Harbor dredging shows good results as more, bigger cargo ships turn to New Bedford's port

By BECKY W. EVANS
Standard-Times staff writer
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Just as the city's majestic whaling ships once loomed large on the waterfront, another type of vessel is drawing attention to New Bedford Harbor and helping to stimulate the local economy.

Welcome to the age of the refrigerated cargo vessel.

As many as 12 of the vessels, which measure about 450 feet in length overall, are expected to arrive in port this winter (three have already come and gone). The massive ships, known as "reefers," will be carrying clementines, oranges and other citrus fruit grown in Morocco and bound for buyers in Toronto, Montreal and the Canadian Maritimes.

Each vessel will unload its cargo at Maritime Terminal Inc., creating about 50 jobs for longshoremen and warehouse workers, said Pierre Bernier, who manages the freight forwarding division at the cold-storage facility on MacArthur Boulevard.

More than 1,100 trucks will visit the terminal over the next three months to load and transport the fruit to Canada, he said.

About five of the 12 vessels will create additional jobs when they are restocked with frozen herring and mackerel caught by New Bedford fishermen and processed locally, Mr. Bernier said. The vessels will carry the exports back across the Atlantic to Western Africa, he said.

The vessels' port presence will be felt throughout the local economy from gear and repair shops to ice and fuel docks, said Kristin Decas, executive director of the New Bedford Harbor Development Commission.

"They will contribute to economic growth through the use of our amenities here in the port. Whether it's the support services or the restaurants ... it's just a real win for the port," Ms. Decas said.

When the refrigerated cargo vessel Cape Belle broke down in Buzzards Bay earlier this month, a local tug boat towed the ship into port for repair. Overall, the incident probably contributed $50,000 to the local economy, Mr. Bernier said.

He estimates that each reefer that makes a port call injects about $1 million into the New Bedford economy.

Attracting refrigerated cargo vessels to the port is "an important component of our effort at trying to expand import and export trade," Ms. Decas said.

The HDC is working on a report that will quantify the economic impact of the port's current maritime activities, she said. It also will outline economic opportunities in global and domestic markets that the port could capitalize on in the future.

A three-phase navigational dredging project (the third phase is likely to begin in late December) in New Bedford Harbor has paved the way for the refrigerated cargo vessels, which draw 20 to 24 feet of water.

The first and second phases of the state-funded project, which began in January 2005, restored the depth of the federal channel and other parts of the harbor to 30 feet. Decades of accumulated sediment and toxic sludge had made parts of the harbor too difficult for large vessels to navigate.

"It brought the channel to the necessary depth to accommodate these cargo ships," Ms. Decas said. "It increased our competitiveness in the global market."

The city is working with the U.S. Army Corps of Engineers to develop a plan for dredging shallow portions of the federal channel in the outer harbor and Buzzards Bay. Ms. Decas said the goal is to make the depth of the shipping lanes consistent with the 30-foot depth of the inner harbor. Currently, refrigerated cargo ships must occasionally wait for the tide to rise so they have enough water to navigate the channel in the outer harbor, she said.

Due in part to dredging, refrigerated cargo vessel traffic at Maritime Terminal is growing, Mr. Bernier said. The company's shipping program increased 35 percent from last year, he said, noting that about 5 more vessels will make port calls this year.

New Bedford competes for the vessels with the ports of Wilmington, Del. and Philadelphia. The Whaling City has an edge on the competition, however, given its closer location to Morocco and Canada, Mr. Bernier said.

He credited Teamsters Union Local 59 and Longshoremen's Union Local ILA 1413 for supplying a capable labor force that helps make the port competitive.

"We have a good setup with them," he said. "They do a really good job."

Philip Sullivan, vice president and business agent for New Bedford's local Teamsters, said the union has about 14 workers employed at Maritime Terminal's warehouse during the shipping season. He said the work brought in by the cargo ships allows the workers to earn a lot of overtime pay "just in time for Christmas." It takes one to three days to unload the fruit from the refrigerated cargo vessels.

"You try to unload it as quickly as possible because of the perishable project," Mr. Sullivan said.

The greatest challenge to further expansion of Maritime Terminal's shipping business is the New Bedford-Fairhaven Bridge, Mr. Bernier said.

