



Energy Efficiency for Ships

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Jakarta

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5th Maritime Indonesia

IMO Strategy for CO2 Emission Mitigation

Entered into force 1 Jan 2013

Technical Measures

EEDI

MARPOL Annex VI Energy Efficiency Regulations

Operational Measures

SEEMP

MARPOL Annex VI Energy Efficiency Regulations

Market Based Measure

?

3 main competing concepts:

- Emission trading scheme
- Bunker levy
- Efficiency incentive scheme

“in-sector or out-of-sector”

Energy efficiency

Strategies:

- Energy efficiency through design
- Energy efficiency through operations
- Incentives: carbon emission pricing
- Adoption of Innovative technologies

MARPOL Annex VI
EEDI

MARPOL Annex VI
SEEMP

IMO Market Based
Measure (MBM)

Energy efficiency through design

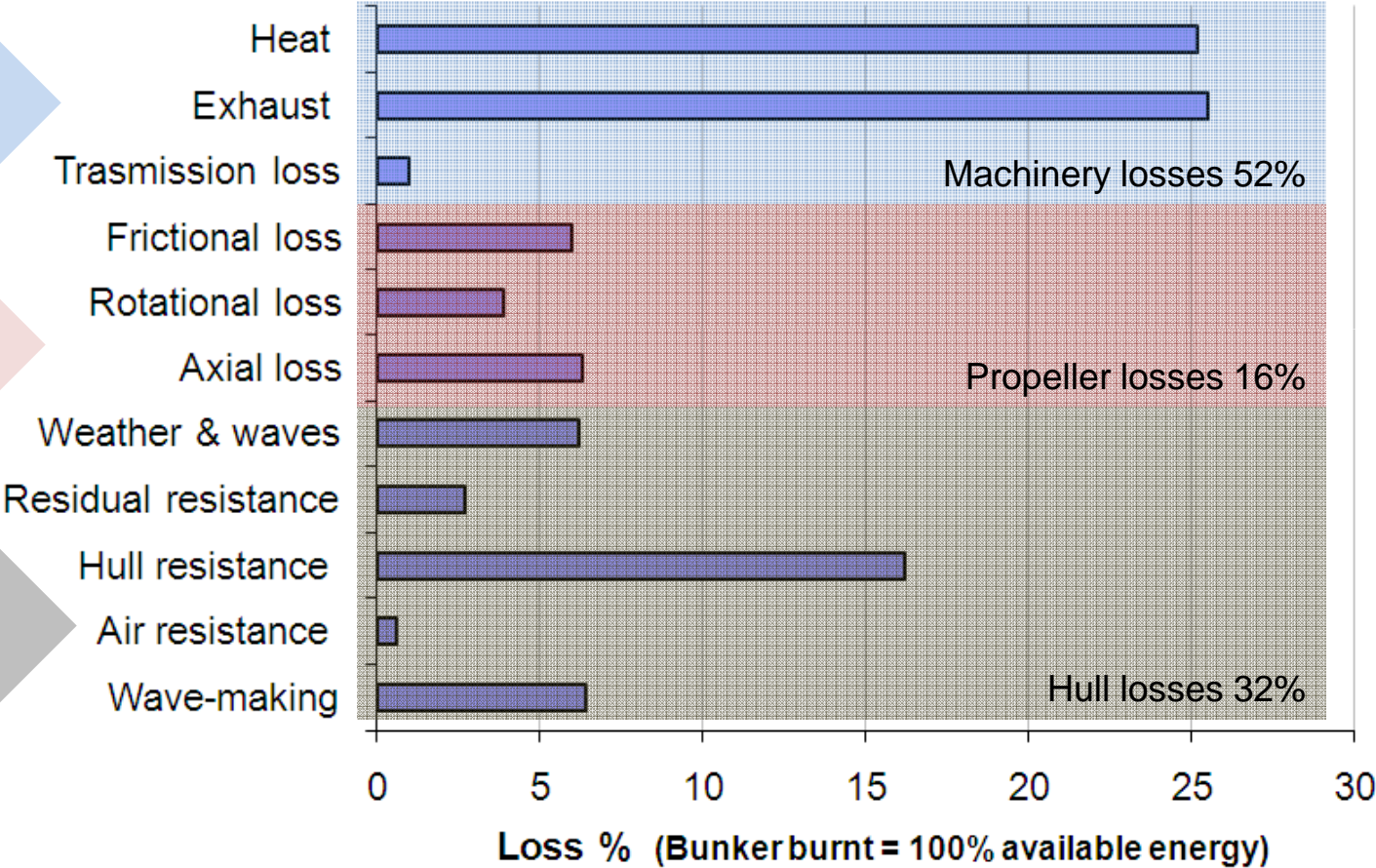
Reduce energy losses

Identify Energy losses

- Waste heat recovery system
- Organic Rankin cycle

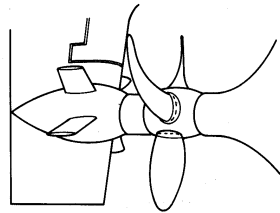
- Propeller energy-saving devices: PBCF; Mewis duct; contra-rotating propellers

