

# Where's my pavement today

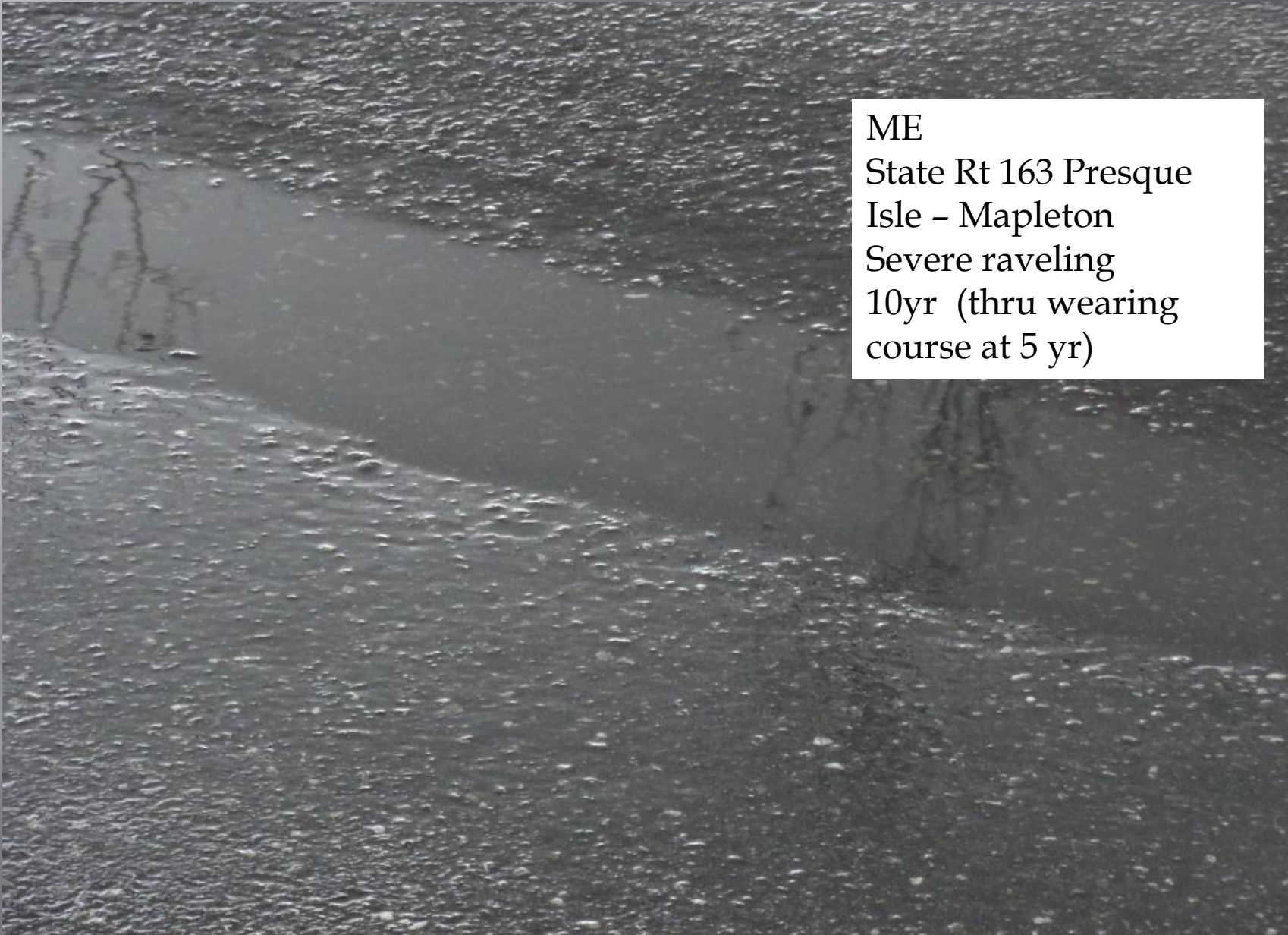
- ▣ VT and many northern states are experiencing a new phenomenon in HMA pavements
- ▣ Despite long term historic performance in VT with the aggregate sources and producers, pavements are experiencing very premature failures
- ▣ Pavement deterioration can be rapid, with wear rates in the  $\frac{1}{4}$  to  $\frac{1}{2}$  inch per year range documented
- ▣ Here are some photos of an unexplained change in performance:

VT  
I 89 Middlesex, VT  
loss of mastic,  
erosion through  
surface 5 yr



VT  
I 89 Middlesex, VT  
loss of mastic  
3 yrs



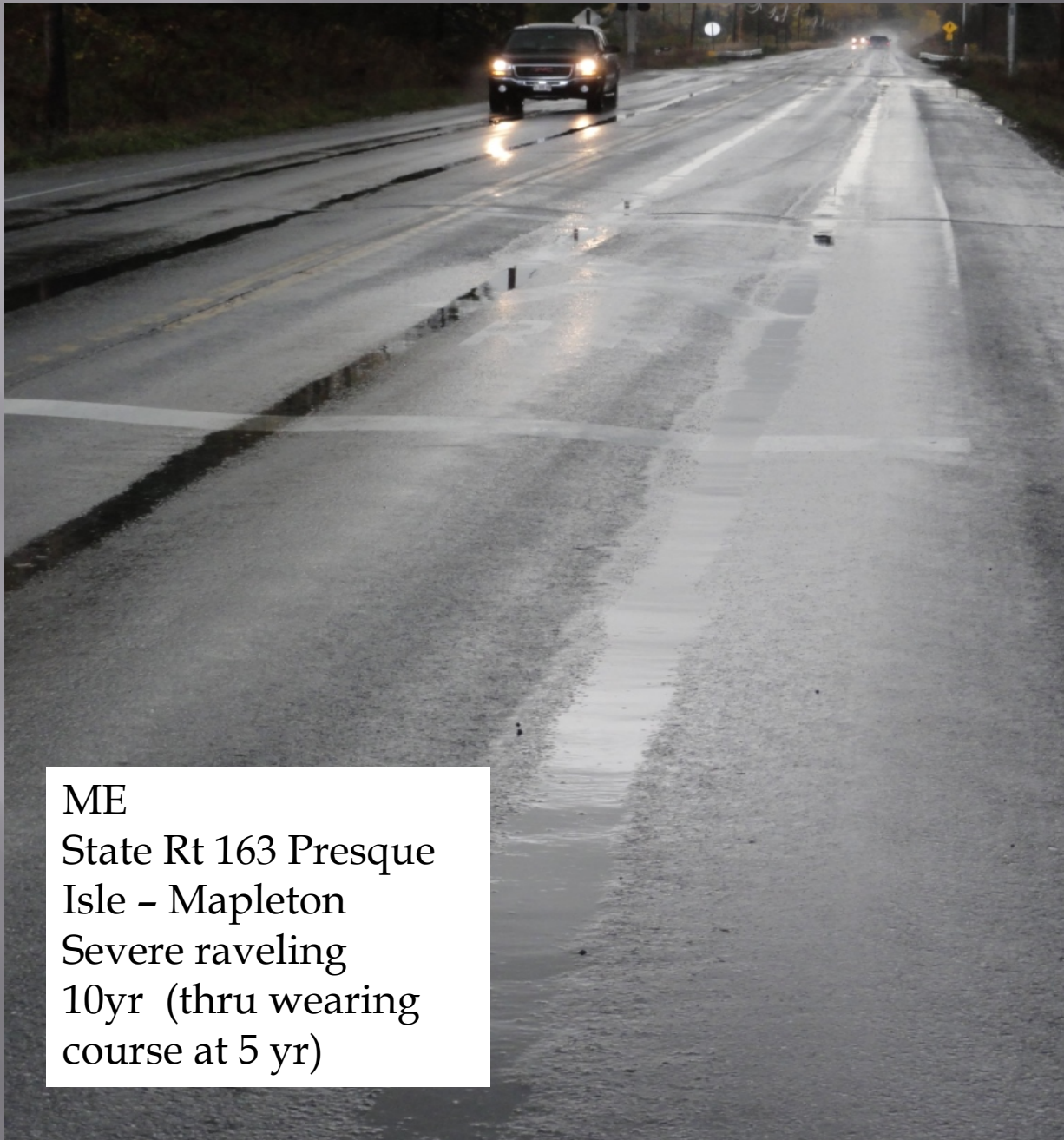


ME

State Rt 163 Presque  
Isle - Mapleton  
Severe raveling  
10yr (thru wearing  
course at 5 yr)

