Gemilerde Enerji Verimliliği ve Enerji Operasyon Planları

Prof.Dr.Mustafa İnsel

5-4-2016

İstanbul ve Marmara, Ege, Akdeniz, Karadeniz Bölgeleri
DENİZ TİCARET ODASI

Tanım

- Gemilerde Enerji Verimliliği Gereksinimi ?
- Mevzuat
- Dizayn
- Operasyon
  - Operasyon
  - Bakım-Tutum-Modernizasyon
- MRV : İzleme, Raporlama, Doğrulama

Gereksinim

Gemilerde Enerji Verimliliği
ve
Enerji Operasyon Planları

İstanbul ve Marmara, Ege, Akdeniz, Karadeniz Bölgeleri
DENİZ TİCARET ODASI

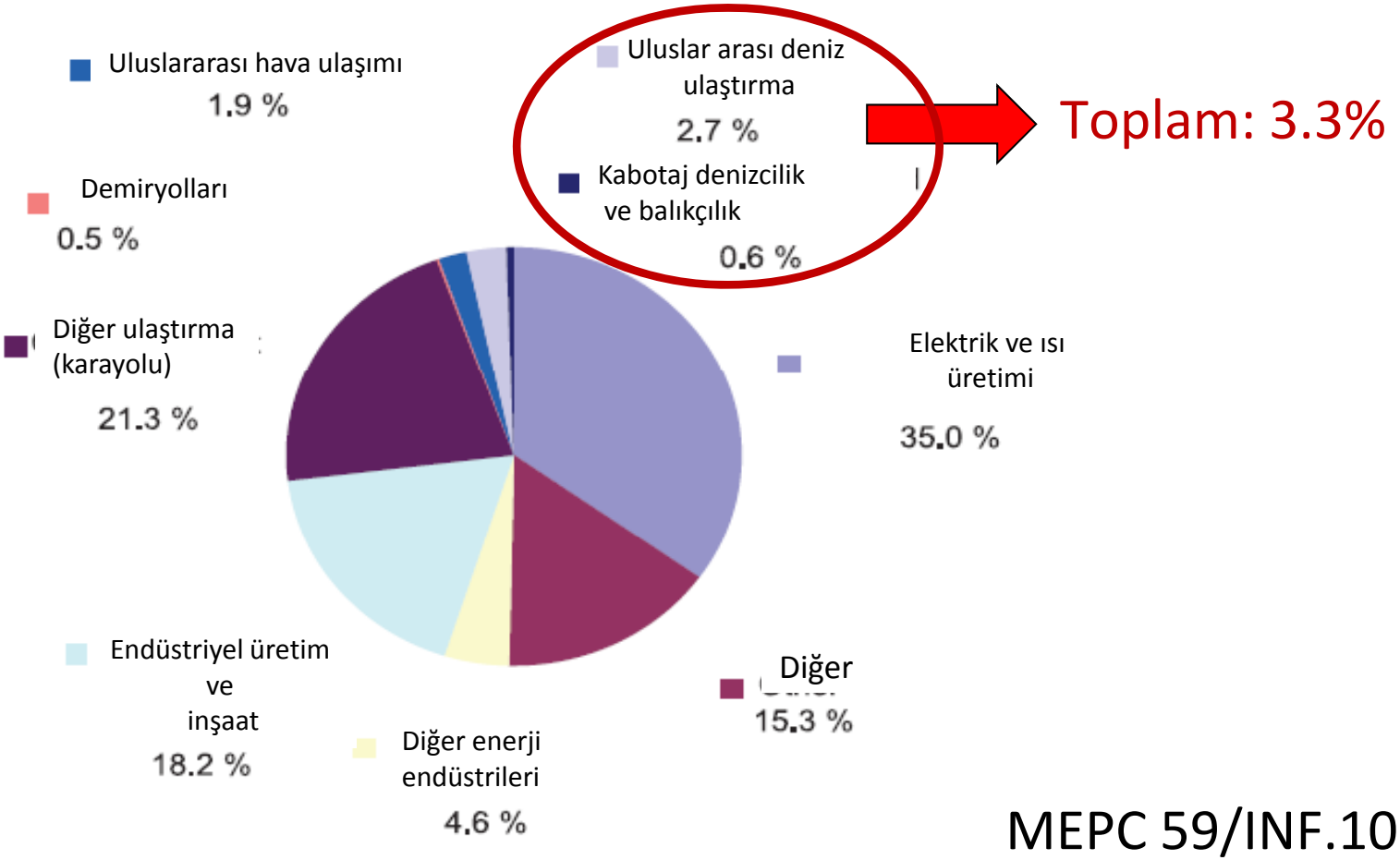
Dünyadan Manzaralar

İstanbuldan Manzaralar

İstanbuldan Manzaralar

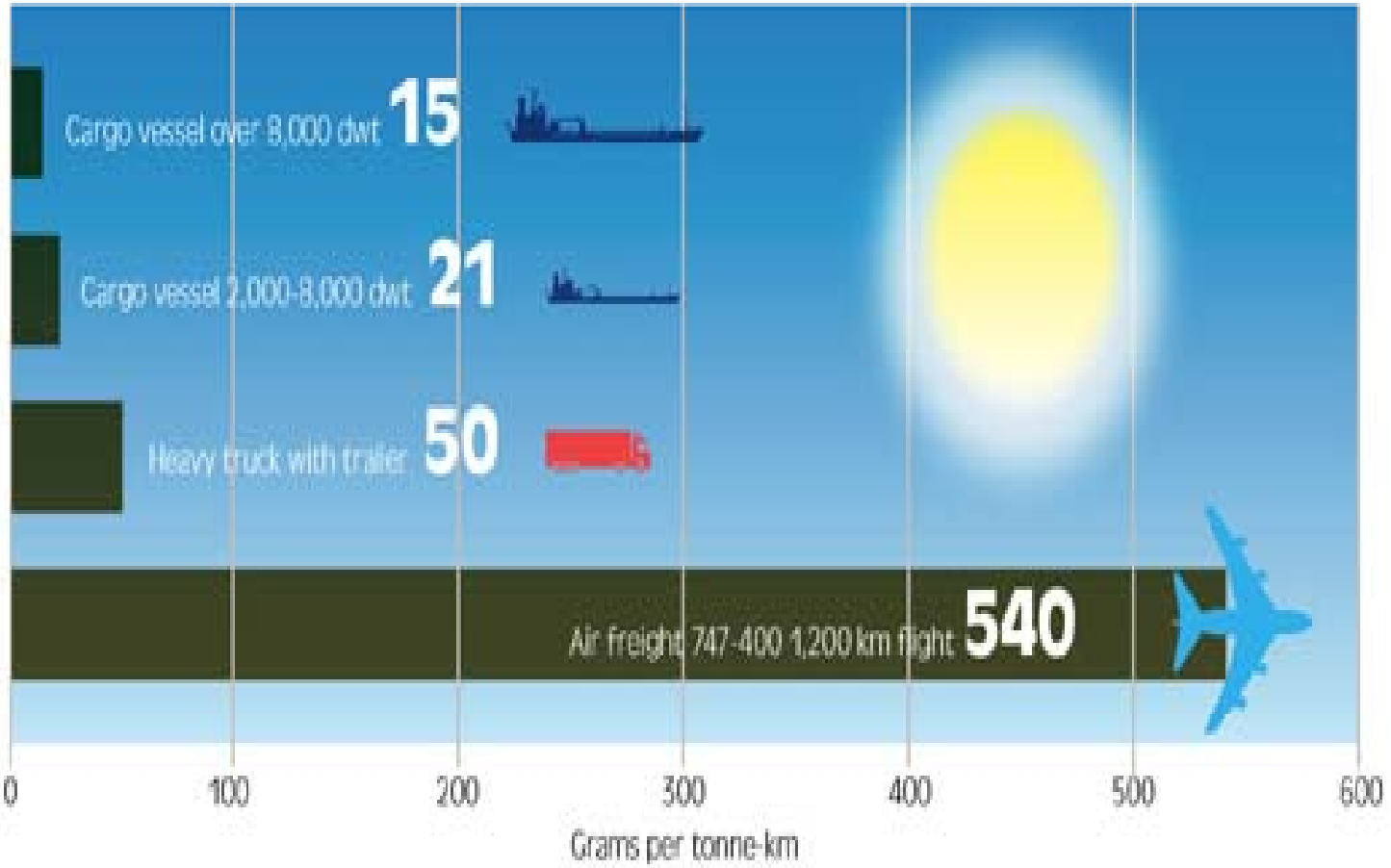
İzmirden Manzaralar

CO2 Salınımlarının Dağılımı

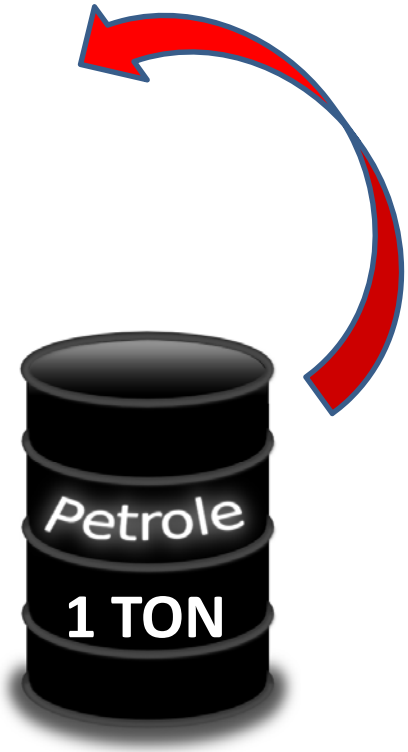


MEPC 59/INF.10

Taşıma Modlarının Karşılaştırması



Yakıt CO2 ilişkisi



Mevzuat

Gemilerde Enerji Verimliliği
ve
Enerji Operasyon Planları

İstanbul ve Marmara, Ege, Akdeniz, Karadeniz Bölgeleri
DENİZ TİCARET ODASI

Denizcilik Sektörüne Yansıma

Yakıt kalitesi ile SOx emisyonlarının azaltımı

Yanma sistemleri ile NOx, emisyonlarının azaltımı

Enerji verimliliği tedbirleri ile CO_2 emisyonlarının azaltımı

NOx

1. MARPOL Annex VI NOx Emission Limits

Tier	Date	NOx Limit, g/kWh		
		n < 130	130 ≤ n < 2000	n ≥ 2000
Tier I	2000	17.0	$45 \cdot n^{-0.2}$	9.8
Tier II	2011	14.4	$44 \cdot n^{-0.23}$	7.7
Tier III	2016†	3.4	$9 \cdot n^{-0.2}$	1.96
† In NOx Emission Control Areas (Tier II standards apply outside ECAs).				

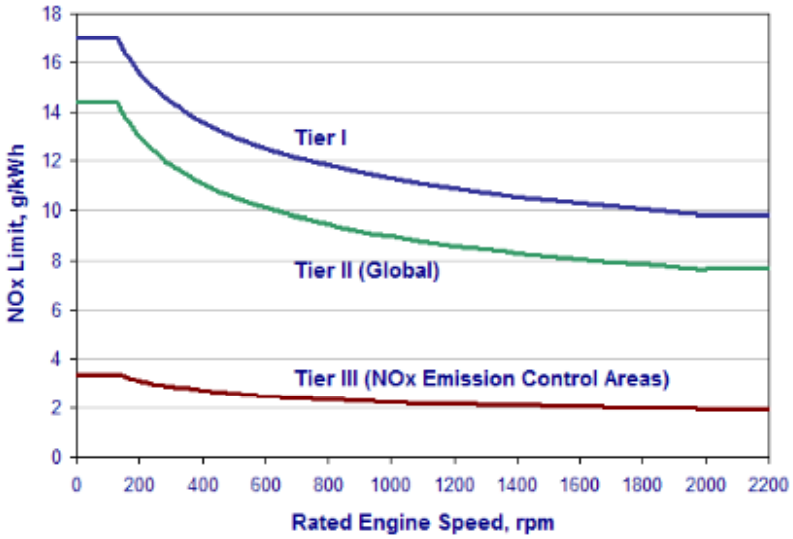


Figure 1. MARPOL Annex VI NOx Emission Limits

SOx

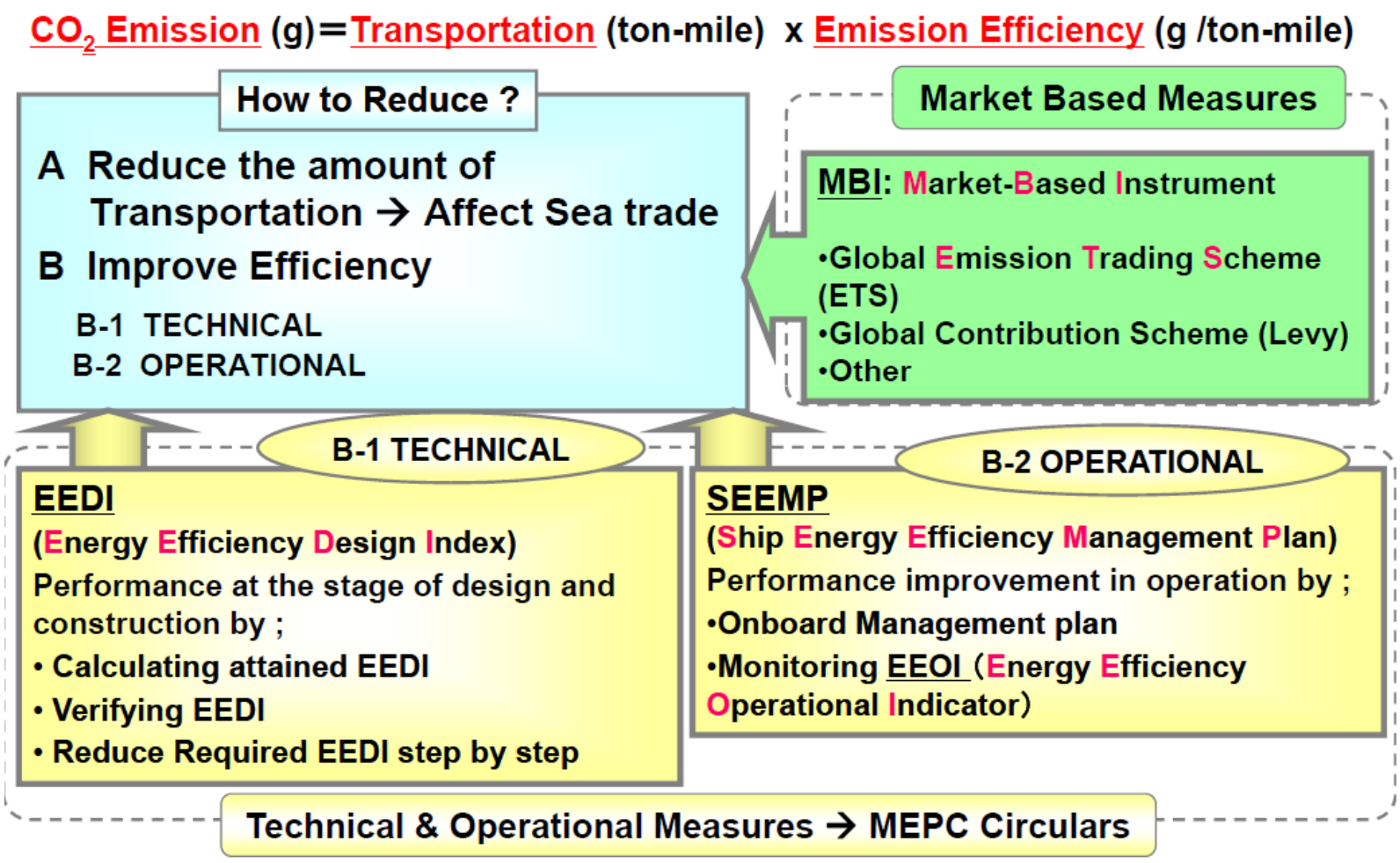
Outside an ECA Established to Limit SOx and PM Emissions	Inside an ECA Established to Limit SOx and PM Emissions
4.50% m/m prior to 1st January 2012	1.50% m/m prior to 1st July 2010
3.50% m/m on and after to 1st January 2012	1.00% m/m on and after to 1st July 2010
0.50% m/m on and after to 1st January 2020*	0.10% m/m on and after to 1st January 2015