- Hull optimization
- Reduce skin friction resistance: LSE coating; air lubrication

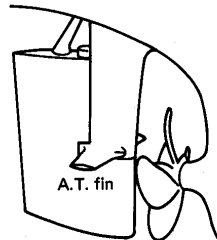


Source: IMO 2nd GHG Study: distribution of energy losses for a tanker in BF6

Some devices for improving propeller efficiency



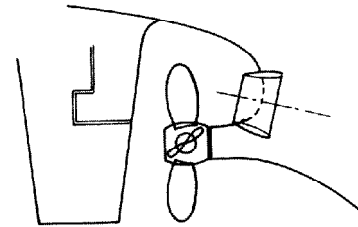
**Kawasaki
Rudder-bulb fins**



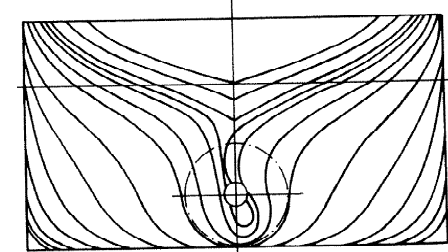
**IHI Additional
Thrusting Fins**



Mewis duct



equalizing duct



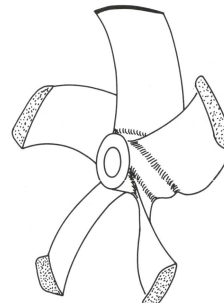
Asymmetrical stern



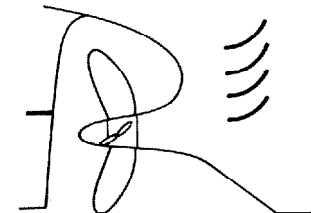
**Mitsui OSK
Propeller boss
cap fins**



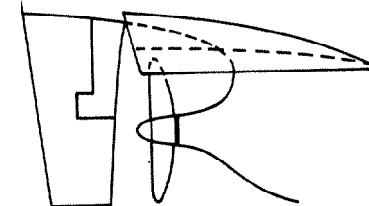
Stern flap



**Contracted & Loaded
Tip (CLT) propellers**



Gruthues spoilers



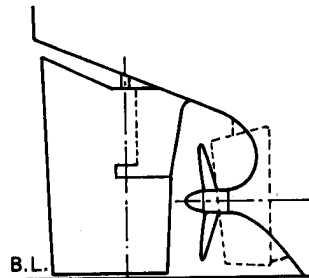
Stern tunnel



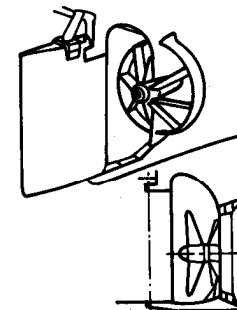
**Modern contra
rotating propellers**



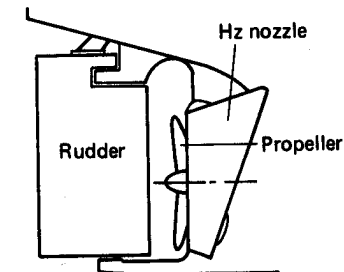
Grim wheel



**Mitsui integrated
ducted propeller**



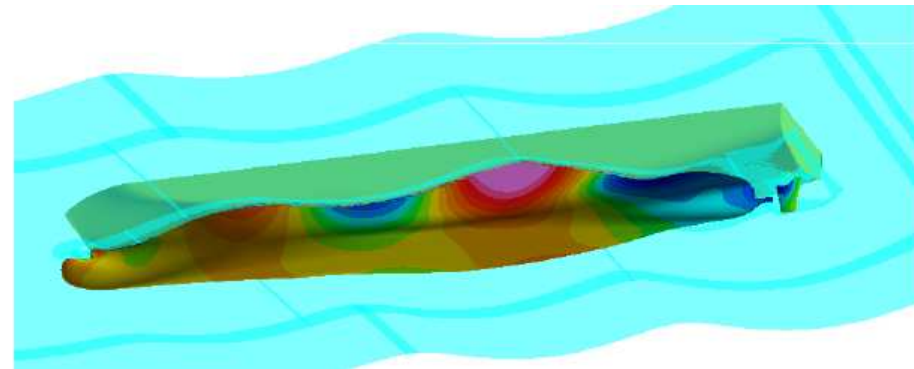
**Takekuma
Reaction fins**



