A POSSIBILITY FOR ON-BOARD TRAINING FOR MARINE GAS TURBINE PERFORMANCE MONITORING AND DIAGNOSTICS

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A POSSIBILITY FOR ON-BOARD TRAINING FOR MARINE GAS TURBINE PERFORMANCE MONITORING AND DIAGNOSTICS

- Computer models and gas turbine performance training.
- The principles of gas turbine engine condition assessment and fault diagnosis.
- The visual interface of a model.
- A computer model for performance simulation and diagnostics.
  - Basics of gas turbine engine operation
  - Understanding the effects of malfunctions
- Further training aspects-conclusions
Computer models and gas turbine performance training

- Provide a means for effectively training
  - Demonstrate behavior of complicated systems
  - Effective use of training time

- Cover an extended range of operating conditions

- Provide values of physical quantities hard or impossible to observe physically

- Abnormal operation can be studied at no cost
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The principles of gas turbine engine condition assessment and fault diagnosis (1)

Schematic representation of the gas turbine process
The principles of gas turbine engine condition assessment and fault diagnosis (2)

Healthy System

Faulty system

The principles of DIAGNOSTICS
The principles of gas turbine engine condition assessment and fault diagnosis (3)

The gas turbine as an input-output system, for monitoring-diagnostic purposes
The principles of gas turbine engine condition assessment and fault diagnosis (4)

The process of gas turbine engine condition diagnosis

Principles:

- Define “healthy” and “faulty conditions”
- Specify observed variables and observable parameters
- Establish interrelation of condition and variables of parameters
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The visual interface of a model
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Basics of gas turbine engine operation (1)

Input for operational parameters
Basics of gas turbine engine operation (2)

Display of performance variables and parameters on an engine cut-out
Basics of gas turbine engine operation (3)

Interrelation of performance parameters

Output power versus ambient temperature for constant turbine inlet temperature (TIT)
Basics of gas turbine engine operation (4)

Operating points on compressor maps for twin spool marine gas turbine: a range of power outputs.
Basics of gas turbine engine operation (5)

Operating points on turbine maps for twin spool marine gas turbine: a range of power outputs.
Basics of gas turbine engine operation (6)

Operating line on compressor map for steady and transient operation
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Understanding the effects of malfunctions (1)

Choice of main components condition parameters

Introducing diagnostic quantities

Modification Factors

Use them for

- Simulating Faults
- Diagnostic Faults
Understanding the effects of malfunctions (2)

Introducing Component Condition Parameters
Understanding the effects of malfunctions (3)

Modification of compressor performance map for a 3% reduction in flow capacity.
Understanding the effects of malfunctions (4)

Example of fault signature
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Further Training Aspects

- **Self sufficiency of software**
  - Self understood interface
  - Interactivity
  - on-line help
  - batch processing
  - exporting capability, interaction with other widespread tools

- **Address people of difference backgrounds**
  - Information provided is complete

- **Accuracy sufficient for practiced use**
Conclusion

Gas Turbine Computer Models Offer great possibilities for training on all aspects of Gas Turbine operation, with particular usefulness when referring to operation with altered (deteriorated, faulty, damaged) components.