* To be implementation on current timeline subject to technical review (2018)

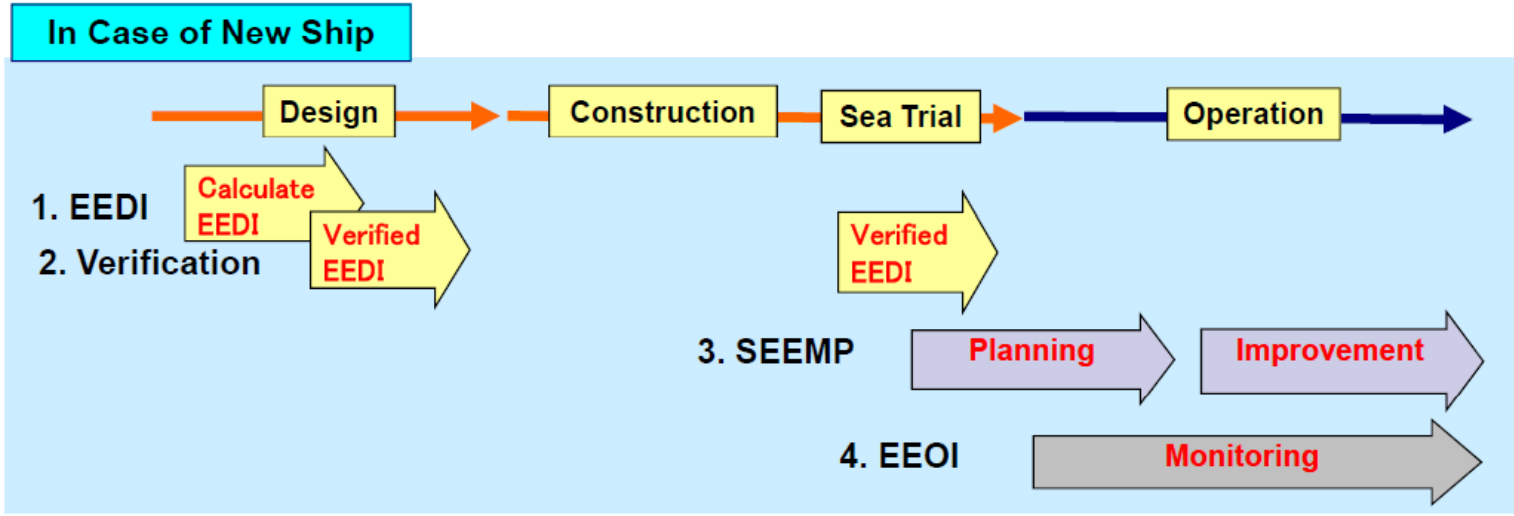
Enerji Verimliliği ve Emisyon Kuralları

- IMO-MARPOL Ek VI (MEPC 62, Temmuz 2011)
- 400 GT dan büyük tüm gemiler için 1 Ocak 2013 (keel laying 1 Temmuz 2013, delivery 1 Temmuz 2015, conver 1 Ocak 2013) ten itibaren geçerli
  - Energy Efficiency Design Index (EEDI), yeni gemiler için zorunlu
  - The Ship Energy Efficiency Management Plan (SEEMP), mevcut gemiler zorunlu
  - Energy Efficiency Operational Indicator (EEOI), mevcut gemiler gönüllü
- Monitoring, Reporting and Verification -MRV

Enerji Verimliliği ve Emisyon Regülasyonları



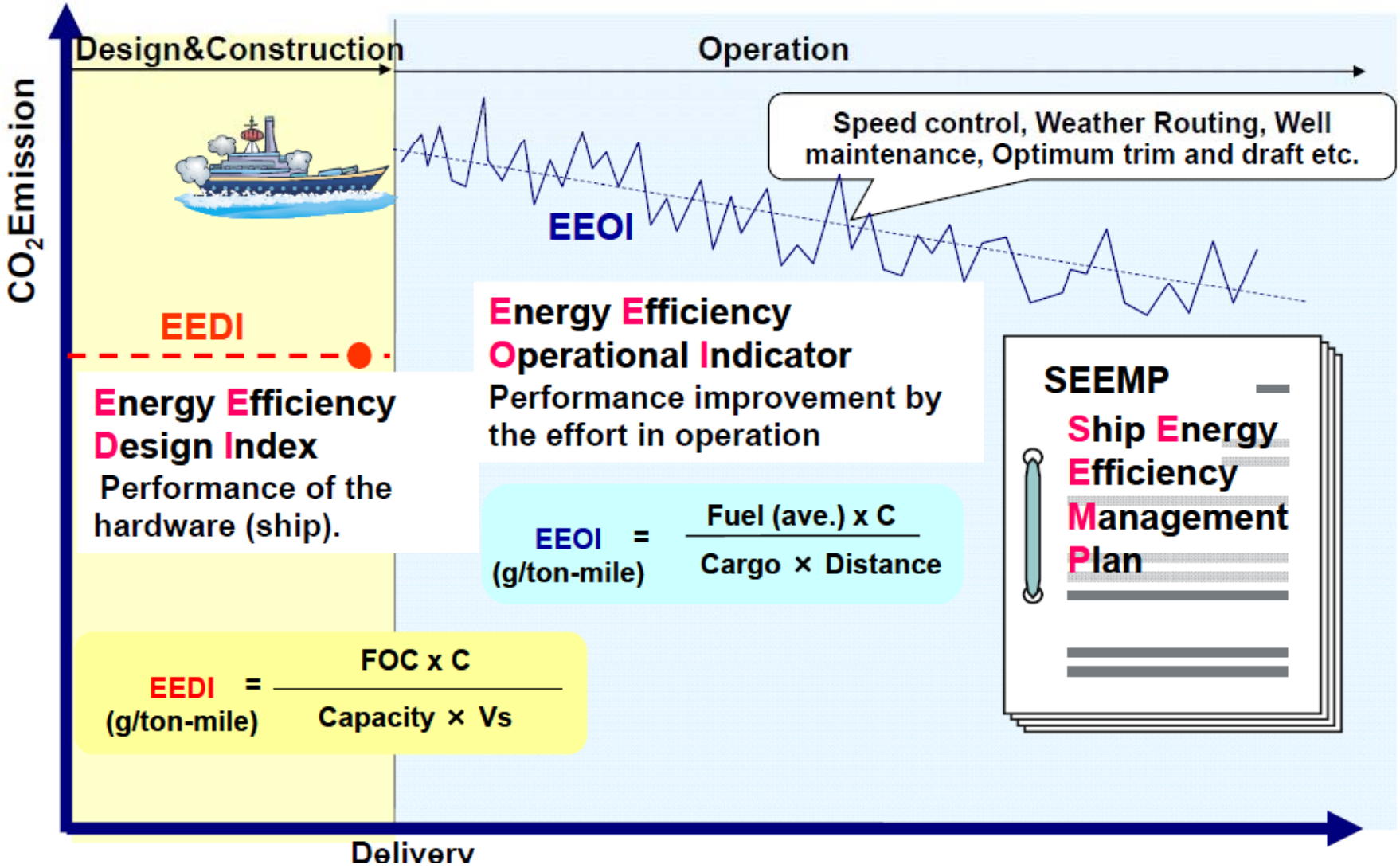
Teknik ve Operasyonel Önlemler



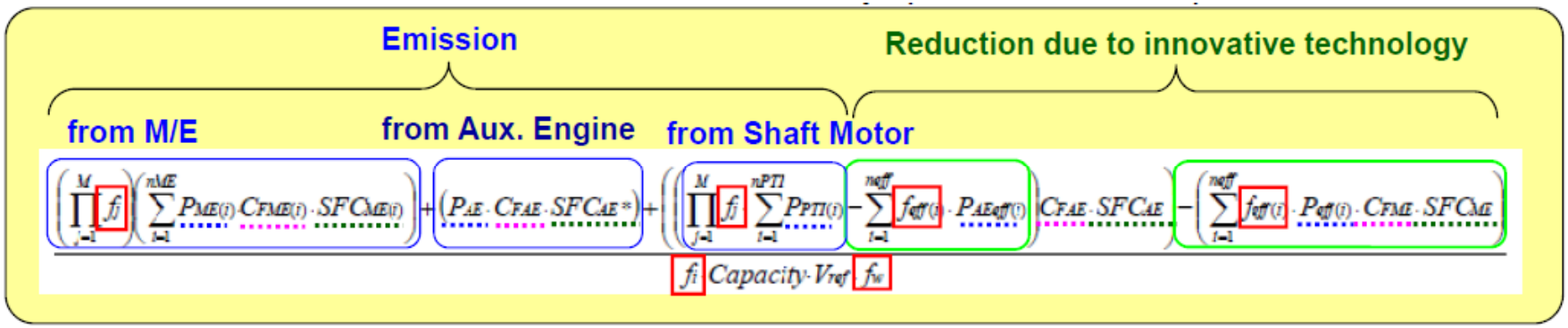
Technical and operational measures ; developed in MEPC.59

→ Trial purposes or Voluntary Implementation

1. **Interim Guidelines on the method of calculation of the EEDI (MEPC.1/Circ.681)**
2. **Interim Guidelines for voluntary verification of the EEDI (MEPC.1/Circ. 682)**
3. **Guidance for the development of a SEEMP (MEPC.1/Circ. 683)**
4. **Guidelines for voluntary use of the EEOI (MEPC.1/Circ.684)**


CO_2Emission
Design&Construction
Operation
Speed control, Weather Routing, Well maintenance, Optimum trim and draft etc.
EEOI
EEDI
Energy Efficiency Operational Indicator
Performance improvement by the effort in operation
Energy Efficiency Design Index
Performance of the hardware (ship).
EEOI (g/ton-mile) = Fuel (ave.) x C / Cargo × Distance
EEDI (g/ton-mile) = FOC x C / Capacity × Vs
SEEMP
Ship Energy Efficiency Management Plan
Delivery

EEDI: Enerji Verimliliği Dizayn İndeksi



$$\frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)}\right) + \left(P_{AE} \cdot C_{FAE} \cdot SFC_{AE}{}^{*}\right) + \left(\left(\prod_{j=1}^{M} f_j \sum_{i=1}^{nPTI} P_{PTI(i)}\right) - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AEeff(i)}\right) C_{FAE} \cdot SFC_{AE} - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME}\right)}{f_i \cdot Capacity \cdot V_{ref} \cdot f_w}$$

P_{ME}, P_{AE} : Power of main and auxiliary engines

P_{PTI} : Power consumption of each shaft motor

P_{AEeff} : Main engine power reduction due to innovative mechanical energy efficient technology

P_{eff} : Auxiliary power reduction due to innovative electrical energy efficient technology

C_{FME}, C_{FAE} : non-dimensional conversion factor between fuel consumption and CO_2 emission based on carbon content. (Table given)

SFC_{ME}, SFC_{AE} : certified specific fuel consumption of main and auxiliary engines

fj : correction factor to account for ship specific design elements (for ice-class, table given)

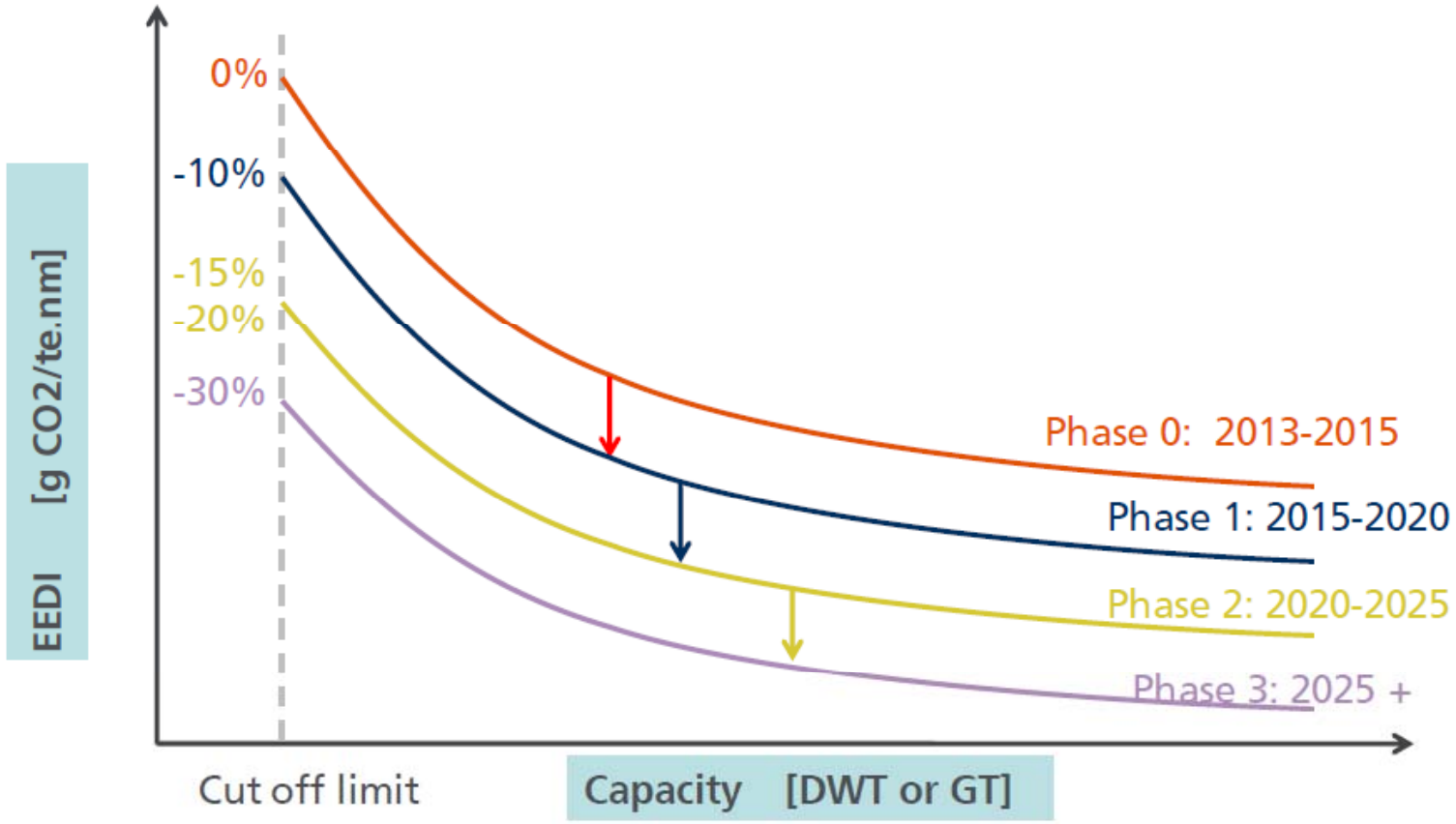
fi : the capacity factor for any technical/regulatory limitation on capacity (for ice-class, table given)

fw : non-dimensional coefficient indicating the decrease of speed in BF6. (=1.0)

