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兼顧船舶營運安全與效率 -執行面應考慮的因素

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簡報目錄

- ❑ 船舶維修保養管理
- ❑ 船舶能源效率管理
- ❑ 船舶資源管理(船舶安全管理)
- ❑ 船舶管理系統共通的需求與執行面應考慮的因素



Practical considerations on achieving safety and efficiency for Ship management

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(2015, 05, 05)

Outline

- ☐ **Maintenance and Repair Management**
- ☐ **Ship Energy Efficiency Management**
- ☐ **Vessel Resource Management**
- ☐ **Common requirements and practical considerations**

船舶維修保養管理

(Maintenance and Repair Management)

- ☐ Maintenance Scheduling by plan (PMS)
- ☐ Maintenance Scheduling by condition (CMS)
- ☐ Store and Spare parts management

Key issues in PMS

- ☐ Data base (equipments and spare parts)
- ☐ Search engine
- ☐ Work order, tables and maintenance reports
- ☐ User interface

Condition-based maintenance and operation

- ☐ Condition Monitoring
- ☐ Performance analysis
- ☐ Health condition analysis
- ☐ Fault diagnosis

CMS

- ☐ **Smart maintenance management system**
- ☐ **Technology of PMS + Condition monitoring**

Fundamental procedure for Condition Monitoring

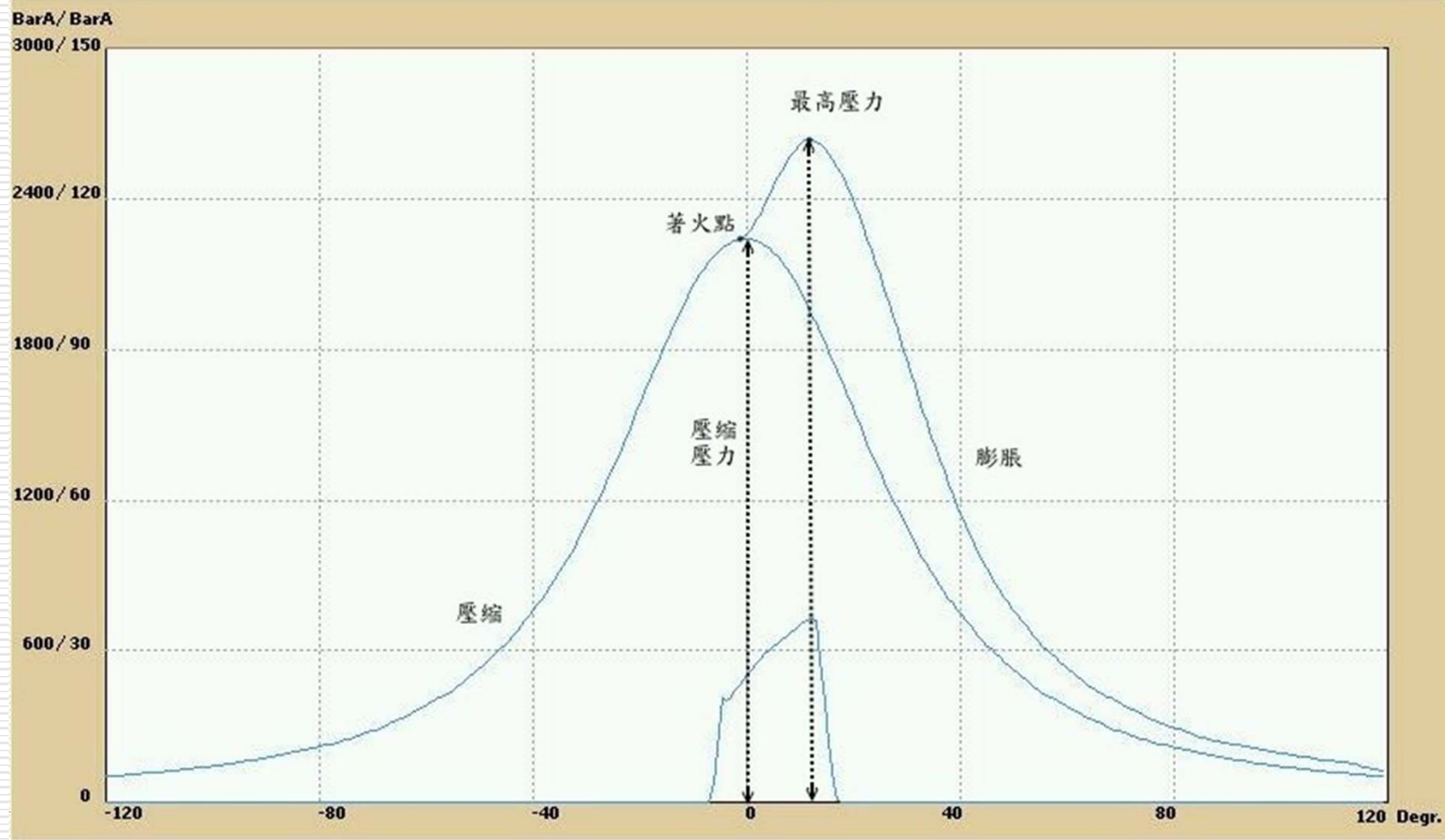
- ☐ Data collecting (DAQ)
- ☐ Feature extraction
- ☐ Pattern recognition (Classification)
- ☐ Decision

