine Management Services

PMI - Pressure Measurement Instrument





PMI is measuring cylinder pressures to determine a set of key values:
Pi, Pcomp, Pmax.
These key values for optimizing engine performance by adjusting parameters in the engine control system.

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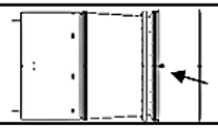
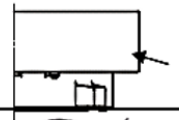
Technical file - NOx components

4. NOx Components marking

Example	Component and marking instruction Actual marking field for use during survey
	Component: **Cylinder liner** Marking instruction: 0742637-8 Actual marking:_____
	Component: **Piston crown** Marking instruction: 0742392-0 Actual marking: _____
	Component: **Cylinder cover** Marking instruction: 0742634-2 Actual marking: _____
	Component: **Compressor wheel** Marking instruction: From turbocharger manufacturer Actual marking:_____ (2 manufacturer dependent locations)
	Component: **Diffuser** Marking instruction: From turbocharger manufacturer Actual marking: _____
	Component: **Nozzle ring** Marking instruction: From turbocharger manufacturer Actual marking: _____

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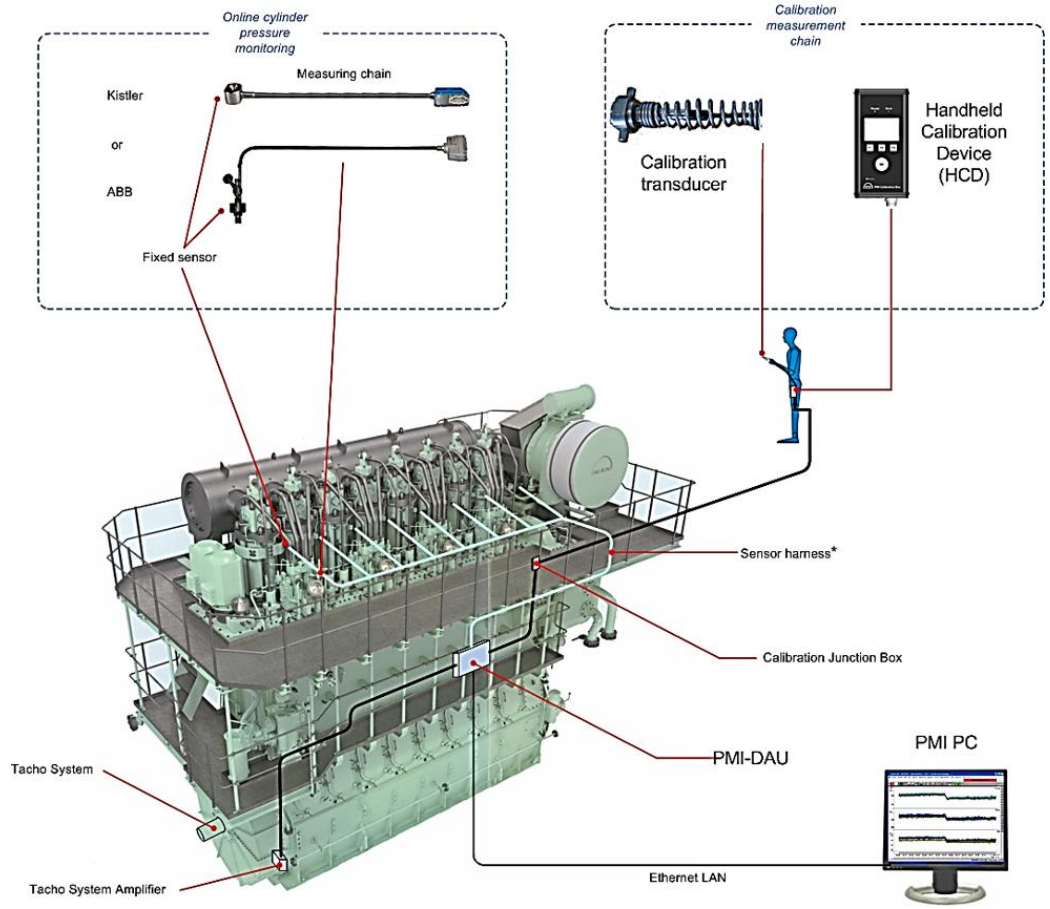
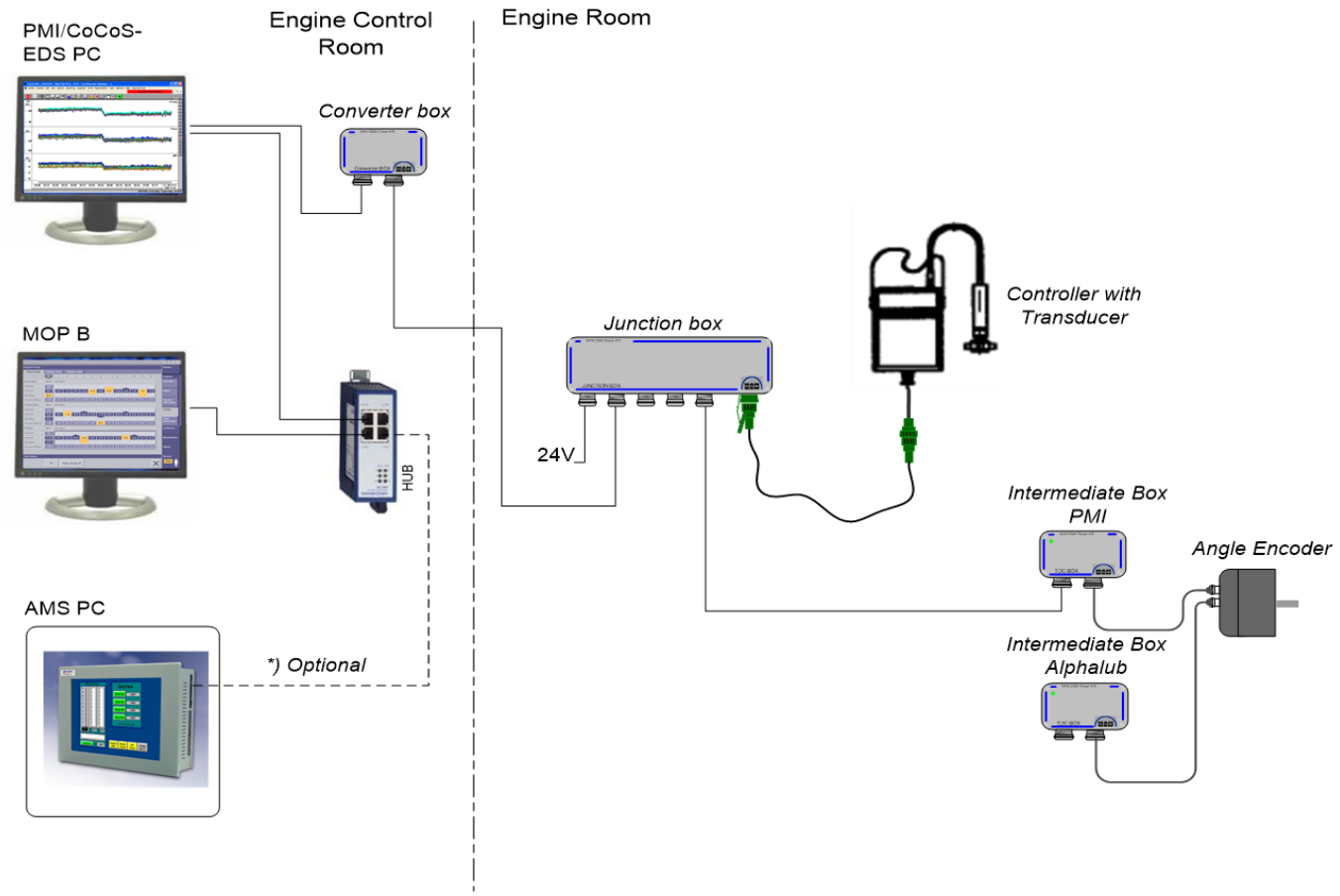
PMI - System design