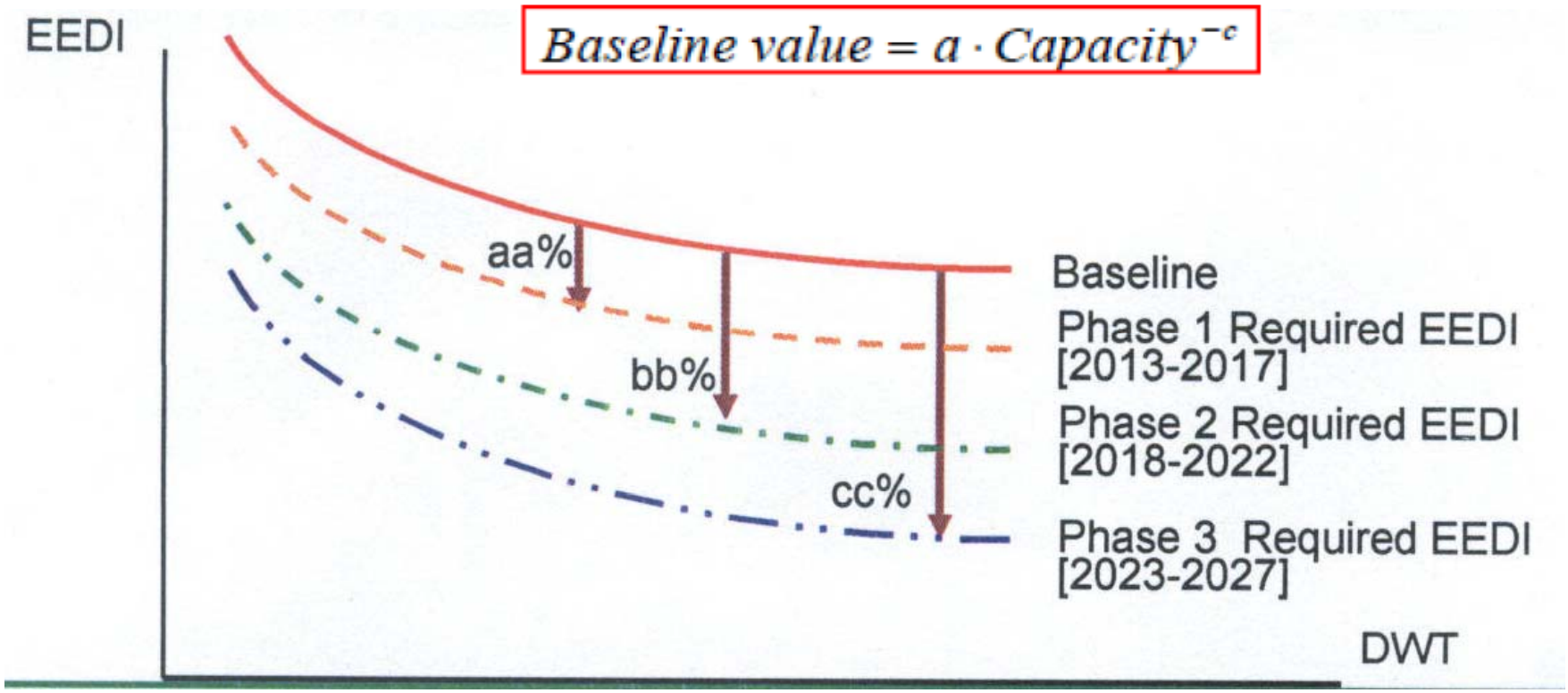
$feff$: availability factor of each innovative energy efficiency technology.(=1.0 for waste energy recovery system)

Interim Guidelines for New Ships(MEPC.1/Circ.681)

EEDI nedir ?


EEDI [g CO2/te.nm]
0%
-10%
-15%
-20%
-30%
Phase 0: 2013-2015
Phase 1: 2015-2020
Phase 2: 2020-2025
Phase 3: 2025 +
Cut off limit
Capacity [DWT or GT]

EEDI



Attained EEDI ≦ (1-X/100) × Reference line value = Required EEDI

EEDI - EEOI

$$EEDI = \frac{b_e \cdot P_{installed} \cdot c_{Carbon}}{Capacity \cdot v_{ref}}$$

$$\mathrm{EEOI} = \frac{\mathrm{Fuel}_{consumed} \cdot c_{Carbon}}{\mathrm{Cargo}_{transported} \cdot \mathrm{Distance}_{sailed}}$$

SEEMP

- 400 GT dan büyük tüm gemiler için 1 Ocak 2013 ten itibaren ılk havuzlama ıntermedıate veya renewal survey ile geçerli
  - Klas sadece SEEMP nin gemide olduğunu kontrol eder. International Energy Efficiency Certificate (IEEC) sertifikası verir
  - PSC ise geçerli IEEC nin olduğunu kontrol eder.

SEEMP Bölüm A

The SEEMP may be separated into two parts:
The generic (Part A) and the ship-specific part (Part B)

- **Company Policy (Section 1)**
- **Measures for Improving Energy Efficiency (Section 4):**
- **Voyage Optimization (4.1)**
  - No hardware modifications
  - Aim at efficient ship operation
- **Propulsion Resistance Management (4.2)**
  - Hull & Propeller Cleaning
  - Propulsion Hydrodynamic Improvement Devices
  - Resistance Monitoring Programs
- **Machinery Optimization (4.3)**
  - Performance Monitoring Tools (M/E – D/Gs)
  - Machinery Retrofitting / Upgrading / Replacements
  - Thrust, power &torque measurements (propeller efficiency)
  - De-rated engines, etc.
- **Bunker Management (4.4)**
- **Personnel Awareness & Training (4.8)**

Part A

Full Compliance with **Res. MEPC.213(63)** Based on **INTERTANKO** guidance

Following aspects to be considered for ship operation:

Voyage Performance / Offshore Operations
- Voyage planning & execution
- Weather routing & sea current
- Speed Management
- Logistic planning
- Chartering/contracts
- Port/harbour operations
- DP operations

Ship Performance
- Hull condition
- Propeller condition
- Trim & draft
- Autopilot & rudder
- Appendages & Technical modifications

Fuel Management
- Pre-bunkering
- During bunkering
- Post-bunkering

Main and AUX engines
- Main Engine efficiency
- Aux Engines efficiency & utilization
- Boilers efficiency & utilization

Consumers
- Thruster operations
- Cargo operations
- Ventilation, HVAC, lights
- Insulation & energy losses
- Water productions
- Incinerator
- Compressors

Management and organisation
- Strategy & tactical plans
- Roles & responsibilities
- Culture & awareness
- Competence & training
- Cooperation & communication
- Performance Management

SEEMP Bölüm B

The SEEMP may be separated into two parts:
The generic (Part A) and the ship-specific part (Part B)

- **Energy Saving Measure:** Options already implemented, under trial, as well as options being considered.
- **Assignment of responsible / monitoring personnel both ashore and onboard**
- **Description of monitoring methods:** Each measure will most likely require different methods & units of measurement.
- **Target:** It is the specific, measurable target that the Company aims to achieve through the adoption of a measure.
- **Records:** The relevant records that will be kept in order to monitor the performance of each measure.
- **Implementation Period:** The period during which the Company will implement and monitor each measure.

Part B

Full Compliance with **Res. MEPC.213(63)**

13. Ship energy efficiency measures in force

No	Energy Efficiency Measures	Implementation	Responsibility	Monitoring	Evaluation
1	Fuel Efficient Operations				
		Careful planning and execution of voyages	Master / CE	Voyage Plan	M Rev / IA
		Course optimization - Great Circle	Master	Voyage Plan	M Rev / IA
		Current optimization	Master	Voyage Plan	M Rev / IA
		Tides	Master	Voyage Plan	M Rev / IA
2	Weather routeing				
		Potential efficiency savings using routeing tools from existing providers	FM / Master	Voyage Plan	M Rev / IA
		Weather forecast	Master	Daily weather report	M Rev / IA
3	Speed optimisation				
		Optimise speed based on early communication with next port on berth availability	Master / CE	LB entrance	M Rev / IA
		Taking into account engine optimal settings and arrival times/availability of berths at port.	CE	ELB entrance	IA
4	Optimised power				
		Setting constant RPM as efficient	CE	ELB entrance	IA
		Power and light control	CE	ELB entrance	IA
5	Optimised ship handling				
		Optimum trim according trim table - Operating at optimum trim for specified draft and speed	Master / CE	LB entrance	IA
		Minimum treatment plant	Master / CE	LB / ELB entrance	IA
6	Optimum ballast				
		Ballasting for optimum trim and steering conditions	Master / CE	LB / ELB entrance	M Rev / IA
		Ballast free	Master	Stab records	IA
7	Optimum rudder				
		Autopilot settings	Watch Officer	/	
		Reducing distance sailed 'off track' and minimising losses caused by rudder corrections	Watch Officer	/	
8	Improved Cargo Handling				
		Using of dock facilities as possible	Master / CO	/	
		Preventing of stowage failure	CO	/	
9	Bunker Quality				
		Control of delivered bunker quality	CE	Bunker notice	IA
10	Stay in port				
		Use of shore side electricity in ports	CE	ELB entrance	IA
11	Others				

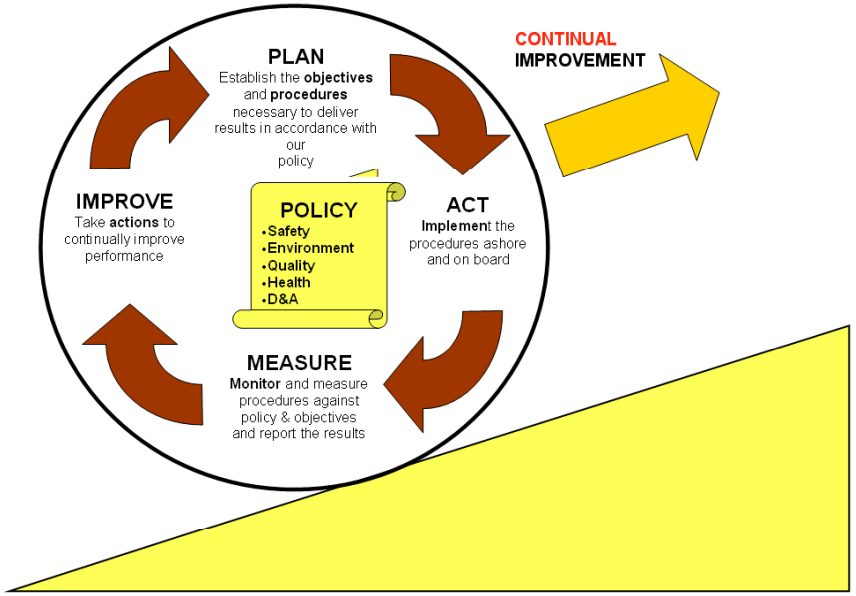
SEEMP - Part B (Example)

Energy Saving Measure:	Speed Selection Optimization (see Part A 4.1.1)
Responsible ashore:	Operations Department / Operator.
Responsible onboard:	Master / Chief Engineer.
Records:	Daily Noon Reports / Voyage Abstracts / EEOI form
Implementation Period:	Continuous (as requested and/or allowed by Charterers, weather and safe navigation permitting - WSNP).
Target:	~~Decrease the fuel consumption by up to 2%~~ a. During ballast voyages: Reduce vessel's speed to be within ±0.5 knots of the vessel's Practical Economical Speed. b. During laden voyages: Taking into account the restrictions imposed by the Charter Party, optimize the speed in order to keep the used fuel per tonne-mile at a minimum level so as to ultimately reduce time spent in anchorage or drifting at waiting areas annually by 1%. c. Reduce annual fleet EEOI average by 1% annually.
Monitoring Method:	a. Random checking of Daily Noon Reports by the Operations Dept. to establish the vessel's speed during ballast voyages. b. Review of voyage data to establish time spent in anchorage or drifting at waiting areas. Statistical data on the calculated quantity of bunkers saved through the implementation of this procedure should be kept by Operations Dpt. (per voyage / per vessel). c. Review of EEOI forms to establish the annual fleet EEOI average.

Energy Saving Measure:	Auxiliary Engine Load Optimization (see Part A 4.3.8)
Responsible ashore:	Technical Department.
Responsible onboard:	Chief Engineer.
Records:	C/E Standing Orders / Superintendent Inspection Reports.
Implementation Period:	Continuous (whenever possible - WSNP).
Target:	- Strict adherence to C/E Standing Orders. - Zero non-conformances during normal operations.
Monitoring Method:	The C/E should review yard's electric balance study, operate E/R pumps accordingly while at port, if possible, and compare on a quarterly basis the expected power consumption against actual data based on the operational profile of the vessel. The C/E should also review yard's air balance study and operate E/R fans accordingly. This involves reduction of number of E/R fans operating while at port based on prevailing ambient conditions. Checks during shipboard attendances by Technical Superintendents.

