



IBEF Symposium

Influence of bitumen nature and emulsion production parameters on product performance

Nadjib Boussad

Global Asphalt Product Technical Advisor
ESSO SAF

nadjib.boussad@exxonmobil.com





Content

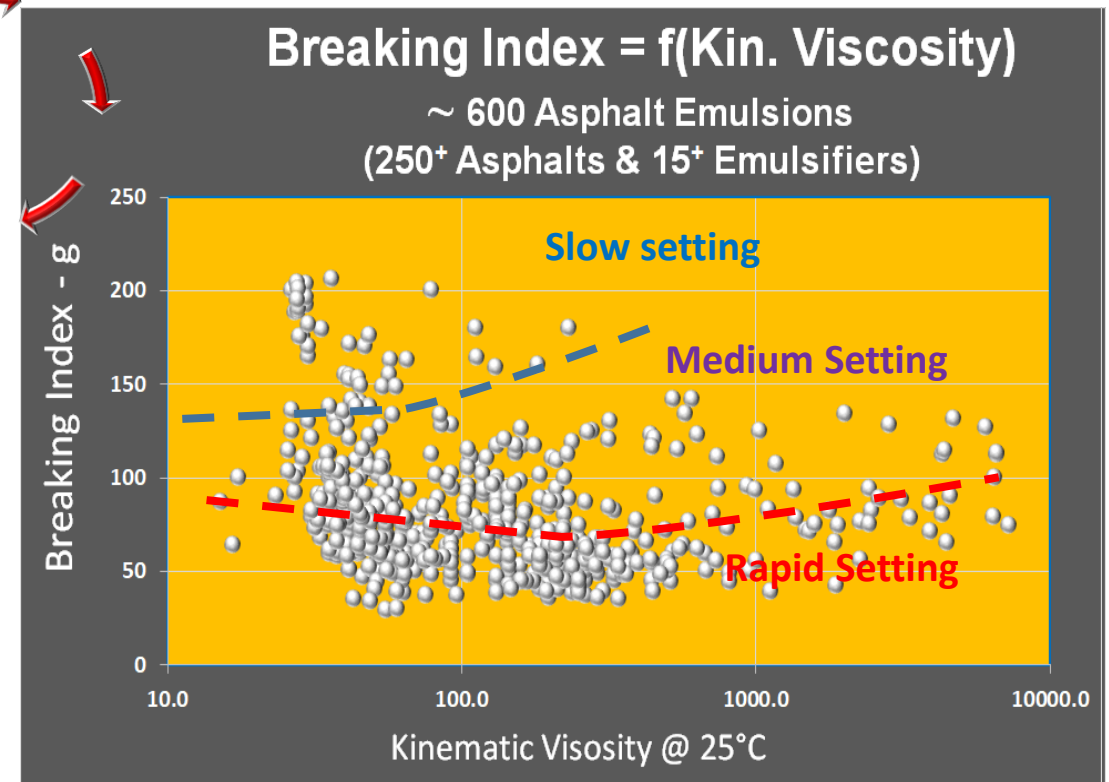
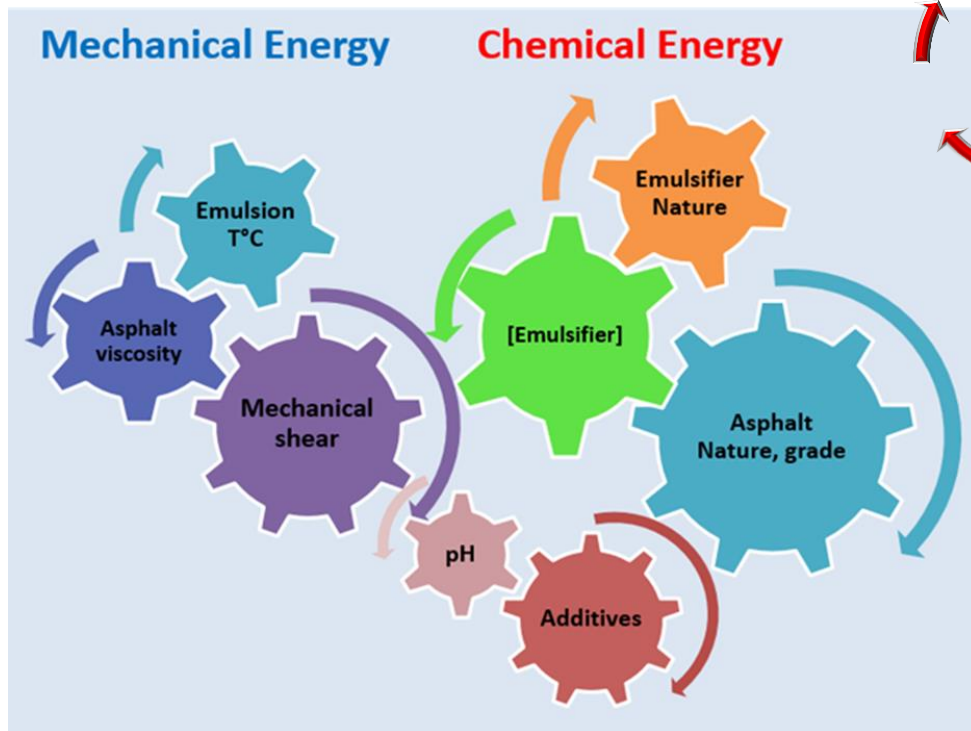
- Bitumen emulsion production parameters relationship to performance
- Emulsion's raw materials & « Right First Time » at production sites
- Example of science used as a base for improvement



