



**Marathon
Petroleum Company LP**

Trends in Asphalt Binder Materials

Marathon Petroleum Corporation



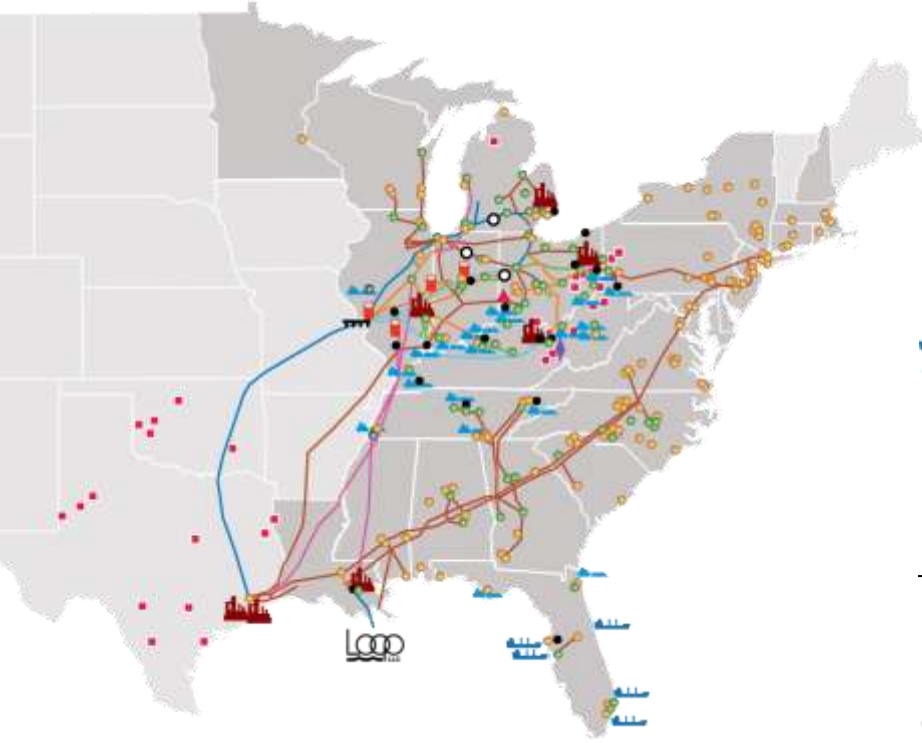
- More than 125 years in business
- Fourth largest U.S. refiner
 - Largest refiner in Midwest
- Employees: approx. 45,340
- Approx. 2,760 Speedway store
- Approx. 5,600 Marathon outlets



- MPC ranked #3 in Forbes “Americas Best Employers” list



Focused and Integrated Network



- Marketing Area
 - MPC Refineries**
 - Light Product Terminals**
 - MPC owned and Part-owned
 - Third Party
 - Asphalt/Heavy Oil Terminals**
 - MPC Owned
 - Third Party
 - Water Supplied Terminals**
 - Coastal
 - Inland
 - Pipelines**
 - MPC Owned and Operated
 - MPC Interest: Operated by MPC
 - MPC Interest: Operated by Others
 - Pipelines Used by MPC
 - Ethanol Facility
 - Biodiesel Facility
-
- MPLX**
 - Tank Farms
 - Butane Cavern
 - Pipelines
 - Barge Dock
 - MarkWest Facility



