

Clean Construction Workshop – NOTES

12/5/06

9-11 am

1 Winter St, Boston, 2nd floor

9:00 to 9:05 Welcome Address (David Cash, EOEAE)

The Department of Environmental Protection (DEP) and Executive Office of Environmental Affairs (EOEA) are addressing the reduction of diesel pollution. DEP has created an inventory looking at diesel particulate sources. Roughly half of all diesel emissions are from on-road vehicles, and half are from off-road sources. Of those off-road sources, half come from construction. So 25% of all diesel emissions are from construction sources. It's an active fleet, with a lot of diesel fleets made up of older, dirtier engines with greater emissions from each vehicle.

Why is this situation a concern? Particulates cause health impacts ranging from acute problems (heart attacks) to long term impacts (lung cancer). Conservative estimates of the economic impacts of diesel emissions in the Commonwealth talk about three billion dollars a year range. Also, diesel emissions cause 400-500 extra deaths per year, and other cardio-respiratory problems. They contribute to missed work days, school days etc.

There are cost-effective solutions. It's rare to tackle an environmental problem with such easy technical and cost-effective solutions – for example, diesel retrofit technologies added to the construction equipment. By sharing information about how these technologies have been used successfully, we will see more widespread adoption.

9:05 to 9:10 Intro to GB3 (Pat Field, Consensus Building Institute)

Greater Boston Breathes Better (GB3) is a voluntary partnership between the public and private sectors working to reduce emissions on a voluntary basis from transportation and construction sector. We're delighted to bring you all together, to share expertise experience to give you concrete and practical conversations. The website where presentations and notes will be posted is: www.epa.gov/ne/eco/gb3

9:10 to 9:35 Why reduce emissions/Everyone doing their part (Christine Kirby, DEP)

What are the health effects? Diesel particulate matter is classified as a probable carcinogen by EPA and an air cancer risk by CARB. This means that CARB has classified it as a carcinogen. It's linked to mortality, cardiopulmonary disease and lung cancer, etc. Even small amounts cause negative health effects.

DEP has undertaken a Diesel Inventory: We have tallied onroad and offroad vehicles. The number of vehicles coming into the state that are not registered in Massachusetts is almost 500,000. In state is about 121,000. Even though we have large numbers of

onroad and offroad vehicles, some of the marine vessels and locomotives of which there are fewer vehicles, are much dirtier so they contribute to a greater degree to pollutants.

Pie Chart: shows number of diesel engines, and that out of state engines comprise 70% of the total. When you look at emissions rather than number of vehicles, you see that offroad emissions make up 40% of total emissions pie.

MA DEP is interested in reducing emissions throughout the state while GB3 focuses solely on Boston. We (DEP) have a number of diesel related programs throughout the state. We have an inspection/maintenance program including an opacity test (which happens every other year for diesels). We work on enforcing and educating about reducing idling. We focus on school buses for enforcement and outreach trainings, and also onroad fleet vehicles and trucks that operate in urban neighborhoods. We have an idling reduction toolkit on the website.

We have retrofit programs: The Big Dig, or Central Artery and Tunnel project was one of the first projects in country to use a diesel retrofit program. For the Big Dig, a joint partnership between MA DEP/Nescaum allowed up to 200 pieces of equipment to be retrofitted with diesel oxidation catalysts. Retrofits are easy to do and accepted by the industry. Then DEP retrofitted all the MBTA buses that could take an emission control device. Additionally, DEP implemented a program under State Revolving Loan Fund where all water and sewer projects require retrofits. In 2000, 50% had to require retrofits, and in 2001, 100% had to have the requirement. There are retrofit requirements on Massachusetts Highway Department, MBTA, and landfill projects. DEP also regularly recommends to MEPA that construction retrofit requirements be included in certificates.

DEP has retrofit vendors and ULSD on state contracts that municipalities can tap into.

Q: Our fleet is 98% diesel retrofitted, but we're having some problems with rental equipment. What should we do about outside rentals?

A: MA DEP is developing a guidance document, and ways to implement the program.

Q: Does equipment run any differently with retrofits on it?

Industry: You have to use low sulfur diesel fuel (LSD) or ULSD. The main problems we were having with high sulfur fuels were clogged converters and back-pressure issues. With the LSD we haven't seen the problems.

9:35 to 9:50 Clean Fuels (Steven Levy, Sprague Energy)

First, you can go to www.cleanerdieselhandbook.org to learn more about diesel and what to do about it.

Where are we now with distillate fuels? Where are we going? The driving force for ULSD fuel and emission control devices is to reduce emissions by a lot. The key that enables these emission control devices is switching to ULSD. You have to take sulfur out of the fuel for them to work properly. Analogies: we switched leaded gas to

unleaded because of catalytic converters. We're dealing with the same paradigm shift here. The MBTA has a big initiative to be cleaner in the communities so it uses ULSD. People don't want the environmental impact in their neighborhood. ULSD brings the biggest bang for the buck, and it meets and exceeds engine manufacturers' requirements.