Bitumen emulsion's science is complex

- Both emulsion characteristics, and production parameters are inter-related

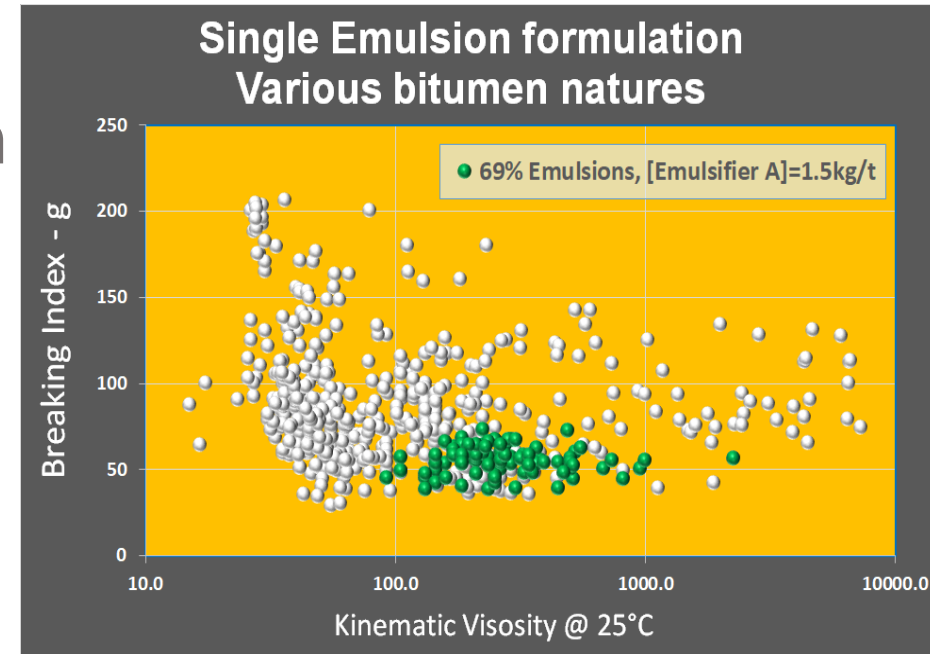
Production Parameters (inter-related)