EMS – Engine Management Services

PMI offline



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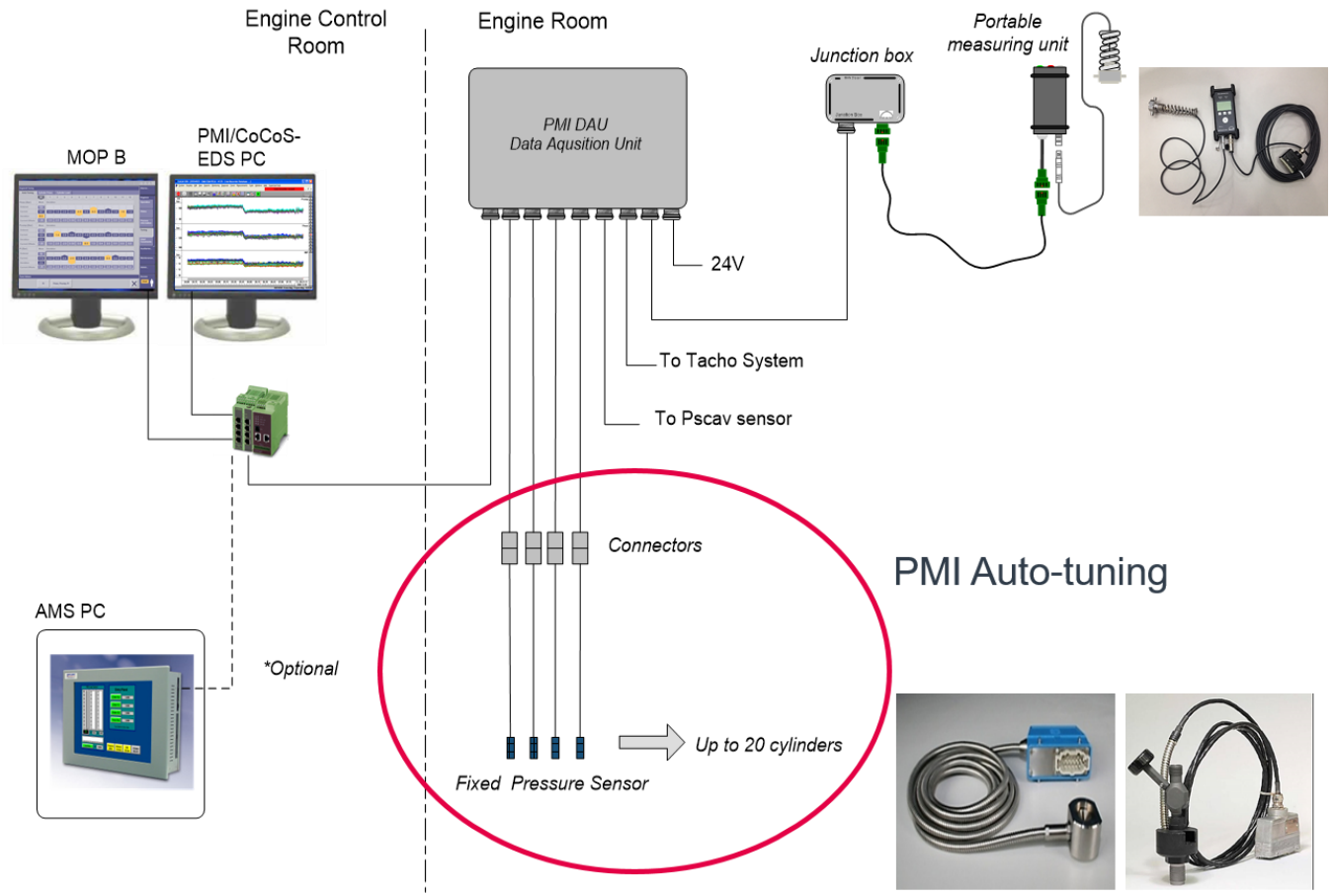
PMI online



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PMI - Portable transducer

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PMI - System & DAU

DAU:

Data Acquisition Unit based on FPGA technology

PMI Auto - tuning application:

Support for up to 12 cylinders
Support for ABB & Kistler sensors
Angle and time triggered data sampling
Real time data logging & transfer
On - unit status indication

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PMI - Pressure sensors

EMS – Engine Management Services

PMI - Pressure sensors

	Kistler	ABB
		
Estimated life time	+4 years	+10 years
Retail price	1	2
Sensor mounting	Between cyl cover & indicator cock	Outer end of indicator cock
Sensor technology	Piezoelectric based	Magnetoelastic based
Calibration / sensitivity (makers recommendation)	Sensitivity check on regular basis	Calibration not required
Indicator cock valve	Re-using existing	New valve included

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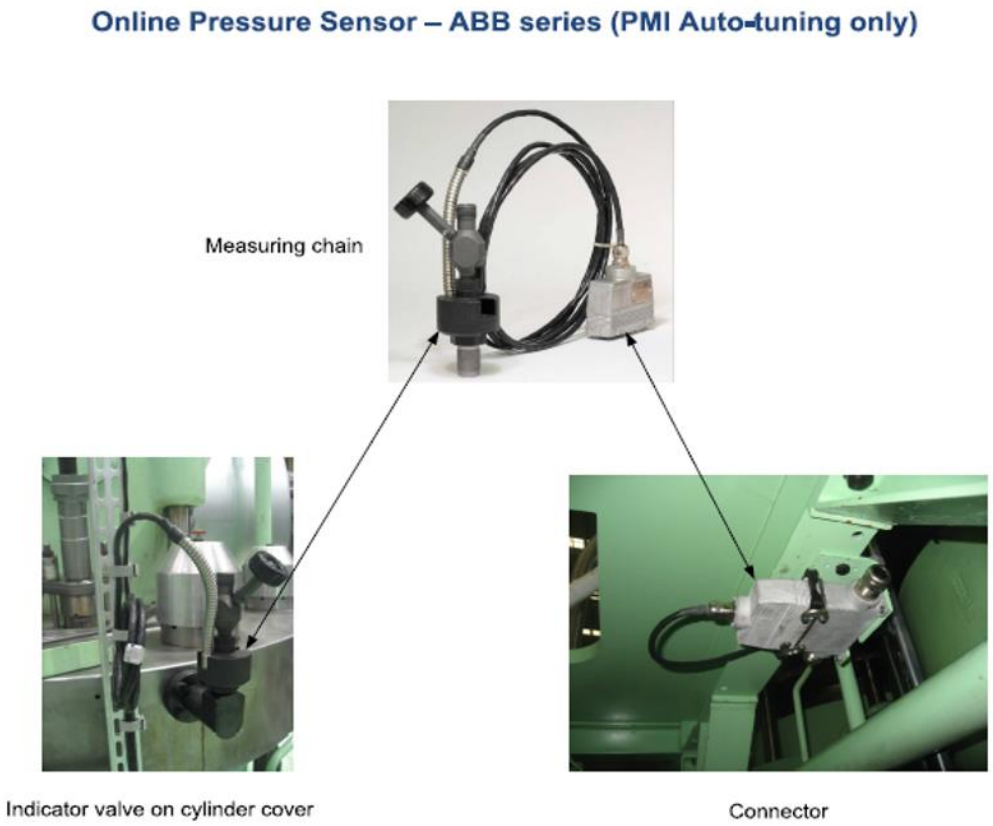
PMI - ABB sensors