VT  
US 2 Montpelier  
Raveling through  
surface course, loss  
of mastic





ME  
State Rt 163 Presque  
Isle - Mapleton  
Severe raveling  
10yr (thru wearing  
course at 5 yr)

ME  
US Route 1A, Holden,  
ME  
Loss of mastic, raveling  
7 yr



MT  
US 2 near Marias Pass,  
MT Mastic loss,  
severe raveling  
3 yr





MT

Marias Pass, MT

Severe mastic loss

3 yr



WI

I90/94

Loss of mastic, raveling

3 yr



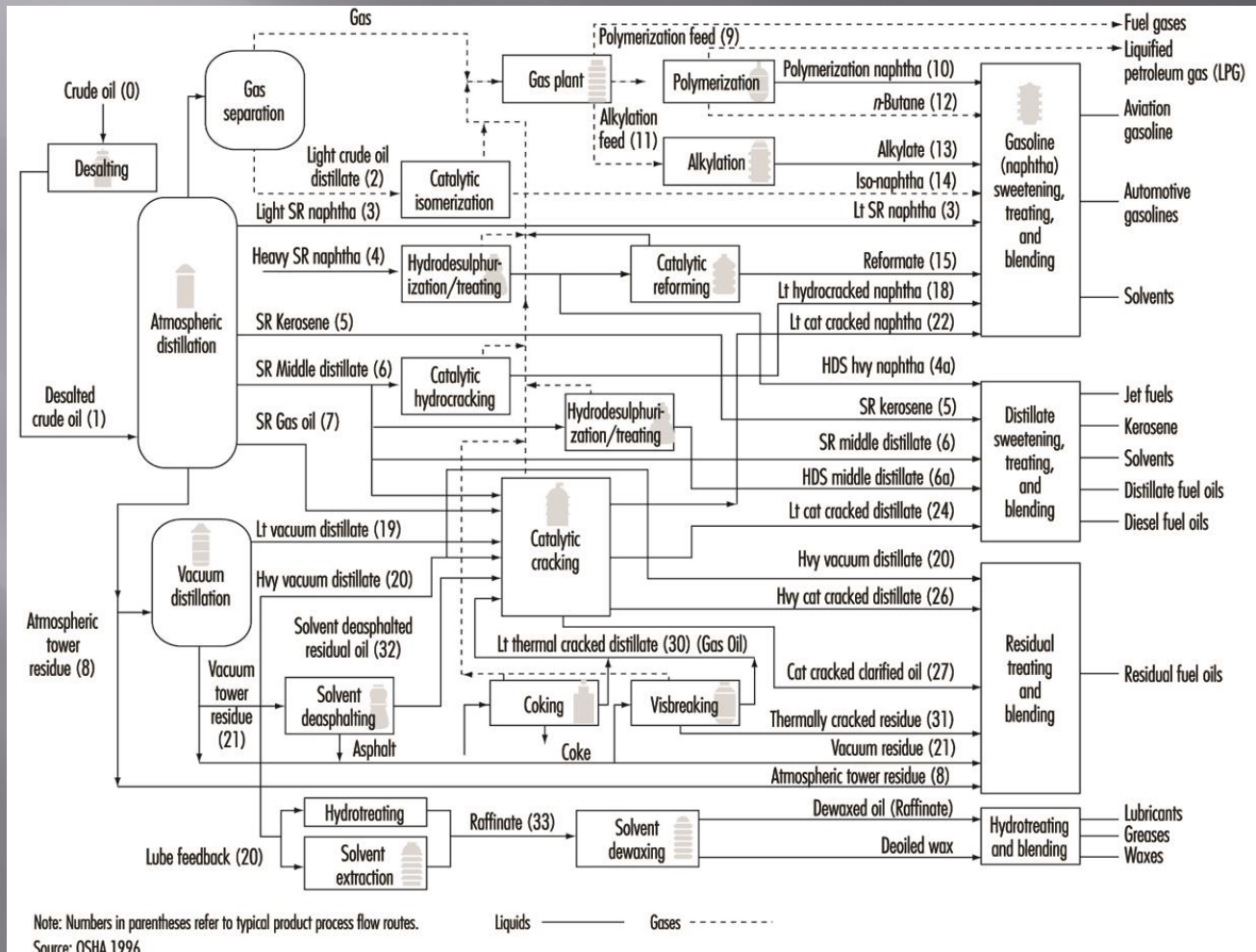
# What's Needed

- ▣ Current research continues to assess pavements through both the components and the final product
- ▣ Performance standards developed under SHRP have been effective, but show no insights on these failures that are occurring on fully compliant mixtures and materials, yet...
- ▣ Examination of the most volatile component of technologic change, the energy sector and refining

