



RE-POWERING THE R/V RACHEL CARSON

Green Boats and Ports
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8/23/2018



CA Air Resource Board

- Commercial Harbor Craft (CHC) require initial report of make/model/EPA class of all diesel engines with annual report of individual engine hour meters as well as fuel usage and operating area
- Research vessels are included within the CHC category
- Current research vessels are not required to reduce emissions by specific dates but do need to report



Carl Moyer Program

- CA state grant program, administered by county air resource boards to provide funds for purchasing cleaner than required engines
- Covers not only marine vessels but agricultural and off-road construction equipment
- Research vessels can be funded to their highest level of 85%, since no current regulation requires reductions of emissions



Timeline

- Identify replacement model, level of effort, and cost
- Mar 2016 - Submit grant proposal
- Aug 2016 – Notified of intended grant award
- Mar 2017 – Grant contract signed
- Mar 2017 - Engine orders placed
- Mar 2017 - Shipyard re-power engineering contract awarded
- Oct 2017 - Carson arrived shipyard
- Dec 2017 - Installation and sea trial complete



2016 Moyer Grant Ranking – Monterey County

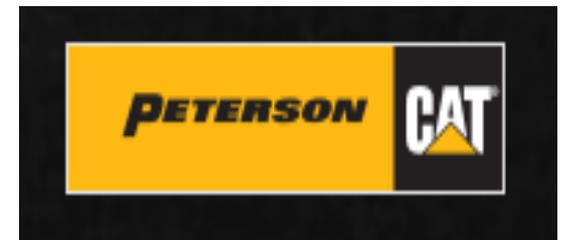
Carl Moyer Program Application Ranking List*

2016 Application Year

GAA Assigned	Applicant Name	Project Type	Annual Emission Reductions (tons/year)	Cost-Effectiveness (\$/ton, max allowed is \$18,262)
615	MBARI	Marine Vessel	8.53	\$16,933.00
605	Graniterock	Off-Road; Loader	4.38	\$18,262.00
622	J&S Farms	Irrigation Pump	1.85	\$5,551.89
618	Sabor Farms	Off-Road; Tractor	1.7	\$18,262.00
609	Lady J Skiff	Marine Vessel	1.63	\$15,812.00
610	Fresh Value Farms	Off-Road; Tractor	1.42	\$5,969.60
617	Sabor Farms	Off-Road; Tractor	1.19	\$18,262.00
626	Cornerstone Masonry	Off-Road; Forklift	1.08	\$18,262.00
619	MRWMD	Off-Road; Compactor	1.04	\$18,262.00
625	Vultaggio & Sons Masonry	Off-Road; Forklift	0.69	\$18,262.00
608	King Philip, Inc.	Marine Vessel	0.65	\$16,219.32
603	Monterey Bay Boat Charters	Marine Vessel	0.52	\$17,706.13
616	Sabor Farms	Off-Road; Tractor	0.52	\$18,262.00
606 Repower	Kim's Concrete Pumping	Off-Road; Concrete Pump	0.48	\$16,272.78
606 Replacement	Kim's Concrete Pumping	Off-Road; Concrete Pump	0.48	\$16,399.20
613	Sea Wave Corp.	Marine Vessel	0.3	\$16,683.51
602	Faurot Ranch	Off-Road; Tractor	0.27	\$16,253.03
604	Chris's Fishing Trips	Marine Vessel	Ineligible - less than 15% Nox reduction	
601	Four Daughters	Marine Vessel	Incomplete Application	
607	Monterey Sport Fishing, Inc.	Marine Vessel	Ineligible - Engines already past required compliance date	
611	Christensen & Giannini	Irrigation Pump	Eligible for East Garrison Grant	
612	Sea Goddess Whale Watching	Marine Vessel	Ineligible - Engines already past required compliance date	
614	Kahuna Sportfishing	Marine Vessel	Ineligible - Less than three years of surplus emissions reduction	
620	Borzini Farms, Inc.	Irrigation Pump	Eligible for East Garrison Grant	



Parties Involved





Rachel Carson - 2017





Rachel Carson - 2017





Replacement Engines

Make: Caterpillar	Model: C32	Model Year: 2016
Serial number: to be built upon order		
Horsepower: 750 BHP		
Displacement (liters): 32 Liters / 2.68 liters per cylinder		
Number of cylinders: 12		
EPA family number or ARB Executive Order number: FCPXN32.1EP3		
EPA Tier Rating: Tier 3 Commercial		

- Closest to current engines, fit within the space and required minimal modifications
- Modifications required to:
 - Cooling system
 - Control system
 - Exhaust system



Opening Up the Engineroom





Main Engines

Out with the old...



In with the new!





