ARIES Meets Industry Meeting Accelerator application to the ship exhaust gases treatment

ITALIAN COAST GUARD EXPERIENCE IN ENSURING COMPLIANCE WITH EXISTING REQUIREMENTS FOR THE SHIP EMISSIONS

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Italian Coast Guard Regional District - GENOVA

CERN, Geneve, 1st December 2017

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- SOME EVIDENCES …

LEGISLATION

- EMISSIONS related to shipborne combustion processes (power, auxiliary systems)
- MARPOL 73/78 Annex VI
  - Ozone depleting substances – i.e. halon
  - Nitrogen oxides - NOx emissions (marine diesel engines)
  - Sulphur Oxides - SOx emissions
  - particulate matter (PM)
- International Air Pollution Prevention Certificate (I.A.P.P.C.).
  - Ships > 400 GT
  - R.O.s
  - Recognized organizations (R.O.) - Port State Control (IT Coast Guard)
- Engine International Air Pollution Prevention Certificate (E.I.A.P.P.)

LEGISLATION

- DIRECTIVE 1999/32/EC (sulphur content of marine fuels)
- DIRECTIVE 2005/33/EC-2012/33/EC amending Directive 1999/32/EC
- DIRECTIVE (EU) 2016/802 relating to a reduction in the sulphur content of certain liquid fuels
- REGULATION (EU) 2015/757 on carbon dioxide emissions from maritime transport

In ITALY:

- **D.lgs. 152/2006** (Testo unico in materia ambientale) article 291 et seq.

ITALIAN environmental law

LEGISLATION

% by mass (IT D.lgs. 112/2014 as amended)

- Maximum sulphur content in marine fuel in territorial seas, exclusive economic zones and pollution control zones
  - 3,50 %
  - 0,50 % as from 1 January 2020
- Sulphur Emission Control Areas (S.E.C.A.)
  - 0,10 % (= Marpol Annex VI/14)
- ships at berth in Union ports
  - 0,10 %
- ships operating on regular services to or from Union ports
  - 1,5%
  - 0,10 % as from 1 January 2020

LEGISLATION

In ports:

- fuel-changeover according to the IT law
  - as soon as possible,
  - not later than 2 hours after arrival at berth
  - recorded in ships' logbooks

VERIFICATIONS AND CONTROLS

IT COAST GUARD MISSIONS

VERIFICATIONS AND CONTROLS

IT CG ACTIVITIES PERFORMED FOR THE MINISTRY OF ENVIRONMENT

- ✓ Marine environment protection
- ✓ Pollution prevention and response
- ✓ Surveillance and police control inside **30 specially protected marine areas** (20.043,153Km^2 at sea - 700km of coast)

VERIFICATIONS AND CONTROLS

- **IT Coast Guard** responsible for verifications and controls according to D.lgs. 152/2006, art. 296 c. 9
- Agreement between the Italian Coast Guard HQ and Customs for sampling of fuel oil in specialized customs laboratories
  - Cooperation at local level between Customs and IT Coast Guard

VERIFICATIONS AND CONTROLS

IT Coast Guard verifications and controls

- Documental verifications
  - Ship certificates
  - inspection of ships' logbooks and bunker delivery notes

- sampling and analysis
  - sampling of the marine fuel for on-board combustion while being delivered to ships
  - analysis of sealed samples to be kept aboard (art. 295 c. D.lgs. 152/2006)
  - sampling and analysis of marine fuel in bunker tanks

VERIFICATIONS AND CONTROLS

- 10% of all ships calling IT ports to be verified
- **20% of controls** by sampling and analysis
  - sealed samples kept aboard
  - samples from bunker tanks
- Port State Control

VERIFICATIONS AND CONTROLS

- Penalties for breaches of IT law provisions - D.lgs. 152/2006, Art. 296, cc. da 5-8
  - For commercializing fuels not in compliance € 15.000 - 150.000
  - For using fuels not in compliance € 15.000 - 150.000
  - For documentary inconsistency or incorrect documentation aboard € 5.000 - 15.000
  - For fuel samples missing aboard aboard € 5.000 - 15.000
  - For fuel-changeover recordings missing aboard € 1.549 - 9.296

VERIFICATIONS AND CONTROLS

- carbon dioxide emissions (CO2)
- REGULATION (EU) 2015/75
- IMO Package for Reducing Shipping's CO2
  - No binding tools (yet)

CRITICAL

VERIFICATIONS AND CONTROLS

- Nitrogen oxides - NOx emissions
  - Marpol Annex VI Reg. 13
  - NOx Technical Code 2008
- How to control Nox emissions?
  - Engine parameter check method
  - Simplified check method
  - Direct measurement and monitoring method