Examples of condition monitoring

- ☐ Vibration analysis (for rotating machinery, ...)
- ☐ P-theta diagram for each cylinder of ME
- ☐ Power-Speed diagram
- ☐ Piston ring monitor
- ☐ Torque meter for propelling load monitoring
- ☐ Thermographic can be used to indicate abnormal temperature site for early fault detection

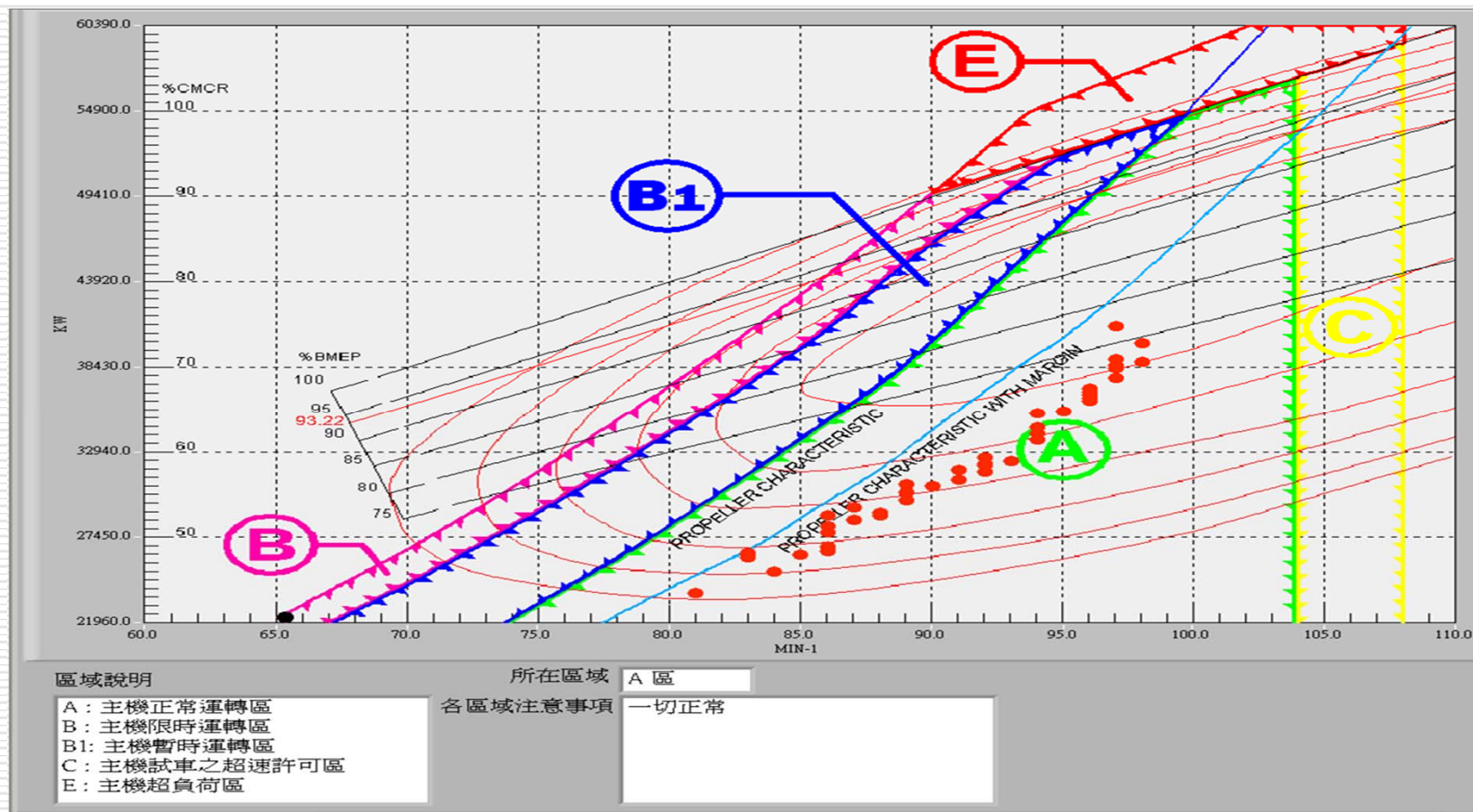