SEEMP

- Planlama
- Uygulama
- Izleme ve ölçme
- Değerlendirme ve geliştirme

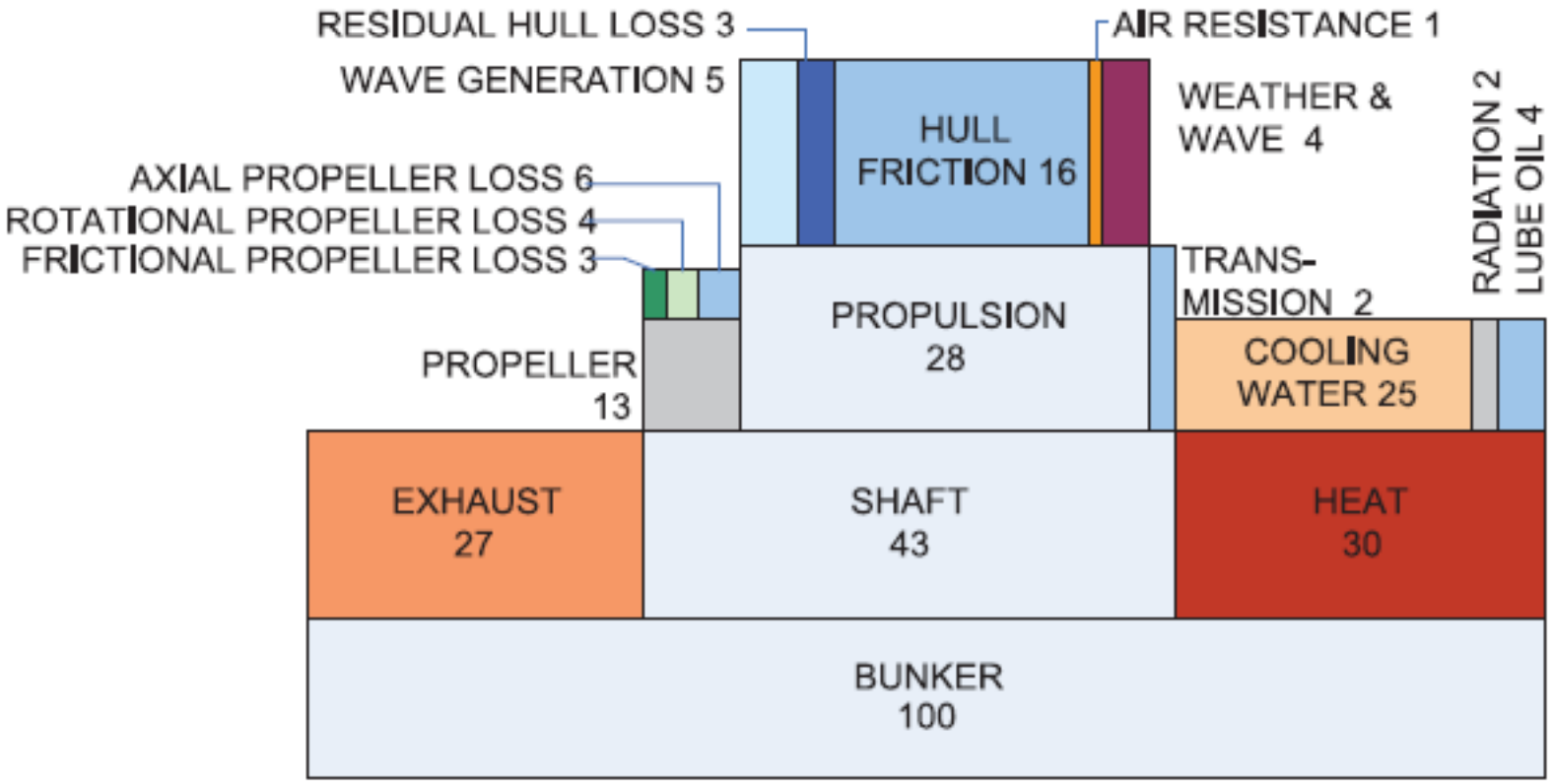


Dizayn

Gemilerde Enerji Verimliliği
ve
Enerji Operasyon Planları

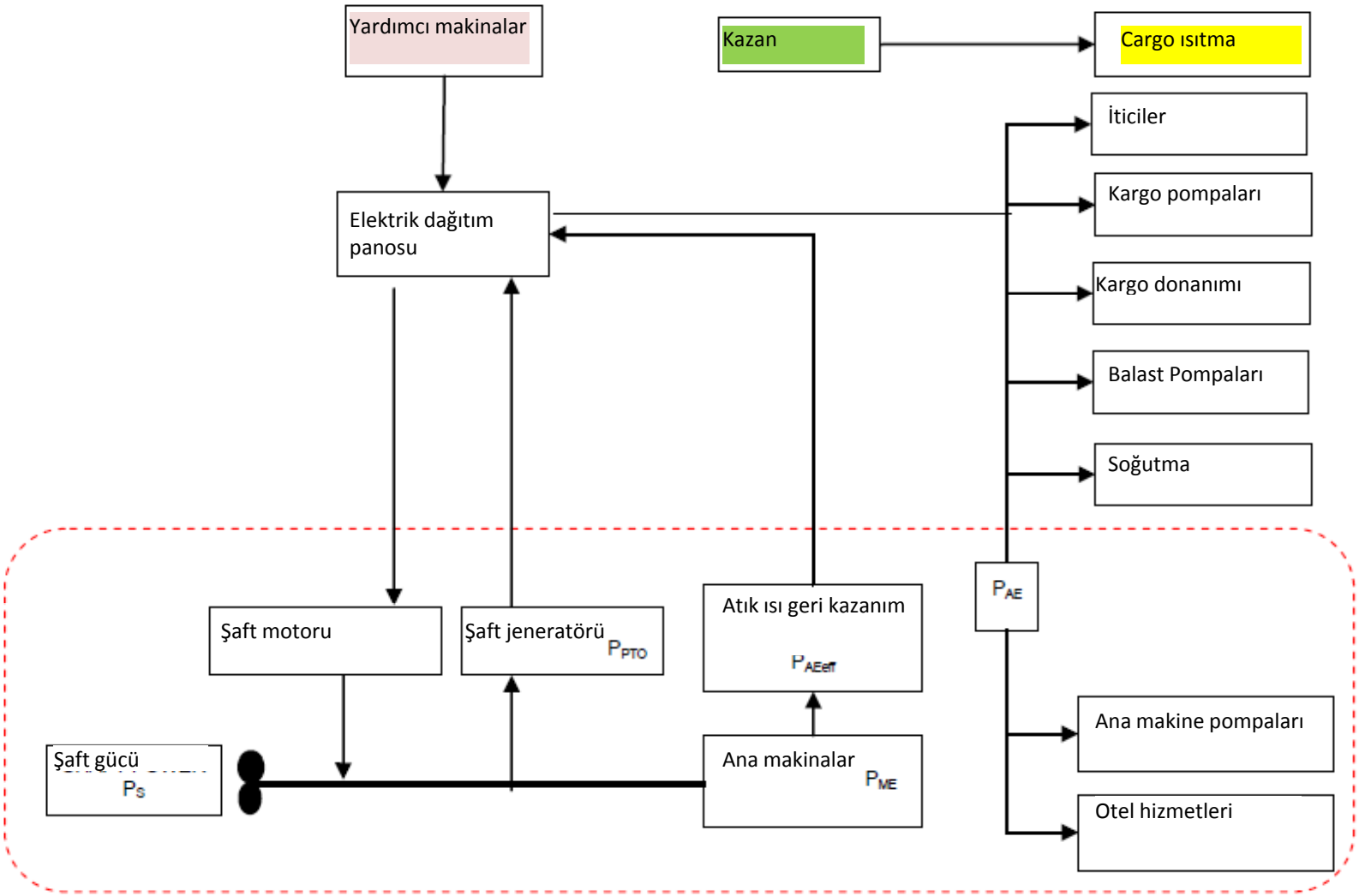
İstanbul ve Marmara, Ege, Akdeniz, Karadeniz Bölgeleri
DENİZ TİCARET ODASI

Gemide Enerji Tüketimi

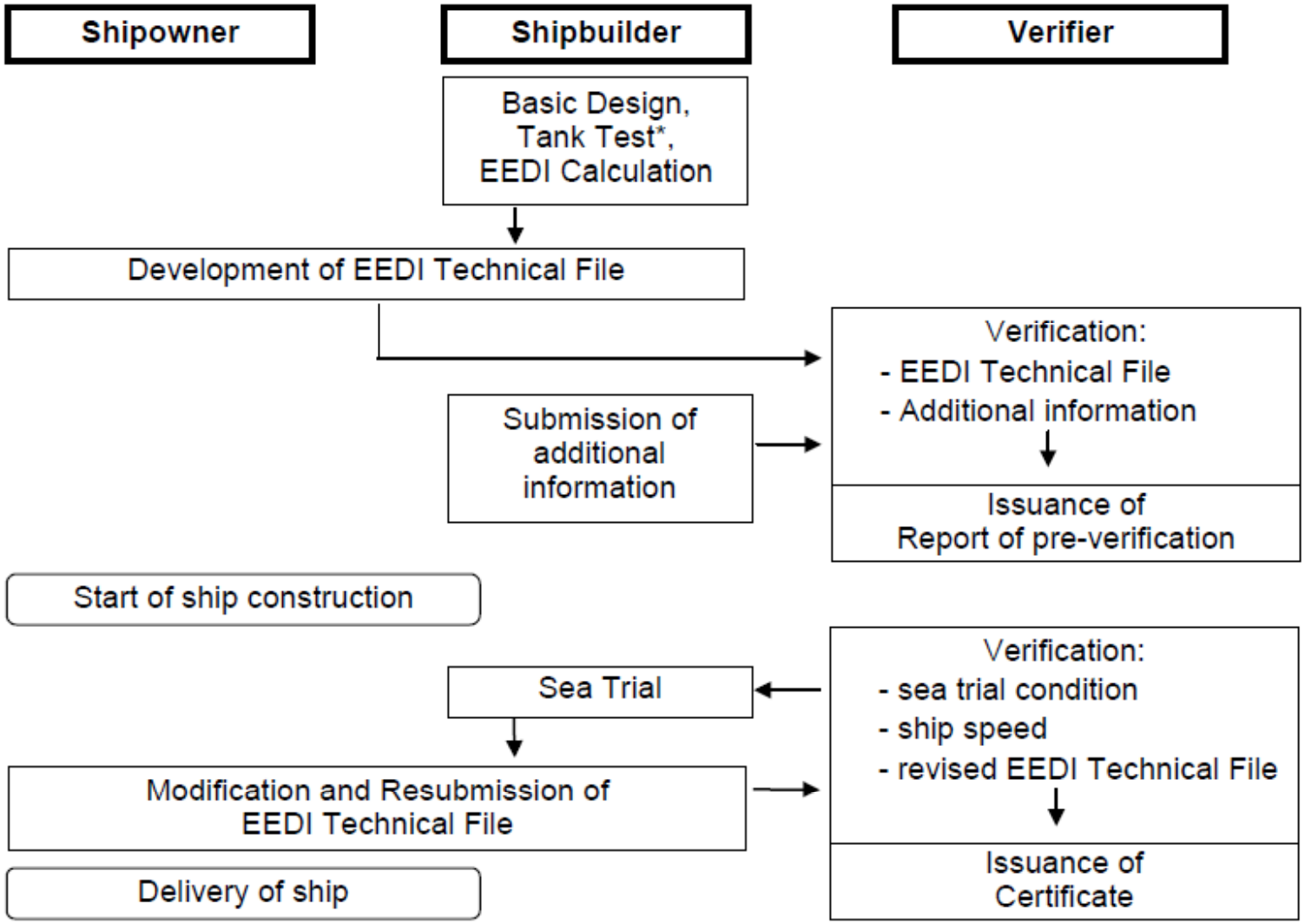


Use of propulsion energy on board a cargo ship, head sea, Beaufort 6

Enerji Tüketicileri

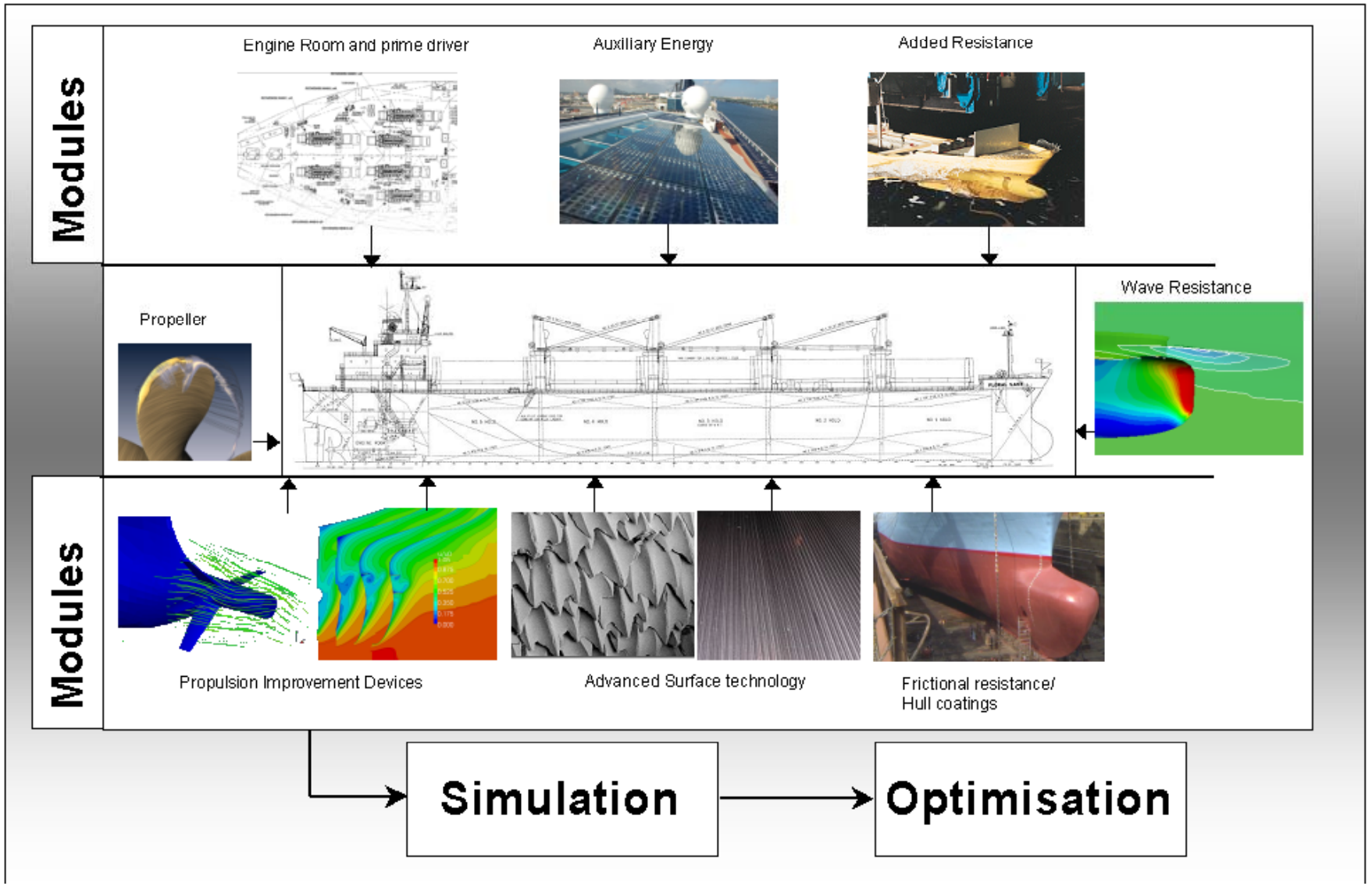


Teknik ve Operasyonel Önlemler



*To be conducted by a test organization or a shipbuilder itself.