Refineries



Biodiesel/Ethanol Facilities



Terminals



Pipelines



Coastal Water Terminals



Inland Water Terminals



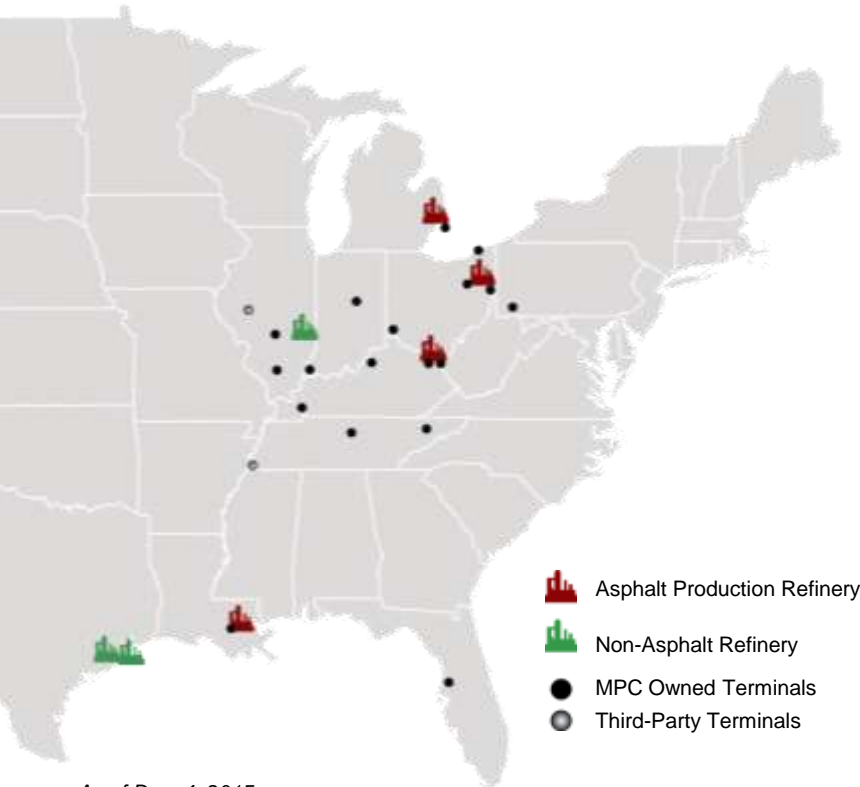
Speedway



Brand Marketing

As of Dec. 4, 2015

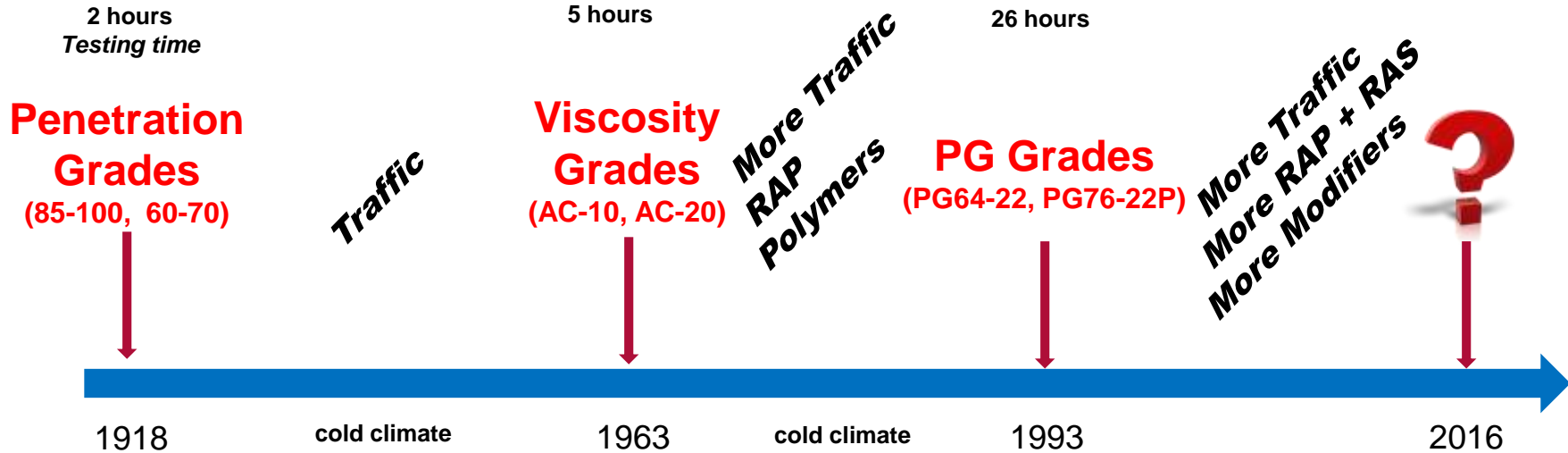
Asphalt and Heavy Oil Overview



As of Dec. 4, 2015

- One of the largest asphalt producers in the U.S. in terms of capacity
- 18 owned and two third-party asphalt terminals
- Market flexibility
- Key indicators
 - Sweet/sour crude differentials
 - Refinery crack spread
 - Market demand