Reducing number of variables simplifies modelling

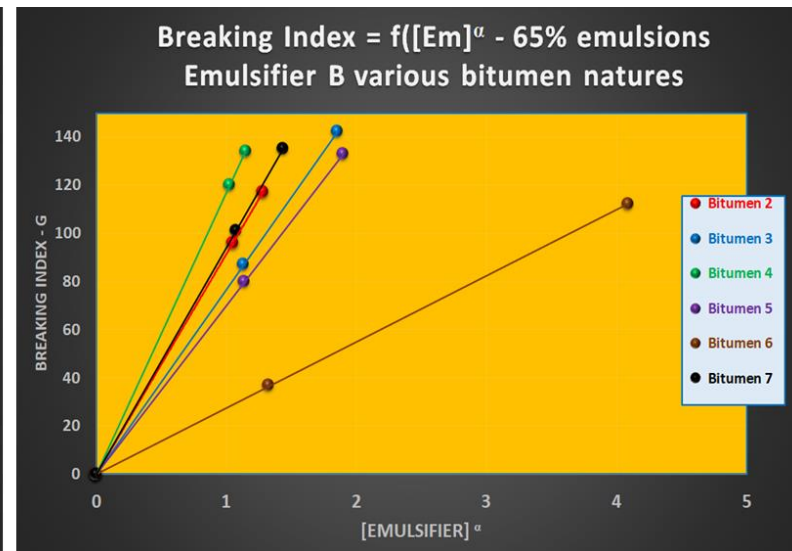
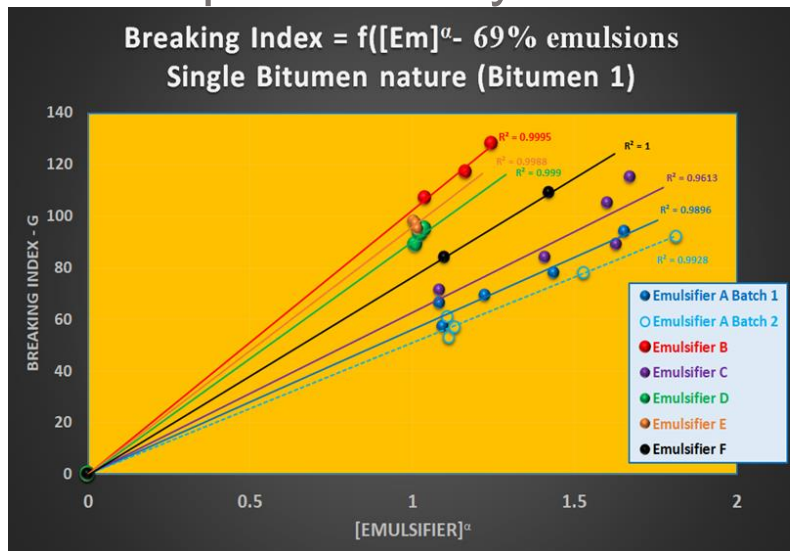
- Single variable : Bitumen nature
- Strong impact of bitumen nature on emulsion characteristics and performance
 - Similar impact of emulsifier nature
- “Right First Time” at industrial sites requires adjustments of production parameters
 - Anticipation of change may be enabled by the modeling of some key emulsion properties





Modeling of emulsion breaking index (BI)

- [emulsifier] and raw materials nature impact strongly emulsion BI
 - Relationships driven by both emulsifier & bitumen natures

