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Reduction of Volatile Organic Compounds Emissions from the use of asphalt

Denis Pineault

Environment Canada

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Objective of the presentation

- Background on VOCs;
- Background on the asphalt industry regarding VOC emissions;
- Actions taken to reduce VOCs by the asphalt industry; and
- Development of a code of practice by Environment Canada.

Why are VOCs a concern?

- Volatile Organic Compounds are listed as Toxic Substances under the Schedule 1 of the Canadian Environmental Protection Act, 1999
- They are precursors of ground level ozone and particulate matter, which are the two principal components of smog.
- Smog is an air quality issue that poses serious health and environmental concerns in Canada, including thousands of premature deaths, hospital admissions and emergency room visits every year. Studies have shown that air pollution is also associated with an increased risk of lung cancer and heart disease.
- These precursors can be transported by prevailing winds over long distances, making them not only a local urban issue but one that extends regionally in Canada into many smaller communities and rural areas.
- In order to reduce smog levels and improve air quality, it is necessary to control and reduce PM, ground level ozone and VOCs.

Background – Reducing VOC's in Canada

- In 2004, to further improve air quality throughout Canada, the Government of Canada published the *Federal Agenda for the Reduction of Volatile Organic Compounds (VOCs) from Consumer and Commercial Products (Federal Agenda)*.
- In March 2010, Environment Canada held a consultation on the proposed renewal of the *Federal Agenda*.
- Environment Canada published in 2010 a discussion paper outlining seven possible initiatives for the Government of Canada to reduce VOC emissions from products during the period 2010 to 2020.
 - The “Cutback Asphalt” category was identified as one of the possibilities for the development of control measure.
- Environment Canada is working on the development of a code of practice to reduce VOC emissions from the asphalt sector in Canada.

Asphalts – Uses, types and definitions

- Asphalt is used to pave, seal and repair surfaces such as roads, parking lots and walkways
- There are various types of asphalt, the most commonly used types of flexible asphalts being cutback and emulsified asphalts
- Cutback Asphalt (CA) is produced by mixing asphalt cement with a petroleum diluent. It generates highest VOCs emissions. Cutback Asphalt is classified into three groups depending on the relative speed of evaporation of the petroleum diluent.
 - Rapid curing (RC)
 - Medium curing (MC)
 - Slow curing (SC)
- Emulsified Asphalt (EA) is produced by emulsifying asphalt cement in water and emulsifying agent, such as soap. The emulsion setting rate will determine four grades for EA.
 - Rapid setting (RS)
 - Medium setting (MS)
 - Slow setting (SS)
 - Quick setting (QS)

Estimated emission factors of VOCs

- Different types of asphalt products are associated with different emission factors of VOCs.

Emission Factors for Product Groupings	
Product Group	Emission Factor
Cutback Asphalt	
Slow cure (SC)	3.5%
Medium cure (MC)	15%
Rapid cure (RC)	28%
Emulsified Asphalt	
Low or no VOC emulsions	0.5%
High float surface treatment emulsions	1.5%
High float mixing grade emulsions	3.0%

Estimated VOC emissions in Canada from asphalt in 2009

- Based on an end-user survey done in 2010:

	Quantity used (kt)	VOC emission (kt)
Total asphalt	301	8.8
Cutback asphalt	45	5.2
Emulsified asphalt	256	3.6

- This information shows that cutback asphalt is responsible for 60% of the total VOC emissions, even if it only represents 15% of the total use of liquified asphalts in Canada.

VOC emissions forecast for asphalt sector

- A study forecasts an average annual growth rate of 2.6% for emulsified asphalt and 1.2% for cutback asphalt.
- Using year 2009 as baseline, VOC emissions are predicted as follows:

VOC emissions in kilotonnes			
	Cutback Asphalt	Emulsified Asphalt	Total Kt
2009	5.2	3.6	8.8
2015	5.6	4.2	9.8
2020	6.0	4.8	10.8

Key observations on the asphalt industry

- April to October is the demanding period for this sector. Ozone and smog alerts also usually happen in the same period in Canada;
- Cutback or Emulsified, what are the differences (or not)?
 - Similar volumes of asphalt are required for a job with both types;
 - Labour costs for application are roughly the same;
 - End-user training is a key factor in the performance of emulsified asphalt vs. cutback asphalt products;
 - VOC emission reductions associated with emulsified products range from 50 to 100%;
 - Curing of some emulsified may be slightly longer and may be more affected by colder weather.
 - Generally, the use of emulsified asphalt does not require additional or different equipment, have fewer odours and safety hazards;
 - Working with cutback asphalt requires TDG certification and trucks can't be left unattended because of flammability of the product.

Actions in other jurisdictions – Canada

- British Columbia has regulated the use of cutback asphalt during the ozone season. It also regulates the asphalt plants.
- In Ontario, Ontario Ministry of Transportation has phased out use of cutback asphalt during the ozone season.
- In Québec, there are restrictions on the use of cutback asphalt during the ozone season, as specified by the Ministère des Transports du Québec.



