

**4<sup>th</sup> Public Workshop to Discuss Development of Regulations for  
Ocean-going Ship  
Main Engines and Auxiliary Boilers**

**2006 OCEAN-GOING VESSEL SURVEY RESULTS**



**March 5, 2008  
Sacramento, CA**



# Ocean-Going Ship Survey

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- ◆ Survey conducted Spring 2007
- ◆ Designed to collect information on OGVs operating in California waters
  - Update emissions inventory
  - Support emission reduction activities
  - Evaluate OGV operation/power needs
    - Targeted propulsion and auxiliary engines
  - Identify vessel modifications necessary to comply with main & auxiliary engine regulations

## 178 Companies Provided Information on 761 Ocean-Going Vessels

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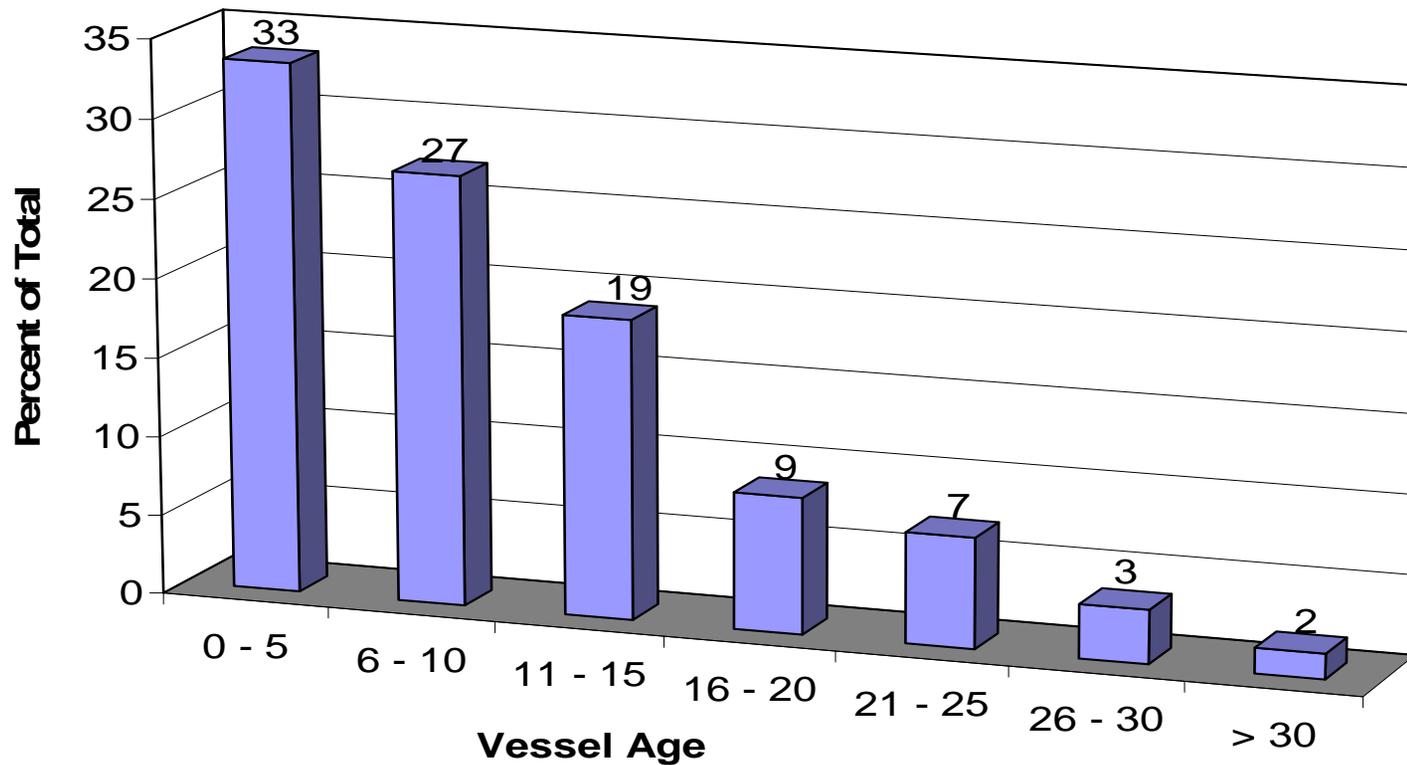
Vessel Type	Number of Vessels	Percent of Total Vessels Responding to Survey
Auto Carrier/Ro-Ro	85	11
Bulk Carrier/General Cargo	145	19
Container Ship	294	39
Motor Ship/Container	6	1
Passenger	36	5
Product Carrier	1	0
Reefer	7	1
Tanker	187	25
<b>Total</b>	<b>761</b>	<b>100</b>