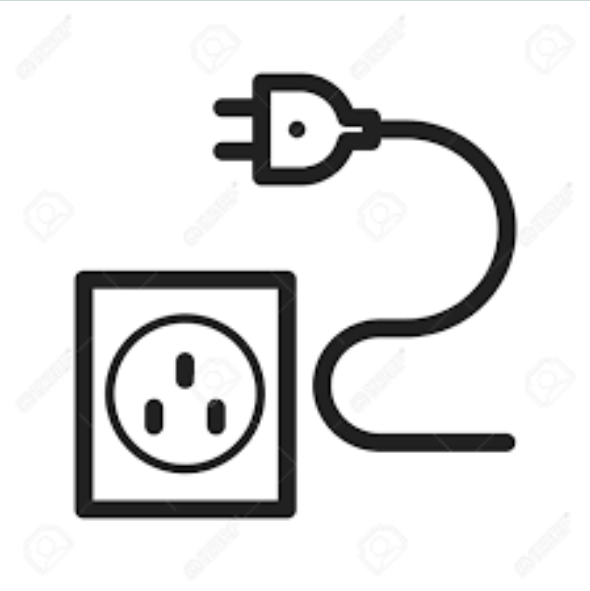
IT COAST GUARD EXPERIENCE IN GENOVA

Coast Guard Experience in Genova

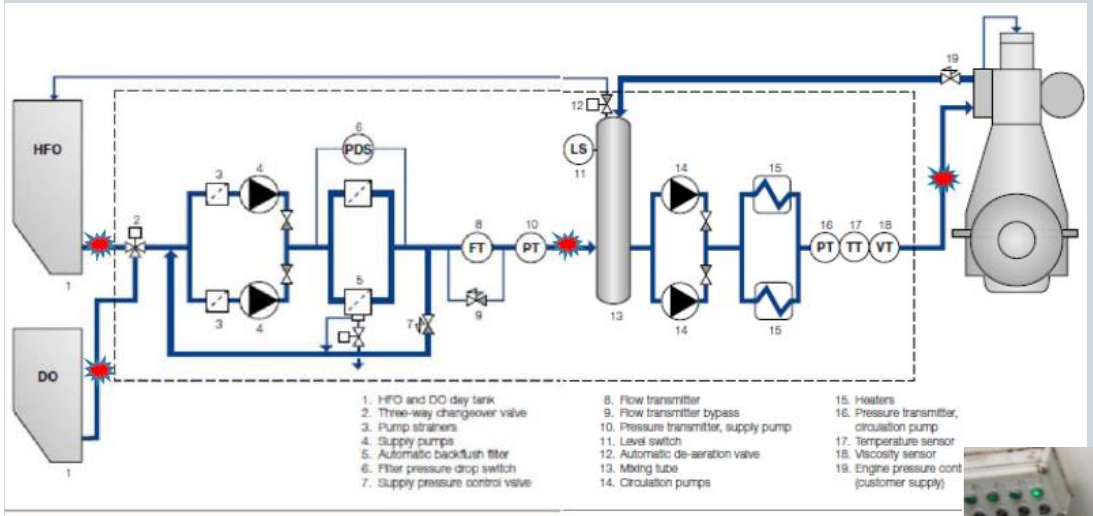
- Documentary verifications
  - inspection of ships' logbooks and bunker delivery notes
- sampling and analysis
  - sampling of the marine fuel for on-board combustion while being delivered to ships
  - analysis of sealed samples to be kept aboard (art. 295 c. D.lgs. 152/2006)
  - sampling and analysis of marine fuel in bunker tanks
- Engine Exhaust Gas Analysis and monitoring