"Every time a ship comes in and out, it is an obstacle,"

He said.

The Brazilian Reefer, which unloaded citrus in New Bedford earlier this month, had to dock at State Pier instead of Maritime Terminal because "she was too wide" to fit through the bridge opening, he said. The swing-span bridge, which was built in 1906, pivots open to create two passages. One opening is 88 feet wide and the other is 92 feet wide. The narrow openings make it difficult and dangerous for some of the larger vessels to pass through, especially in strong winds, Mr. Bernier said.

According to Ms. Decas, New Bedford and Fairhaven are looking at alternatives to the bridge.

The towns are working on the scope for an environmental impact report that would examine three alternatives: no action; moving the bridge; or replacing the bridge with a double-leaf bascule bridge. Ms. Decas said the bascule bridge appears to be the most "common-sense approach" because it could be done within a more reasonable time frame and at a more reasonable cost than moving the bridge.

It is too early in the process to know how much the bridge would cost, she said.

The double-leaf bascule bridge would have two connecting platforms that each would be lifted by a counterweight, creating a single, wide path through which reefers and other large vessels could pass. Ms. Decas said the new bridge would "open up huge opportunities" for the North Terminal area, a 50-acre marine industrial site to the north of the current bridge.

The refrigerated cargo vessels that make port calls in New Bedford hail from countries around the globe such as Lithuania, Liberia and the Bahamas.

As it welcomes foreign vessels and crewmen, Maritime Terminal must adhere to new security measures established by the Maritime Transportation Security Act and Accountability for Every Port Act.

As of Oct. 15, the Coast Guard is requiring truck drivers, vendors, contractors and other workers at certain port facilities in the Northeast to carry Transportation Worker Identification Credentials, known as TWIC.

Mr. Bernier said adapting to the new rules has taken considerable effort.

"It is challenging, but so far, so good," he said.

New Bedford Police Sgt. Jill Simmons said her port security unit is present when the massive cargo ships make their way in the early morning from the outer harbor, through the hurricane barrier and down to Maritime Terminal.

The unit sends out a patrol boat that follows the ship and communicates with commercial or recreational vessels that might get in the way.

"Basically, we are running traffic control," she said.

"We go out and meet them and peek around the corners."

The unit also is on hand in case anyone were to jump off the cargo ship and try to swim to shore, she said.

Although it requires extra work, Sgt. Simmons said she is happy to see the cargo ships enter the harbor.

"It's a great thing, because it's pumping a ton of money into the economy," she said.

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Getting Around the Port / Port Operations
Freight & Cargo Facilities

New Bedford State Pier:
Rick Cunio, Pier Manager
Phone: (508) 993-1646
Fax: (508) 993-1646
E-mail: nbs.pier@state.ma.us
www.state.ma.us/seaport

Maritime & Bridge Terminals:
Maritime International Inc.
Pierre Brenier
Phone: (508) 996-8500 x233
Fax: (508) 991-3431
E-mail: pierreb@maritimeinternational.org
http://www.maritimeinternational.org/

Pope's Island Terminal:
Mark White, D.W. White Construction
Phone: (508) 763-8868
E-mail: mwhite@dwwhite.com

Sprague Energy Petroleum Terminal
Lisa Fortin, Terminal Manager
Phone: (508) 994-0899
Fax: (508) 994-0177
Web Site: http://www.spragueenergy.com/

Freight Ferry Terminal on State Pier
The Quick Start Ferry facility on New Bedford State Pier allows intermodal transfers of waterborne freight and freight carried by truck and rail. The terminal features a 27-foot pier depth, roll on-roll off capability, offsite cold storage, and easy access to the interstate highway system. The ramp is 100 feet long and 18 feet wide and will hold up to 200 tons. The facility complies with all applicable Americans with Disabilities Act (ADA) requirements. The HDC is responsible for the daily operation and maintenance of the facility.