# **Survey Results for Main Engines**

# Age Distribution of Surveyed Ocean-Going Vessels

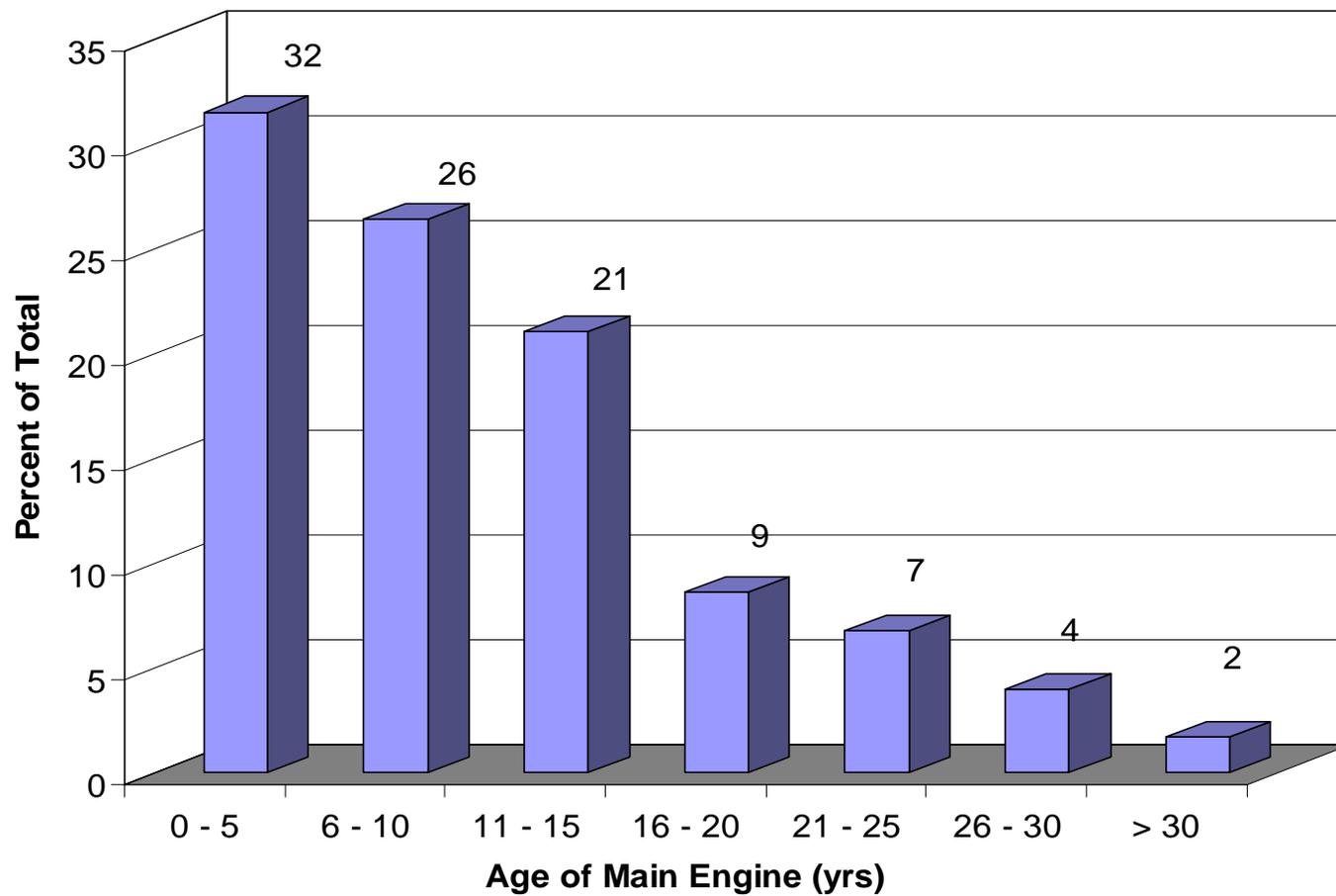
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## Percent of Vessels by Age