ULSD has been around for a long time (as well as emission control devices). I started back in 1998. Larry Silverstein is being honored tonight by the League of Conservation Voters as he was first construction project to dedicate his equipment in the rebuilding of 7 World Trade Center to ULSD and clean equipment. The biggest hurdle is getting the operator to use the product and emission control devices. Union leaders were there saying they wouldn't switch. But, we won them over. The equipment was good for minus 40 degrees, and when you start it up, there was no black smoke. So they were pretty happy about that. You can ask outside entities to be using ULSD if they're coming onto your site too.

What's really happening? Around world, sulfur coming out of fuel. Everyone is switching to reduce emissions. When you switch to the lowest sulfur fuel, you can see immediately emissions reductions beyond 95% even.

The rules: ULSD will be mandated by Jan 2007. Some say Oct 15 2006. Not necessarily. Only reason why mandated: some local statutes (state/city) will be requiring it by then, you may have a piece of retrofitted equipment that requires ULSD, or you're buying new piece of equipment. Other than that, for onroad diesel, it's a refiner and importer requirement. Basically, 97% or so of all diesel refined today for onroad or imported is 15 ppm or less. What was supposed to happen: on Oct 15, 2006, ULSD would have retail availability at service stations, so that by Jan 1, 2007 new pieces of equipment would have fuel to run on. Then, there would be a complete shift by 2010. Marine, locomotive, etc in 2007 will transition to 500 ppm, and in 2010 go to 15ppm. But, the real world is that to have 500 ppm and 15 ppm going, it will be hard to maintain product integrity for 15 ppm. There is not a lot of 500 ppm around. Refiners can't have different product streams. Before transition comes next year for offroad applications (including power generators and emergency engines), a lot of vehicles will be using 15 ppm. Before 2010, really probably within a few years, everyone will be using 15 ppm except for select fuel who will pay a premium price if they need to use it. For example, a lot of companies have really old equipment made to run higher sulfur content oil.

Home heating oil is different, as there is a state regulation requirement as opposed to federal. This is quite a hurdle to transition down. Probably after 2010-2012 we'll be down to 15 ppm for everything. The market will transition down to one product.

What's going on with ULSD today? From refiners to service stations – in our industry – everyone panics. Industry always comes through though. The product has been maintaining 15 ppm and we only had one supply issue out in Midwest. Here in the Northeast and specifically in MA there is plenty of 15 ppm. However, we have ample #2 15ppm which helps with the issue with blending in winter. Operability with ULSD has

really been working out well, except if you already had an operability issue (injector pumps or whatever).

Key pioneers in greater Boston area: the MBTA was the first entity that did it. Boston Public schools has also been using ULSD for last four and a half years.

ULSD is not a fungible project like other diesel, with ULSD there's going to be many terminals where we're never out of product, and there will be other terminals out of product every now and then because of the nature of ULSD. There's a lot of testing to make sure that there are only 15 ppm sulfur, and that it meets lubricity. It's important when you do business with a supplier, you need to know *their* supplier to know about their supply of ULSD.

If you have an onroad vehicle today, (and if you will have an offroad vehicle in a few years), you will get a big fine (\$32,500) per day if you are found in noncompliance for using fuel 15 ppm sulfur or under. So you need to know, and maybe test once in a while.

Biodiesel: With prices where they are for gas, heating oil, and diesel, a lot of you probably read about biodiesel. Biofuel, biodiesel and bioheat. It's here, going to stay, and at some point you may be mandated to use it. Like ULSD you must look for a quality supplier. You want the supplier to be BQ9000. Most of the good product is virgin soy, not cooking oil, trapped grease, canola or palm oil. Within a year or two, those will be good sources as well. The key thing about biodiesel is that you want to make sure supplier is credible. Want to buy biodiesel that is maximum of 15 ppm sulfur (but best if 0 ppm). The biodiesel should meet ASTM standards. A lot of suppliers are making investments internally too, so look for suppliers who are rack blending. The process should be transparent to the driver. And you should get lubricity, winterization, etc.

Q: What's the sulfur content in plain old #2?

A: In MA, it's 3000 ppm, but it's probably less than that.

Q: Does this have an effect for homeowners?

A: Many folks are now blending with biodiesel, and there are some people using 15 ppm for turbines, power generators, etc. As far as heating oil goes, not many people are using 15 ppm for heating. There's more experimenting being done.

Q: Standby generators for 15 ppm: what's the shelf life?

A: Of the fuel itself? Same as 500 ppm. I would suggest that for any fuel, to burn it within a year or a year and a half.