View of New Bedford Freight Ferry Terminal
Photos: Diana Konstantakos/HDC

NEW BEDFORD'S STATUS AS A FOREIGN TRADE ZONE CAN BRING DOWN YOUR BUSINESS COSTS!!! LEARN MORE BELOW:

Foreign Trade Zone 28
An FTZ is a designated area that, for Customs purposes, is considered outside the U.S. Nearly any imported merchandise can be brought into the FTZ for almost any kind of manipulation duty-free, unless it enters the U.S. market. Goods in the FTZ can be assembled, manufactured or processed and final products re-exported without paying Customs duties. If the final products enter the U.S.,

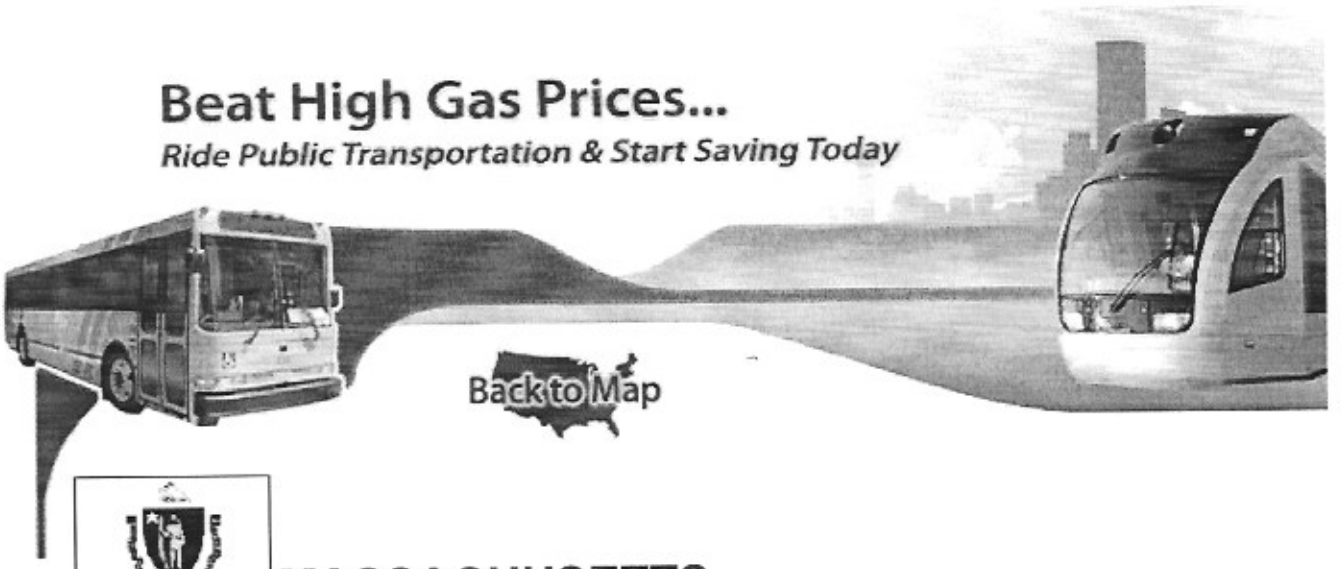
the duty rate may be lower than the duty applicable to the product itself or its parts.

The City of New Bedford is the grantee and holder of Foreign Trade Zone (FTZ) #28 offering a competitive advantage to foreign businesses looking to trade in US markets. The Port, Regional Airport, and adjacent areas form the New Bedford FTZ #28, which provides duty-free manufacturing opportunities for importers and exporters.

FTZ #28 is able to sponsor expanded general purpose sites within a 60-mile radius of the City. In addition, the FTZ has the potential to sponsor qualified subzones anywhere in Massachusetts. By establishing a subzone international businesses can reduce operational costs by categorizing imports and exports so that goods are taxed at the least cumbersome stage in the chain of distribution.

New Bedford offers international distribution services that support the FTZ including sea, air, and rail services, as well as interstate highway systems. Further, New Bedford shipping agencies, freight forwarding and stevedore services, and warehouse and truck-brokering facilities are great resources to support foreign business and labor needs.

Left: Truck on freight boat
Above: View from ferry with truck
Photo: Doug Motta/Mayor's Office



MASSACHUSETTS

Click on your county to find public transportation options in your community.