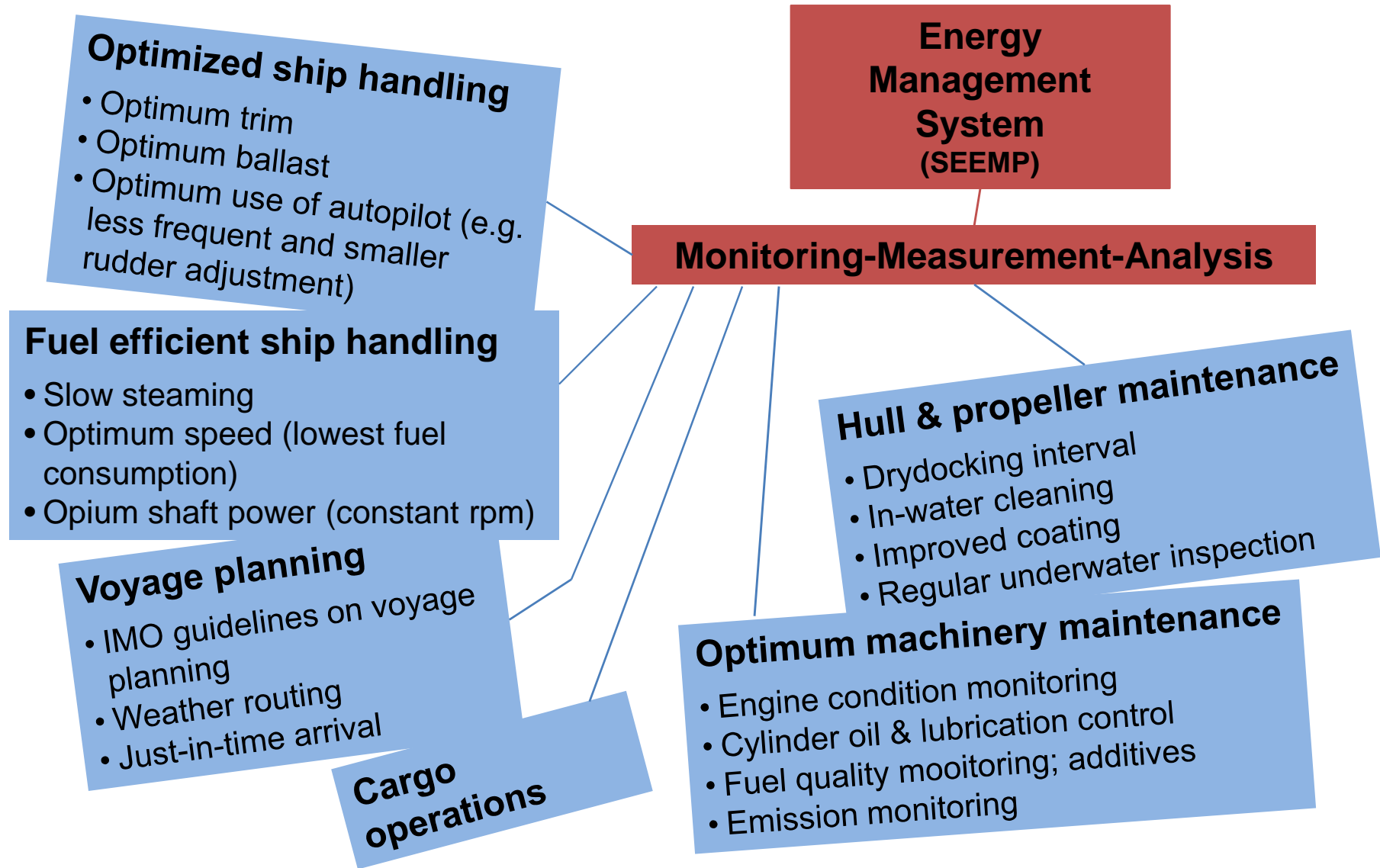
Hitachi Zosen nozzle

Improving design practices...

- **Hull form**, optimized for a range of operational drafts and sea states
- **Propeller**, improved design methodology – considering propeller-rudder interactions and operating profile
- **Engine**, improved engine technology: electronic control; variable-nozzle turbochargers; longer stroke....spread fuel efficiency across wider operating load range
- Twin-screw? Higher propulsive efficiency at expense of first cost
- Other...



Energy efficiency through operations



SEEMP – the 3 critical elements

Evaluation of current practices

- Energy performance indicator (EEOI?)
- Energy performance base line



Select energy-saving measures that suits the operation

- Target major energy consumers
- Low hanging fruits

Scheme for measurement, monitoring & analysis

- Measure fuel consumption accurately
- Analyze, review performance

Next stage of improvement



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