IT COAST GUARD EXPERIENCE IN GENOVA

- The port of Genoa is the first IT port to have an Energy regulator plan



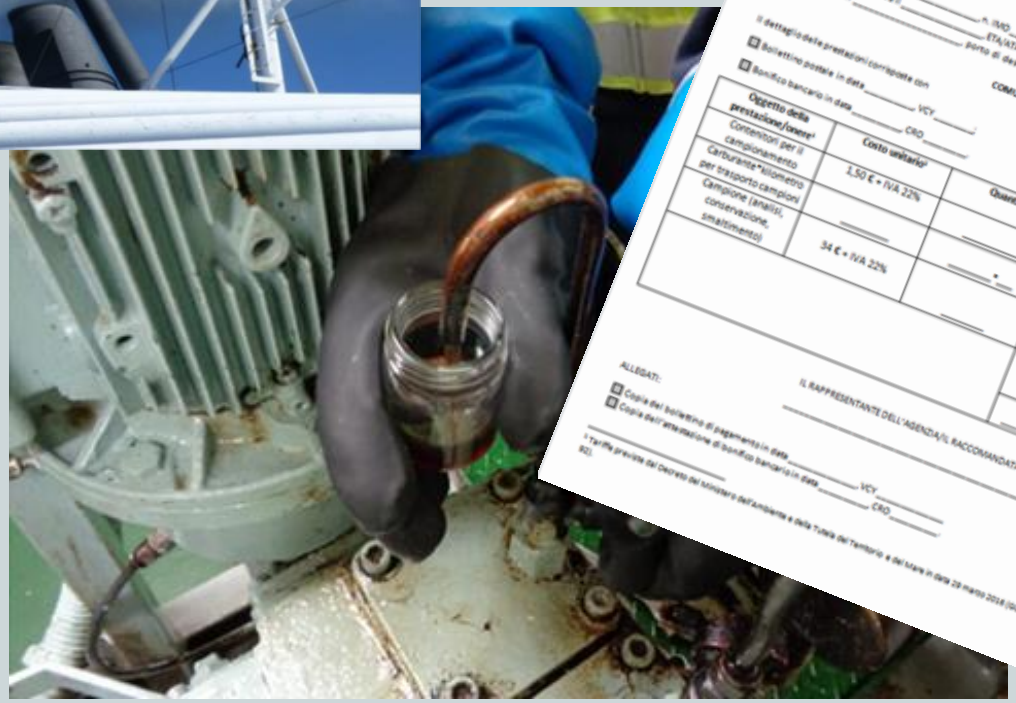
SAMPLING OF MARINE FUEL



Sampling point as close as possible to the fuel user

SAMPLING OF MARINE FUEL

SAMPLING OF MARINE FUEL



CAPITANERIE DI PORTO – GUARDIA COSTIERA

COMUNICAZIONE DI PAGAMENTO DEGLI ONERI DELLE PRESTAZIONI E DEI CONTROLLI PREVISTI DALL'ART. 296 COMMA 5 DEL D.LGS. 152/2006

Alla Capitaneria di porto di Genova – Sezione Tecnica

Il sottoscritto _____ nato a _____ il _____

☐ in qualità di rappresentante dell'Agenzia/ Raccomandatario Marittimo _____ (barrare la casella che interessa) n° _____ C.A.P. _____ e residente a _____ in via/piazza _____ n° _____ Cod. Fisc. _____

in rappresentanza dell'armatore _____ C.F./partita IVA: _____ con sede in _____

☐ in qualità di armatore

della nave: Nome _____ n. IMO _____

arrivata nel porto di Genova il _____ ETA/ATA _____ porto di provenienza _____

precedo partire il _____ porto di destinazione _____ presso la banchina _____

COMUNICA

Il dettaglio delle prestazioni corrisposte con

☐ Bollettino postale in data _____ VCY _____

☐ Bonifico bancario in data _____ CRO _____

Oggetto della prestazione/onere*	Costo unitario*	Quantità*	Totale*
Contenitori per il campionamento	1,50 € + IVA 22%		
Carburante*volumetro per trasporto campioni			
Campione (analisi, conservazione, smaltimento)	34 € + IVA 22%		
			TOTALE

ALLEGATI:

☐ Copia del bollettino di pagamento in data _____ VCY _____

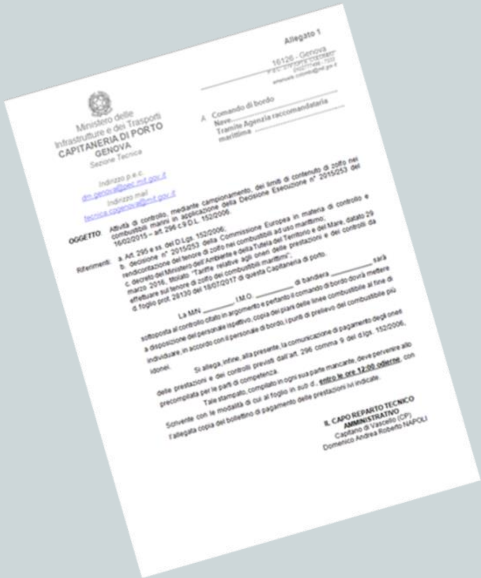
☐ Copia dell'attestazione di bonifico bancario in data _____ CRO _____

IL RAPPRESENTANTE DELL'AGENZIA/L RACCOMANDATARIO MARITTIMO/L'ARMATORE

* Tariffe previste dal Decreto del Ministero dell'Ambiente e della Tutela del Territorio e del Mare in data 29 marzo 2018 (GU 20 aprile 2018 n. 92).