Barnstable	Berkshire	Bristol	Dukes	Essex	Frank
Hampden	Hampshire	Middlesex	Nantucket	Norfolk	Plym
Suffolk	Worcester				

Barnstable County	
Boston	**BSCC** (Bay State Cruise Company)
Dennis	**The Breeze** (Cape Cod Regional Transit Authority, CCRTA)
Falmouth	**FEF** (Falmouth-Edgartown Ferry) **Island Queen** (IQ)
Harwich Port	**FCL** (Freedom Cruise Line)
Hyannis	**HLC** (Hy-Line Cruises)
Plymouth	**CJB** (Captain John Boats) **PBSRC** (Plymouth & Brockton Street Railway Company)
Woods Hole	**WHSA** (Woods Hole, Martha's Vineyard & Nantucket Steamship Authority)
Berkshire County	
Pittsfield	**BRTA** (Berkshire Regional Transit Authority)
Bristol County	
Attleboro	**GATRA** (Greater Attleboro-Taunton Regional Transit Authority)
Boston	**MBTA** (Massachusetts Bay Transportation Authority)
Fairhaven	**AEMC** (American Eagle Motor Coach)
Fall River	**BCC Shuttle** (Bristol Community College Campus Bus Shuttle)
New Bedford	**CBL** (Cuttyhunk Boat Lines) **SRTA** (Southeastern Regional Transit Authority)
Taunton	**BBL** (H & L Bloom Bus Lines)
Woods Hole	**WHSA** (Woods Hole, Martha's Vineyard & Nantucket Steamship Authority)
Dukes County	
Edgartown	**VTA** (Martha's Vineyard Regional Transit Authority)
Falmouth	**FEF** (Falmouth-Edgartown Ferry) **Island Queen** (IQ)
Harwich Port	**FCL** (Freedom Cruise Line)

Hyannis	**HLC** (Hy-Line Cruises)
New Bedford	**CBL** (Cuttyhunk Boat Lines)
Quonset, RI	**VFF** (Vineyard Fast Ferry)
Woods Hole	**WHSA** (Woods Hole, Martha's Vineyard & Nantucket Steamship Authority)
Essex County	
Beverly	**BCOA** (Beverly Council on Aging)
Boston	**MBTA** (Massachusetts Bay Transportation Authority)
Gloucester	**CATA** (Cape Ann Transportation Authority)
Haverhill	**MVRTA** (Merrimack Valley Regional Transit Authority)
Lowell	**LRTA** (Lowell Regional Transit Authority)
Lynn	LEWL (City of Lynn East/West Loop)
North Andover	ABC Bus (ABC Bus Company)
Peabody	Peabody Transit (PT)
Plaistow, NH	**Coach Company** (CC)
Portland, ME	TRANSIT AGENCIES **NNEPRA** (Northern New England Passenger Rail Authority, Downeaster Passenger Rail) OTHER SITES **DownEastRiders** (A Passenger's Guide to Downeaster Travel) **TRN** (Train Riders/Northeast)
Franklin County	
Amherst	**UTS** (University of Massachusetts Transit Service, UMASS Transit Service)
Greenfield	**FRTA** (Franklin Regional Transit Authority) **GMTA** (Greenfield-Montague Transportation Area)
Springfield	**PVTA** (Pioneer Valley Transit Authority)
Hampden County	
Hartford, CT	**NHHS Rail** (New Haven-Hartford-Springfield Commuter Rail Implementation Plan)
Springfield	TRANSIT AGENCIES **PVTA** (Pioneer Valley Transit Authority) OTHER SITES **PVPC** (Pioneer Valley Planning Commission)(non-operating) WMCTNOW (Western Massachusetts Coalition for Transit NOW)
Hampshire County	
Amherst	**UTS** (University of Massachusetts Transit Service, UMASS Transit Service)
Greenfield	**FRTA** (Franklin Regional Transit Authority)
Springfield	TRANSIT AGENCIES **PVTA** (Pioneer Valley Transit Authority) OTHER SITES **PVPC** (Pioneer Valley Planning Commission)(non-operating) WMCTNOW (Western Massachusetts Coalition for Transit NOW)
Middlesex County	
Bedford	**BLT** (Town of Bedford Local Transit)
Boston	**Cavalier Coach** (CC)(unofficial) **MBTA** (Massachusetts Bay Transportation Authority)
Burlington	**Bline** (Town of Burlington)
Cambridge	**EZRide** (Charles River Transportation Management Association, Cambridge-North Statio Shuttle) **CGS** (Cambridgeside Galleria Shuttle) **HUSS** (Harvard University Shuttle Services)
Dracut	**TBL** (Trombly Bus Lines)
Framingham	**LIFT** (Town of Framingham Lift Public Transit System)
Haverhill	**MVRTA** (Merrimack Valley Regional Transit Authority)
Lexington	**Lexpress** (Town of Lexington)
Lowell	TRANSIT AGENCIES **LRTA** (Lowell Regional Transit Authority) OTHER SITES