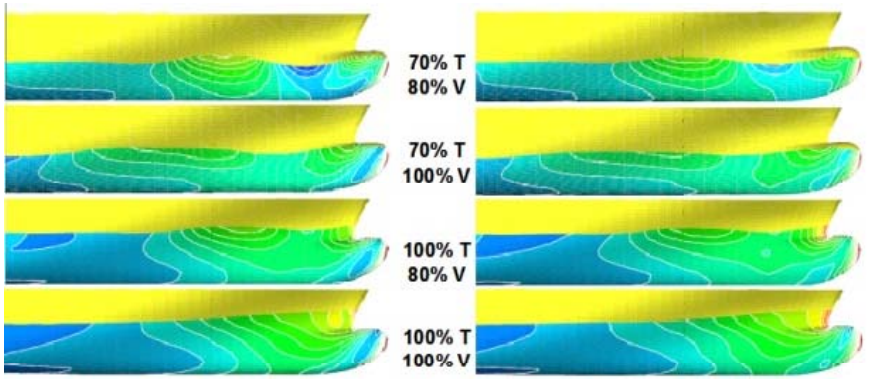
Entegre Önlemler

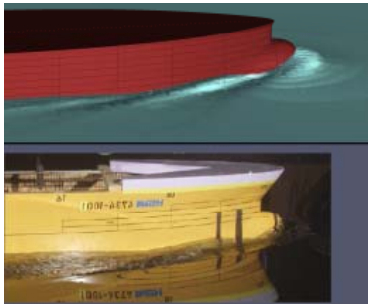


Gemi Direnci

Form direnci

- Tekne form optimizasyonu – CFD

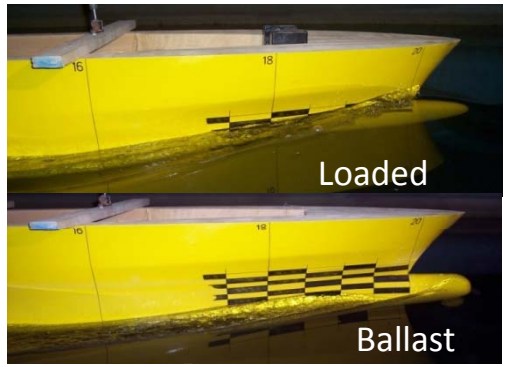


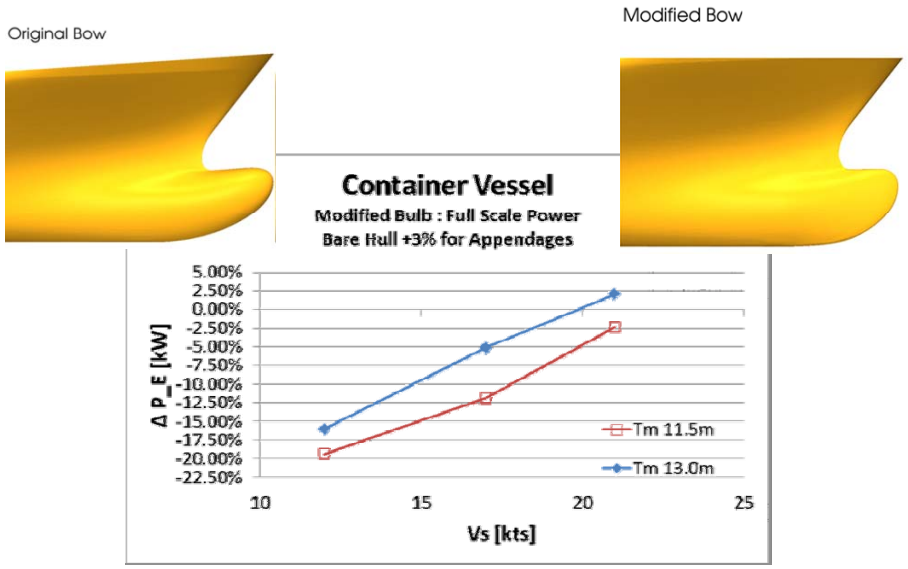


Gemi Direnci

Form direnci

- Tekne form optimizasyonu – CFD





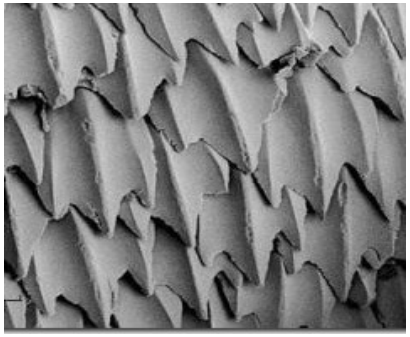
Gemi Direnci

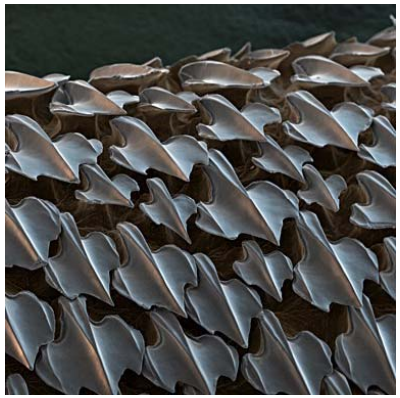
Form direnci

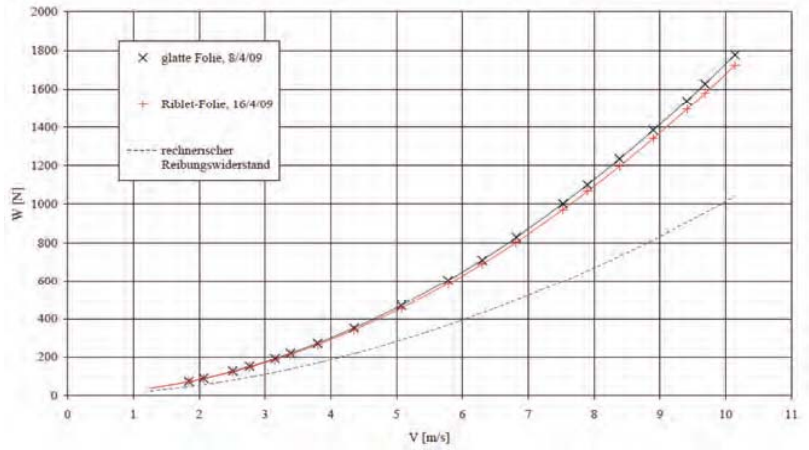
- Tekne form optimizasyonu – CFD

Viskoz direnç

- Pürüzlülük direnci
- Boya ve yüzey







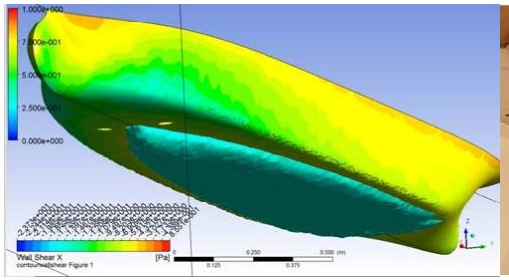
Gemi Direnci

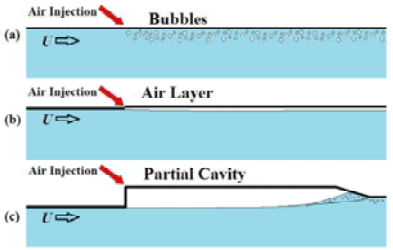
Form direnci

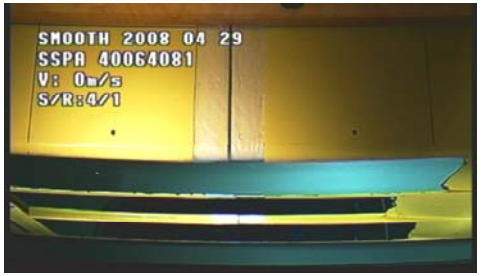
- Tekne form optimizasyonu – CFD

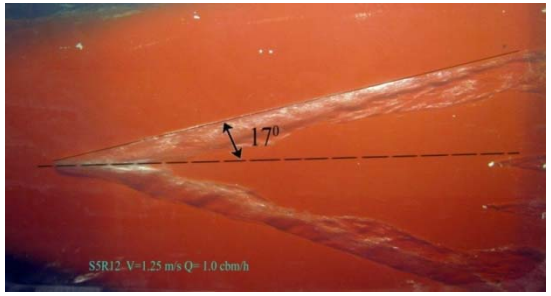
Viskoz direnç

- Pürüzlülük direnci
- Boya ve yüzey
- Hava yağlama









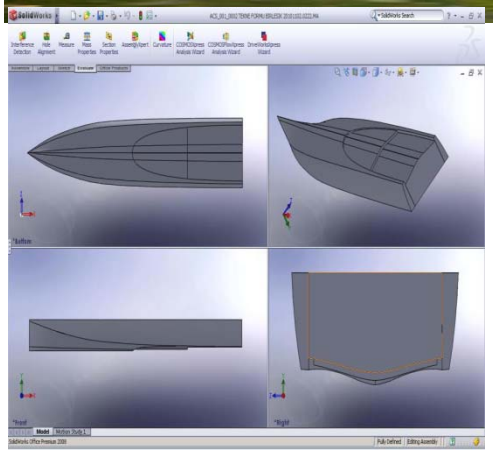
Gemi Direnci

Form direnci

- Tekne form optimizasyonu – CFD

Viskoz direnç

- Pürüzlülük direnci
- Boya ve yüzey
- Hava yağlama



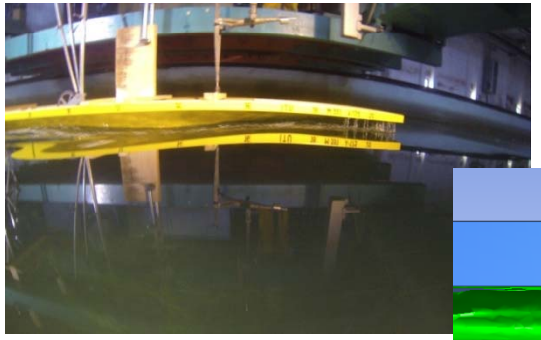
Gemi Direnci

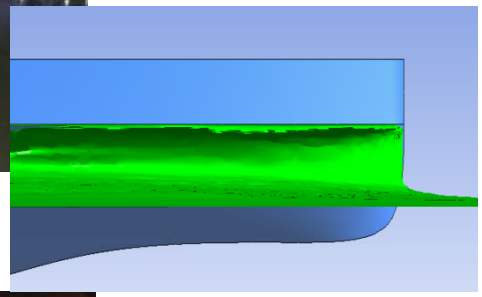
Form direnci

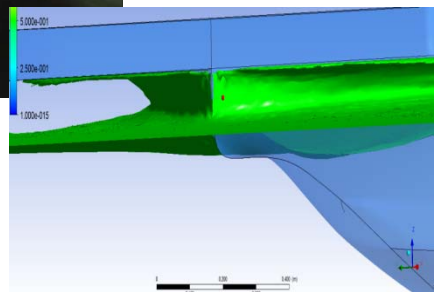
- Tekne form optimizasyonu – CFD

Viskoz direnç

- Pürüzlülük direnci
- Boya ve yüzey
- Hava yağlama
- Spray direnci







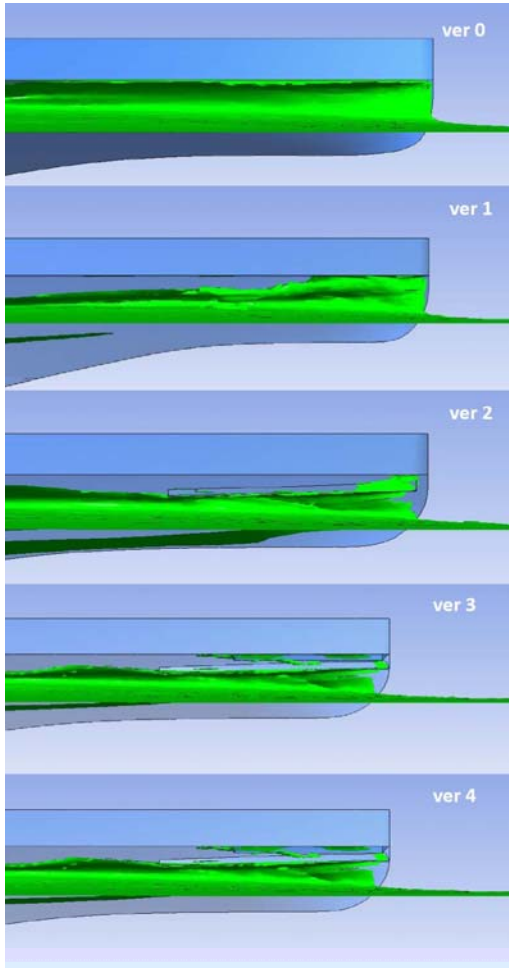
Gemi Direnci

Form direnci

- Tekne form optimizasyonu – CFD

Viskoz direnç

- Pürüzlülük direnci
- Boya ve yüzey
- Hava yağlama
- Spray direnci



Gemi Direnci

Form direnci

- Tekne form optimizasyonu – CFD

Viskoz direnç

- Pürüzlülük direnci
- Boya ve yüzey
- Hava yağlama
- Spray direnci

Ek direnç bileşenleri

- Dalgalarda direnç artışı
- Hava direnci

Figure 6.1.3.1: Aerial view of Case ship

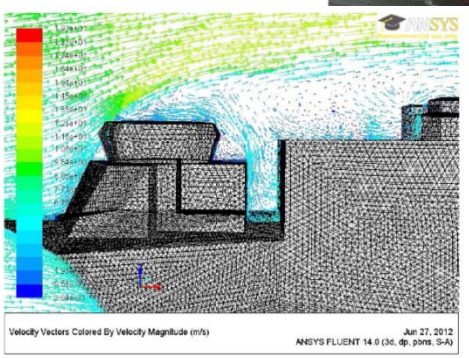
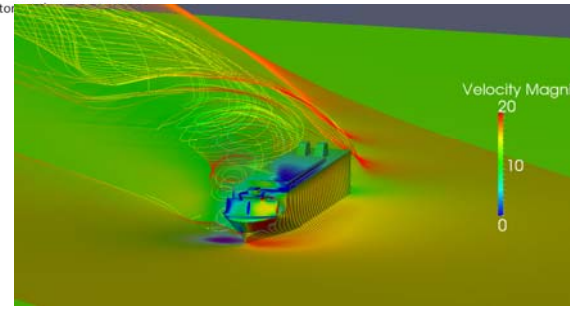


Figure 6.1.3.8: Flow velocity vecto

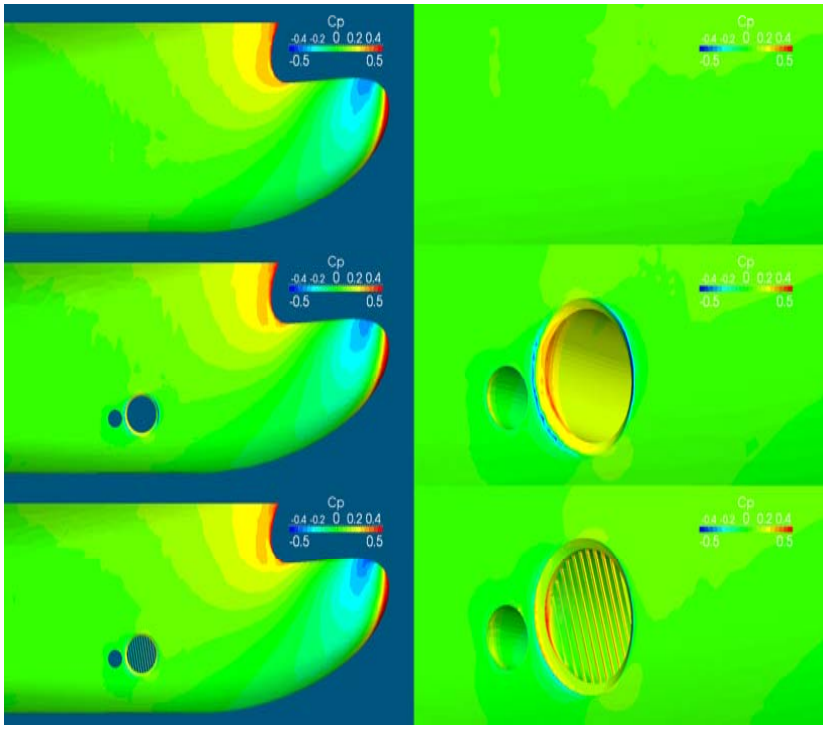


Gemi Direnci

Form direnci
- Tekne form optimizasyonu – CFD

Viskoz direnç
- Pürüzlülük direnci
- Boya ve yüzey
- Hava yağlama
- Spray direnci

Ek direnç bileşenleri
- Dalgalarda direnç artışı
- Hava direnci
- Takıntı direnci



Gemi Sevki

Sevk sistemi

- Yüksek performanslı pervaneler
- Pervane boyama

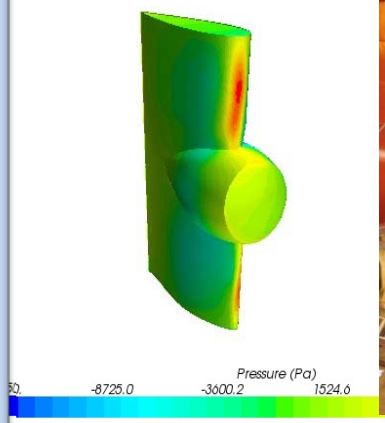
KAPPEL

CLT

Gemi Sevki

Sevk sistemi

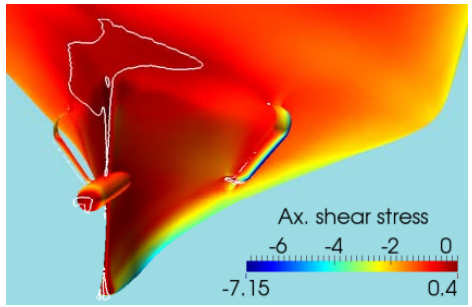
- Yüksek performanslı pervaneler
- Pervane boyama
- Pervane – dümen etkileşimi