9:50 to 10:10 Diesel Retrofit Technologies (Scott L'Engel, Cummins Northeast)

DOC = diesel oxidation catalyst. It is an entry level 'fit and forget' type of device. It's sized to engine displacement and engine model year. For onroad vehicles, can go back to

1994 engines and newer to use this device. Offroad application: 1991 and newer. The cost of the device goes into the catalyst platinum base.

DPF = Diesel particulate filter. These are not traps. We use Johnson Matthey's products. They call their DPF a CRT (and they also have a CCRT which allows lower temp operating range).

Horizon: electronic DPF – applicable to low duty cycle.

DOC – reduces PM visible smoke out of tailpipe by 20-25%. HC, and CO by 90% and Toxic HC's by 70%. Verification is important because the washcoat and technology must work for the application. It is not a temperature dependent device, and not ULSD dependent. It's a simple device, to leave in place for life of vehicle. It is applicable to on and off highway. In an offroad application, take care how you place and mount a DOC. It comes in a stainless steel housing so that it won't rust or fall apart. It comes with a mat that insulates the device from vibration. Offroad applications may have to be custom made but they are used to that.

DPF: goes one step beyond DOC because it adds a second filter. Every other passage is blocked for exhaust, which forces carbon and exhaust components through a thin wall. Exhaust will go through so you don't have backpressure issues but it holds carbon within the filter itself. You can get 85% reduction in PM because it forces the exhaust through that thin wall. Also, you can see 80% reduction on other pollutants. It comes in a larger can with newer versions that have sensors to manage the regeneration. The filter piece is what requires the ULSD so it won't plug.

Passive Regeneration – you place this on the engine and over time it converts exhaust stream pollutants to CO₂ and NO. So it takes elemental carbon out of the stream. Ash is larger than PM so ash gets stuck inside and will have to be maintained by taking it out of the chassey and putting through high pressure air stream. In an on highway vehicle like school bus this cleaning should happen one time a year. For an onhighway truck, this cleaning should happen maybe every 18 months. For a low duty cycle construction vehicle, you're looking at an annual cleanout. But if high use, maybe a year to 18 months. Cleaning needs are duty cycle dependent.

Example Application: A snowmelter at MASSPORT (John Deere power unit). They replaced the existing muffler, but it was an easy application. When snowmelter was going it was running at 1800 rpm consistently, and that generates lots of heat. They haven't cleaned in 2 years of use.

Electronic Particulate Filter has been certified by CARB, manufactured by Cummins West. If a technology is verified by CARB, or EPA, the other organization recognizes it. The electronic particulate filter can be put on anything from 1994 and newer. Just goes after particulate matter. It doesn't use the same kind of ceramic brick. It uses a silicon carbide filter. This is the retrofit used on Paul Revere buses (MASCO Shuttles). It has been verified for use with ULSD, 300 ppm diesel, and biodiesel up to 20%. It has a robust, and broad fuel range. It is temperature insensitive and doesn't have a duty cycle

because it has an electronic hot plate to do the regeneration. You can also get NO2 reductions up to 70%.

It's a little complicated because the hotplate is passive, it collects carbon on a thin wall. Then you plug this in for 8 hours or so (not every day) on school bus application or every 3-4 weeks on an old crane every other day. This really works well in the northeast where cold temperatures affect capability of retrofit projects.

DOC – \$1200-1400 range. Including taking out existing muffler and putting this in.

DPF – \$8500 (CRT) installed range. Works for heavy duty cycle application.

CCRT – \$10,000-10500 range you'd see installed on equipment

Filter from Horizon – \$9,500-10,000 range not including shore power.

Check technologies and what temperature requirements there are.

Q: How are you handling filtering?

A: We have a filtering system on site in Dedham and this takes about 30 minutes. If for some reason there's something wrong, wet fuel gets into filter, we put it into an oven where the temperature is raised slowly and cooled slowly. This is called a level 2 cleaning. From January 2007, all new on-highway trucks will have particulate filter on them. The strategy for those pieces will be on an exchange basis. You can either bring it in and we'll clean it or exchange it.

Q: On engine manufacturers, will they honor the warranty?

A: Yes they will honor the warranty. It's the same deal with biodiesel.

10:10 to 10:40 Instituting Construction Retrofits (Phil Ricardi, General Growth Properties, Inc.)

Construction manager with General Growth properties. Developers of Natick mall. Mixed use retail and residential.

The original mall built around 1965. In 1993-1994, they demolished the old Sears and built a new Sears. They worked on Shopper's World too. They demolished a bunch of things through the late nineties, abated asbestos, and excavated down 20 feet, with 2 levels underground parking. The mall being constructed, will almost double the size, put up a 6 level parking deck, reroute the road, and build 2 residential towers each 11 and 12 stories. In the center, there's another parking lot, then 4 stories of condos with 215 condos all told.

The mall will be opening September 7, 2007. Neiman Marcus and Nordstroms will follow after that. And condos will come online in the spring of 2008.