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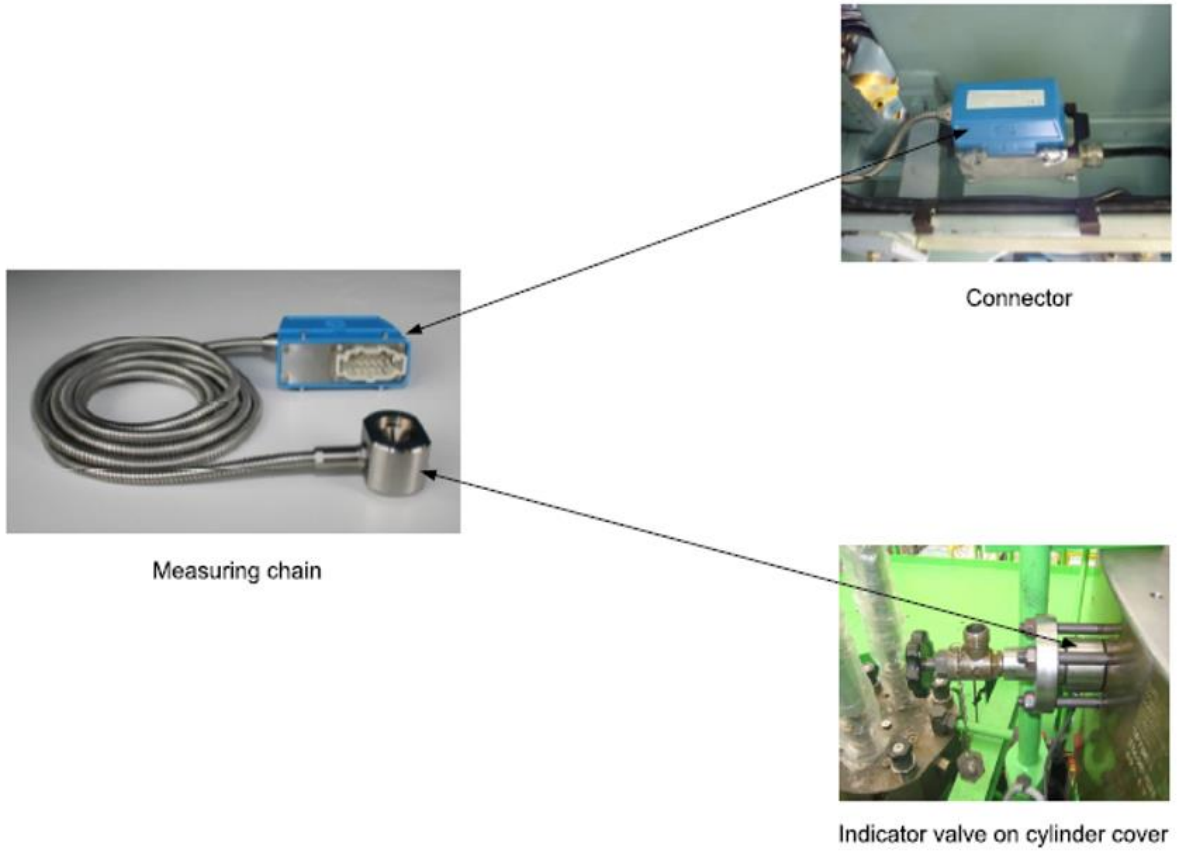
PMI - Kistler sensors