Cyl. Pressure / angle diagram

主機氣缸燃燒性能監視



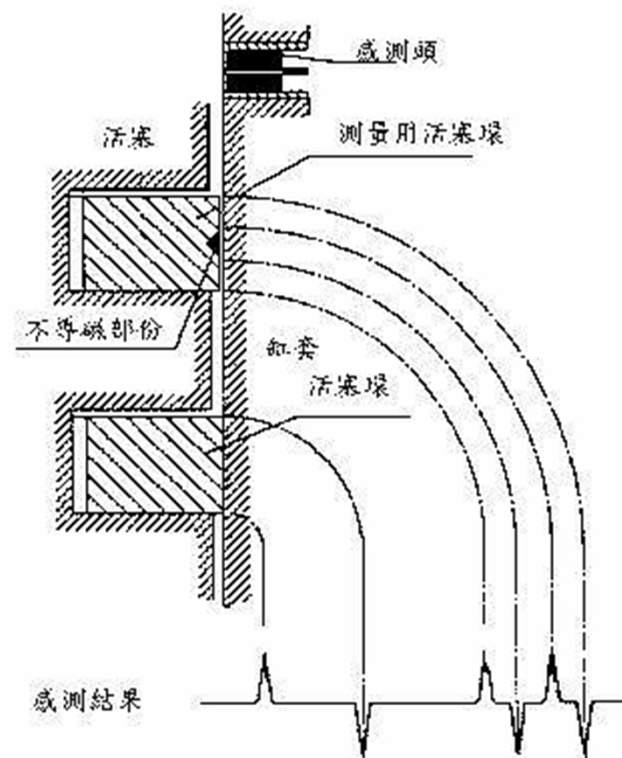
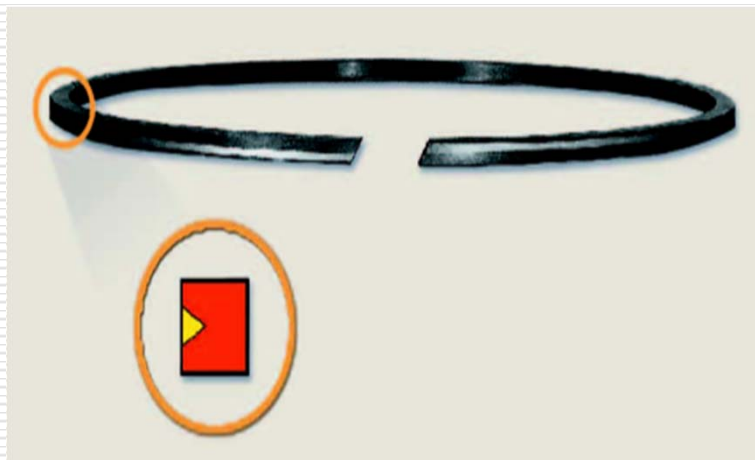
Power /Speed diagram

主機工作點監視(功率/轉速)

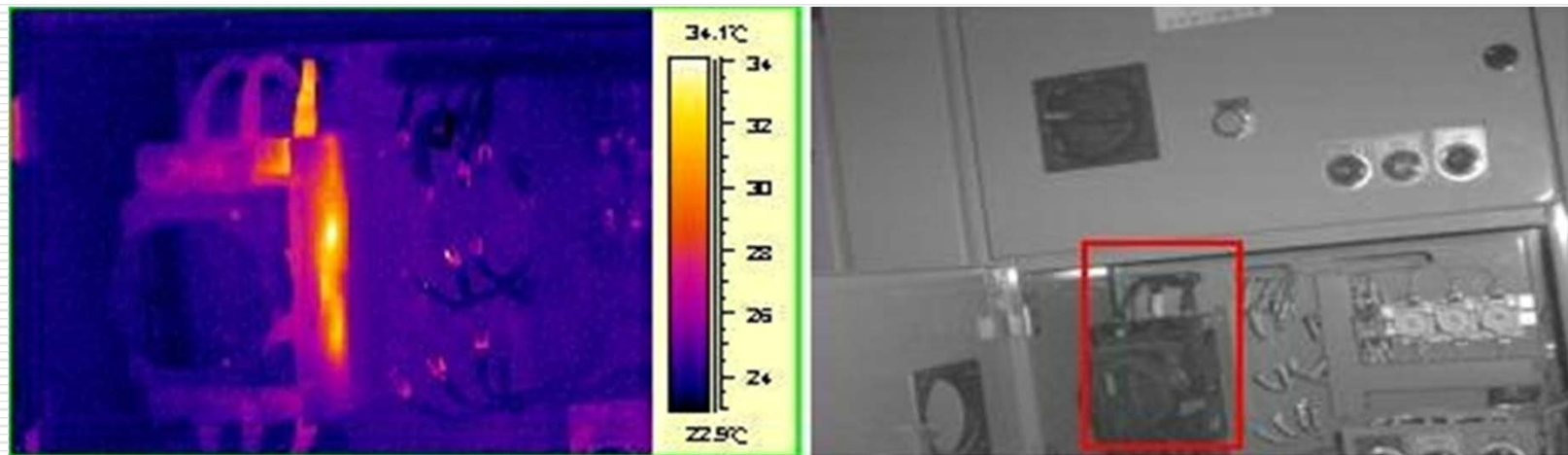


Piston ring monitor

主機活塞環監測裝置



Thermographic image



配電盤

異常 :開關內部

異常

How to construct condition monitoring schemes for existing ship ?