# Why look at PG Binders

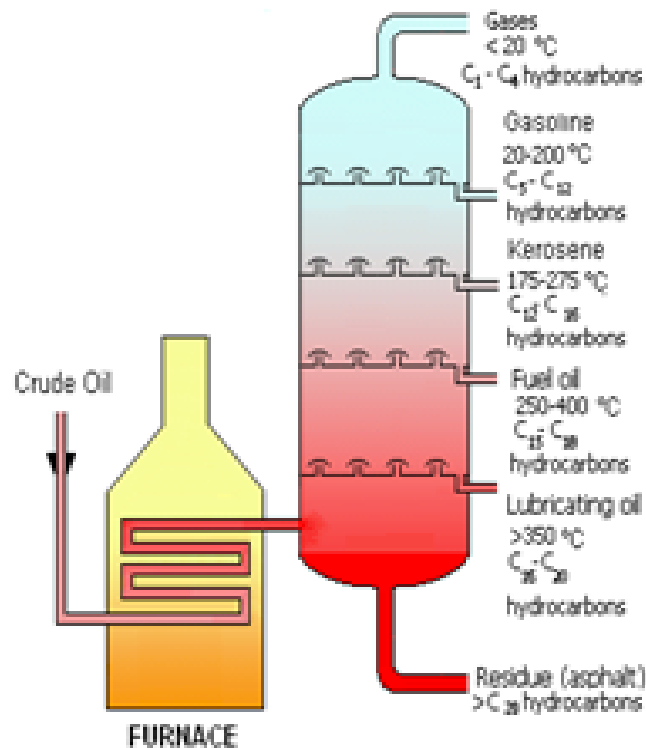
- ▣ Technology advances and market forces in the petroleum industry are driven by high value products
- ▣ Side streams like asphalt are byproducts that typically are sold after reformulation to meet standards
- ▣ Advanced knowledge and sophistication have introduced new materials into asphalt production
- ▣ Our current standards could not have contemplated the scope of manufacturing change

# General Refinery Process Diagram



# Product Values and Market Pressures

## Refining Economics:



### Brent Crude - \$79.19/barrel

Gases: Propane or Butane

Propane: \$0.84/GAL or \$35.28 per barrel

Gasoline: \$2.07/GAL or \$86.94 per barrel

Distillates: Diesel, Heating Oil, Kerosene, Jet fuel

Heating Oil: \$2.40/GAL or \$100.80 per barrel

Asphalt: \$450/ST (\$1.94/gal) or \$81.82 per barrel

# Moving forward

- Support a research agenda to address the changes - NCHRP Problem 2016-D-04, The Impacts on Pavement Performance from Changes in Asphalt Production
- Identify changes in crude oil refining related to asphalt binder production that have occurred since 1996.
- Investigate incidents of premature asphalt pavement failure occurring in several states and provinces since the mid-2000s. Identify the principal failure mechanisms.
- Evaluate the correlation between major changes in oil refining/energy market demands and occurrences of premature pavement failure.
- Compare the physical and chemical properties of current asphalt binders with binders from different periods, either through recovery from field samples or from stockpiled reference samples such as those collected by the Long Term Pavement Performance program.
- Identify gaps in the existing PG binder specification that may be leading to use of binders that contribute to early pavement failure.
- Evaluate binder tests to determine how they can be used to better predict actual pavement performance.

# Why: From the problem statement

- ▣ The nationwide investment in pavements is in the billions of dollars. Some agencies are experiencing reductions in expected pavement life of fifty percent or more, requiring earlier application of pavement preservation or rehabilitation treatments. Considering the reduced funding levels for highway agencies, coupled with increased costs of asphalt pavements, these reductions in pavement life will make it extremely challenging to meet the performance measures required under MAP-21.