



April 10, 2025

# Asphalt Cement (AC) 101: The Oil Refining Process

Chris Campbell,  
Global Asphalt Group Lead & North American Asphalt Technical Lead

*This communication may contain confidential information for the use of the entity to which it is addressed. If you are not the intended recipient, you are hereby notified that any use, dissemination, distribution, or copying of this communication is prohibited. If you are the intended recipient, information may not be reproduced or further distributed out of your organization without the originator's authorization in writing. 2025 © Imperial Oil Limited. All rights reserved.*

# Crude Oil

- “Crude oil is a naturally occurring, yellowish-black liquid found in geological formations beneath the Earth's surface”
- It is a mixture of numerous different hydrocarbons
- Each oil has a unique mix of molecules, which define its properties, like color and viscosity

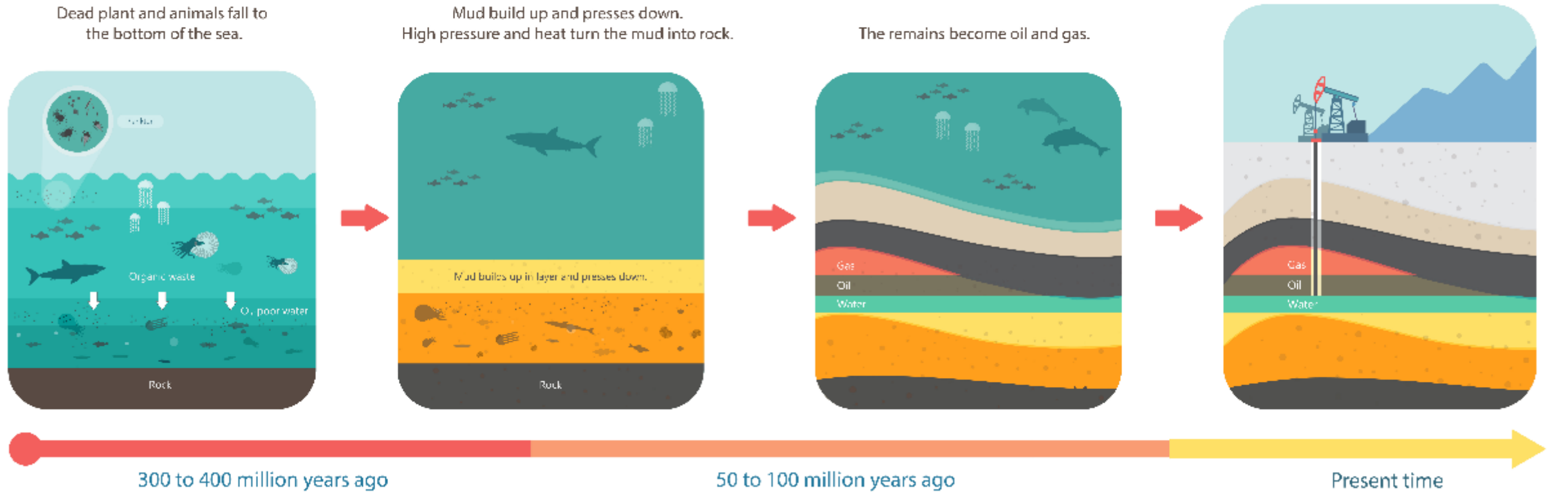
## Composition by weight

Element	Percent range
Carbon	83 to 85%
Hydrogen	10 to 14%
Nitrogen	0.1 to 2%
Oxygen	0.05 to 1.5%
Sulphur	0.05 to 6.0%
Metals	< 0.1%