	LNHPT (Lowell National Historical Park Trolleys)
Medford	**A&AMT** (A & A Metro Transportation)(unofficial)
Natick	**NNB** (Natick Neighborhood Bus)
Newton	**NST** (Town of Newton Senior Transportation)
Portland, ME	TRANSIT AGENCIES **NNEPRA** (Northern New England Passenger Rail Authority, Downeaster Passenger Rail) OTHER SITES **DownEastRiders** (A Passenger's Guide to Downeaster Travel) **TRN** (Train Riders/Northeast)
Southborough	**GBL** (Gulbankian Bus Lines)(unofficial) **TLC** (The Local Connection -- Marlborough Southborough Community Transit Service)
Waltham	**128BCS** (128 Business Council Shuttles) **RaiLink** (Neponset Valley Transportation Management Association) **Waltham CitiBus** (WC)
Nantucket County	
Harwich Port	**FCL** (Freedom Cruise Line)
Hyannis	**HLC** (Hy-Line Cruises)
Nantucket	**The Shuttle** (Nantucket Regional Transit Authority, NRTA)
Woods Hole	**WHSA** (Woods Hole, Martha's Vineyard & Nantucket Steamship Authority)
Norfolk County	
Boston	**BHC** (Boston Harbor Cruises) JBL Bus Lines (JBL) **MBTA** (Massachusetts Bay Transportation Authority)
Braintree	A&BCL (A & B Coach Lines)
Brockton	**BAT** (Brockton Regional Transit Authority)
Dedham	Dedham Bus (Town of Dedham, DB)
Quincy	**Harbor Express** (HE)
Randolph	BHT (Brush Hill Tours)
Whitman	CBL (Carey's Bus Lines)
Plymouth County	
Attleboro	**GATRA** (Greater Attleboro-Taunton Regional Transit Authority)
Boston	JBL Bus Lines (JBL) **MBTA** (Massachusetts Bay Transportation Authority)
Bridgewater	**BSC** (Bridgewater State College Transportation Services)
Brockton	**BAT** (Brockton Regional Transit Authority)
New Bedford	**SRTA** (Southeastern Regional Transit Authority)
Plymouth	**CJB** (Captain John Boats) **PBSRC** (Plymouth & Brockton Street Railway Company)
Taunton	**BBL** (H & L Bloom Bus Lines)
Whitman	CBL (Carey's Bus Lines)
Suffolk County	
Airport Ground Transportation	**MLATI** (Massport Logan Airport Transportation Information)
Boston	LARGE TRANSIT AGENCIES **MBTA** (Massachusetts Bay Transportation Authority) OTHER TRANSIT AGENCIES AWS (Airport Water Shuttle) **BHC** (Boston Harbor Cruises) **Cavalier Coach** (CC)(unofficial) **CWT** (City Water Taxi) **Logan TMA** (Logan Airport Employee Transportation Management Association, Eastie Ea Shuttle, Winthrop Shuttle) **MASCO** (MASCO Parking & Transportation) **Mission Link** (ML)(unofficial) **RWWT** (Rowes Wharf Water Taxi) **TranSCom** (Transportation Solutions for Commuters) OTHER SITES