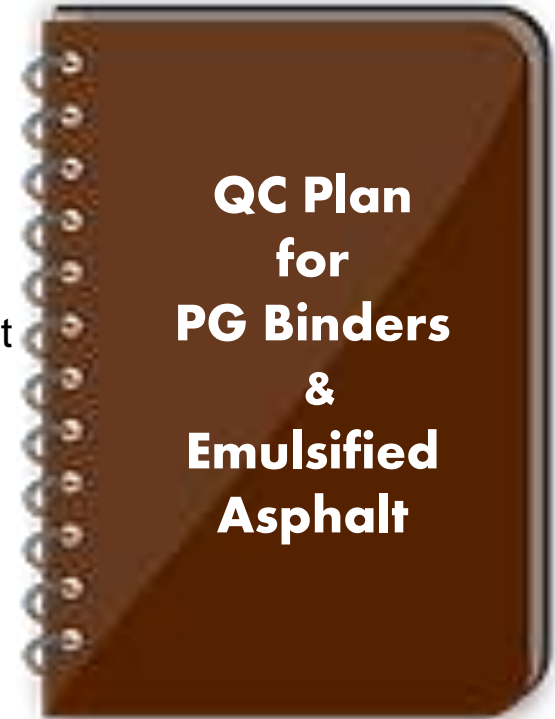
Trends in Asphalt Binder Materials



ODOT initiating Warning Band Limits

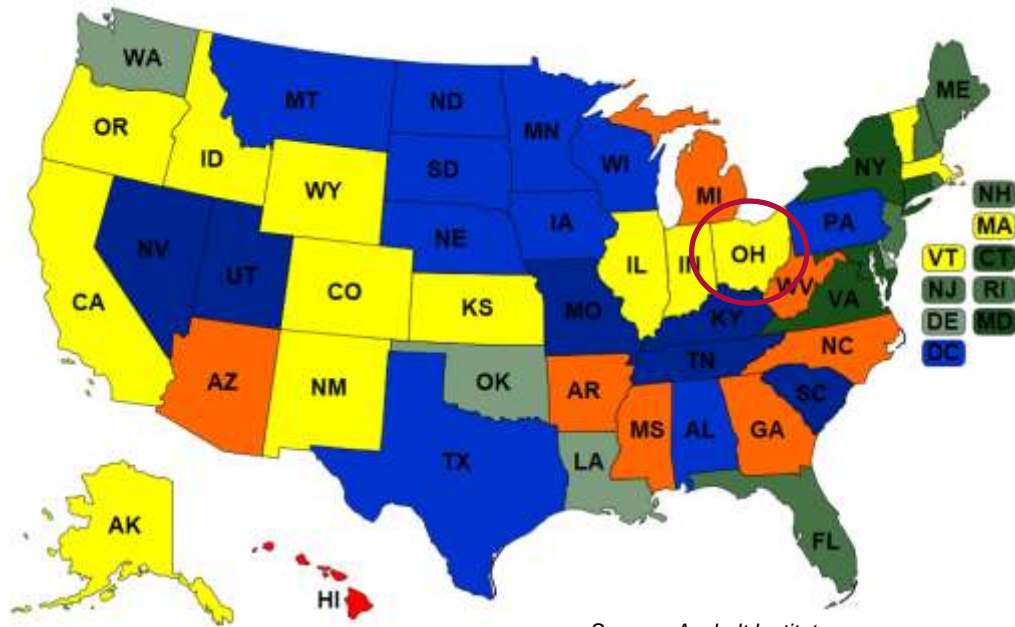


- ODOT not matching some supplier results
 - m-Value: Supplier 0.304; ODOT off-spec 0.298 (0.300 min.)
 - ODOT less tolerance for test method precision
- ODOT requires additions to QC Plan
 - Warning Band for each criteria: 0.300 – 0.308
 - Action Plan if result in the band: retest, adjust, delay shipment
- **Issues Remaining to be Resolved**
 - Each Supplier likely have different Warning Band
 - Supplier with poor history may have wider Warning Band
 - Higher “specification” on refinery sales
 - Managing supply to Ohio (versus surrounding states)
 - First year growing pains



MSCR is being implemented

AsphaltInstitute.org: Specification Databases



Source: Asphalt Institute

State Color Key		
Full Implementation	Partial Implementation	Testing/Evaluation
Full Implementation Modified Grades Only	Planned Partial Implementation (12 months)	No Activity
Planned Full Implementation (12 months)	Considering Implementation (No Time Frame)	To Be Posted Soon

- Improved binder correlation to high traffic rutting performance
 - **Jnr & %Recovery** better describes benefit of polymer modification
- Few States – full implementation
 - PG76-22PM → PG64E-22
- More States – partial implement
 - **%Recovery** only: replace PG Plus
 - Elastic Recovery - 7 method variations
- ODOT Testing / Evaluating
 - Suppliers need state/state uniformity
 - Stay tuned for future discussions

