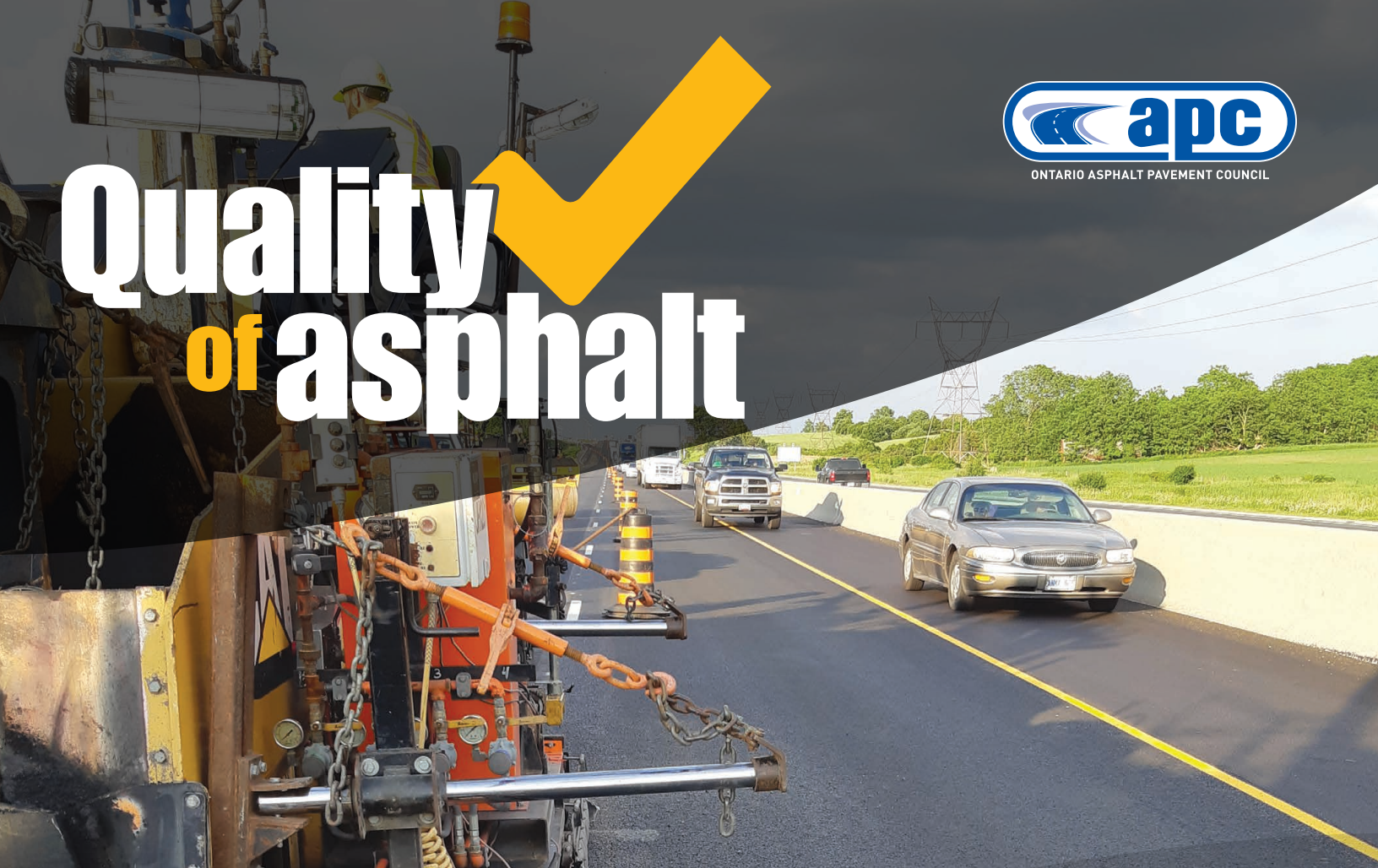


Quality of asphalt

apc
ONTARIO ASPHALT PAVEMENT COUNCIL

Warm Mix Asphalt (WMA)

In any asphalt paving project, the important focus areas for all stakeholders are - **EFFICIENCY, ECONOMIC USE OF ENERGY**, with the corresponding reduction in the emission of green-house gases (GHG), and above all, producing a **QUALITY** product! **Warm Mix Asphalt (WMA)** technology allows for mixing, handling and compaction of an asphalt mix, at temperatures typically 20°C lower than conventional Hot Mix Asphalt (HMA). It is applicable to all types of asphalt mixtures, and used for all different thicknesses and traffic configurations.

Read the following checklist to learn about some key facts about Ontario's experiences and pathways for WMA technology as its implementation becomes more widespread.