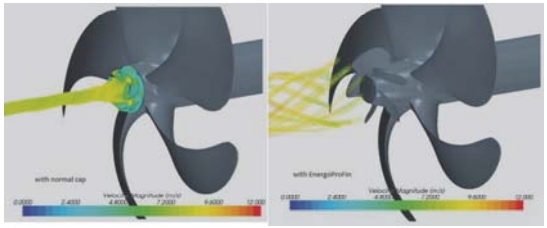


Gemi Sevki

Sevk sistemi

- Yüksek performanslı pervaneler
- Pervane boyama
- Pervane – dümen etkileşimi
- Duct-fin ve sınır tabaka finleri

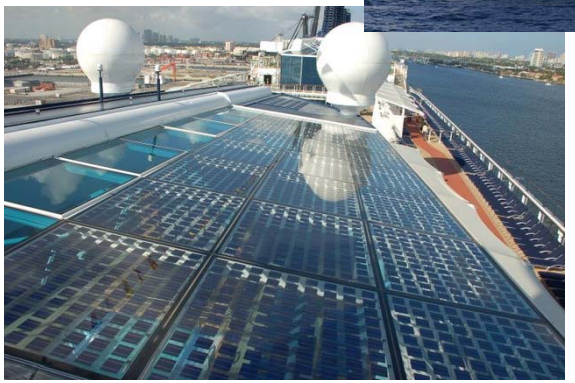




Enerji Üretim ve Depolama Sistemleri

Yenilenebilir enerji

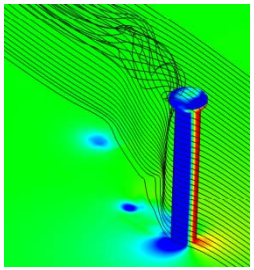
- Güneş enerjisi (Photovoltaic)



Enerji Üretim ve Depolama Sistemleri

Yenilenebilir enerji

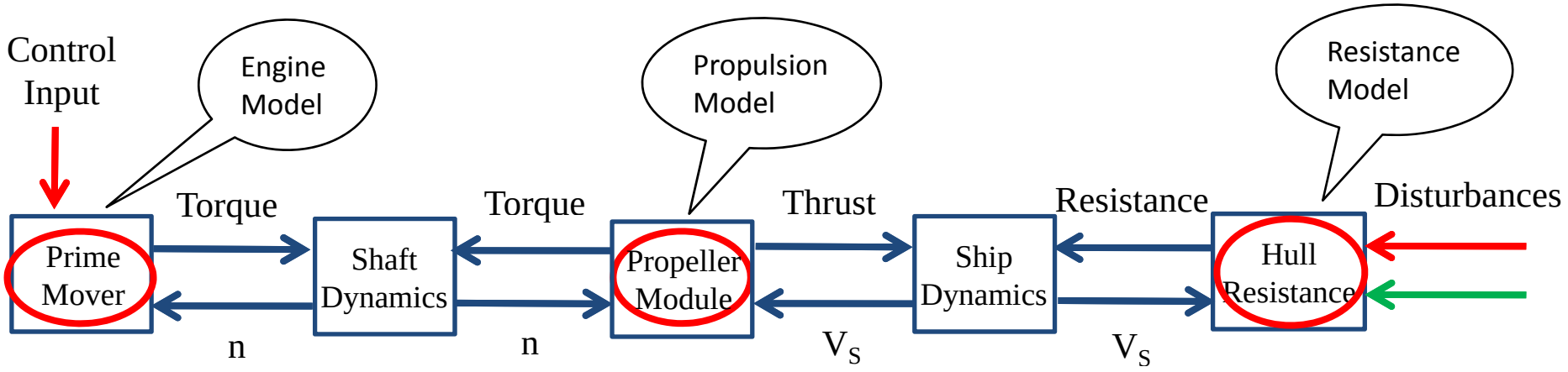
- Güneş enerjisi (Photovoltaic)
- Rüzgar enerjisi



Enerji Üretim ve Depolama Sistemleri

Yenilenebilir enerji

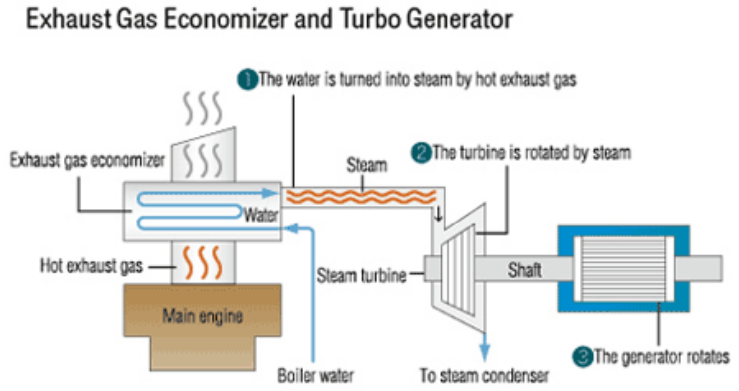
- Güneş enerjisi (Photovoltaic)
- Rüzgar enerjisi
- Yakıt pilleri
- Dinamik Enerji Simülasyonları



Enerji Üretim ve Depolama Sistemleri

Yenilenebilir enerji

- Güneş enerjisi (Photovoltaic)
- Rüzgar enerjisi
- Yakıt pilleri
- Dinamik Enerji Simülasyonları
- Enerji depolama
  - Mekanik
  - Electro-kimyasal
  - Termal



Enerji Üretim ve Depolama Sistemleri

Yenilenebilir enerji

- Güneş enerjisi (Photovoltaic)
- Rüzgar enerjisi
- Yakıt pilleri
- Dinamik Enerji Simülasyonları
- Enerji depolama
  - Mekanik
  - Electro-kimyasal
  - Termal
- Alternatif yakıtlar
  - LNG
  - Metanol

Operasyon

Gemilerde Enerji Verimliliği

ve

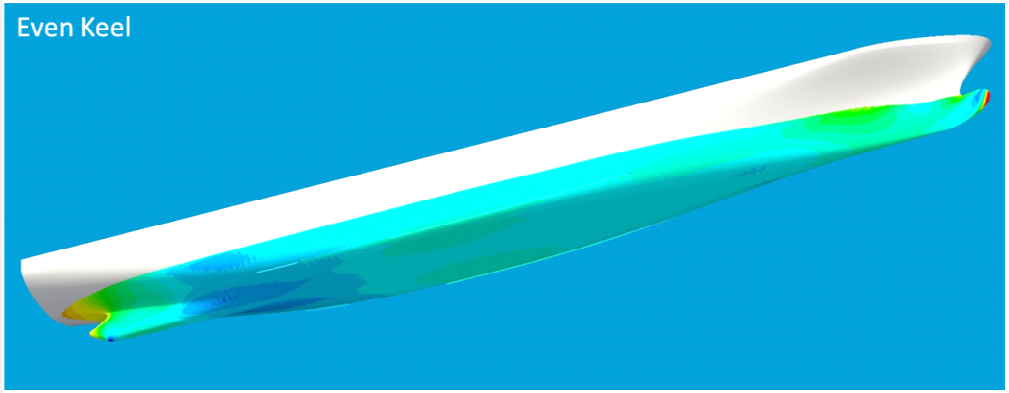
Enerji Operasyon Planları

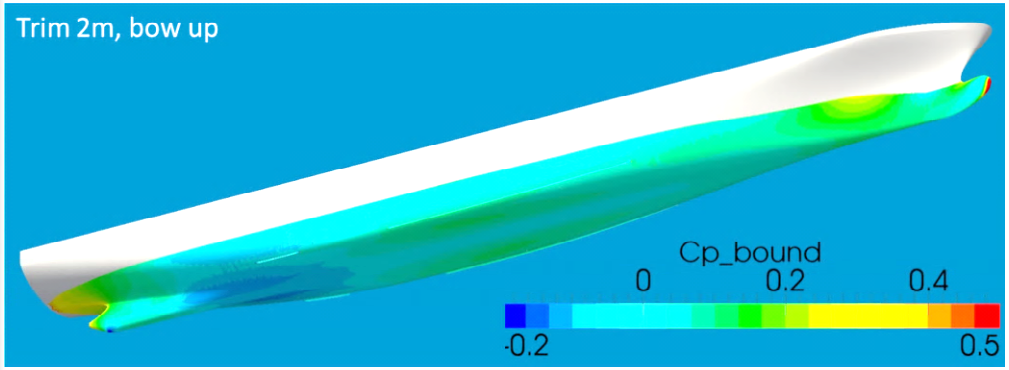
İstanbul ve Marmara, Ege, Akdeniz, Karadeniz Bölgeleri
DENİZ TİCARET ODASI

Değişik operasyon tipleri

İşletim Yaklaşımları

- Trim-Draft Optimizasyonu

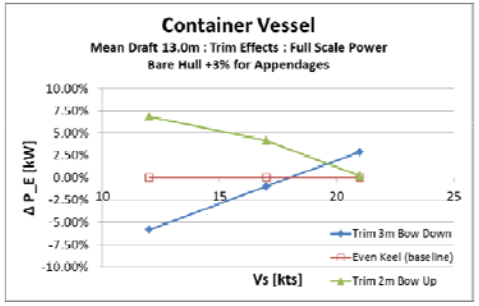


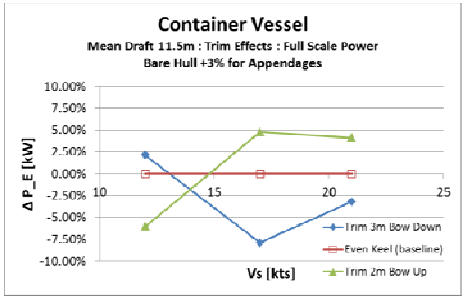


İşletim Yaklaşımları

- Trim-Draft Optimizasyonu

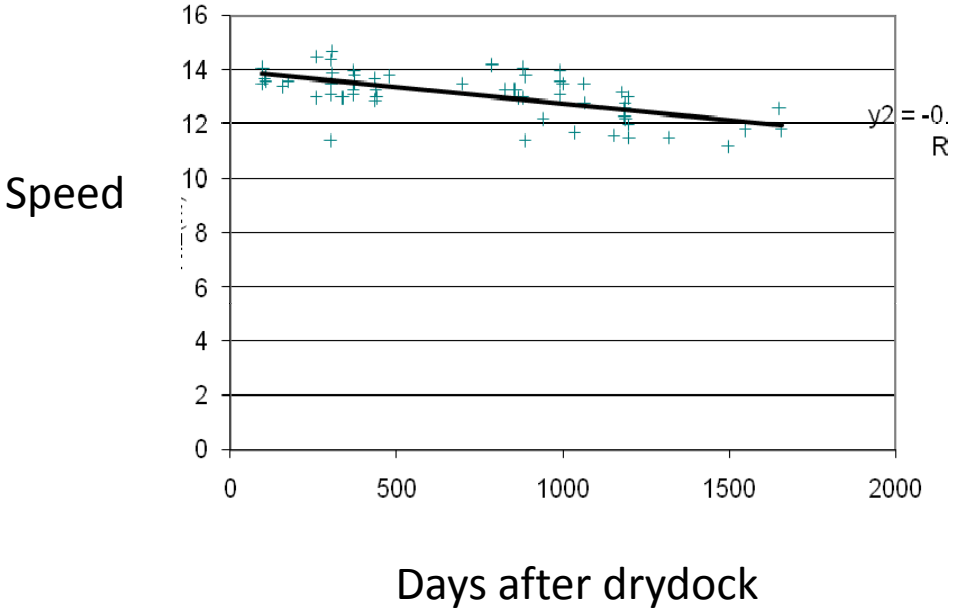
Draft/Trim [m]	2.7	2.5	2.0	1.5	1.0	0.5	0.0	-0.5	-1.0	-1.5	-2.0	-2.5	-3.0
15.0							-3%						
14.5							-3%						
14.0	-8%	-9%	-10%	-11%	-10%	-7%	-4%	-6%	-9%	-7%	-6%		
13.5	-4%	-5%	-6%	-8%	-7%	-6%	-5%	-6%	-8%	-5%	-3%		
13.0	3%	3%	1%	-1%	-2%	-4%	-5%	-7%	-9%	-6%	-4%	-4%	-5%
12.5	11%	10%	8%	5%	2%	-2%	-5%	-8%	-10%	-7%	-5%	-7%	-9%
12.0	12%	11%	9%	7%	4%	1%	-3%	-5%	-8%	-6%	-4%	-7%	-9%
11.5	12%	12%	10%	9%	6%	3%	0%	-4%	-7%	-5%	-3%	-6%	-9%
11.0	7%	6%	4%	1%	0%	0%	-1%	-2%	-3%	-3%	-2%	-5%	-7%
10.5	2%	1%	-2%	-6%	-6%	-4%	-2%	-1%	0%	0%	-1%	-4%	-6%
10.0	-4%	-4%	-7%	-9%	-8%	-5%	-3%	-2%	-2%	-2%	-2%	-4%	-7%
9.5					-10%	-7%	-3%	-3%	-4%				
9.0							-4%						





İşletim Yaklaşımları

- Trim-Draft Optimizasyonu
- Tekne temizleme/Havuzlama



İşletim Yaklaşımları

- Trim-Draft Optimizasyonu
- Tekne temizleme/Havuzlama
- Optimum hız
- Sefer planlama
- Hava durumuna göre yol seçimi

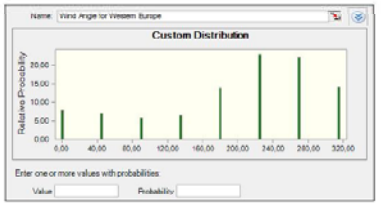


Figure 5.2.2: Wind direction probability (0: North, 90: East, 180: South, 270: West)

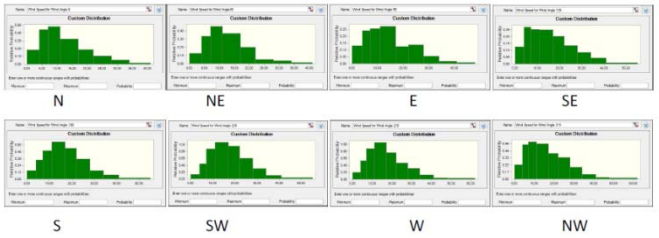
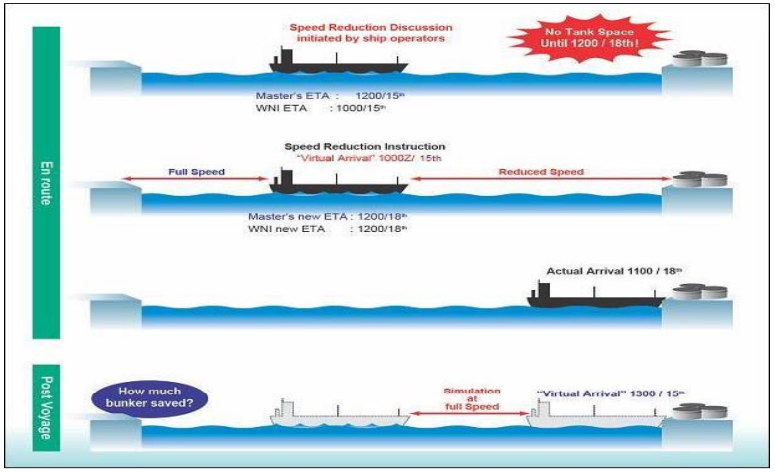


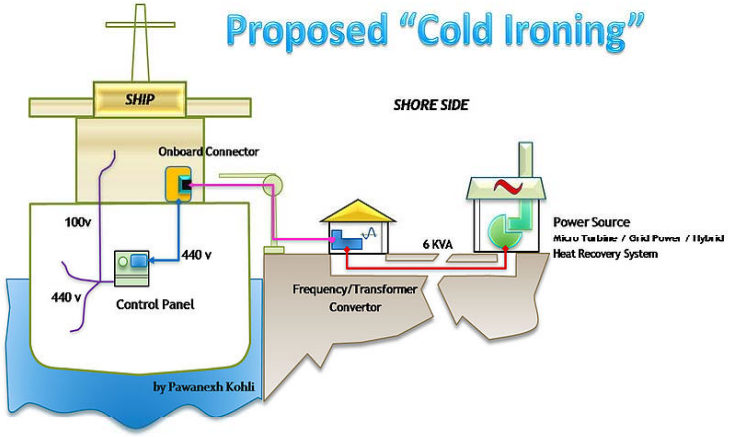
Figure 5.2.3: Wind speed representation with wind direction

Figure 5.3.3: Wave height probability distributions for each wind speed for Western Europe

İşletim Yaklaşımları

- Trim-Draft Optimizasyonu
- Tekne temizleme/Havuzlama
- Optimum hız
- Sefer planlama
- Hava durumuna göre yol seçimi
- Tam zamanında varış ve izafi varış
- Sahil elektriği
- Makine yük yönetimi
- DG yönetimi & Shaft Gen.