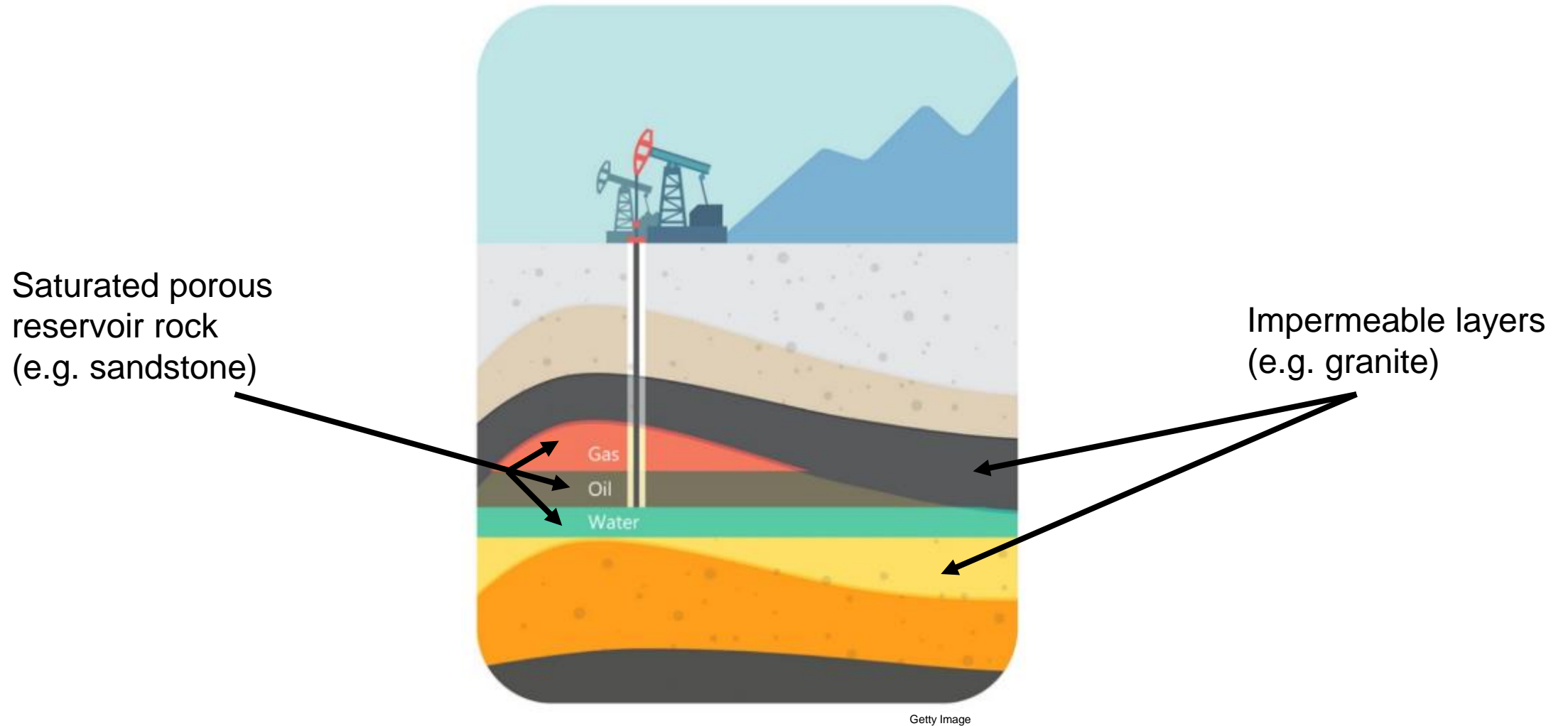
Getty Image

# Crude Oil Origin

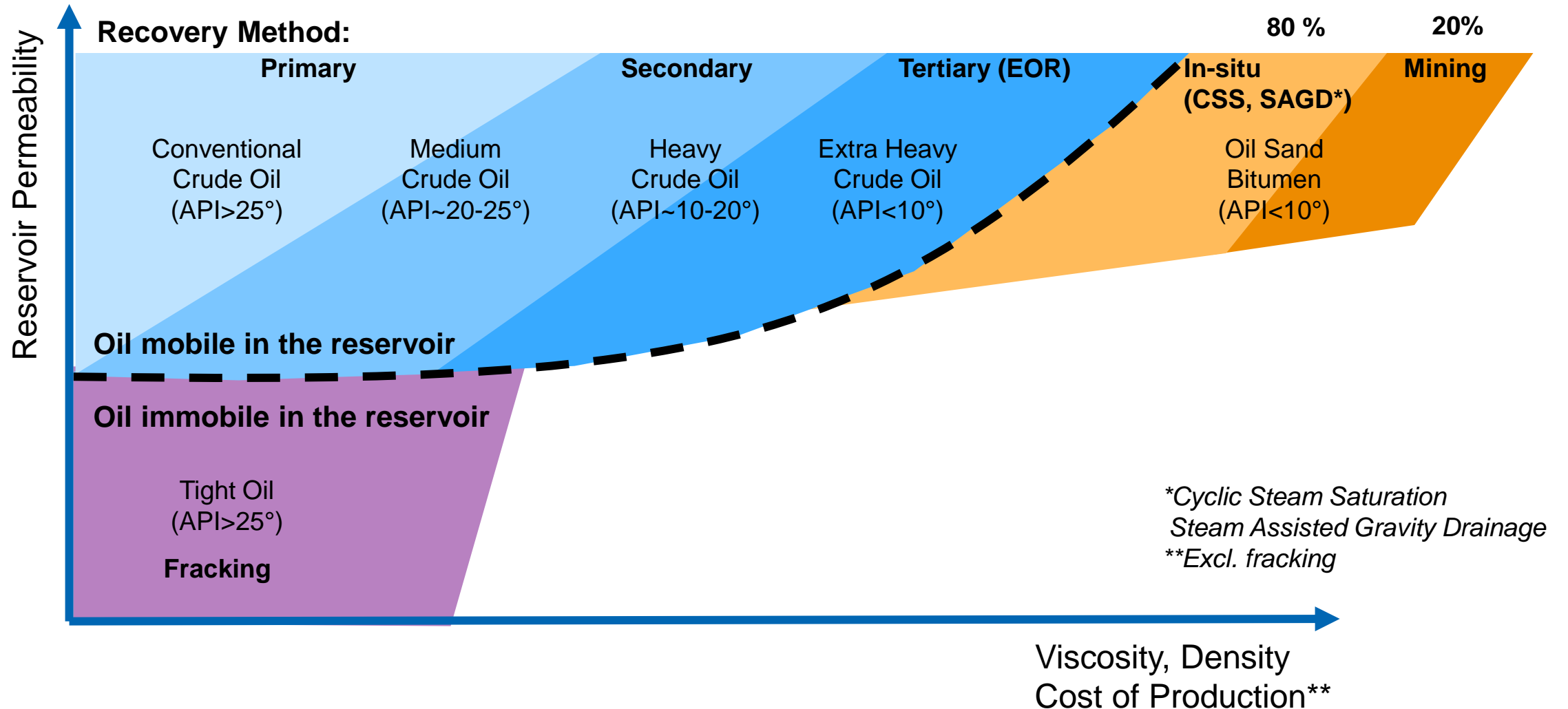


