GREEN MUNICIPAL FUND
FONDS MUNICIPAL VERT

# MAKING NEW ASPHALT OUT OF OLD—IT CAN BE DONE

## Municipalities and communities need to expand the use of recycled asphalt in road works.

The idea is simple and intuitive: use waste asphalt from existing road surfaces to make new pavement. Because it essentially contains 100% recyclable asphalt and stone, this "waste" can be used quite easily to make new asphalt mixes. This reduces the consumption of raw materials, which have a fairly large carbon and environmental footprint. However, a recent project in a small Quebec municipality has shown that a number of organizational and people-related challenges hinder the use of reclaimed asphalt pavement (RAP) in municipal road works.

### LESSONS LEARNED

- **Combining an R&D project with a standard project brings its own set of challenges.**
- **The industry is not familiar with the "performance" approach.**
- **Performance testing presents challenges.**
- **The design of these materials must be flexible.**
- **Cooperation among all stakeholders is essential to the project's success.**

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CERIEC Centre d'études et de recherches intersectorielles en économie circulaire | ÉTS Le génie pour l'industrie

The particular situation in Quebec must be taken into account when considering the use of RAP. The wide temperature ranges put enormous stress on the province's roads, which are often subject to heavy traffic. This largely explains why the use of RAP varies a good deal among the province's towns and cities. While some allow the use of mixtures containing more than 20% RAP, which exceeds the recommended threshold for the road network managed by Quebec's Ministère des Transports et de la Mobilité durable, others completely prohibit its use.

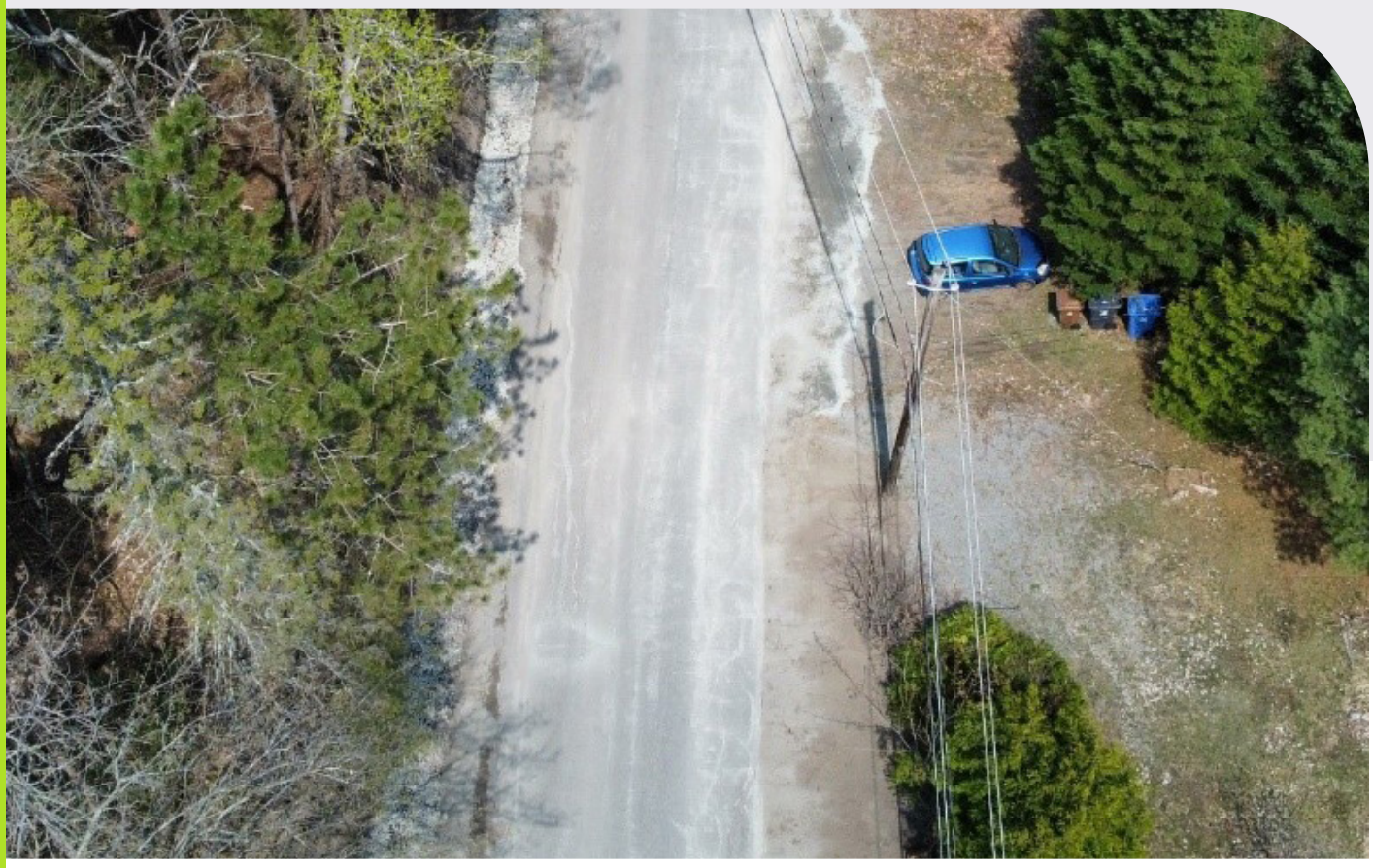
This variability is somewhat surprising since the technique is commonly used in a number of countries. For example, Vermont and Maine, just south of the Quebec border, allow RAP contents of 50% and 30% respectively, in all their roads. There and elsewhere, the mechanical performance of recycled asphalt mixes appears to be at least equal to that of asphalt mixes made from new materials. In fact, there is overwhelming evidence of that in the international scientific literature.