## Age Distribution of Main Engines in Surveyed Ocean-Going Vessels

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# Need for Vessel Modifications Varied with Operating Distance on Low-Sulfur Distillate Fuels

<b>Operating Distance on Low-sulfur Distillate Fuels</b>	<b>Number of Surveyed Ships Indicating Modifications Needed</b>	<b>Percent of Total Surveyed Ships</b>
24 nm	168	22%
50 nm	196	26%
100nm	213	28%

## Number of Vessels Reporting Need for Modifications to Use Low-Sulfur Distillate Fuel in the Main Engine (Out to 24nm)

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Vessel Type	Number of Vessels Reported as Needing Modifications	Percent of Total Vessels in Listed Vessel Type
Container Ships	73	25
Tankers	32	17
Bulk Carrier/General	16	11
Auto Carrier/Ro-Ro	43	51
Passenger	5	14
Others	1	7
<b>Total</b>	<b>170</b>	<b>22%</b>

## Types of Modifications Reported to Use Low-Sulfur Distillate Fuel in the Main Engine (Out to 24nm)

Number of Vessels Reported	Containers	Tankers	Bulk Carriers	Auto Carrier	Passenger	Others
		73	32	16	43	5
Equipment Type	Equipment Modifications for Vessels Reported					
Fuel Tanks	17	17	13	43	0	1
Cylinder Lube Oil Systems	9	25	10	1	0	1
Fuel Valves	1	3	5	1	0	0
Fuel Piping & Pumps	24	17	4	42	5	1
Engine Fuel Pumps	2	6	5	1	3	0
Engine Fuel Injectors	2	3	5	1	0	0
Others	15	6	2	2	1	0

## Total Costs Reported by Vessel Type to Use Low-Sulfur Distillate Fuel in the Main Engine (Out to 24nm)

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Vessel Type	Minimum	Maximum	Average (Cost in Dollars)
Auto Carrier/Ro-Ro	\$107,000	\$107,000	\$107,000
Bulk Carrier/General Cargo	\$2,000	\$390,000	\$179,500
Container Ship	\$45,000	\$178,000	\$129,800
Passenger	\$150,000	\$180,000	\$166,366
Tanker	\$15,000	\$1,750,000	\$599,954