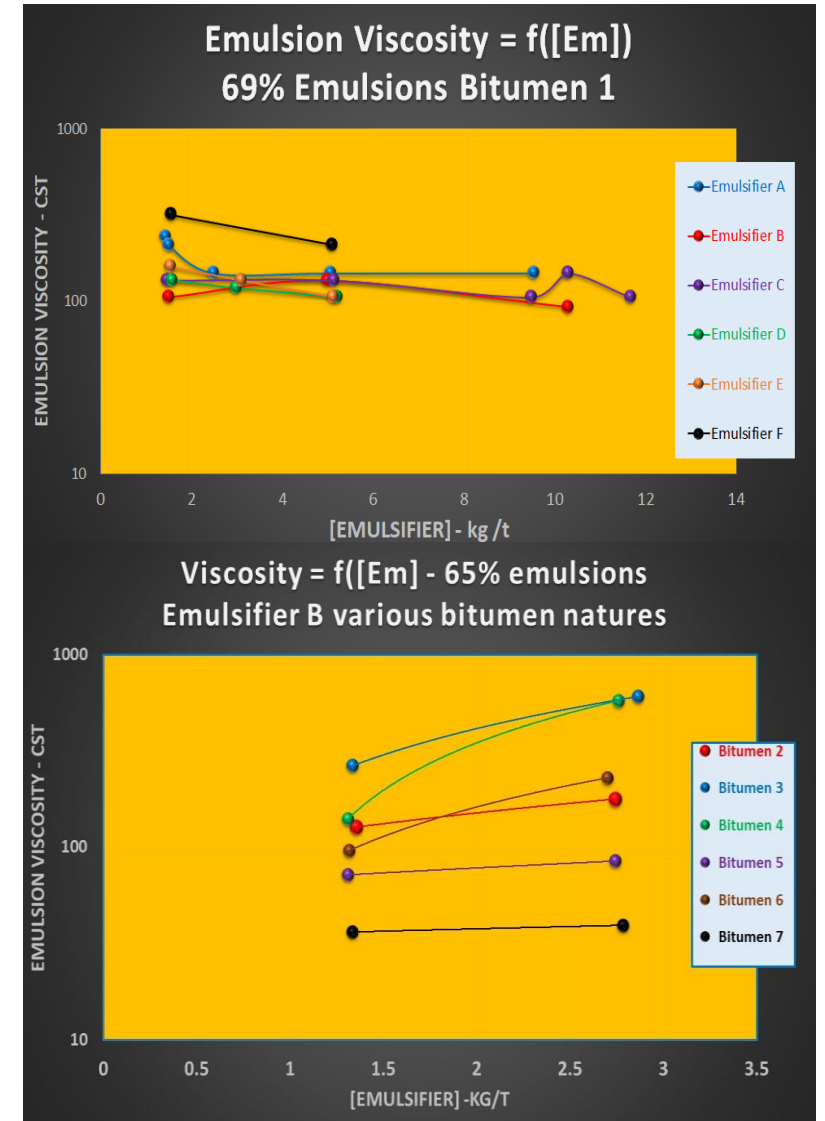


- Despite good tendency, interpretation remains complex
- BI relationship to [Emulsifier] better described by a power function:
 $BI = a.[Em]^\alpha$



Modeling of Emulsion Viscosity (η)

