VOLATILE ORGANIC COMPOUND EMISSIONS:
AN EVOLVING INFLUENCE ON THE REGULATORY LANDSCAPE AND ON PAVEMENT PRESERVATION

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Why & how air quality reg’s continue to evolve

Volatile organic compounds (VOC’s): ozone, air quality, & human health

History of AEMA interaction with Ozone Transport Commission (OTC)

International Technical Committee reaction to OTC

Examples of air quality management agency responses to shareholder concerns

Summary: new business opportunities
Why air quality reg’s continue to evolve

Economic impact of poor air quality & human health

- Abundant academic research correlates air quality with human health
- 2007: 52 MM suffer from asthma worldwide
- 2007: 15 MM asthmatics in the U.S.; estimated annual care cost is $1.5 B
- Federal & state air quality control agency decision making may be influenced by results of research from many quarters: academia, policy institutes, industry
Regulatory agencies measure VOC’s impact in health $’s

This two-year old BenMAP study used recognized models (CalGrid) to project the monetary benefit of more stringent (than current CAIR) restrictions on permitted levels of monitored air pollutants.

Findings indicated that over $1.5 billion benefit (human health: mortality, hospital respiratory admissions, ER emergencies, school absences, worker productivity).
Government view is: VOC = Health = Cost

Regulatory agencies measure VOC impact in health dollars
Government view is: VOC = Health = Cost

Regulatory agencies measure VOC impact in health dollars

President Obama’s budget for the Dept. Of Health & Human Services FY 2010 includes

$454 B to Medicare + $288 B to Medicaid
FUNDS DISTRIBUTION TO MEET OBJECTIVES

- Tax relief for people ($237B) companies ($51B)
- Healthcare ($86B is for Medicaid)
- Education programs & infrastructure
- Aid to Low-Income Workers, Unemployed
- Energy investment
- Core infrastructure investment
- Gov’t facilities % gov’t vehicles investment
- Other
- Supplemental investments
- Housing
- Science
- Environment

Objectives of Stimulus
Where & how funds distributed
Funds for highways
Funds for maintenance
Caltrans example
What is next
Tax relief for people ($237B) companies ($51B)

Healthcare ($86B is for Medicaid)

Education programs & infrastructure

Aid to Low-Income Workers, Unemployed

Energy investments

Core infrastructure investment

Gov’t facilities % gov’t vehicles investment

Other Supplemental investments

Housing

Science

Environment

Includes $27.5B for highways, bridges, surface roads, parking facilities, & also passenger rail, freight rail, & ports

Objectives of Stimulus

Where & how funds distributed

Funds for highways

Funds for maintenance

Caltrans example

What is next
DISTRIBUTION OF “CORE INFRASTRUCTURE” FUNDS

Agencies within the Department of Transportation ($51B)

Objectives of Stimulus
Where & how funds distributed

Funds for highways
Funds for maintenance
Caltrans example
What is next
The long fuse of increasing regulatory restrictions

Non-Attainment Zones in USA est’d by CAA of 1990

Analyses based on Federal standards for 8-h ozone (now, PM 2.5) levels of ozone, lead, CO, SO2, and PM-10.
Air Quality Initiatives Strengthen Annually

State, Regional, & Municipal Air Quality Agencies

Within the California EPA, and the CA Air Resources Board, there are 35 Regional Air Quality Districts
Air Quality Initiatives Strengthen Annually

National Association of Clean Air Agencies (NACAA)

Environmental Quality, Air Quality Division

Contact Name: Vinson Hellwig

Contact Title: Chief

Address: Michigan Department of Environmental Quality
Air Quality Division
Constitution Hall
525 West Allegan Street
Lansing, MI 48909

Phone: (517) 373-7069

Fax: (517) 335-6993
Air Quality Initiatives Strengthen Annually

Midwest Regional Planning Organization
Air Quality Initiatives Strengthen Annually

Ozone Transport Commission

U.S. Agency Contacts

Agency Name: Connecticut Department of Environmental Protection, Bureau of Air Management

Contact Name: Arne Gobin

Contact Title: Bureau Chief

Address: Connecticut Department of Environmental Protection, Bureau of Air Management, 73 Elm Street, Hartford, CT 06106