	APT (Association for Public Transportation) **MBTA.net** (MBTA Riders Network) **NETransit** (New England Transportation Site) TransitWorks **Wizeguides.com**
Brockton	**BAT** (Brockton Regional Transit Authority)
Cambridge	**EZRide** (Charles River Transportation Management Association, Cambridge-North Statior Shuttle)
Chelsea	**PRT** (Paul Revere Transportation)
Fairhaven	AEMC (American Eagle Motor Coach)
Plymouth	**PBSRC** (Plymouth & Brockton Street Railway Company)
Portland, ME	TRANSIT AGENCIES **NNEPRA** (Northern New England Passenger Rail Authority, Downeaster Passenger Rail) OTHER SITES **DownEastRiders** (A Passenger's Guide to Downeaster Travel) **TRN** (Train Riders/Northeast)
Southborough	**GBL** (Gulbankian Bus Lines)(unofficial)
Taunton	**BBL** (H & L Bloom Bus Lines)
Worcester County	
Boston	**Cavalier Coach** (CC)(unofficial) **MBTA** (Massachusetts Bay Transportation Authority)
Charlton	**SCME** (South Central Massachusetts Elderbus)
Fitchburg	**MART** (Montachusett Regional Transit Authority)
Randolph	BHT (Brush Hill Tours)
Southborough	**GBL** (Gulbankian Bus Lines)(unofficial)
Worcester	**RTA** (Worcester Regional Transit Authority)

Note: Some counties may also be served by transit agencies in adjoining counties.

What can be done to control tropospheric ozone?

Remember that hydrocarbons and NOx are the pollutants that lead to O3 formation. Hence, efforts to control O3 focus on controlling emissions of these precursors. For example, as we saw earlier, emissions of these compounds per automobile decreased greatly since the early 1970's, but vehicle miles have increased so much that actual decreases in total emissions were less than the decrease per vehicle would suggest.

Remember, as you read this, that in addition to helping to control ozone pollution, many of the measures described below (e.g., those that focus on improved fuel efficiency, decreasing reliance on cars, or switching to alternative kinds of fuels) will also help the battle against global climate change (since tropospheric ozone is a powerful "greenhouse gas," and sources of ozone precursors are also, often, sources of CO2. The same measures will, by and large, lessen our dependence on fossil fuels (fostering, perhaps, less political instability in the world). As an example, it is estimated that if the CAFE (Corporate Average Fuel Efficiency) increased from the current 27.5 mpg for passenger cars up to 40 mpg over the next 10 years, we could save 2 million bbl of oil per day, which is more oil than we import from the Persian Gulf and could get from the Arctic National Wildlife Refuge combined! This standard did increase from 18 to 27.5 mpg between 1978 and 1985 -- it IS possible for another change to happen as well!

Auto emission standards in the US were first set in 1968 and became more and more stringent over time. A car in the early 1990's had about 1/5 the VOC and CO (carbon monoxide) and 1/2 -1/3 the NOX emissions of a car 25 yrs before that time (1993 data). However, urban miles travelled went up 100% over this 25 yrs so about ¼ of the decrease in CO and VOC and 2/3 of the decrease in NOX per car merely offset the increased miles driven!

Late in 1999 (or early in 2000), Federal legislation was passed that closed a loophole that had allowed SUV's (sport utility vehicles), minivans, and pickup trucks to emit three to five times more pollutants than passenger cars were allowed to emit. Emissions of NOx and fine particulates from these heavier vehicles are slated to decrease over a phase-in period, with reductions being complete by about 2008.

However, heavy duty diesel trucks and buses were still allowed to emit much more pollutants than other vehicles. One 18-wheeler, for example, can emit as much NOx and fine particulates as 150 passenger cars! (Air quality inside many diesel school buses is also notoriously bad, endangering the health of the children who ride these buses.) New regulations on such vehicles will, however, tighten emission standards for them as well, and went into effect beginning in 2007. These new vehicles should produce 75 - 90 % less NOX and 90% less particulates than those that were manufactured before 2007. In addition, oil refiners were required to decrease by 97% the sulfur content of the diesel fuel that these vehicles use by the year 2006, so that the pollution control devices on the new vehicles will work properly.