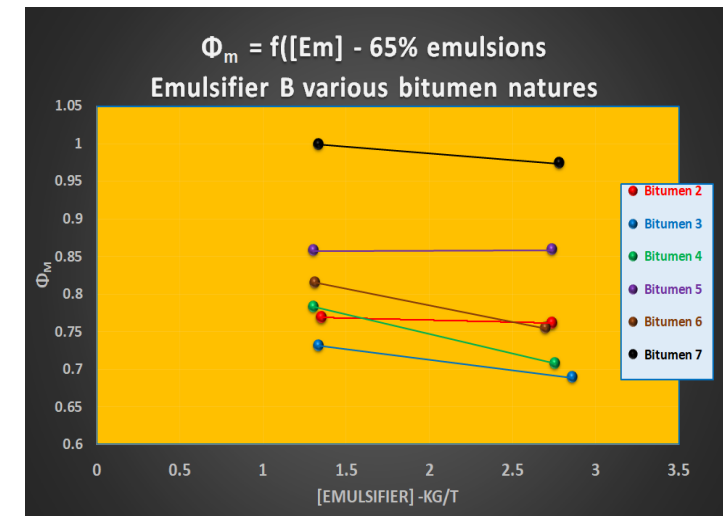
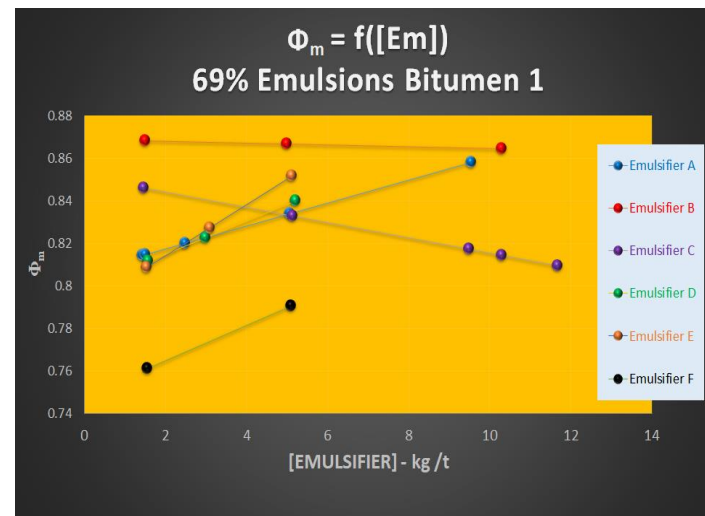
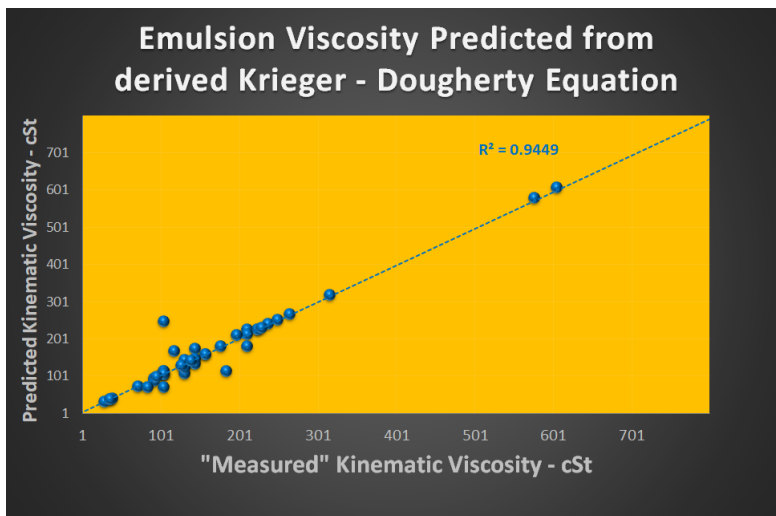
- Within the emulsions population studied
 - Major impact of bitumen nature for 65% emulsions
 - Smaller impact of emulsifier nature or concentration for 69% emulsions
 - 69% & 65% emulsions cannot be compared as such
- Bitumen content in emulsion can be extracted by using colloid science





Use of colloid science for predicting emulsion η

- Krieger – Dougherty equation : $\eta / \eta_0 = (1 - \Phi / \Phi_m)^{[\eta] \cdot \Phi_m}$
 - Φ_m maximum packing fraction
- Assumption: Φ_m related to [Emulsifier]: $\Phi_m = a [E_m] + b$



- Φ_m parameters do not depend upon [bitumen]