SAMPLING OF MARINE FUEL

- IT Coast Guard office schedules annually the number of Documentary verifications and samplings to be done
- on a weekly basis the ships to be checked are identified
- One day in advance the ship agency is given notice about the activity to be done aboard
- The agency is also given a form to pay in advance for the analysis



AGENZIA DELLE DOGANE E DEI MONOPOLI

Allegato 5

Riservato all'Ufficio
Prot. N________ del _______

RICHIESTA DI ANALISI

Ai sensi dell'Accordo quadro tra Agenzia delle Dogane e dei Monopoli e il Ministero delle Infrastrutture e dei Trasporti per l'analisi chimica dei combustibili ad uso marittimo per la verifica dei tenori di zolfo

Il Richiedente Capitaneria di Porto di	
Sede legale (Via, numero civico, CAP, Città, Provincia)	
C.F./P. Iva	
Codice IPA	
Telefono:	Fax:
Indirizzo di posta elettronica:	

Chiede di eseguire l'analisi chimica dei combustibili ad uso marittimo per la verifica dei tenori di zolfo
su n. _____ campioni di gasolio
su n. _____ campioni di olio combustibile

N. _____ contenitori forniti dall'Agenzia delle Dogane e dei Monopoli

Ai sensi dell'Accordo Quadro e del Decreto 29 marzo 2016 del Ministero dell'Ambiente e della Tutela del Territorio e del Mare il richiedente si impegna al pagamento di 34,00 € per l'analisi, la conservazione e lo smaltimento di ogni singolo campione.

Si impegna ad effettuare il pagamento nella misura prevista per le prestazioni richieste tramite bonifico, indicando la causale di pagamento, riportata sulla fattura.
Le informazioni fornite saranno trattate da parte del Laboratorio esclusivamente per le finalità connesse all'erogazione del servizio e per gli eventuali successivi adempimenti. Il Laboratorio tratta tali dati in conformità al citato D.Lgs. n.196/2003 e s.m.

Data__________ Timbro e firma del richiedente________________

Note (riservato all'ufficio)

Visto

Il Direttore / Responsabile dell'Ufficio
(Dr. Nome Cognome)

Data__________ Firma________________

SAMPLING OF MARINE FUEL

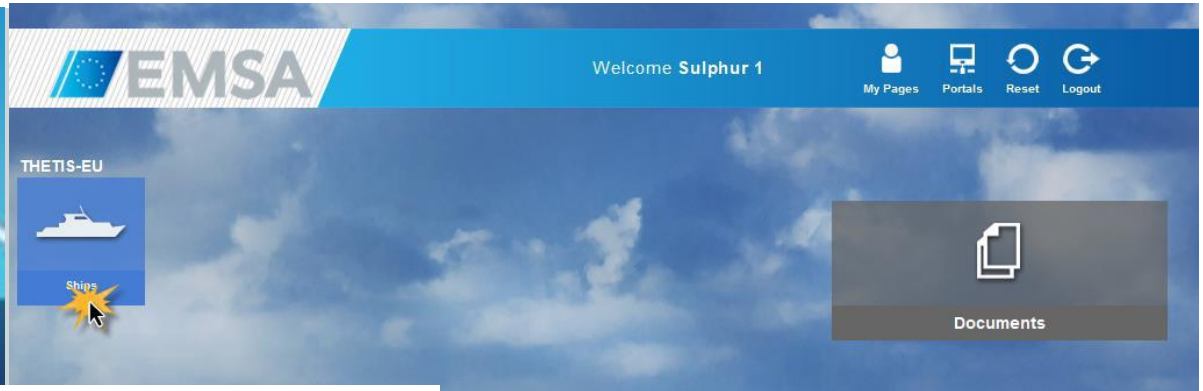
SOME STATISTICS …

Year	No of controls	Sanctions	motivation
2015	208 (documental verif.)	1	fuel-changeover recording missing
2016	184 (documental verif.)	0	//
2017*	181 (documental verif. - **29 sampling**)	2	sealed samples aboard missing / fuels not in compliance (> 0,1 %)

*01/01/2017 – 09/11/2017

N.B. : No. of ship calls in the port of Genoa : about 1,500 per year

SAMPLING OF MARINE FUEL



Icons

The following icons are used in the system in the main screen

Icon	Table Column	Meaning
	Alert	Indicates that one or more manual alerts have been recorded to the ship
	Alert	Indicates that the last recorded Sulphur inspection is older than one year or non-existing.
	Calls	Indicates that there are more PortCalls in the user MS which are not being displayed in the screen. With mouse over the icon, the system will indicate the number of calls for that ship.