Actions in other jurisdictions – United States

- The US EPA Control Technique Guidelines, recommends the use of emulsified asphalt instead of cutback asphalt, with some exemptions for outside the ozone season. It also set concentration limits for maximum petroleum distillate in emulsified asphalt.
- Wisconsin, Texas, Pennsylvania, Ohio, New York, New Jersey, Michigan, Massachusetts, Maryland, Indiana and Illinois have promulgated regulations prohibiting with some conditions/exemptions the use of cutback asphalt from May 1 to September 30.
- The Ozone Transport Commission (OTC) made recommendations that included prohibiting the use of cutback asphalt during the ozone season and limiting the use of emulsified asphalt during the ozone season to those following ASTM Method D244.
 - OTC include Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia .

Actions in other jurisdictions – California

- The most stringent regulations in the U.S. are those which have been promulgated by the California districts, under the California Air Resources Board (CARB). In these districts, rules are specified for rapid cure, medium cure and slow cure of cutback asphalt and emulsified asphalt.
- The following is an example from San Luis Obispo County:
 - A person shall not sell, offer for sale, use, or apply for paving, construction, or maintenance of parking lots, driveways, streets, or highways, any cutback asphalt material which contains more than 0.5 percent by volume VOCs which evaporate at 260 degrees Celsius or less.
 - A person shall not sell, offer for sale, use, or apply for paving, construction, or maintenance of parking lots, driveways, streets, or highways, any emulsified asphalt material which contains more than 3.0 percent by volume VOCs which evaporate at 260 degrees Celsius or less.

Decision to develop a Code of Practice

- In March 2012, Environment Canada held a consultation on possible control instruments.
- Two control instruments, a regulation and a code of practice, were discussed.
- The benefits of regulating cutback asphalt are:
 - Environment Canada could set mandatory limits of concentration for asphalt products; and
 - Establish a level playing field for all companies across Canada.
- Stakeholder feedback on this approach included the increased administrative costs and less flexibility with respect to use of products for specific cases.
- A code of practice was the preferred option in order to encourage reduction of VOCs while allowing for flexibility. It was also recognised that it could be:
 - Developed more expediently;
 - Used by industry and associations to set standards and encourage better practices; and
 - Cited by all levels of government and other parties in procurement and contract specifications.



What is a code of practice?

- CEPA 1999 provides the Minister with authority for promulgating codes of practice related to preserving the quality of the environment.
- A code of practice is used to encourage the sustainable use of the environment and to reduce pollution.
- A code of practice can be composed of a set of recommended best practices designed to help the particular sector to prevent, control or eliminate emissions.
- A code of practice can incorporate limits and other best practices;
- During the development of the code of practice there is a duty to consult with stakeholders.
- Notice of the instrument or entire instrument must be published in *Canada Gazette*, Part 1.

Example: Code of Practice for the Environmental Management of Road Salts

Considerations for a code of practice

- **Intent**
 - The intent of the code of practice would be to provide guidance for all levels of the asphalt sector regarding all activities that can serve to reduce emissions of VOC from the use asphalt.
 - Reductions in VOC emissions resulting from measures taken would generate environmental and health benefits that could be translated into economic terms.
 - A code of practice could provide a "level playing field" for the asphalt sector by setting the same standards and best practices across Canada.

Considerations for a code of practice (cont'd)

- **Monitoring and reporting**

- Would be considered, in order to verify the quantities of different asphalt being produced/used and to monitor VOC reductions achieved.
- Environment Canada would also use this data to make performance measurements in order to evaluate the chosen instrument and determine if a more stringent instrument should be developed.

- **Economic considerations**

- Since an alternative to cutback asphalt is available, whose cost is similar and considering that the same machinery can be used for either product, it is believed that a code of practice would not have a negative economic impact on the industry.

- **Targeted publication date**

- The code of practice is planned for final publication in the *Canada Gazette*, Part I in 2014. The coming into force of the code of practice would be determined by Environment Canada after consultation with stakeholders.

Possible VOC reduction strategies

- Prohibiting use of cutback asphalt during ozone season with some exceptions;
- Specifying standards for emulsified asphalts use during the ozone season;
- Specifying standards for rapid cure, medium cure and slow cure of cutback asphalt used outside the ozone season; and
- Encouraging the use of low VOC alternative, such as bio-fuels, cold mix, etc.

Possible content of the code of practice

1-Scope and Definitions

- Objectives
- Targeted organizations

2-General requirements for stakeholders

a) Procurement – Governments and private sector:

- Best practices/VOC release limits
- Plans and specifications
- Contracting practices
- Promote the use of low emitting voc products

b) Applicators (paving companies):

- Best practices/VOC release limits
- Waste handling and recycling
- Training

c) Manufacturers:

- Best practices/VOC release limits
- Reporting

3-Monitoring and reporting

Path forward

- Drafting the code of practice (2012-2013);
- Ongoing consultation on the development of a code of practice;
- Publication of a proposed code of practice with a 30-day consultation period in 2013; and
- Final publication in *Canada Gazette*, Part I in 2014.

Contact

Yann Guilbault

Senior Evaluation and Regulatory Specialist

Products Division

Environment Canada

yann.guilbault@ec.gc.ca

Telephone: 819-953-1669

Denis Pineault

Head, VOC Controls Unit

Products Division

Environment Canada

denis.pineault@ec.gc.ca

Telephone: 819-934-8079