Incidentally, diesel electricity generators, both large (as are used for back up electricity production in times of regional energy shortages, as were experienced in California in 2001) and small, are major polluters. Other non-road diesel engines are also big polluters, including those used in agriculture, construction, and marine trasnport. Both the fuel that they burn and the burning and emissions technology are poor, and they are present poorly regulated. There are moves afoot to tighten restrictions on their emissions as well, which is important -- such sources produce more fine particulate pollutants than all other mobile sources combined! On a typical day, ships in the Los Angeles Basin release more ozone precursors than do one million

cars! (2004 information)

PORTLAND, OREGON EXAMPLE:

Portland's ozone maintenance program has strategies to decrease VOC emissions :

- increased vehicle inspections to test tail pipe emissions
- expansion of the boundary included in testing to take in more commuters who live outside the old boundary
- eliminate the exemptions for vehicles > 20 yrs old. A small fraction of vehicles emit the bulk of the pollutants. These ultra dirty cars aren't necessarily all old vehicles; some newer ones have been tampered with or have malfunctioning emission systems. Much control effort focuses on continuing to decrease emissions from new vehicles (and to change the rules, as we'll see), but in some sense these contributions will be relatively small since the "gross polluters" are still on the road.
- encouraging new developments to be built with less reliance on cars
- encouraging mass transit and biking via transportation plans
- implementing an employee commute options rule which requires employers with >50 employees to submit trip reduction programs. These are to be designed to reduce single occupant vehicle travel to and from work sites through mechanisms like carpooling, compressed work weeks, telecommuting, etc.
- increasing stringency of emission standards for new gas powered lawn and garden equipment and requiring sale of paints, solvents and other products with reduced VOC emissions

MISCELLANEOUS "CAR STUFF:" CLEANER FUELS AND CLEANER CARS

One way to reduce tailpipe emissions is through catalytic conversion: most cars are equipped with three-way catalytic converters, which capture CO (carbon monoxide) and hydrocarbons (VOC's) by catalytic oxidation and NOx by catalytic reduction.

California has had real troubles with meeting O3 standards, and as part of the solution, cars sold in CA must meet stricter emissions standards than in other states. (However, several states have also adopted the CA standards.) CA is trying to achieve reductions not only by improving emissions reductions capacity on conventional fueled vehicles (catalytic converters) but also by gradually phasing in over recent years cars that are between 50-85% less polluting than the strictest national standards on the books today.

CA recently stiffened its auto emissions standards again -- including imposing limits on CO2 emissions. In 2002, CA became the first state to regulate "global warming potential" of vehicles, requiring auto makers to cut emissions of CO2, CH4, nitrous oxide (N2O), and several other pollutants by at least 30% by 2009. As of this writing (early 2006), WA and OR have both signed on to the CA standards, as have several other states in the NE US.

ALTERNATIVE FUELS:

See some links to interesting car "stuff" in the section of notes that deals with your Resource Use Reduction Project.

Click "green" to find information on "environmental friendliness" of various car models, ranging

from hybrids to SUV's (see the Green Center within that site).Additional useful information is at a site called Clean Cars for Oregon

These vehicles are fueled with hybrid (gas + electric) technologies or with alternative fuels (methanol, ethanol, natural gas, hydrogen) which:

> **(1)** Are reformulated to have **lower reactivity** (lower ozone forming potential) and evaporation rates (volatility). Reformulated gas can burn as cleanly as methanol or ethanol blended with gas in flexible fueled cars. Decreasing fuel vapor pressure decreases the generation of vapors in the fuel system, which decreases evaporative emissions from the system, which are about 50% of a car's VOC emissions! In fact, hydrocarbon emissions are sometimes greater when the car is not running than when it is. This is a phenomenon called "hot soak," which occurs after the engine is turned off but when it is still hot. Diurnal breathing is also involved, in which the fuel tank breathes in air as it cools at night and breathes out air and gas vapor as warms in day.
>
> **(2) burn cleaner**--especially concerning VOC's. In fact, some of these fuels actually produce more NOx than conventional fuels, although this isn't universally true. (Molecules in these alternative fuels are smaller and simpler than gas, with fewer c-c bonds, so they burn more cleanly than conventional gasoline. More complex molecules have more complex combusition and more chance of incomplete combustion.)