IMO	9991625	Ship type	Gas carrier	Inspection date	18/07/2016 12:31	Member state	Italy
Name	IT RED 05	Flag state/Registry	Saint Vincent and the Grenadines	Regime	Sulphur,	Port	Cagliari

CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

LEGISLATION/VERIFICATIONS AND CONTROLS / IT COAST GUARD EXPERIENCE IN GENOVA / SAMPLING OF MARINE FUEL / **CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS** / SOME EVIDENCES …

CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

- In 2013 IT **Coast Guard and A.R.P.A.L.** launched a campaign of controls on ships exhaust emissions into the atmosphere in cooperation with shipping companies
- Italian flagged ro/ro ships regularly calling the port of Genova
- purposes :
  - To give an answer to citizens' complaints about exhaust emmissions from ships while in the port of Genova
  - To understand the real problem in consideration of other existing emissions in the area
  - To compare results coming from different ships and give a contribution in order to promote investiments and improvement

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Agenzia regionale per la protezione dell'ambiente ligure

CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

- N.B. exhaust emissions are not directly linked to not in compliance marine fuels. Often they are due to a poor engine maintenance

CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

- Cooperating Shipping companies:
  - Grandi Navi Veloci S.p.A.
  - Moby S.p.A.
  - Tirrenia – Compagnia Italiana di Navigazione S.p.A.
- MM/VV:
  - GNV La Superba (2001)
  - Moby Otta (1975)
  - Tirrenia Sharden / Nuraghes (2005 / 2004)

CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

2001

49257 GT

4 engines Wartsila 16V46C diesel

2 propellers

67200 kW

16 cilinders

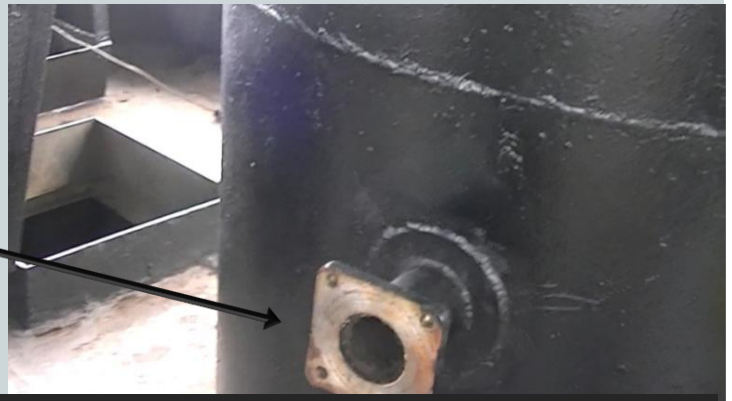
CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

- Targets:
  - % Nitrogen oxides (Nox)
  - % Carbon dioxide (CO2)
  - %Sulphur Oxides (Sox)
  - % Sulfur dioxide (SO2)
  - % and composition of particulate matter (PM)
    - solid particles and liquid droplets
    - Metals

CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

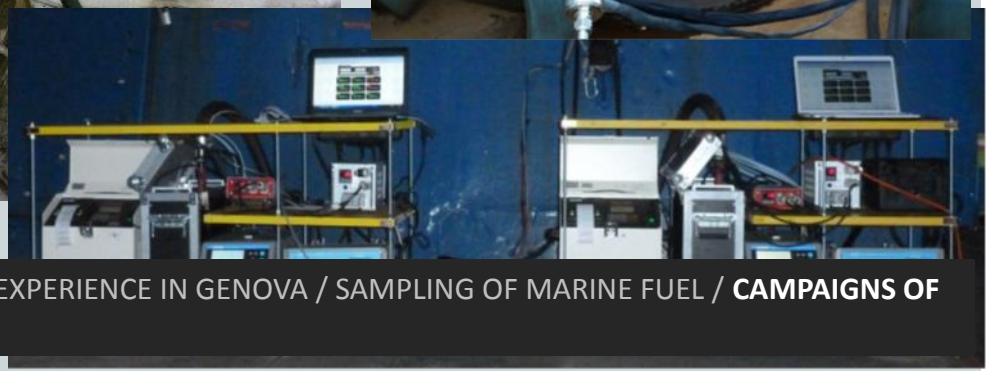
- Methodology:
  - According to MARPOL 73/78 Annex V “Guidelines for on-board NOx verification procedure – direct measurement and monitoring method”

    e.g. :
    - (NOx) analysis - Chemiluminescent Detector (CLD)
    - Carbon dioxide (CO2) - Non-Dispersive Infrared (NDIR)
    - Hydrocarbon (HC) - Heated Flame Ionization Detector (HFID)
  - exhaust gas sample representative of the average exhaust emission from engine cylinders
  - **sampling probe**



CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

- exhaust emissions sampling
- particulate matter
- Speed, temperature, humidity of exhaust gases