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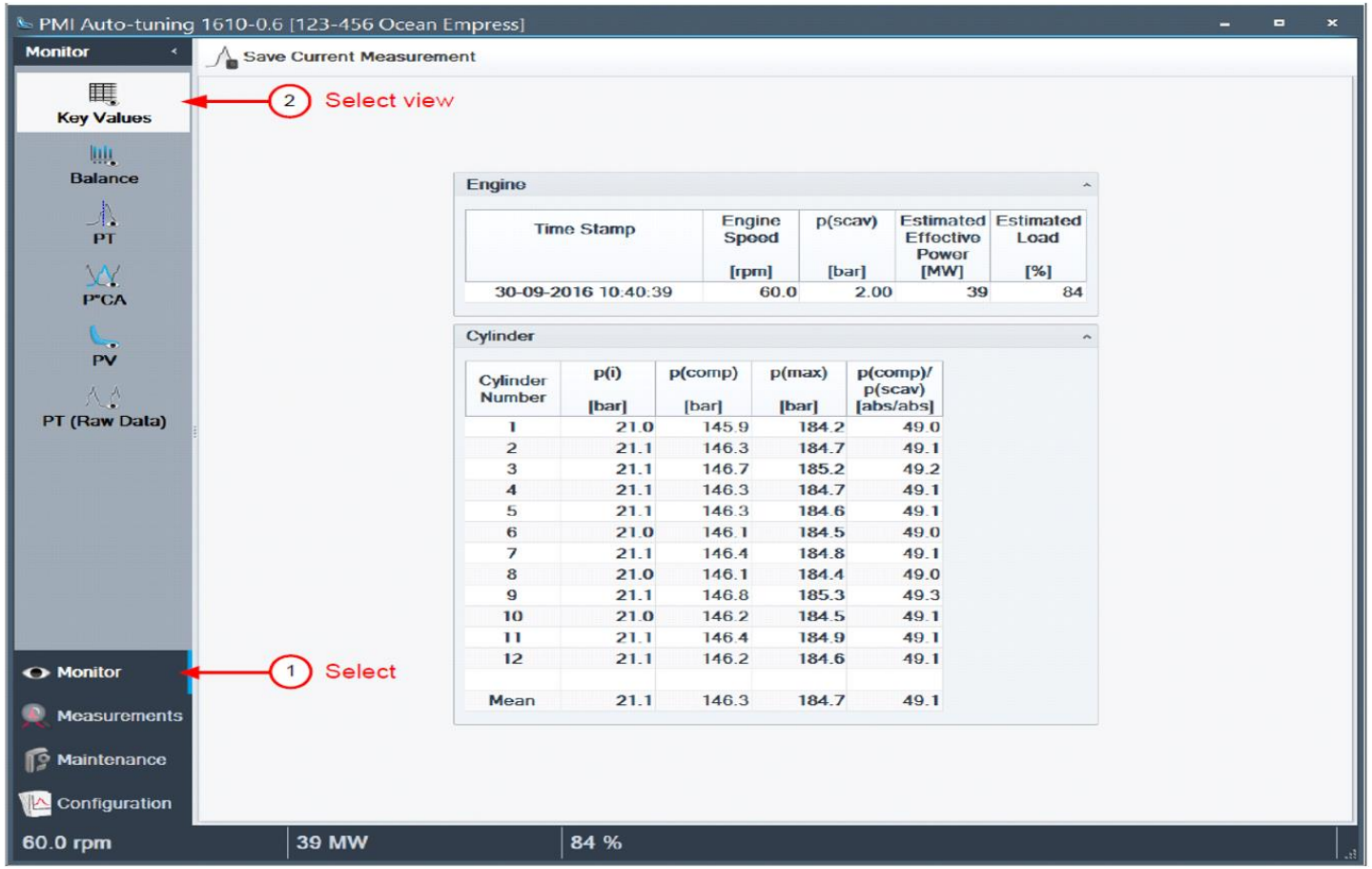
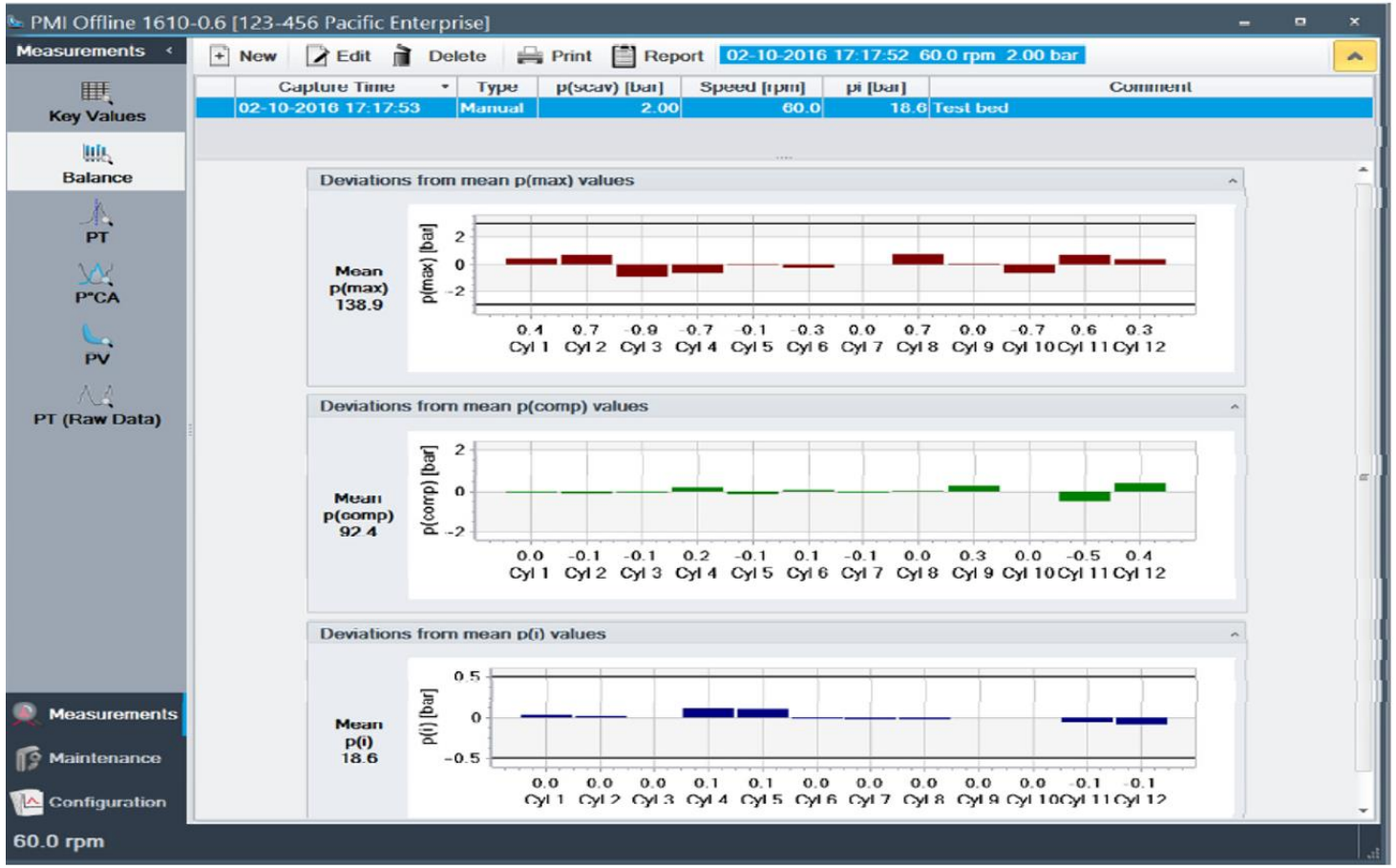
PMI - Displays