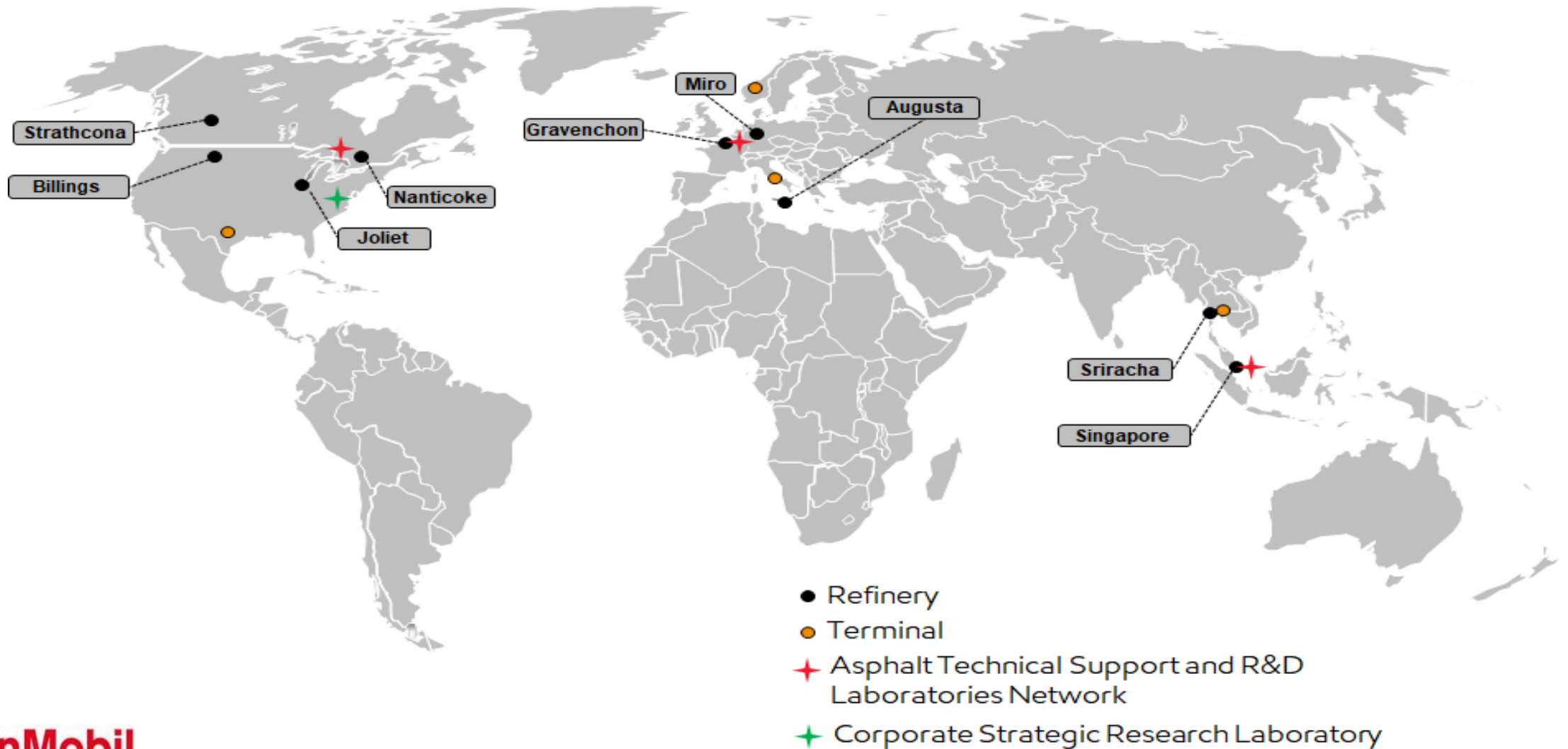


Conclusion

- Bitumen emulsion is a complex science: product performance is affected by numerous inter-related production parameters
- Reducing number of variables simplifies modelling
- Dataset confirms variation in raw materials (bitumen, emulsifier) can impact significantly emulsion characteristics
- Sound scientific approach is recommended for better control of emulsion production operations, as far as range of variation in raw materials is anticipated
- Research is on going for the inclusion of additional emulsion characteristics and production parameters in predictive models



Aknowledgments





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