## PROVIDING ESSENTIAL DATA

There is clearly a lack of a reliable reference framework for Quebec municipalities when it comes to the use of RAP. With this in mind, the Construction lab at the Centre for Intersectoral Study and Research into the Circular Economy (CERIEC) conducted a pilot project in collaboration with Saint-Hippolyte, a town in the Laurentians. Saint-Hippolyte is a useful model, since with more than 130 km of paved roads and a population of about 11,500 people spread over 133 $km^2$, it is similar to a number of Quebec municipalities. So a 400 m section of Chemin du Lac-Bleu with numerous surface defects was studied in 2023.

The École de technologie supérieure (ÉTS) team carried out a meticulous and comprehensive characterization of the section. In the preparatory phase, pits were dug to analyze the structural composition and sample the granular layer under the asphalt pavement. Additional samples were collected and sent to the lab during the stage that involves breaking up the asphalt pavement on site and mixing it with the granular layer.

The research team then made an asphalt mix consisting of 30% RAP and the basic materials in the formula intended for the site. The goal was to compare the mix's resistance to rutting, thermal cracking and water to that of the asphalt mix collected at the job site. The latter was made in a factory by a contractor selected by Saint-Hippolyte after a tendering process. The technical specifications defined the performance criteria for the mix containing the RAP rather than requirements about the composition of the materials. In principle, such a method should provide arguments to convince municipalities of the merits of using RAP in asphalt mixes.



## UNEXPECTED OUTCOMES

Unfortunately, significant performance differences between laboratory- and factory-made asphalt mixes were measured, which severely limits the scope of the project's conclusions from a technical point of view. Éric Lachance-Tremblay, the professor in the ÉTS Construction Engineering Department who headed up the project, said that he was somewhat disappointed and frustrated by the results, especially since it is impossible to explain the differences in light of the available information. "There were a number of issues that came up among the various stakeholders during the various stages of preparing and implementing the project," he said. This shows that taking innovative approaches to tender specifications for road works and transitioning from traditional to performance specifications requires greater collaboration among stakeholders and an integrated process for making and installing the materials.

These difficulties also illustrate the doubts that several municipalities, and industries, have about the use of RAP in asphalt mixes.

"There is currently a lack of technical knowledge about RAP," said Éric Lachance-Tremblay. For example, the procedures for evaluating the performance of asphalt mixes and optimizing the formulation of recycled asphalt need to be improved.

Nevertheless, the industry will have to become more competent, since greener road management is synonymous with circularity. "Quebec's Ministère des Transports et de la Mobilité durable (MTMD) is currently thinking about increasing RAP concentrations in asphalt mixes to over 20%," he noted. "Attitudes are changing." The researcher is also delighted to see municipalities like Prévost and Bromont embrace RAP. "I believe in the potential of RAP for Quebec. Further research is needed on its impact on water resistance, freeze-thaw damage, and ravelling in Quebec," he concluded.

## THE ASPHALT MIX INDUSTRY IN QUEBEC

**127 active**
asphalt mix plants in 2022

More than **8 million** metric tons of asphalt mix produced in 2022:


RAP inventory in QC:
**4,477,122 metric tons**

**1,155,768 metric tons**
of RAP reused in asphalt mixes (average concentration of **14.4%**)

**960,282 metric tons**
of RAP reused in the pavement subbase

*Source: Survey by Bitume Québec in 2022*