Cutting FUEL CONSUMPTION by regulating Pavement Materials

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Global Greenhouse Gas Emission

- Energy supply: 26%
- Industry: 19%
- Residential & Commercial buildings: 8%
- Agriculture: 14%
- Transport: 13%
- Forestry: 17%
- Waste and wastewater: 3%
Global Greenhouse Gas Emission

Key players:

1. Traffic behavior
2. Engine performance
3. Rolling resistance
Rolling resistance ≈ Energy loss through tire-pavement contact

Contribution to energy

- 20% passenger cars
- 40% trucks

Key players:

- Tire -> LRR Tires
- Pavement -> ?
**Main Challenge**

Breaking Vs Rolling resistance

**Kinetic energy of the vehicle**

Energy Dissipation in braking

- **96%**

Energy Dissipation in moving

- **70 - 85%**

**Tire**

- **4%**

- **20 - 40%**
Rolling resistance

Hysteresis

= Tire deflection

Pavement

= Asphalt dispersion quality

1-10 mm

[1] Continental ©
Rolling resistance

Hysteresis

= Tire deflection

+ Tread slip

Pavement

= Asphalt dispersion quality

+ Stone size
Rolling resistance

RR in Tire

= Tire deflection + Tread slip + Tread deformation

Pavement

= Asphalt dispersion quality + stone size + stone type
Pavement Design regulations

From 1980: US states (all)  
Canada  
EU countries (all)

From 2010: 6/50 US states  
Canada (under research)  
EU (under research)

Our topic of research

Pavement = Asphalt dispersion quality + stone size + stone type
While the importance of the role of pavement macro-texture in providing adequate surface friction has been increasing in the United States, few states actually measure it and even fewer appear to have minimum macro-texture requirements.

- Still no policy for Micro-texture
Development of a multi-scale framework to explore micro & meso pavement surface roughness spectrum to minimize Rolling resistance
ROSANNE study in Denmark found 20% difference between the rolling resistance (RR) of similar roads in Poland:
- Same roughness
- Same testing procedure
- Same company
- Different mix

Why it matters?
Thank You