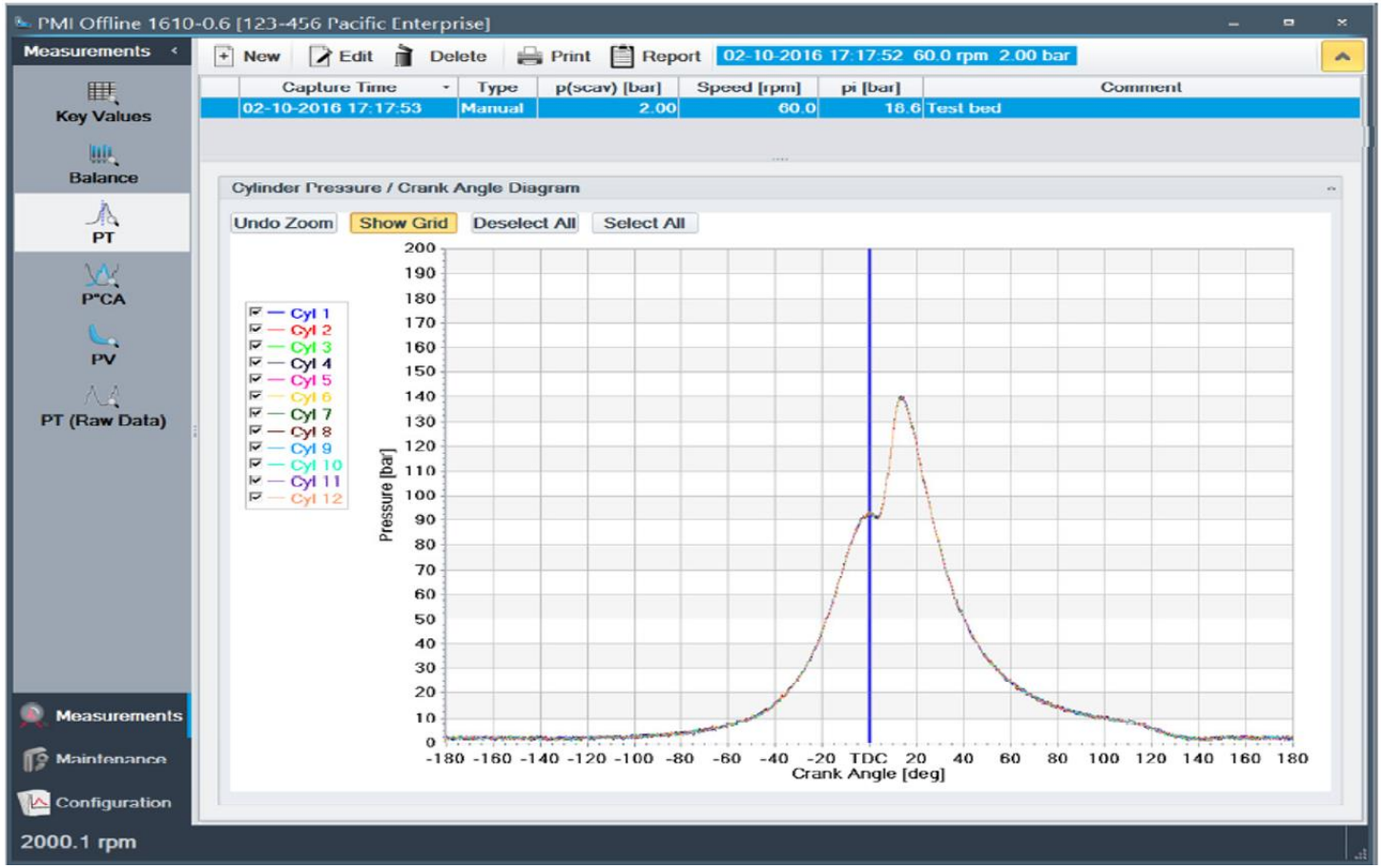
EMS – Engine Management Services

PMI - Displays



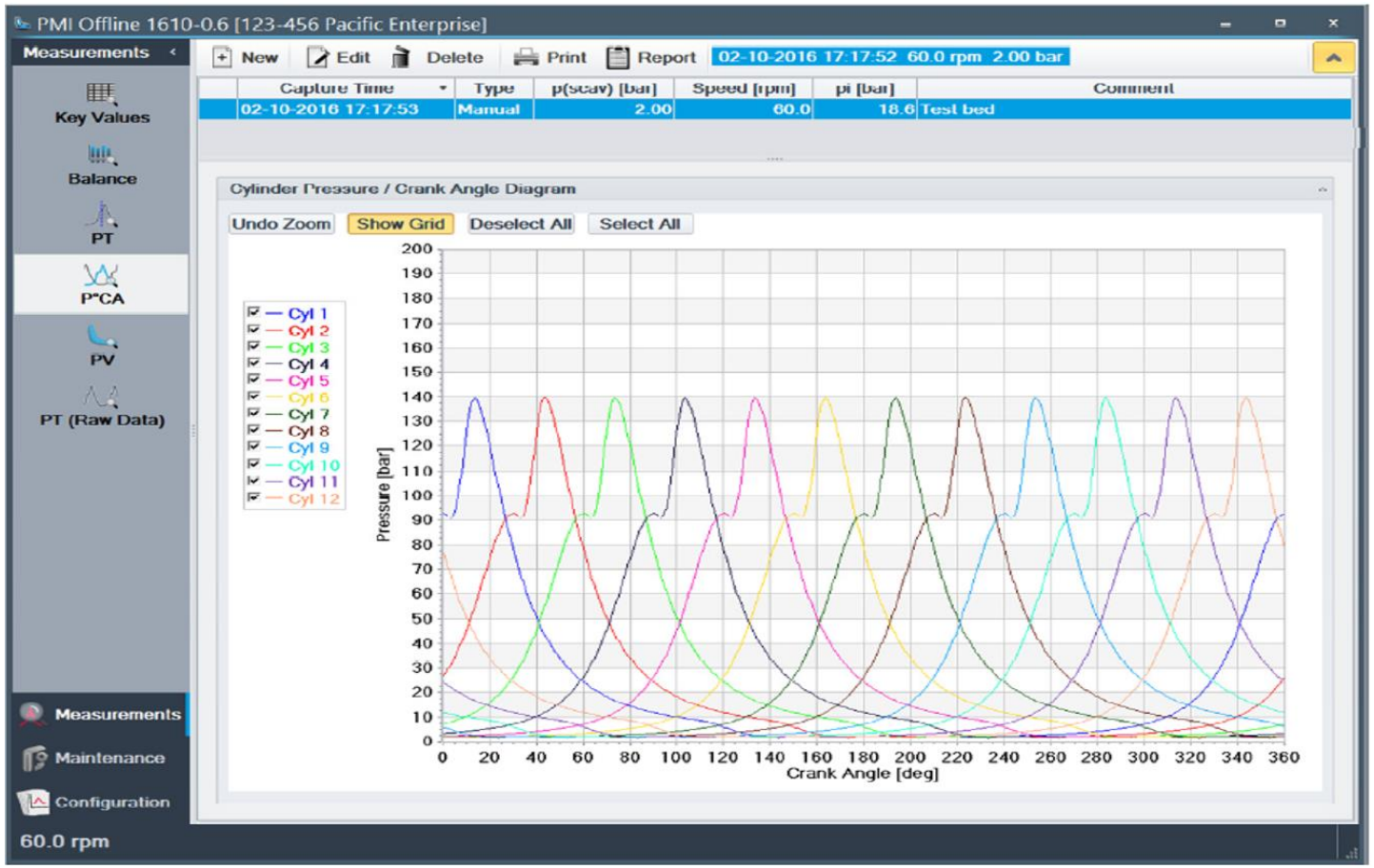
EMS – Engine Management Services

PMI - Displays



EMS – Engine Management Services

PMI - Displays



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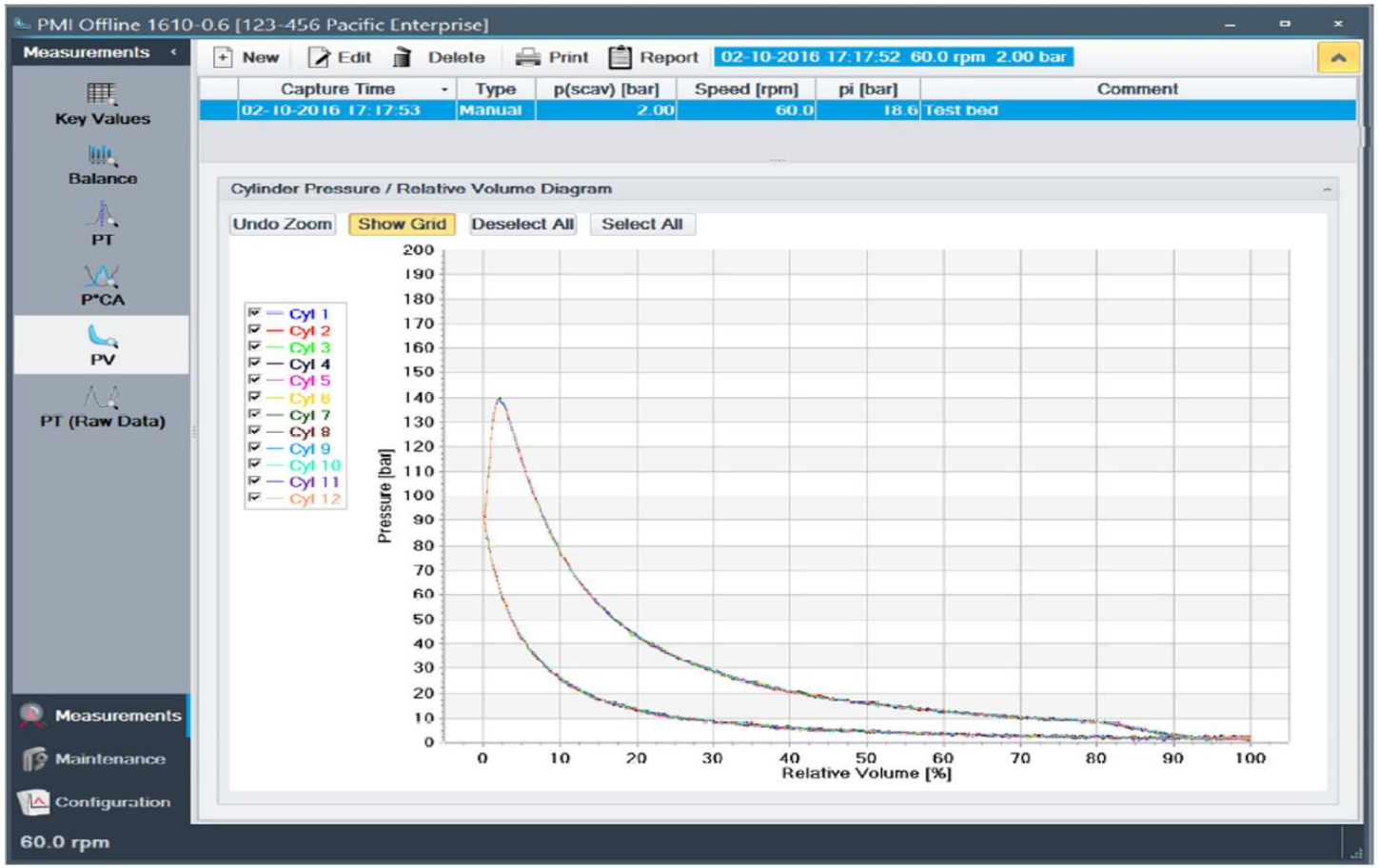
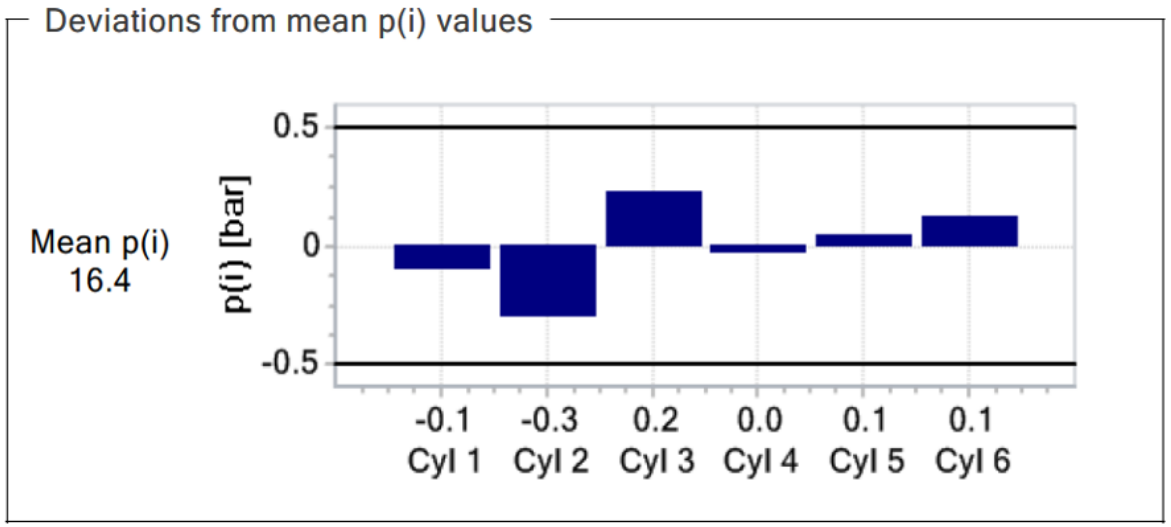
PMI - Displays



EMS – Engine Management Services

PMI - Balanced plot, Pi



*** Pi tuning:**

Offset (high) load