Phone: (860) 24-3026

Fax: (860) 24-4060

Local Agencies:
- Bridgeport
- Bristol-Burlington
- Greenwich
- Milford
- New Haven
The 1990 Clean Air Act Amendments established the Ozone Transport Commission (OTC) to coordinate the development of control plans for ground-level ozone in the Northeast and Mid-Atlantic Region. (1)

1. Source: www.dep.state.pa.us/dep/DEPUTATE/AIRWASTE/AQ/transport/transport.htm
AEMA Interaction with OTC

- Sept. 2006: OTC contacted AEMA about “banning” solvent use in cutbacks & asphalt emulsions
- International Technical Committee contacted OTC: education on emulsions & applications, data sharing
- Nov. 2006: OTC recommended 20% across-the-board reduction in solvents for all emulsions
- OTC Board forwarded the recommendation to the 13 member States
- Lesson: proactive initiatives needed to assist regulators in understanding stakeholder issues
Laboratory Data on VOC Emissions: Thin Films

Initial Weight Loss from Thin Film of United PG 58-28 Containing 15 wt% Hydrocarbon Diluent at 40°C 50% Rh

\[ y = 14.623x - 0.4522 \quad R^2 = 0.9937 \]

\[ y = 17.114x + 0.218 \quad R^2 = 0.9227 \]

\[ y = 17.895x + 0.218 \quad R^2 = 1 \]

% Solvent Loss

Naphtha
Diesel
Kerosene

Long Term Weight Loss from Thin Film of United PG 58-28 Containing Hydrocarbon Diluent at 40°C 50% Rh

\[ y = 5.8623x + 5.3662 \quad R^2 = 0.9864 \]

\[ y = 2.1506x + 12.844 \quad R^2 = 0.9933 \]

0 20 40 60 80 10 12

% Solvent Loss

0 0.5 1.0

hr at 40°C 50% Rh

Naphtha
Diesel
Kerosene
ITC Reaction to CT DEP Regulation

Laboratory Data on VOC Emissions: Dense Mixes

Percent Loss Solvents from D-G CMS Mixes
Maximizes around 25% Loss at 60°C, 10% Rh

\[ y = -3.4622 \ln(x) + 90.464 \]
\[ R^2 = 0.9923 \]

\[ y = -4.552 \ln(x) + 99.01 \]
\[ R^2 = 0.9982 \]

\[ y = -2.6099 \ln(x) + 92.68 \]
\[ R^2 = 1 \]

Solvent Content (% initial)

Time (h)

<table>
<thead>
<tr>
<th>State</th>
<th>Cutback Asphalt</th>
<th>Emulsified Asphalt</th>
</tr>
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<tbody>
<tr>
<td>CT</td>
<td>22a-174-20 (k): VOC content limited to 5% during June, July, August, and September</td>
<td>Nothing specified</td>
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<td>Reg. No. 24, Section 34: Ban during ozone season</td>
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Note calendar periods when compliance is required, are the “ozone season,” which corresponds to the “paving season.”
CT DEP Objective: ozone = smog reduction

- CT regulatory legislation targeted cutbacks & asphalt emulsions
- Goal: <0.5 g distillate in 200 mL emulsion (ASTM D 244)
- Kiernan Wholean, DEP rep, allowed 6 mL distillate due to comments made by asphalt industry stakeholders in the region
State of Rhode Island
Department of Environmental Management
Office of Air Resources

Notice of Public Hearing and Comment Period

Concerning adoption of proposed amendments to Air Pollution Control Regulations Nos. 25, 31 and 33 and proposed new Air Pollution Control Regulation No. 44.

Notice is hereby given that a public hearing regarding adoption of proposed amendments to Air Pollution Control Regulations Nos. 25, 31 and 33 and proposed new Air Pollution Control Regulation No. 44 will be held in Room 300 of the Department of Environmental Management, at 235 Promenade Street, Providence, Rhode Island on Friday, February 20, 2009 at 10:00 AM, at which time interested parties will be heard.