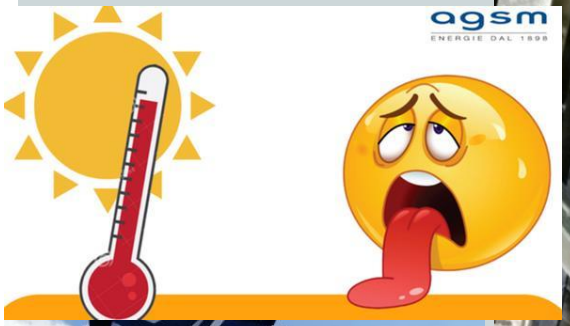


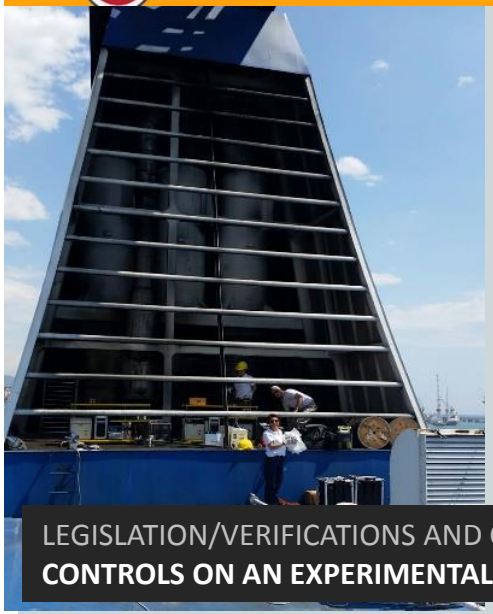
CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

Sailing from Genoa to Palermo
20 mins manouvring – under way

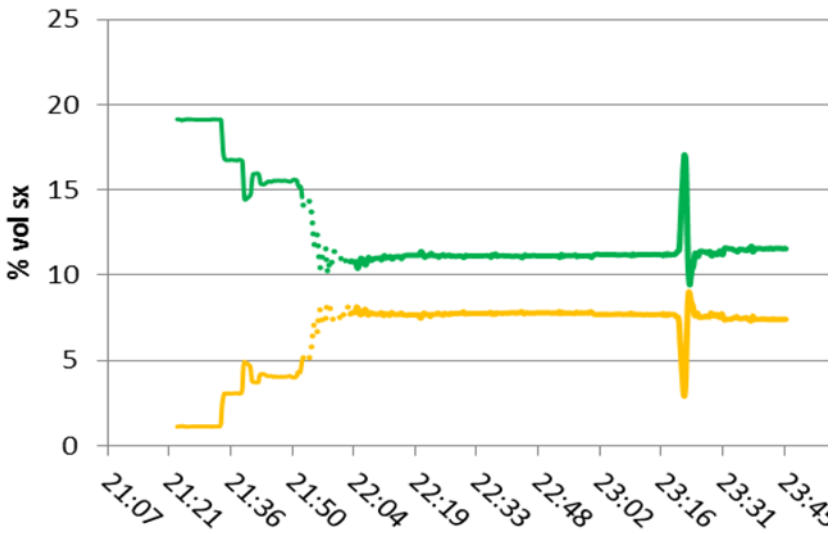
CAMPAIGNS OF CONTROLS ON AN EXPERIMENTAL BASIS

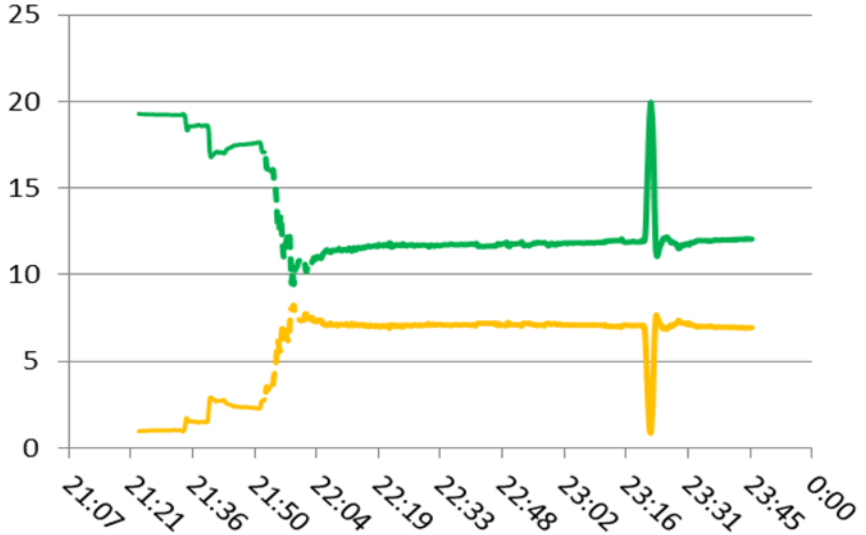
- Not easy!