Main reason we got involved: a line was put into the general conditions. We had to put in clean burning fuel and other things. We don't take that lightly. I had worked in environmental field, working for environmental engineering firm. We went to a site contractor, and some equipment would be long term, then some quickly leave. So we had

the discussion about if we retrofit them, then they leave, they might not find the right kind of fuel.

The targets were to retrofit, refuel and reduce idling.

We went to site contractors, and retrofitted 12 – 15 pieces of equipment that were on site long term. \$25000 on a project this size is not so much. For fuel, we are paying 10 cents a gallon premium. And we burn roughly 13000 to 15000 gallons a month. We got crane operators to burn the lower sulfur fuel.

When Royce takes equipment off, he'll have to take devices out because of fuel availability.

All of it hasn't been too bad to do. Getting others to burn LSD has not been too hard. And for all equipment on site, we're pretty close to 100% with LSD.

The toughest thing has been reducing idling. A lot of dump trucks, concrete trucks etc come in and idle for a few minutes, then move up in a line. It's difficult to get them to adhere to what we want. We posted notice that they could be fined. One person has been diligently working with these trucks and they'd shut off when he's around. But clearly this requires constant monitoring.

One of bigger problems is that all the trucking is completely independent. So while we may be able to work with say, Boston Sand and Gravel, a lot of truckers come in and out and do what they can do to make their day go faster. We had success overall but there is still a long way to go. We see the value in taking this approach.

Q: Catalyst on the fuel stream not exhaust?

A: Yes: a few of cranes had it on the exhaust stream, and some cranes were electric. We paid for a change order to Royce for equipment, and to change fuel. But it was written into contracts from then on. So on all sub contracts – had to switch fuels, etc.

Q: Why do you think drivers don't like to shut off diesel engines?

A: It's a restart issue depending on time of year.

Industry: It's also wear and tear on the engine. Ideally you'd only start the vehicle once. I can share your frustration from an owner/operator perspective. They'll have different trucks there every day. If they lose a tire for the day, they've lost a weeks profit. When you ask them to put in \$3000 scrubber system, they look at you like, are you crazy?

A: One thing you have to realize, when you go to contractor and mention "environmental" they think "oh no contamination, everything has to stop, cost me time etc more money" etc. There's a real reluctance in industry to engage.

Industry: The reason we are comfortable is that we got a good jumpstart on clean construction with the Big Dig. If you have a partner to help you get over the initial cost, it makes it a no-brainer. Our experience with the devices definitely helped us as well. If there were more participation from owners and government agencies to meet us halfway to get over the initial cost of retrofit, we could get a lot more done.

EOEA: On money issue, EPA gave the state a grant of \$100,000 to help paving contractors. We went out with one RFP in the spring, and issued one contract. We will go out with another RFP posted on GB3 website at some point. We have \$50,000 left.

DEP: Would a loan fund be helpful? If we can't do strict grants?

Industry: Anything is better than nothing. But a lot of contractors see this as non-recoverable cost. They are not increasing production or savings, other than being a green neighbor or user. A grant is the best way, or have it built in to the contract – so a certain amount allowed in the contract (it's there and known cost).

Q: You control fuel by having it onsite? Or did you mandate individual people to have individual vendors?

A: Individual. And we see the rack slips on submitted change orders.

DEP/EOEA: To get word out there – is there a cost benefit analysis?

A: From a marketing point of view, it's always good to say look what we've been doing. But as far as showing what the benefits are, it's a sub contractor who is buying and using it on equipment. As long as you can find LSD fuel, it would be worth it to keep devices on equipment.

Q: What is the ULSD availability?

A: Yes, it's available everywhere and there are several suppliers.

Q: For the Natick project, was air quality an issue that came out with the public?

A: No. We were trying to get ahead of the complaints. How can we best avoid it? Let's try to work with General Growth so they don't see black smoke. I'll be honest – I have not had a complaint nor has board of health.

Q: I think it'd be useful to have a list of projects who have gotten involved in this – we have clients with smaller or mid-sized projects that had projects down the street that had been using LSD or retrofits.

MEPA: We have initial list of projects.

Q: We've all sat at red lights, watched them turn green, and have a truck put out that black cloud next to us. Do local authorities have any way of enforcing?

DEP: The only entity in Commonwealth can pull these guys over are the State Police.

Q: Are those vehicles ones that qualify for bi-annual inspection?

DEP: Yes.

EOEA: You raise the question: What are people in this room doing and what are others doing? Other things I didn't talk about, we're developing comprehensive strategy on diesel. Are there technological fixes for that and can we set up some kind of monitoring system. More broadly, marine and locomotives are big source so we're looking there too. What are ways we can regulate and provide incentives?

Q: With time periods Steven put up in his presentation? Is that national?

A: Yes.