(0,3 / 16.4) x 100% = 1.8 %

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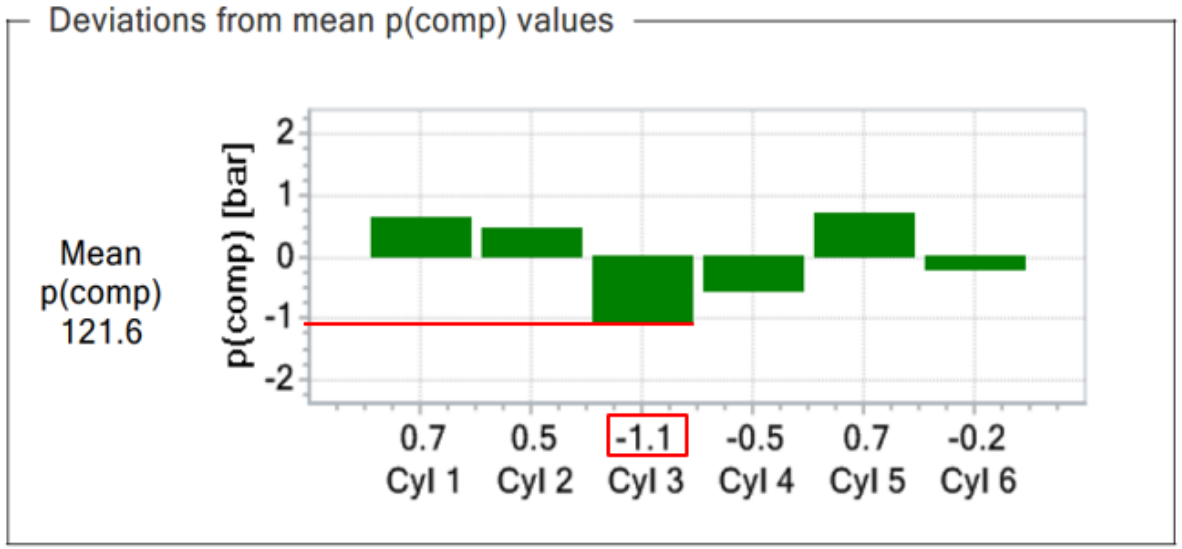
PMI - Balanced plot, Pcomp



*** Pcomp tuning is done by entering a compression ratio offset:**

Cratio=Pcomp / Pscav

Cratio= 1,1 / 3,52 = 0.31

(Reading from Pscav sensor is corrected to Absolute value by adding atmospheric pressure, one bar)

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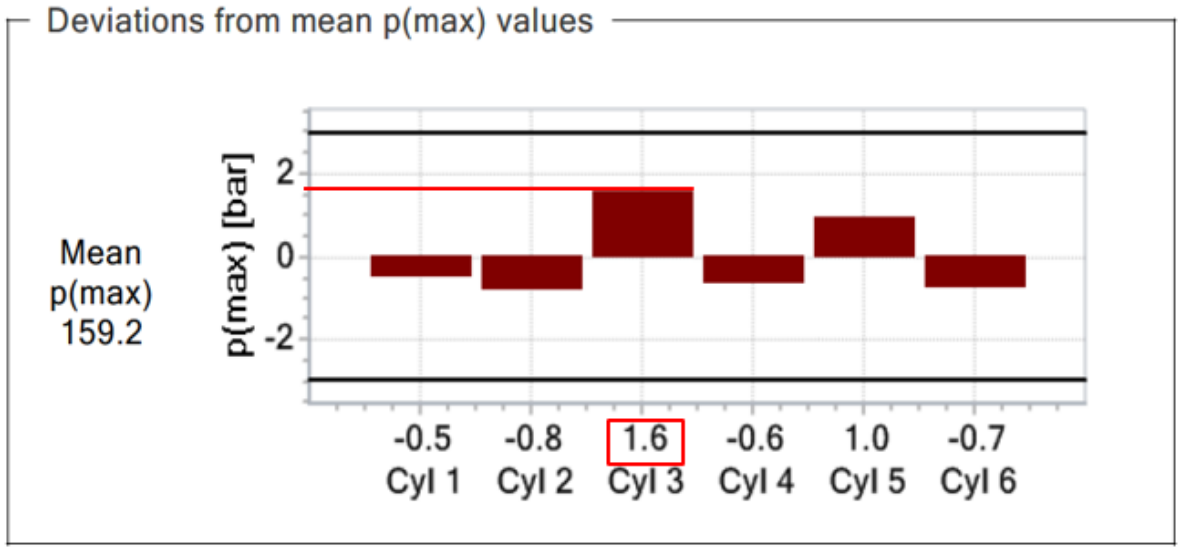
PMI - Balanced plot, Pmax