Decreasing **sulfur content** of fuels is also important, because sulfur interferes with efficiency of catalysts for VOC's, CO and NOx, damaging catalytic converters. While the US has the strictest auto emission standards in the world, it also permits the highest sulfur content in fuels, negating many of the gains made in clean car technology. CA regulates fuel sulfur content, allowing a maximum of 40 ppm sulfur, while gasoline sold in the rest of the country averages (or did until recently) about 330 ppm. It is estimated that reducing sulfur content of fuel nationwide to the CA standard would be equivalent to taking 53 million cars off the road, in terms of reduced pollutant emissions!! For OR, the gain would be equivalent to removing about 1/3 of the vehicles from the Salem-Portland area! Late in 1999, a Federal ruling did require oil companies to produce cleaner burning fuel with lower sulfur content, and the new rules concerning diesel trucks and buses will require, as mentioned above, a 97 % decrease in the sulfur content of diesel fuels as well.

Regulation tends to focus on hydrocarbon (VOC) emissions, which can generally be reduced more readily than can NOx emissions. The main control strategy for NOx from stationary sources is to change the combusion conditions largely by reducing temperatures, which reduces NOx production. "Lean burn" strategies, which minimize the amount of air mixed in when burning can be effective.

(Incidentally, adding MTBE (methyl tertiary butyl ether) or other oxygenates decreases CO emissions but has little effect on atmospheric reactivity and O3 formation, and sometimes increases NOx emissions.)

That is, attention is being paid **both to cleaner fuels and to cleaner cars**. Instead of focusing only on the car, focus on what we put in it to burn!

Methanol is made most cheaply from natural gas and also from coal, wood, or agricultural wastes.

Ethanol is often made from corn, but also from other biomass. As is true for methanol, ethanol is a simpler molecule than gasoline, so it burns cleaner. The energetics of using ethanol as a fuel source (in addition to gasoline or alone) is complex -- it depends on what is being used to matke the ethanol. Think, for example, about all the energy that goes into corn production! Instead of using corn, which could be used to feed people either directly or indirectly, as livestock feed, interest is growing in using other biomass to produce ethanol -- including woody biomass -- in which case the energetics may turn out to be more positive than when the ethanol is produced using corn. There is a LOT of attention being paid to "biofuels" these days -- largely ethanol manufactured from biomass (ranging from corn to wood debris) and biodiesel. While it is possible that use of some sources of biomass as fuel could help decrease dependence on fossil fuels -- and also help decrease CO2 emissions, in most cases that I've read about so far, the savings just aren't clear -- and it is hard for me to understand using crops that could be used for food to make fuel. Early in 2007, a team of economists from OSU published "Biofuel Potential in Oregon: Background and Evaluation Options," a report that examined the energetics and emissions associated with biofuels and was not optimistic about their prospects -- the authors suggest that simply increasing fuel efficiency of conventional cars (even modestly -- 1 mile per gallon!) would likely be far more effective. See also the editorial in the November 2006 issue of BioScience. (OSU is, by the way, one of five universities in the US that receives funds from the US government under a "Sun Grant." This allows OSU to serve as a regional center for the study and development of sustainalbe and environmentally friendly biofuels [or other bio-based energy alternatives.].)

Natural gas -- vehicles powered with natural gas have much lower NOx, VOC, and CO2 emissions than do convertional gaoline-powered vechicles. GM, Chrysler and Ford all have **natural gas** vehicles on the road now, as do other manufacturers -- note the natural gas powered buses at eht Portland, OR airport! These produce about 80% less emissions of NOx and VOC than conventinal fueled cars and are about 30% less expensive/mile to operate than conventional gas-fueled cars. As of 2005, ~ 250 "gas" stations in CA provide natural gas.

Some of the techniques to decrease emissions of NOx, CO and VOC's tend to increase car weight, however, and may decrease fuel efficiency. For example, compressed natural gas has to be stored under high pressure, which requires heavy tanks (if you want decent driving range on a tank). Cars run on methanol also need bigger tanks because methanol only contains 1/2 the energy per volume that gas does (is 30% > efficient, though, so may balance out). However, use of new light weight plastic composites for body construction to decrease weight could counterbalance some of these problems.

Diesel -- Many kinds of diesel vehicles are very efficient in terms of fuel economy -- diesel contains ~ 10 times more energy per unti volume than does conventional gasoline. However, diesels have historically been quite "dirty" -- producing much greater emissions of fine particulates ('soot") and NOx than conventionally-fueled vehicles. However, both the fuels and the engines and exhaust sytems have been