Asphalt. ONTARIO RIDES ON US

ORBA

ORBA CONSULTATION – IDENTIFIED WMA BARRIERS AND CHALLENGES

WMA technology is not new to Ontario. Provincial use of WMA dates as early as 2006, with over 500,000 tonnes (with *many of the contracts incorporating 10 to 20 percent reclaimed asphalt pavement*), paved between 2008 and 2013[1]. Select Municipalities have also explored the use of WMA technology over the last 10 years. Key positives drawn from those provincial experiences were attributed to improvements in longitudinal joint performance, a "greener" alternative to HMA, and an anticipated longer pavement life. However, its implementation has declined in recent years for a number of reasons. The underlisted summarizes key identified barriers and challenges for full implementation of WMA in Ontario:

The underlisted from consultative dialogue summarizes key identified barriers and challenges for full implementation of WMA in Ontario:

- Numerous technologies (*organic additives, chemical additives, and foaming processes*) in the market;
- The added production costs to making warm mix, in addition to the cost of the additives themselves – general concerns regarding plant modification requirements, and in particular burner efficiency settings;
- Emission control requirements and/or special considerations for "Plant" and "Paver" operating temperatures; and
- Many contractors have used the WMA treatments as strategic compaction aids during challenging ambient conditions rather than producing mix as true WMA operations at lower operating temperatures.

NAVIGATING THROUGH THE SOLUTIONS

The first ORBA/MTO task force was established in 2011 to develop specifications that led to a number of successful trial projects. To further influence the increased use of the WMA technology throughout the province, recent collaborative efforts between OAPC and MTO have resulted in the development of ***NSSP BITU0029*** - a non-standard special provision, which amends OPSS 313, April 2021 with additional requirements when the tender item title includes "Warm Mix". Noteworthy specifics in navigating through the solutions include:

- **Available Technologies:**
  - BITU0029 permits use of warm mix treatments such as CWM, Evotherm M1, Rediset LQ-1200A, WarmGrip N1 and Zycotherm SP2.
  - Provincial experiences with wax-based (*natural or synthetic*) warm mix additives have not been favorable, and are prohibited for provincial use at this time.
  - WMA produced using the water-based foaming process requires more substantial plant modifications, and with the right approach, this could be an option for near-future exploration.
- **Operational Constraints:**
  - BITU0029 requires a maximum allowable WMA production temperature of 135°C, or at least 20°C below the production temperature of the control HMA with identical mix design parameters, not exceeding 150°. Daily start-up exceptions apply. It is expected that, there will be little or no operational issues.
  - Baghouse condensation may require some modification for long-term production. However, plants must ensure sufficient temperature and air flow as a minimum requirement.
  - Making WMA technology available as a material handling and compaction aid should be taken into account as an option to owner agencies when ambient conditions dictate its use.
  - The benefits associated with using warm mix additives can be realized regardless of plant type, current configuration, or heating system. As warm mix becomes more commonly used producers can find benefits in terms of reduced costs and flexibility during construction. It should also not take long before producers see the advantages of WMA and as a result, seek ways of optimizing operations through burner tuning and plant upgrades towards more competitive operations.

1 Tabib S., Marks P., Bashir I., and Brown A. "Successful Implementation of Warm Mix Asphalt in Ontario", Paper Presented at the Warm Mix Asphalt Session at the 2014 of the Transportation Association of Canada (TAC) Conference, Montreal, Quebec, (2014).

- **Emission and Temperature Measurements**
  - Mix temperature and emission measurement are important aspects for agencies to gather and understand. Lower plant mixing temperatures translates into significant savings in fuel consumption, and reduction in GHG emissions. Typically expected reductions are 30 - 40% for CO_2 and SO_2, 50% for volatile organic compounds, 10 - 30% for CO, 60 - 70% for NO_x, and 20-25% for dust[2].
  - In Ontario, the emphasis on best practices to lower emissions has been a mainstay for several decades. The Environment Practices Guide (EPG) – developed by OHMPA (now OAPC) provides significant guidelines to help asphalt operations improve on efficiency and environmental stewardship.
  - For select contracts BITU0029 mandates a proposal from an **environmental consultant** detailing emissions measurements procedures and methodologies, in compliance with the requirements of the special provision. OAPC recommends detailed discussions at the pre-pave meeting for clarity of intent, purposes and associated protocols.
  - Several technologies (e.g., infrared thermometer, thermal camera etc.) may be employed for the required temperature verification. These devices must be calibrated and a certificate of calibration must be available upon request.
  - It is anticipated that the requirements for emission testing will be in use for a limited time on Ministry contracts to confirm the anticipated reductions.

WMA lowers fumes and emissions, approximately 30 – 90%.

Thermometer Reads 228.1°F/108.9°C.