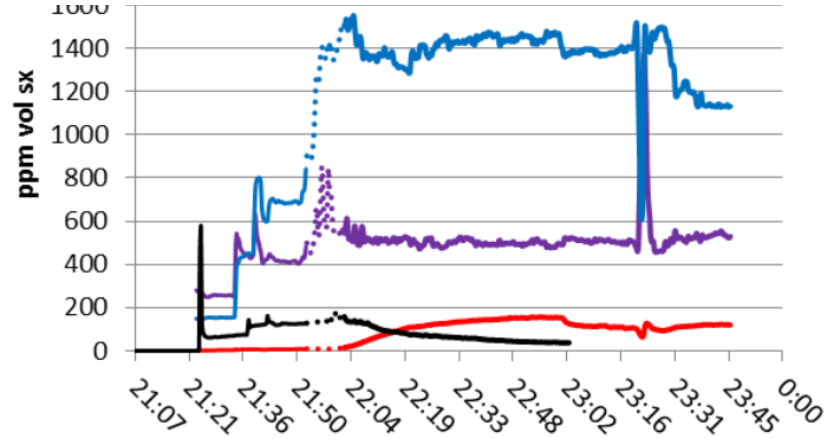


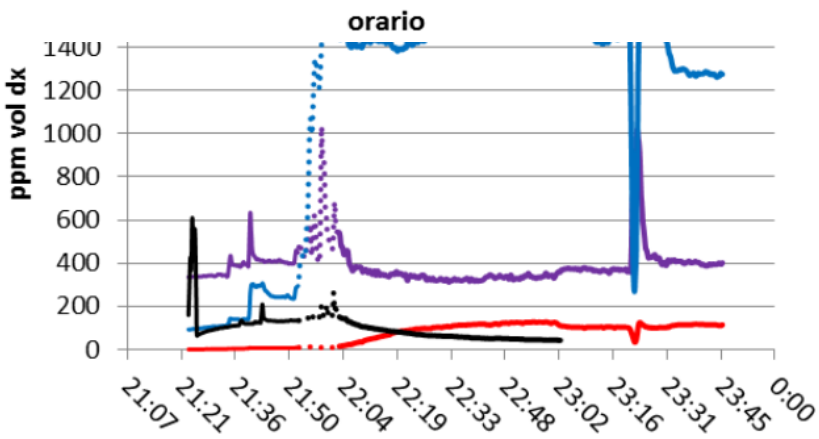


SOME EVIDENCES









SOME EVIDENCES

Engine start – 20 mins (manouvring)

O_2	(13 ± 2*) %vol	
CO_2	(7 ± 2*) %vol	140 $g/_Nm^3$
CO	(750 ± 950*) ppm vol	940 $mg/_Nm^3$
NO_x	(1100 ± 200*) ppm vol	2300 $mg/_Nm^3$ (come NO_2)
SO_2	(190 ± 70*) ppm vol	540 $mg/_Nm^3$

(*) standard deviation

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SOME EVIDENCES

Under way (10 mins)

O_2	(11 ± 2*) %vol	
CO_2	(9 ± 1*) %vol	180 $g/_Nm^3$
CO	(700 ± 600*) ppm vol	870 $mg/_Nm^3$
NO_x	(1400 ± 90*) ppm vol	2800 $mg/_Nm^3$ (come NO_2)
SO_2	(270 ± 40*) ppm vol	770 $mg/_Nm^3$

(*) standard deviation

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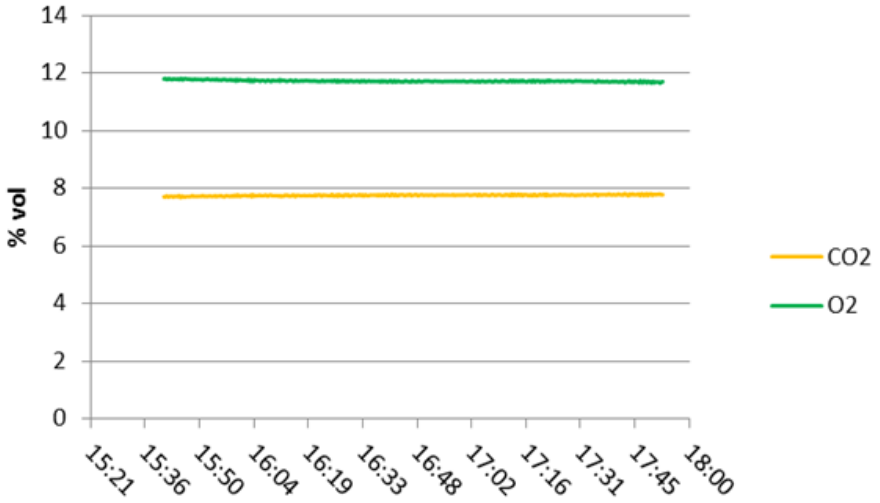
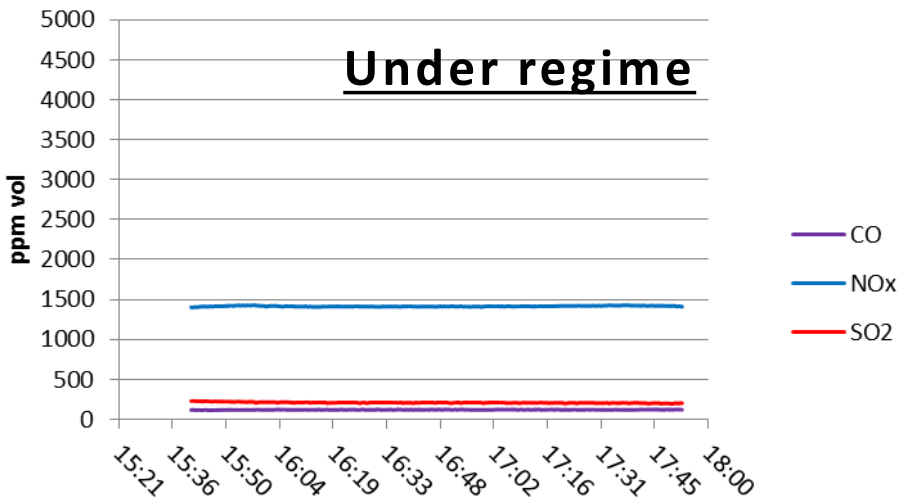
SOME EVIDENCES