* Pmax tuning is done by entering an offset directly in bar

Pmax offset = - 1.6

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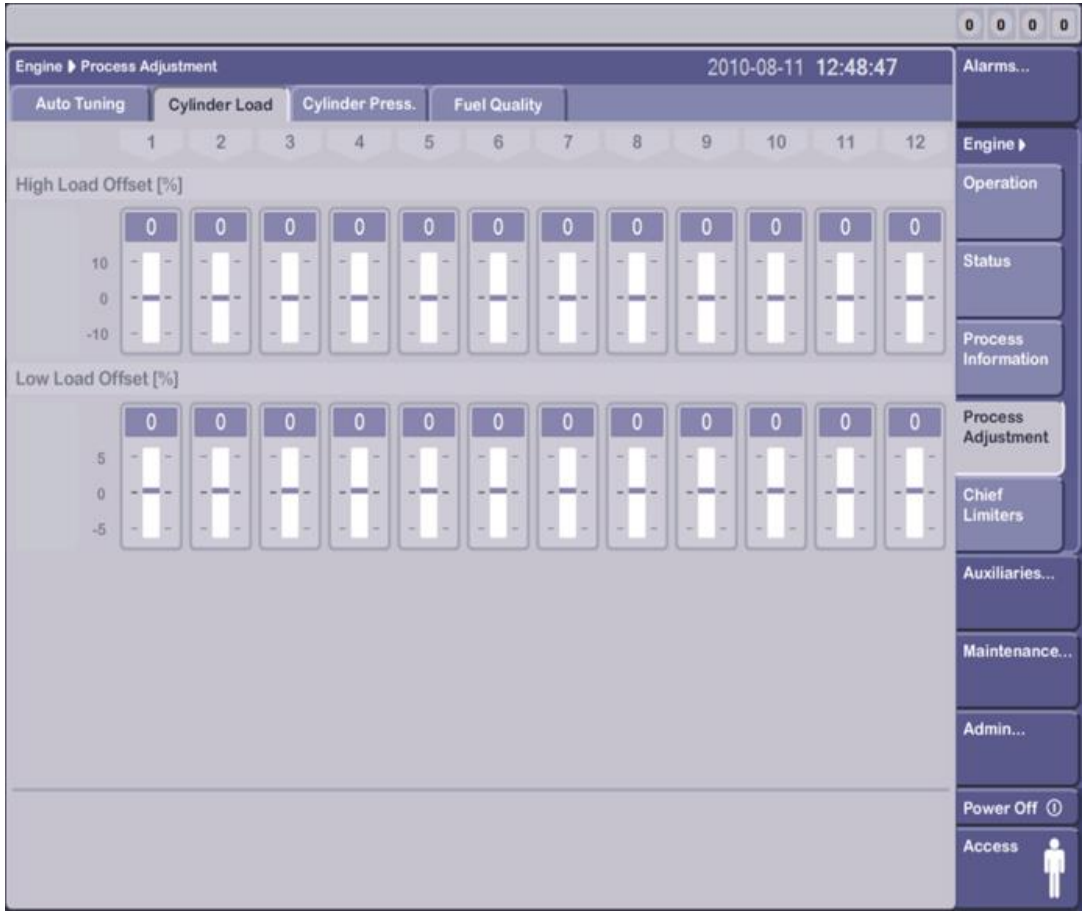
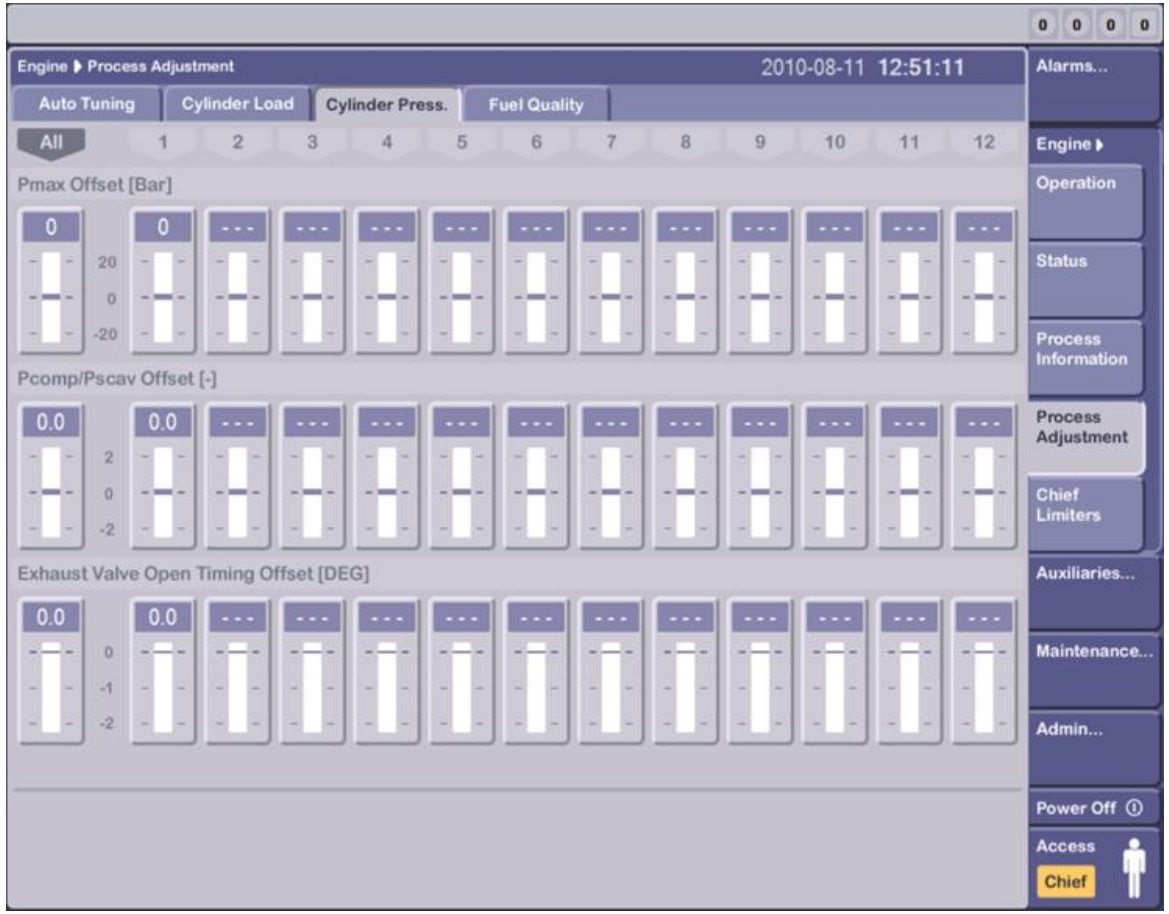
PMI - Manual adjustments