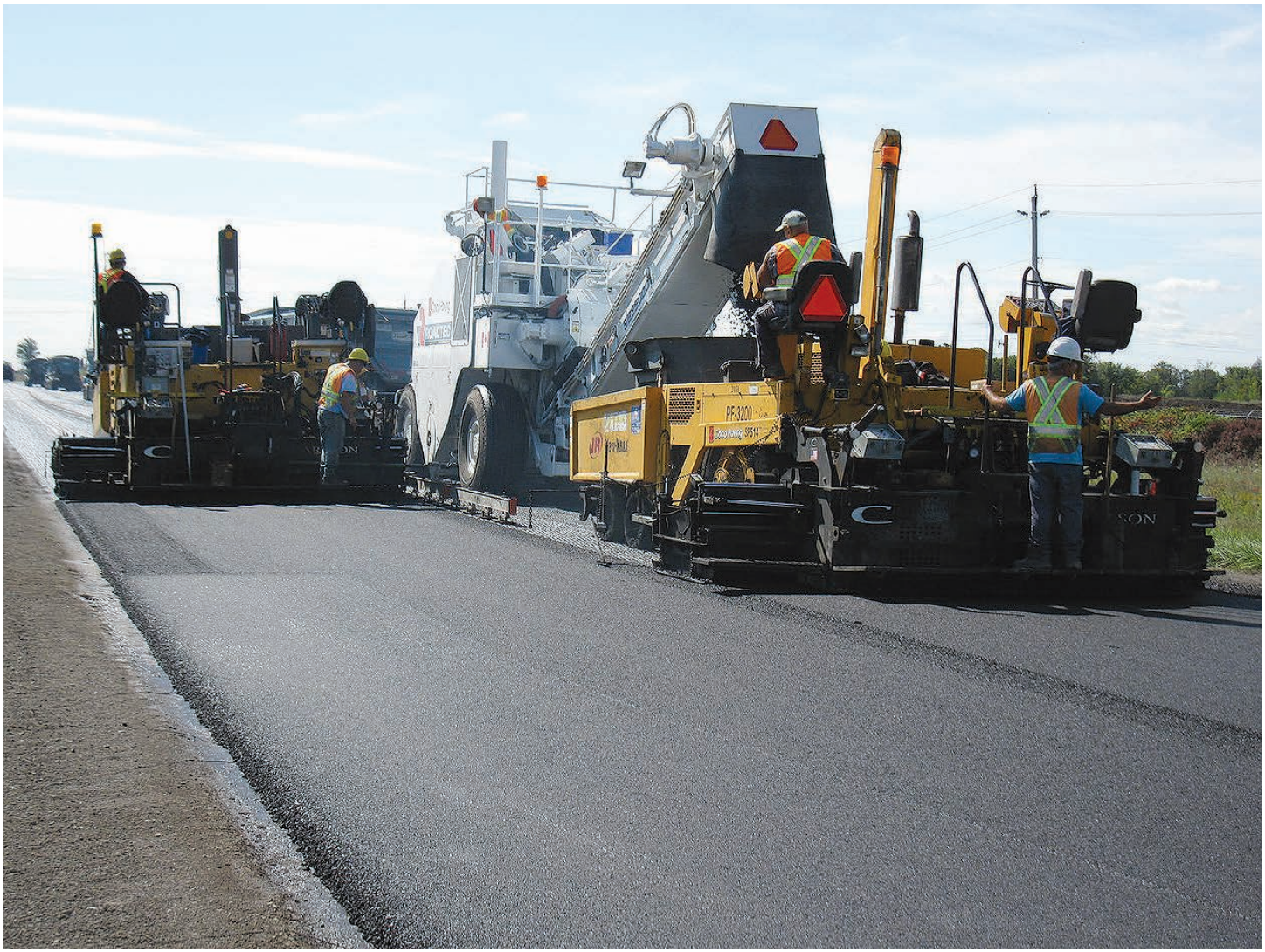
DRIVING FACTORS FOR FULL IMPLEMENTATION

- The goal of WMA is to produce mixtures with similar or improved strength, durability, and performance characteristics as HMA using substantially reduced production temperatures. Ontario's renewed interest in this technology provides another opportunity to re-evaluate and re-validate its environmental benefits (c/o reduced energy consumption), field paving benefits (including extension of the paving season and allowing longer haul distances), and improved welfare and wellbeing of the production and paving crew.
- Whether HMA or WMA is specified, stakeholders expect a mix that is durable and can satisfy its design and performance requirements. Through investigative research studies and field demonstration trials, WMA can become an acceptable alternative to HMA in Ontario as it has in many other jurisdictions in North America.
- BITU0029 provides continuing steps in the right direction. Notwithstanding, increased investments, collaborations and partnerships are recommended towards the development of an Ontario specific best practice and a standard specification that addresses those pertinent concerns surrounding aggregate handling and storage to minimize influence from moisture, production burner adjustments, and potentials for other available WMA technologies.

2 FHWA in Cooperation with AASHTO and NCHRP "Warm-Mix Asphalt: European Practice" Prepared by the International Technology Scanning Study Team (February, 2008).

WMA FACTS AND PRODUCTION RESOURCES

- *FHWA FAQs: https://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/wma-faqs.cfm*
- *FHWA's Every Day Counts: https://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/pdf/wmafnlweb.pdf*
- *Best Practices & Resources: http://www.warmmixasphalt.org/*
- *OAPC Environment Practices Guide (EPG) – New Update Coming Soon: http://www.onasphalt.org/files/Publications/OHMPA%20EPG%20Document%20Single%20Pages%20-%20Website.pdf*



Paving in Echelon with WMA.

Ontario Asphalt Pavement Council
365 Brunel Road, Mississauga, ON L4Z 1Z5 • Tel. 905-507-1107 • Fax. 905-890-8122 • www.onasphalt.org