REOB blending into PG binders is under review



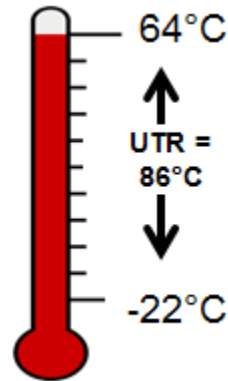
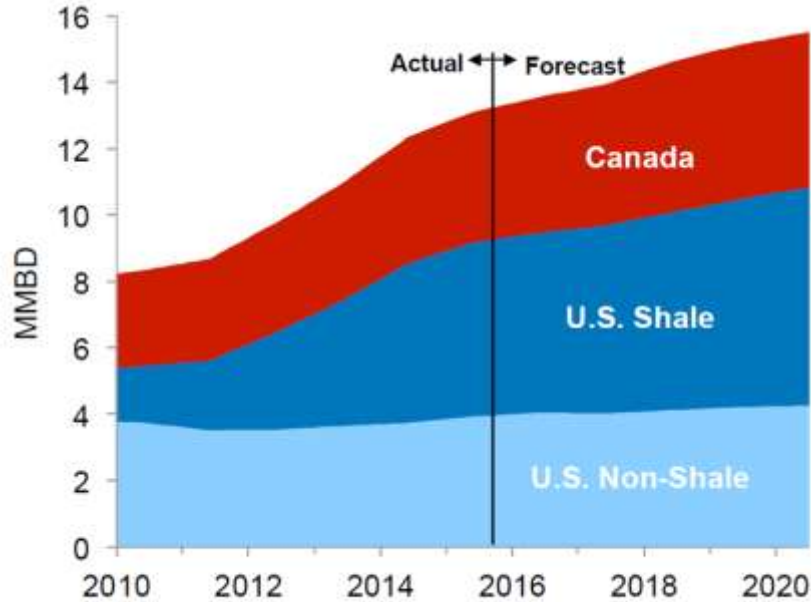
- Significant Industry Issue – DOT scrutiny
 - Many New England States have banned use
 - Discovered use without prior notification
- Claims of premature pavement cracking
- NORA: Trade Association Specifications
 - Re-refining with vacuum distillation (VTAE)
 - More than just re-claimed used engine oil
- Asphalt Institute Task Force
 - Developing publication
 - *“State of the Knowledge: The Use of REOB / VTAE in Asphalt”*
 - AI does not endorse or promote any materials



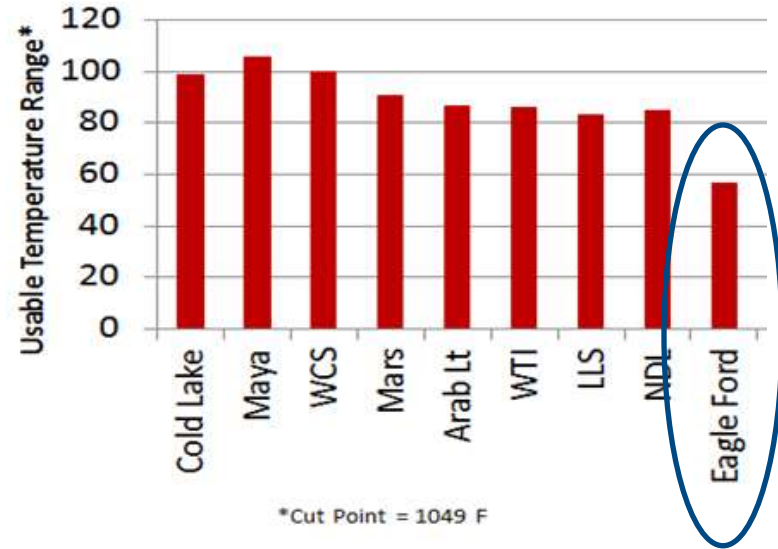
- Renewable & Sustainable
 - Not tied to crude oil cost
 - Chemical processing of:
 - Soybean Oil
 - Other vegetable Oil
 - Corn fodder & Switch grass
 - Algae based
- Proposed benefits
 - Soften binders for RAP mixes
 - Achieve low temperature grade



Shale Crude – minimum impact on asphalt



Resid Asphalt Properties



Sources: MPC, CAPP

“New” PG binders may require new specification



- NCHRP 9-60 Research Program
- “Addressing Impacts of Changes in Asphalt Binder **Formulation** and **Manufacture** on Pavement Performance through Changes in Asphalt Binder Specifications”
- Problem statement: changes since SHRP ‘87
 - Wider, more variable range of crude oils
 - Wider variety of additives: Polymers, REOB, PPA, Bio Oils, GTR
- MSCR resulted from the last NCHRP on asphalt binders