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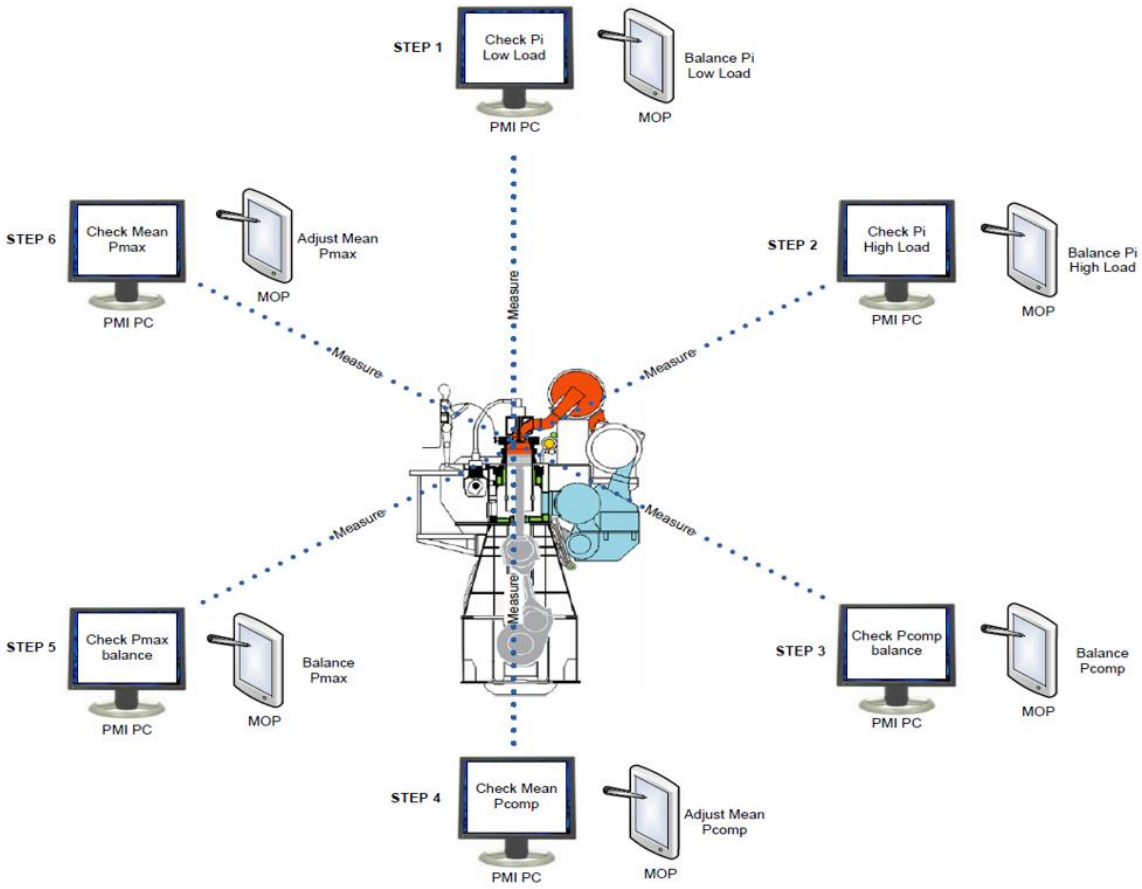
PMI - Auto tuning



EMS – Engine Management Services

PMI - Auto tuning

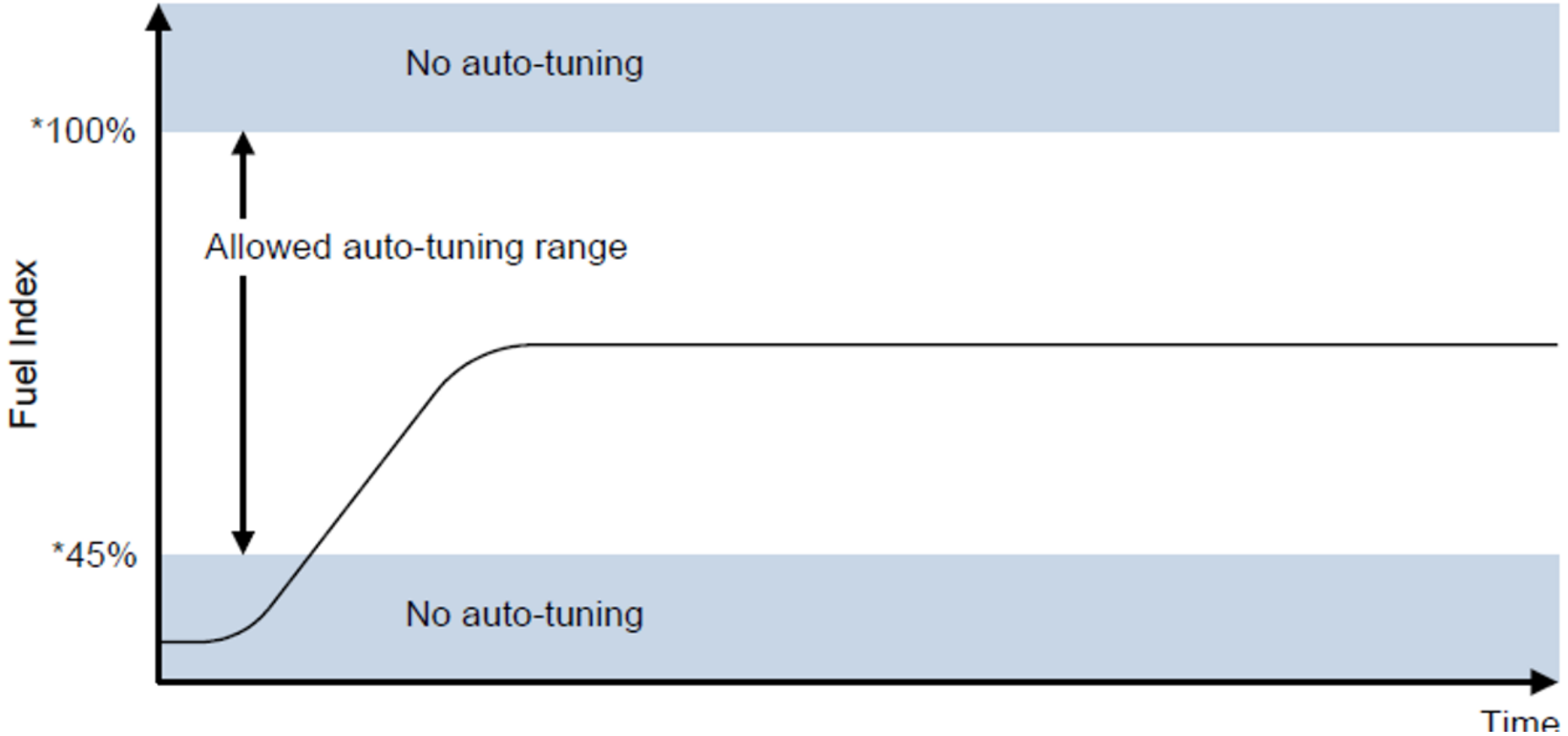
Based on estimated engine load

Measured by PMI online

Manually adjusted values

EMS – Engine Management Services

PMI - Auto tuning range



EMS – Engine Management Services

PMI - Thresholds

Threshold icon	P_{max} (bar)	P_{comp} (bar)	P_i (bar)
	>20	>20	>2
	3 to 20	3 to 20	0.5 to 2
	1 to 3	1 to 3	0.2 to 0.5
	-1 to 1	-1 to 1	-0.2 to 0.2
	-1 to -3	-1 to -3	-0.2 to -0.5
	-3 to -20	-3 to -20	-0.5 to -2
	< -20	< -20	<-2

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