Bakım-Tutum-Modernizasyon

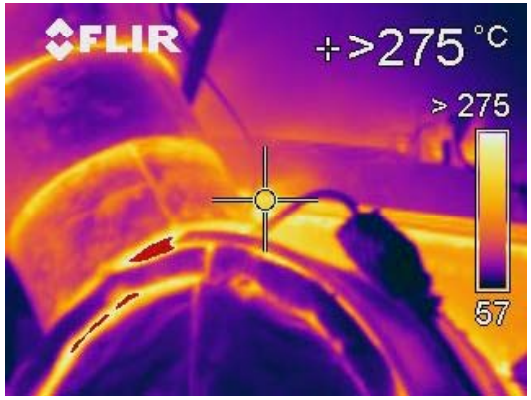
Gemilerde Enerji Verimliliği

ve

Enerji Operasyon Planları

İstanbul ve Marmara, Ege, Akdeniz, Karadeniz Bölgeleri
DENİZ TİCARET ODASI

Enerji Denetimi (Energy Audit)

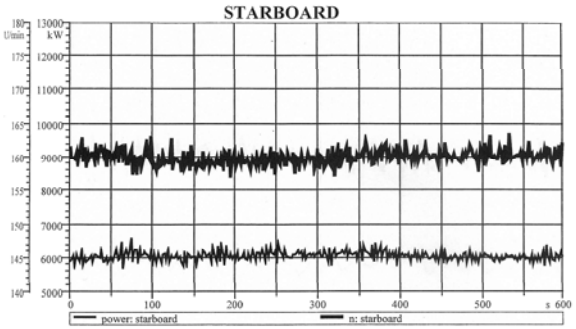


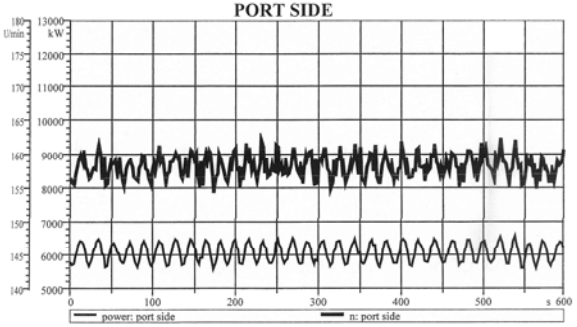
Exhaust gas outlet of M/E to T/C No.1

Şaft güç ölçümü

$$P_S = 2\pi Qn$$

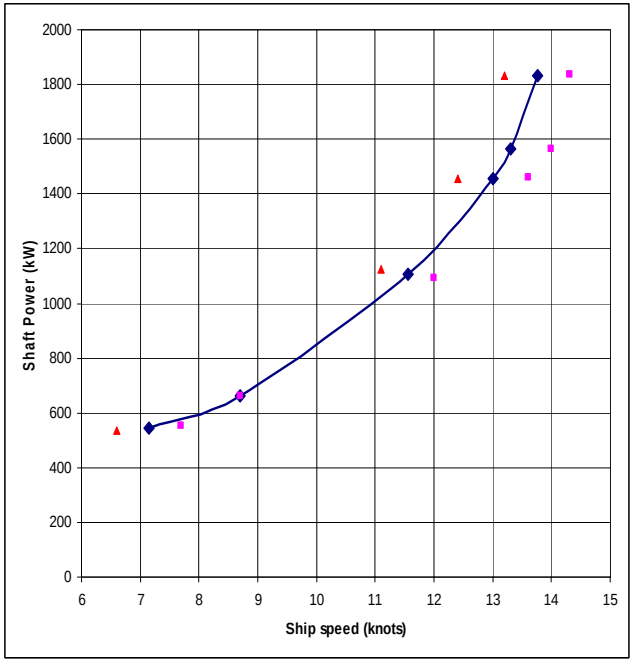
P_S: Shaft power
Q: Shaft torque moment
n: Shaft rate of revolution





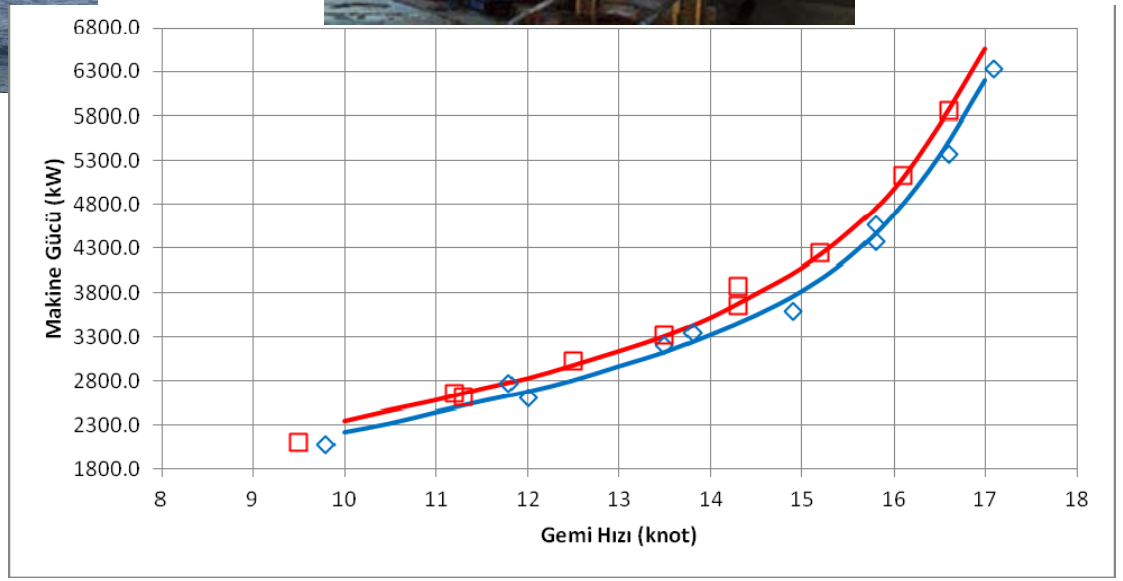
Mean Values	starboard	port side
power [kW].....	6054	6077
r. p. m. [U/min].....	160,0	158,2

Run No. 9

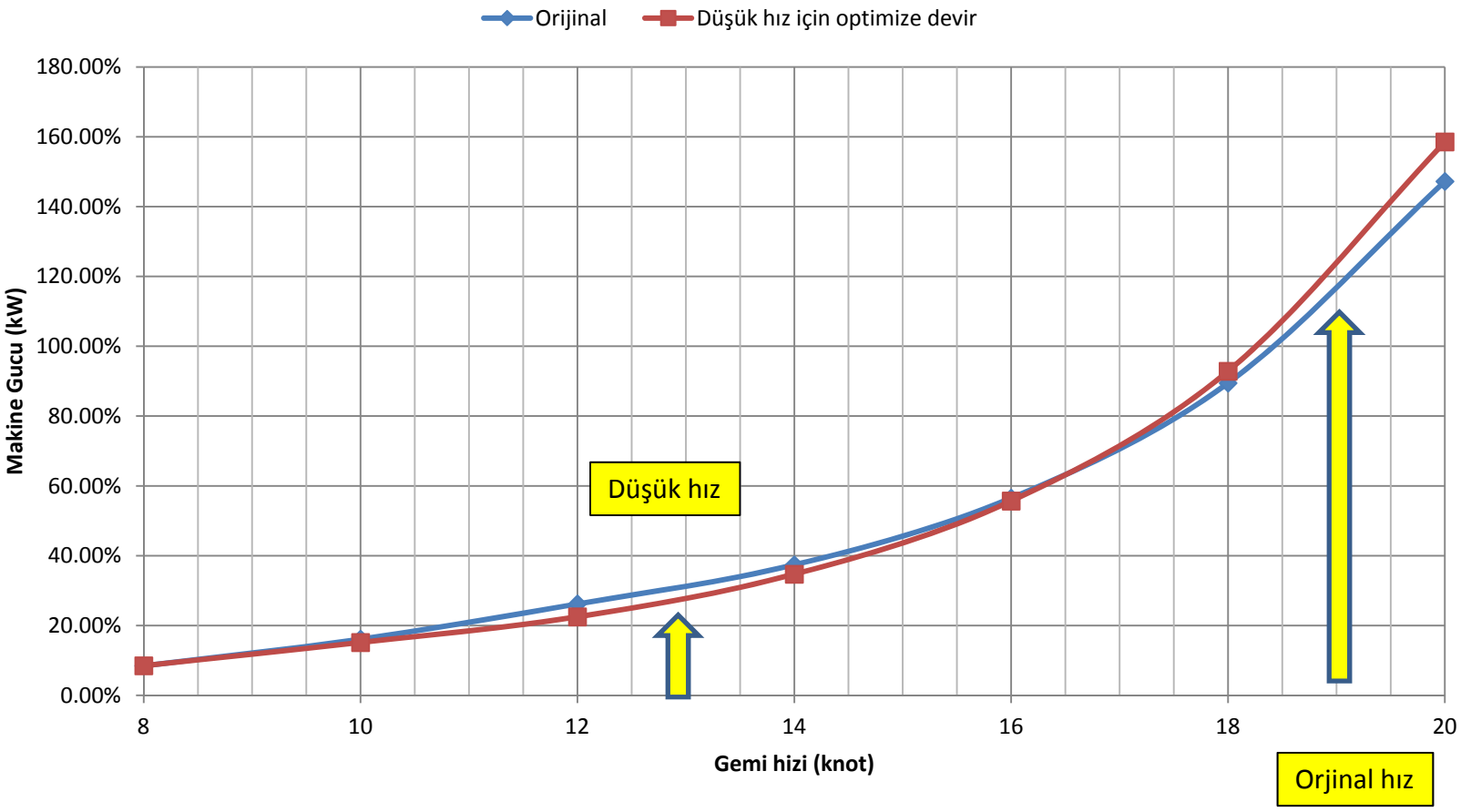


Boya etkisi


ARKAS


Makine Gücü (kW)
6800.0
6300.0
5800.0
5300.0
4800.0
4300.0
3800.0
3300.0
2800.0
2300.0
1800.0
8
9
10
11
12
13
14
15
16
17
18
Gemi Hızı (knot)

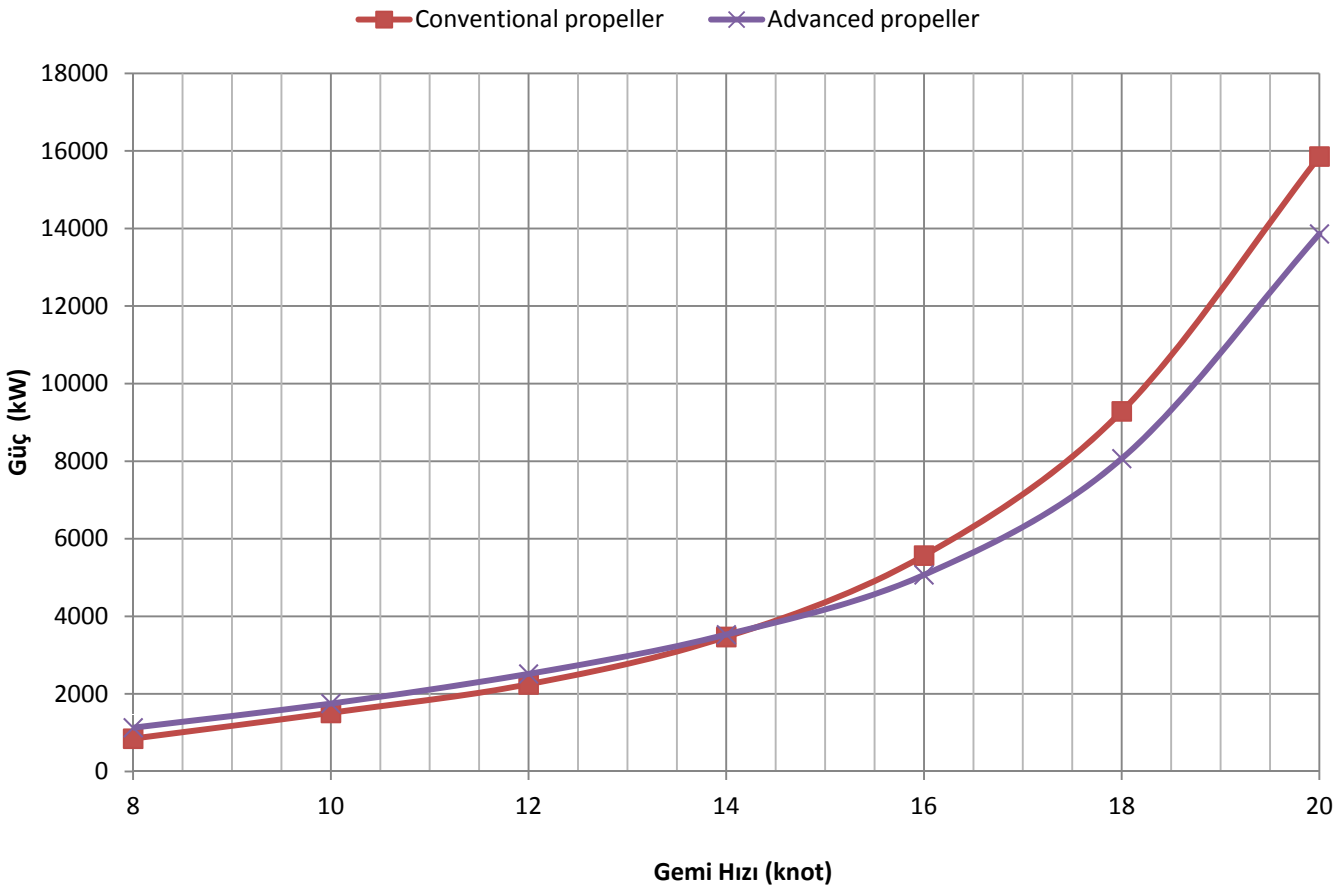
Pervane devir etkisi



Pervane Değişimi

KAPPEL

CLT



İzleme, Raporlama ve Doğrulama (MRV)