Destruction of Old Engines

Grant requires that engines be made inoperable and witnessed by Air Resource Board rep





Additional Cooling

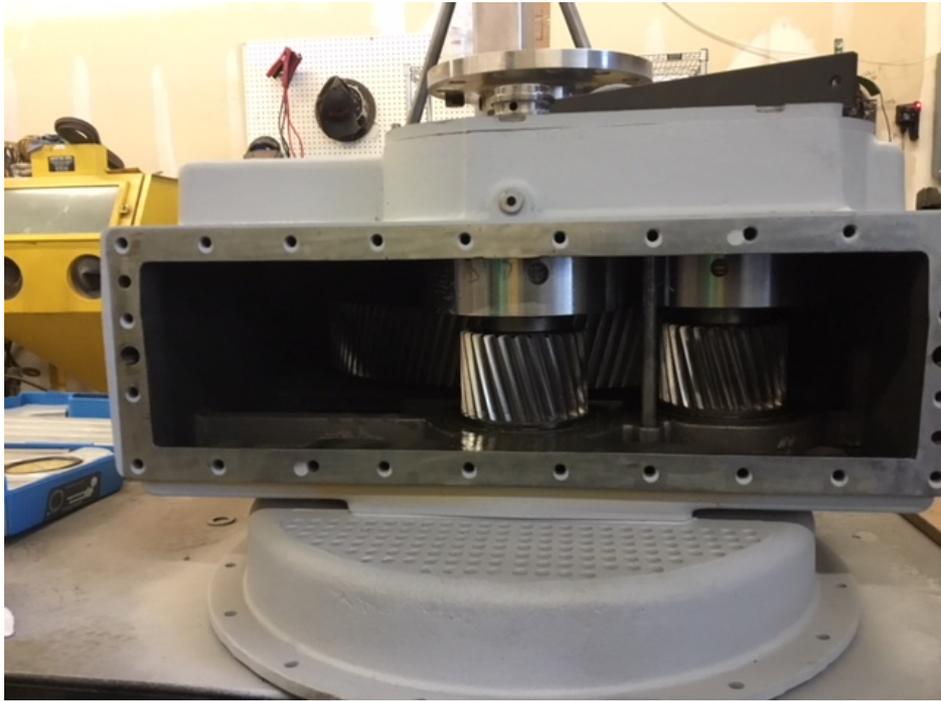


New Engine in Place





Transmission Re-build

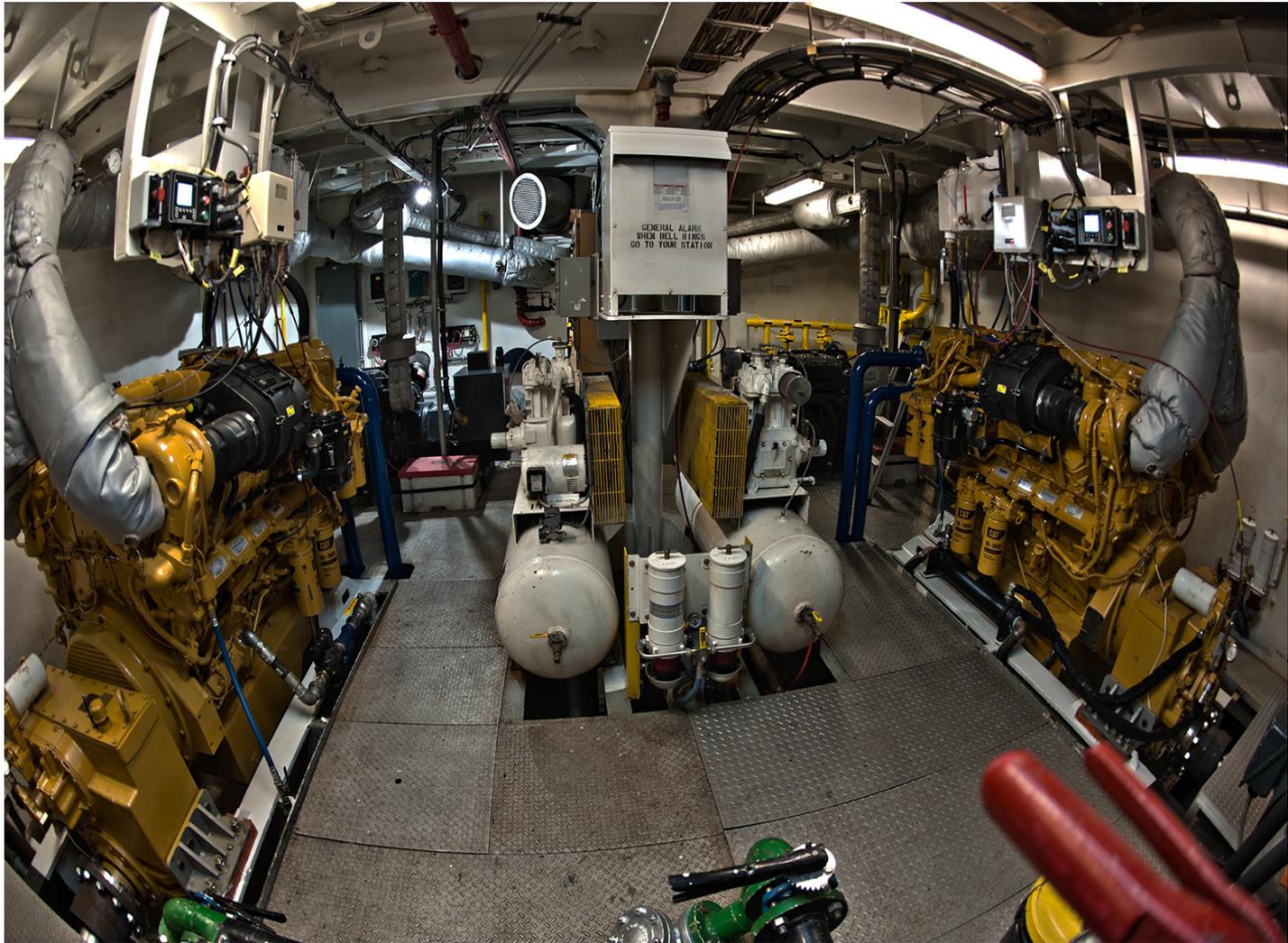








The Final Product





CARB FORM

Monterey Bay Aquarium Research Inst This form is to be completed by owner/operators of ALL commercial harbor craft with diesel engines that operate within regulated California waters.	1/24/2017	This form is to be completed by owner/operators of ALL commercial harbor craft with diesel engines that operate within regulated California waters.	1/24/2017
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If you print a hardcopy, please select Print Range Pages From: 1 To: 5 to print appropriate pages.					ENGINE INFORMATION										ENGINE OPERATIONS IN REGULATED CALIFORNIA WATERS						
(7)	Note	(20)	(21)	(22)	(23A)	(23B)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)
Vsl. No.	Harbor Craft Name	Main or Aux.	Engine Make	Engine Model	Current Engine Model Year	If Rebuilt To Tier 1 Standard, Year of Rebuild	Engine Family	Engine Serial Number	Rated Brake Horsepower	Total Engine Displacement (Liters)	Number of Cylinders	Hour Meter at the Last Top End Rebuild	Hour Meter at Last Full Rebuild	Number of Full Engine Rebuilds	Current Hour Meter Reading	Annual Fuel Consumed by Each Engine (Gallons)	Annual Hours of Operation (Each Engine)	Percentage % Annual Hours of Operation 0 to 3 miles	Percentage % Annual Hours of Operation >3 to 24 miles	Percentage % Annual Hours of Operation >24 miles	Total Must Equal 100%