- ☐ Through engine monitoring system (via data mining)
- ☐ Through Integrated Control and Monitoring System (ICMS)
- ☐ Handheld monitoring scheme

Comments to condition-based maintenance system (CMS)

- ❑ PMS and CMS are complementary
- ❑ KPIs extract from Performance analysis is also helpful to health monitoring as well as fault diagnosis
- ❑ Reliability of sensor is important !
condition monitoring is failed when specific sensor is failed, unless software redundancy is included to rebuild the monitored condition

船舶能源效率管理

(Ship Energy Efficiency Management)

- ☐ Ship Energy Efficiency evaluation
(eg. EEOI)
- ☐ Performance check, condition check
- ☐ Interact with Ship Energy Efficiency Management Plan (SEEMP)

EEOI monitoring

□ Daily EEOI

$$\text{EEOI} = \frac{\sum_j FC_j \times C_{Fj}}{m_{\text{cargo}} \times D}$$

□ Voyage EEOI

$$\text{Average EEOI} = \frac{\sum_i \sum_j (FC_{ij} \times C_{Fj})}{\sum_i (m_{\text{cargo},i} \times D_i)}$$

EEOI monitoring (continue)

- ☐ **Fuel consumption rate is important on calculating EEOI**
- ☐ **Mass flow meter can be considered for more accurate fuel consumption measurement**

Fundamental procedure in SEEMP

- ☐ Planning
- ☐ Implementation
- ☐ Monitoring
- ☐ Self evaluation and Improvement

Comments to implement SEEMP

- ☐ SEEMP is becoming a standard procedure to maintain ship energy efficiency (paper work?)
- ☐ EEOI is only a rough indicator to ship energy efficiency

Comments to implement SEEMP

- ☐ More specific KPIs are required to indicate actual cause which is responsible for degraded energy efficiency, so that useful improvement can thus be made to restore ship energy efficiency
- ☐ Condition monitoring is helpful to accomplish SEEMP

船舶資源管理

(Vessel Resource Management)

- ❑ Vessel Resource Management (VRM) is also known as Maritime Resource Management (MRM)
- ❑ It contains the trainings of Bridge Resource Management (BRM) and Engine-room Resource Management (ERM)
- ❑ In addition to training, resource management is deserved to realize actively

Objectives of VRM

- ❑ to motivate the team to change its behavior to good resource management practices during everyday operations
- ❑ An overall objective is to increase safety, efficiency and job satisfaction in shipping companies
- ❑ Important issues including Leadership and Teamwork, Situation awareness, risk assessment and risk management, crisis management

Objectives of VRM (continue)

- ❑ Condition monitoring and fault diagnosis will help personnel on vessel to a better **situation awareness**
- ❑ Check-list and Standard Operation Procedure (SOP) also help peoples who carry out **crisis management**

Practical considerations for building Ship management system

- ❑ **How to choose a proper information management scheme to assist managing ship efficiently ?**
如何選擇適用的資訊管理方案來協助船舶作有效率的管理？
- ❑ **Choose to build your own management system or purchase professionally designed software ?**
系統要自己建置還是使用專業設計的軟體？
- ❑ **What level the user-friendliness of software interface is ?** 使用界面的親和度如何？
- ❑ **Is it worth the cost to build up the system ?**
建置的花費是否值得？

Practical considerations for building Ship management system

- How long does it take for the training of software operation ? 軟體的操作訓練期需要多久？
- What do we need to prepare and adjust if we decide to set up the system ?
如果決定要建置，公司需要有那些準備及配合的工作？
- How do we take good care and enhance the operation efficiency of our ships by this management system ?
如何藉由管理系統來顧好我們船舶的安全，進而提升船舶的營運效率？

Summary

- ❑ Safety and efficiency are common goals to MRM, SEEM and VRM
- ❑ Performance analysis, health condition analysis, condition monitoring are common technology to accomplish MRM, SEEM and VRM
- ❑ Environment for monitoring is easier to accomplish for new building ship, specification should be carefully survey and determined for Safety and efficiency consideration
- ❑ Investment is needed to enhance safety and efficiency



**Thank you very much for
your attention !**