The proposed revisions to Regulation No. 31, “Control of Volatile Organic Compounds (VOC) from Consumer Products,” and No. 33, “Control of VOC from Architectural Coatings and Industrial Maintenance Coatings,” and proposed new Regulation No. 44, “Control of VOC from Adhesives and Sealants,” would limit the VOC content of 102 categories of consumer products, 53 categories of architectural and industrial maintenance coatings and 40 categories of adhesive and sealant products. VOC is a precursor to the formation of ozone in the ambient air. The proposed revision to Regulation No. 25, “Control of Volatile Organic Compound Emissions from Cutback and Emulsified Asphalt,” would prohibit the use of cutback asphalt and limit the VOC content of emulsified asphalt used for road paving, maintenance or repair during the ozone season (April through September).
Medium curing cutback asphalt used for the manufacture of patching mixtures or as a penetrating prime coat shall have less than 5 percent (5%) of the total solvent evaporate at a temperature up to and including 500°F.

25.3.2 During the period of April 1st through September 30th of any calendar year, no person shall use or apply emulsified asphalt unless:

(a) The emulsified asphalt was formulated to contain 0.1% or less VOC by weight, as applied, or

(b) The emulsified asphalt, as applied, produces no greater than 6.0 milliliter of oil distillate by distillation as measured by ASTM Method D 244 or AASHTO Method T 59.

25.3.2 No person shall cause, allow or permit the manufacture, mixing, storage use or application of cutback asphalt between 1 October and 31 March except in the following circumstances:
Paving applications affected by VOC reg’s

- Prime coats
- Seal coats
- CMS & HFMS cold virgin and recycling mixes
- Stockpile patch mix
Paving applications affected by VOC reg’s

- Prime coats
- Seal coats
- CMS & HFMS cold virgin and recycling mixes
- Stockpile patch mix

Numerous asphalt chemicals manufacturers and emulsion suppliers have developed new, VOC-free emulsions for these applications.
Things to come in the foreseeable future

- Facts: regulatory restrictions will increase
The foreseeable future

- Facts: regulatory restrictions will increase
- Facts: some phase out of current technologies / formulations is likely
Industry Stakeholders **Can** Work with Agencies to Influence Regulations

The Spring 2009 EPA Regulatory Agenda lists regulations & major policy under development or review over the next 12 months.
NAPA developed test methods for the EPA to analyze VOC emissions at mix plants

Excerpt from EPA Spring 20009 Regulatory Agenda

97. ADDITION OF METHOD 208, PROTOCOL FOR THE SOURCE TESTING, ANALYSIS, AND REPORTING OF VOC EMISSIONS FROM HOT MIX ASPHALT PLANT DRYERS

Legal Authority: 42 USC 7401 et seq
CFR Citation: 40 CFR 51, appendix M
Legal Deadline: None

Abstract: Method 208 is a protocol for collecting, analyzing, and reporting of volatile organic compounds (VOC) emissions from asphalt paving production operations. It will produce more accurate measurement of the mass of VOC emissions from such operations than any other current method for measuring VOC. The method will allow the EPA to make a more accurate assessment of whether asphalt paving plants are major sources under the Federal programs for New Source Review and Prevention of Significant Deterioration. This method was developed by the National Asphalt Paving Association specifically for asphalt paving plants as an alternative to existing EPA methods for measuring VOC. EPA is promulgating these methods to make them more widely available and acceptable for use by asphalt paving producers in meeting various environmental regulations.
Government – Industry – Public alliance is possible

Asphalt Industry

Productive, Sustainable Goals

Government Regulatory Agencies

Stakeholders

Public
The foreseeable future

Next Steps for the Asphalt Emulsion Industry

- Facts: regulatory restrictions will increase
- Facts: some phase out of current technologies is likely
- Facts: regulatory agencies are interested in finding sustainable solutions
- Balancing industry growth & EHS issues
Next Steps for the Asphalt Emulsion Industry

- **Facts:** regulatory restrictions will increase
- **Facts:** some phase out of current technologies is likely
- **Facts:** regulatory agencies are interested in finding sustainable solutions
- **Balancing industry growth & EHS issues**
  - prepare for more research that shows asphalt adversely impacts air quality
The foreseeable future

Next Steps for the Asphalt Emulsion Industry

- **Facts:** regulatory restrictions will increase
- **Facts:** some phase out of current technologies is likely
- **Facts:** regulatory agencies are interested in finding sustainable solutions
- **Balancing industry growth & EHS issues**
- **View regulatory mandates as business opportunities rather than business burdens**
FY 2010
EPA Budget in Brief

$ 10.5 Billion, up 34% from 2009.
THANK YOU.