1	RV Western Flyer	main	Caterpillar	3512	1992			24Z04562	1,314	51.80	12	27210	30808	0	32,249	34,896	1,444	1 %	80 %	19 %	100 %
1	RV Western Flyer	main	Caterpillar	3512	1992			24Z04579	1,314	51.80	12	1500	30806	0	32,261	35,206	1,456	1 %	80 %	19 %	100 %
1	RV Western Flyer	main	Caterpillar	3408	1992			78Z04706	558	18.00	8			0	4,422	3,182	134	0 %	80 %	20 %	100 %
1	RV Western Flyer	main	Caterpillar	3408	1992			78Z04700	558	18.00	8			0	4,394	3,104	132	0 %	80 %	20 %	100 %
1	RV Western Flyer	Aux	Caterpillar	3306	1992			85Z14743	275	10.50	6			0	3,172	2,095	87	50 %		50 %	100 %
2	RV Rachel Carson	main	Caterpillar	3412	1995		YCPXM27.0MTA	60M09007	720	27.03	12			0	1,368	25,650	1,368	1 %	85 %	14 %	100 %
2	RV Rachel Carson	main	Caterpillar	3412	1997		YCPXM27.0MTA	60M07007	720	27.03	12			1	1,365	25,650	1,365	1 %	85 %	14 %	100 %
2	RV Rachel Carson	main	Caterpillar	3126	1995		YCPXM07.2MTA	14ZJ03887	350	7.20	6			0	7,227	3,150	417	1 %	85 %	14 %	100 %
2	RV Rachel Carson	aux	John Deere	6068AFM7 SE, F	2011		BJDXN06.8125	PE6068G825584	245	6.84	6			0	4,709	14,077	1,193	1 %	85 %	14 %	100 %
2	RV Rachel Carson	aux	John Deere	6068AFM7 SE, F	2011		BJDXN06.8125	PE6068G825574	245	6.82	6			0	4,688	13,935	1,179	1 %	85 %	14 %	100 %