Gemilerde Enerji Verimliliği

ve

Enerji Operasyon Planları

İstanbul ve Marmara, Ege, Akdeniz, Karadeniz Bölgeleri
DENİZ TİCARET ODASI

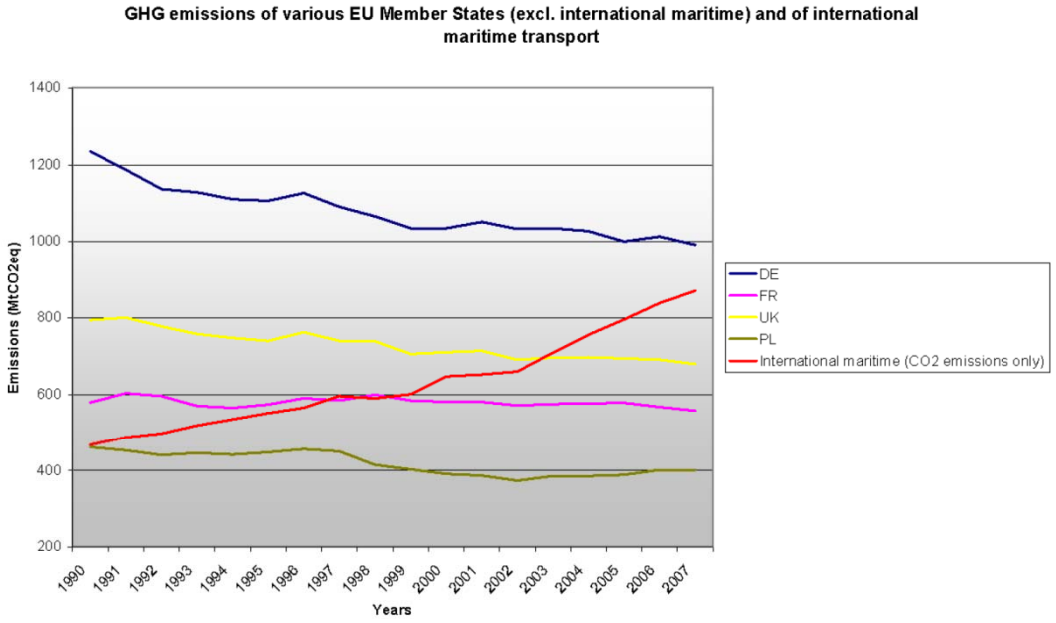
MRV

- Avrupa Birliği (EU Directive 2009/16/EC ve EU regulation 2015/757)
  - 1 Temmuz 2015 de MRV uygulamaya konmuştur
  - 5000 GT dan büyük AB limanlarına uğrayan gemiler yıllık CO2 emisyonlarını AB merkezi veribazına göndermek zorundadır.
  - Kargo, enerji verimliliği vs değerleri sertifikalanmak durumundadır.
  - 1 Ocak 2018 den itibaren veri toplama başlıyacaktır
  - 31 Ağustos 2017 den önce denizcilik şirketleri yakıt tüketim saptama ve raporlama metod planlarını doğrulayıcı kuruluşlar ile bildirmeleri gerekmektedir.
  - Sefer ve yıllık veri toplanması zorunlu hale gelmektedir.

- IMO

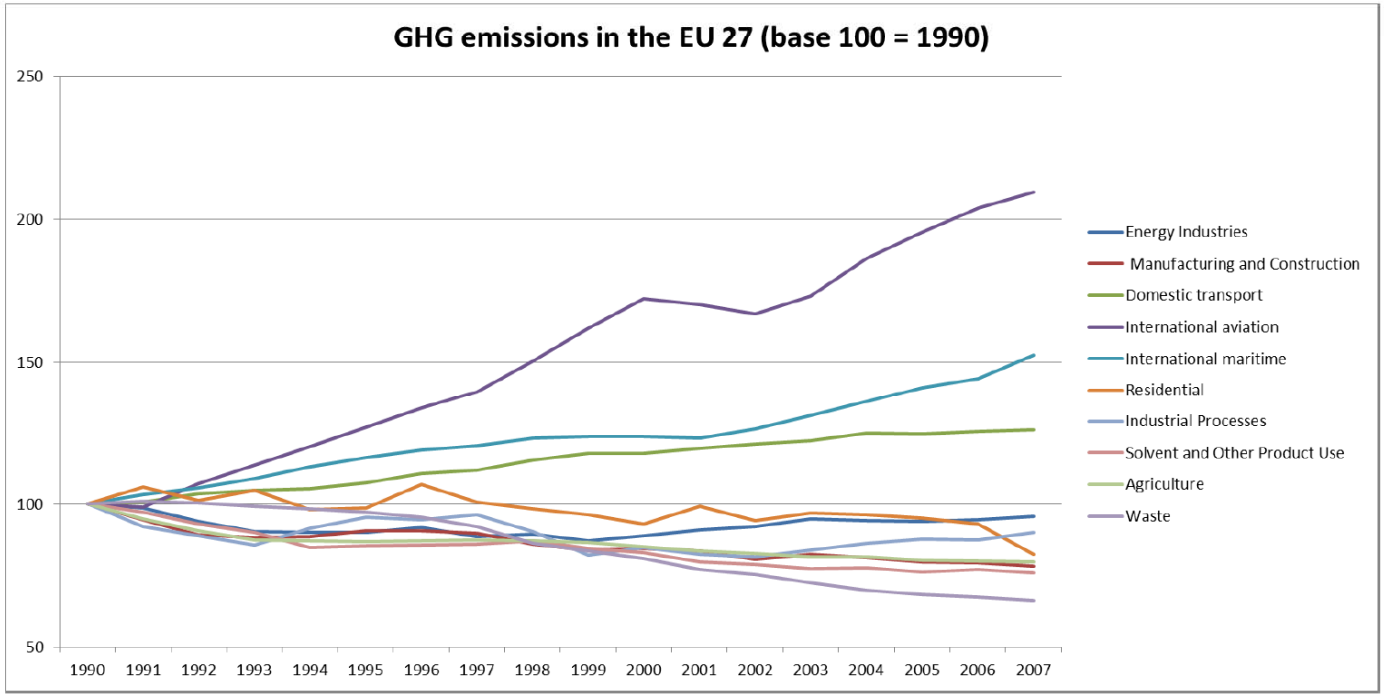
AB nedenleri

- Avrupa Birliği küresel ısınmayı 2 C ile sınırlandırmak istenmekte, bunun ise CO2 emisyonlarını 2030 da 1990 değerlerine göre % 40 azaltmak hedeflenmiştir.



Projeksiyon

EU 27 GHG emissions



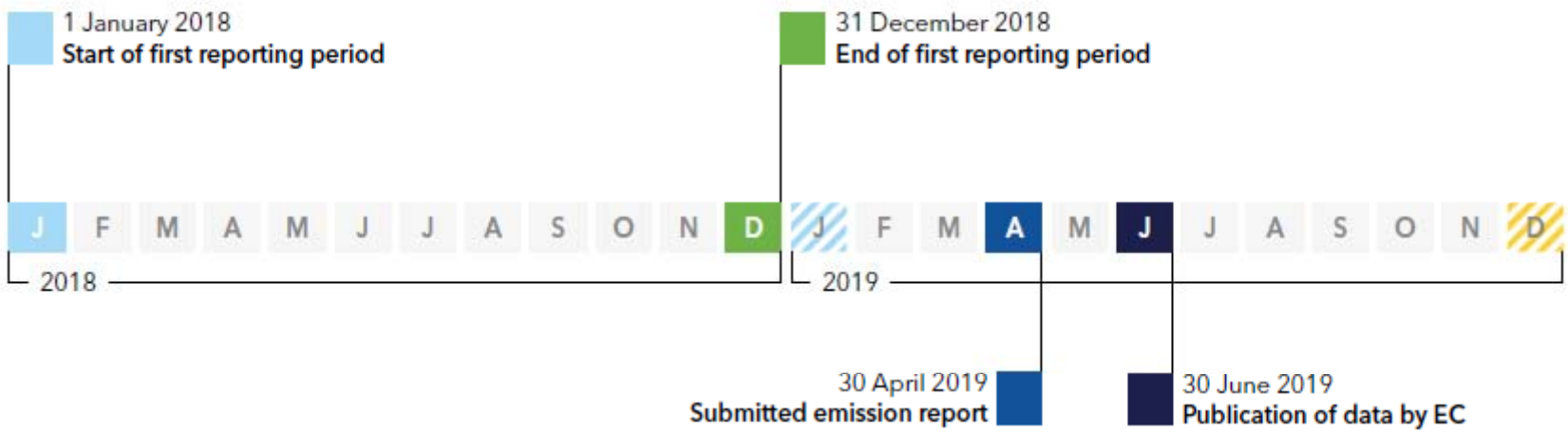
Amaç

Amaç gemilerin çevresel performans ve enerji verimliliği bilgilerinin toplanarak Pazar farklılıklarının kaldırılması

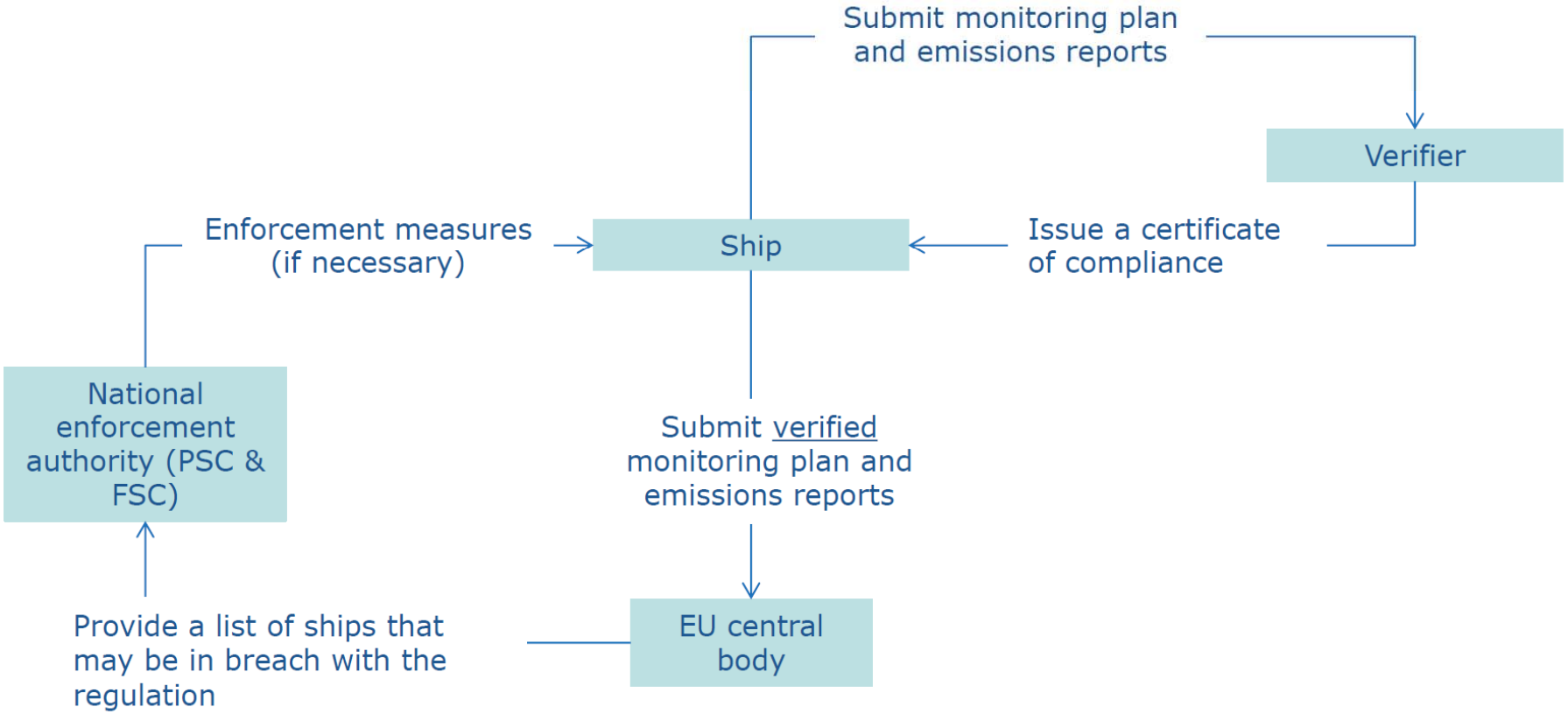
Objective of the MRV system

- To monitor, report and verify CO2 emissions of the maritime sector related to the EU in order to remove market barriers, especially related to the lack of information on the environmental performance/energy efficiency of ships.

Zamanlama


1 January 2018
Start of first reporting period
31 December 2018
End of first reporting period
J F M A M J J A S O N D J F M A M J J A S O N D
2018
2019
30 April 2019
Submitted emission report
30 June 2019
Publication of data by EC

Uyum metodolojisi (5000 GT üzeri gemiler)



Gereksinim

- Bir AB limanından AB dışı limana
- Bir AB dışı limandan AB limanına
- AB limanları arasında

Sefer yapan gemiler (Yılda bir defa bildirim zorunluluğu için yeterli)

Yakıt Raporlama Metotları

- Bunker delivery notes
- Bunker tankları sounding ölçümleri
- Flowmetreler
- Doğrudan emisyon (CO2) ölçümleri

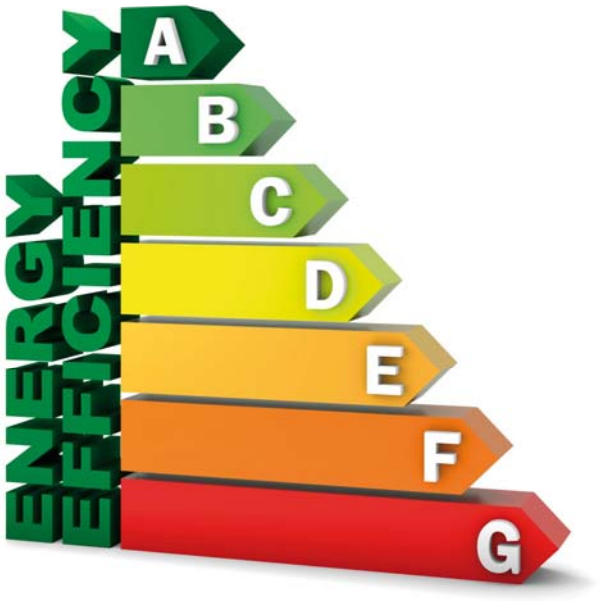
Diğer Değerler

- Ayrılan/Varılan liman gün ve saat
- Kullanılan yakıtın miktarı ve emisyon faktörleri
- CO2 emisyonu
- Sefer mesafesi
- Seferde (denizdeki) süre
- Taşınan kargo
- Taşıma iş değeri

Sonuç

- AB MRV gelecek yıllara gemilerin AB limanlarına girişi konusunda bariyerler yaratma potansiyeline sahiptir.
- Ticari verilerin merkezi toplanması ve yayınlanması riski vardır
- IMO MRV henüz tamamlanmasına rağmen benzer potansiyel yaratmaktadır.

Teşekkürler



Mustafa Insel : mustafainsel@gmail.com