# Costs by Modification Type (Out to 24 nm)

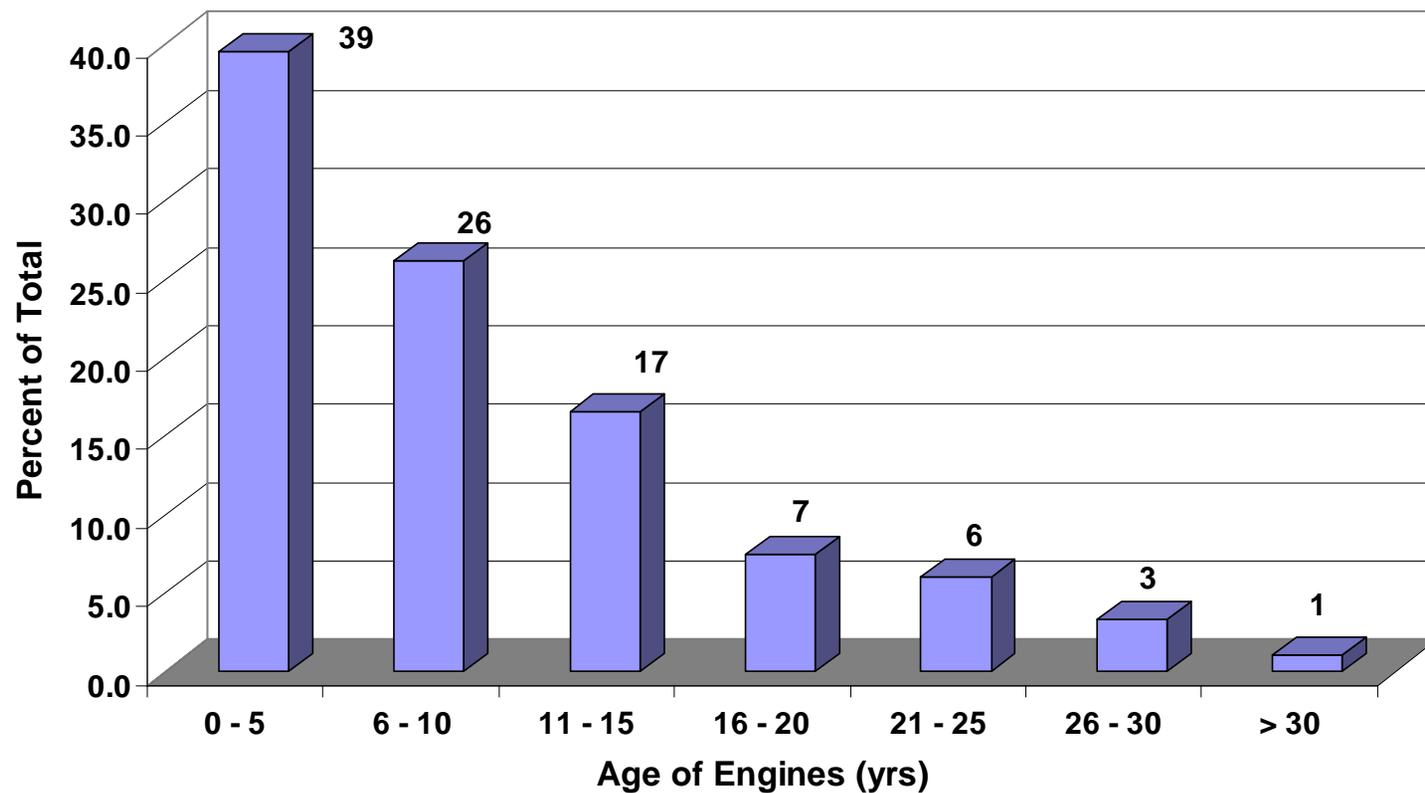
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<b>Modification</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Average (Cost in Dollars)</b>
<b>Fuel Tanks</b>	\$5,000	\$1,000,000	\$149,141
<b>Cylinder Lube Oil Systems</b>	\$2,000	\$500,000	\$122,562
<b>Fuel Valves</b>	\$10,000	\$10,000	\$10,000
<b>Fuel Piping &amp; Pumps</b>	\$10,000	\$250,000	\$60,564
<b>Engine Fuel Pumps</b>	\$120,000	\$180,000	\$129,000
<b>Engine Fuel Injectors</b>	\$10,000	\$10,000	\$10,000
<b>Other</b>	\$169,098	\$169,098	\$169,098

# **Survey Results for Auxiliary Engines**

# Age Distribution of Surveyed Auxiliary Engines

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# Number of Vessels Reporting Needing Modifications to Comply with Auxiliary Engine Fuel Regulation

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<b>Modifications</b>	<b>Number</b>	<b>Percent</b>
No	678	94%
Yes	40	6%
<b>Total</b>	<b>718</b>	<b>100.0</b>

# Types of Modifications Undertaken for Compliance with Auxiliary Engine Regulation

- ◆ Fuel oil system modifications
- ◆ Conversion of HFO tanks to MGO and new fuel lines
- ◆ Rebuild and modify fuel injection pumps and fuel oil pumps
- ◆ Fuel oil micronizer
- ◆ Additional storage tanks for MGO or MDO fuels
- ◆ Install cooler for diesel fuel
- ◆ Change the TBN of the lube oil and add cooling lines to the fuel oil pumps

# Reported Costs for Modifications to Comply With Auxiliary Engine Fuel Regulation (Costs in dollars)

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<b>Minimum Costs</b>	<b>Maximum</b>	<b>Average*</b>
<b>\$600</b>	<b>\$140,000</b>	<b>\$50,644</b>

\*Cost information provided for 13 vessels

# Contact Information

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Ron Hand  
(916) 327-6683  
rhand@arb.ca.gov

Peggy Taricco  
(Manager)  
(916) 323-4882  
ptaricco@arb.ca.gov

Dan Donohoue  
(Branch Chief)  
(916) 322-6023  
ddonohou@arb.ca.gov

**Email Questions to [coastalm@calepa.ca.gov](mailto:coastalm@calepa.ca.gov) (during workshop only)**

**<http://www.arb.ca.gov/marine>**