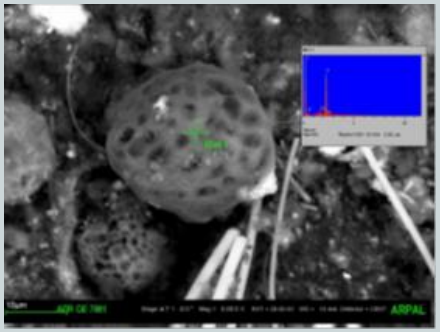
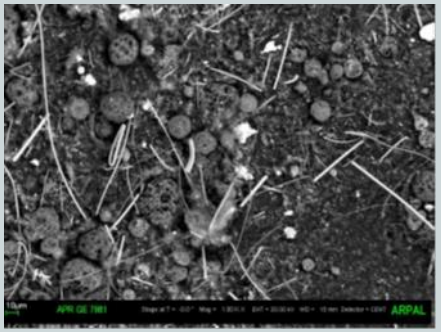
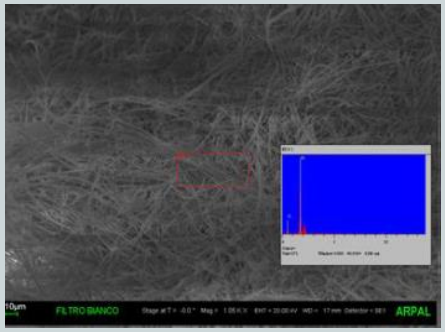
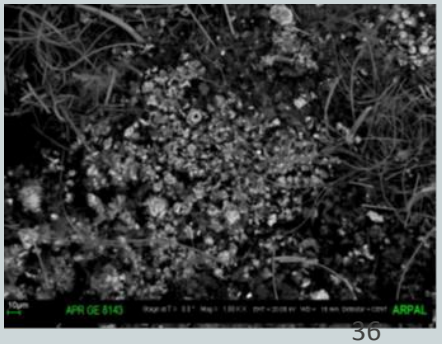


O_2	(11.7 ± 0.1*) %vol	
CO_2	(7.76 ± 0.02*) %vol	150 $g/_Nm^3$
CO	(120 ± 2*) ppm vol	150 $mg/_Nm^3$
NO_x	(1420 ± 5*) ppm vol	2900 $mg/_Nm^3$ (come NO_2)
SO_2	(210 ± 7*) ppm vol	600 $mg/_Nm^3$

SOME EVIDENCES

- particulate matter (PM)

engine	°C	Humidity %	Kg/h	status
sx	256	7,6	7,5	Port of Genoa - out
dx	256	5,4	2,9	
sx	333	4,9	6,8	Under way
dx	348	4,3	5,3	
sx	303	6	2,7	Port of Genoa - in
dx	308	6	0,5	

SOME EVIDENCES

Particulates (mg/m3)

SX

	GE→Pa	in GE	out GE
As	1.1	1.6	1.9
Hg	0.000	0.000	0.005
Cd	0.1	0.0	0.2
Cr	29	19	39
Fe	382	284	500
Ni	436	323	535
Cu	29	21	38
V	317	263	371
Al	149	116	191
Pb	4	3	6

DX

	in+out Pa	GE→Pa	in GE	out GE
As	2.3	1.5	2.6	4.1
Hg	0.000	0.000	0.000	0.009
Cd	0.0	0.0	0.0	0.2
Cr	34	16	10	25
Fe	470	230	162	321
Ni	520	257	171	406
Cu	37	18	13	27
V	380	189	135	279
Al	195	90	62	145
Pb	6	3	3	5

SOME EVIDENCES

Campaigns of controls on an experimental basis

- Difficulties in performing experimental controls
- Many parameters to consider
- Engine maintenance
- Not binding tools

QUESTIONS ???

Thank you for your attention!

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