Getty Image

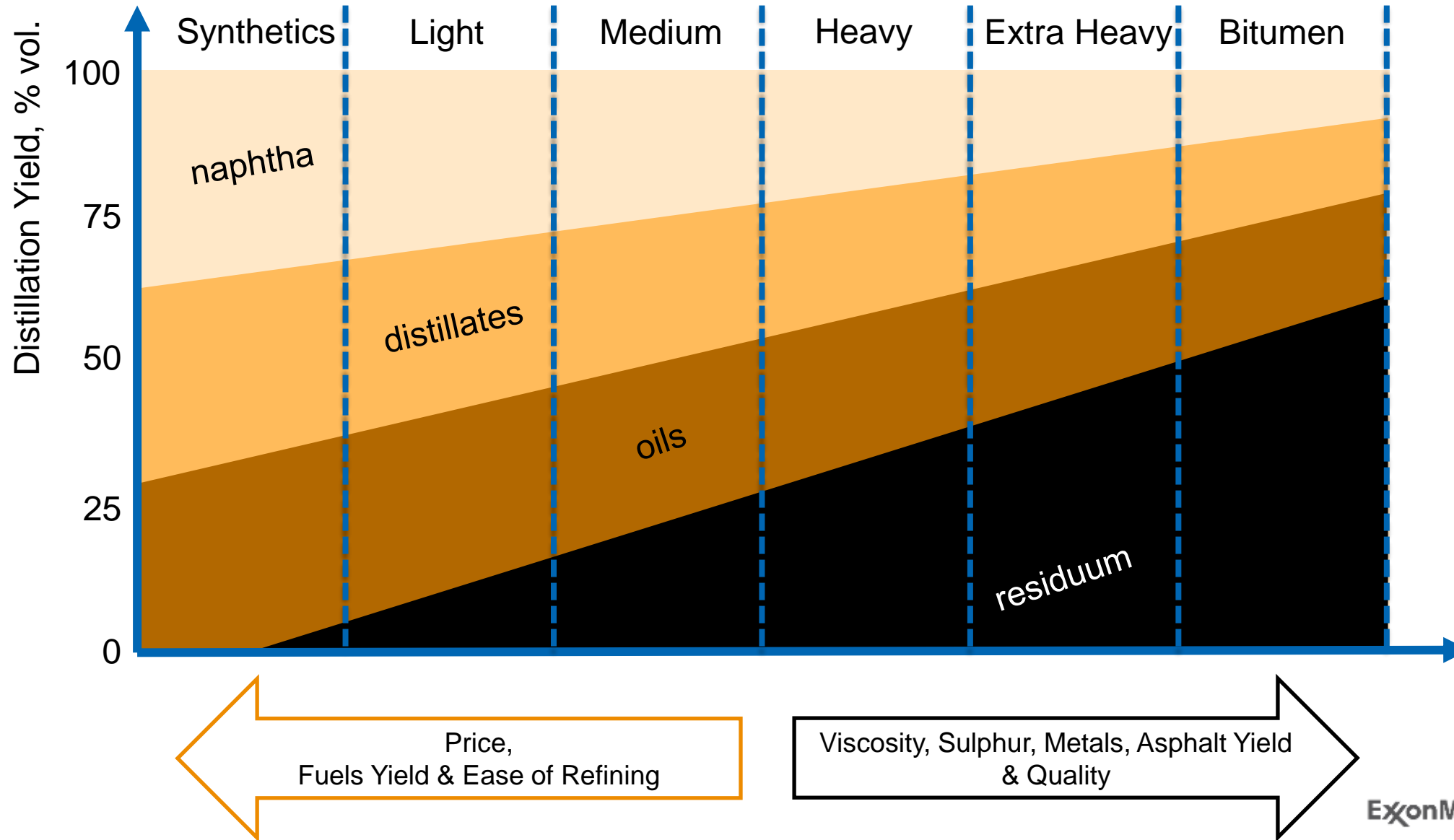
# Crude Oil Reservoir



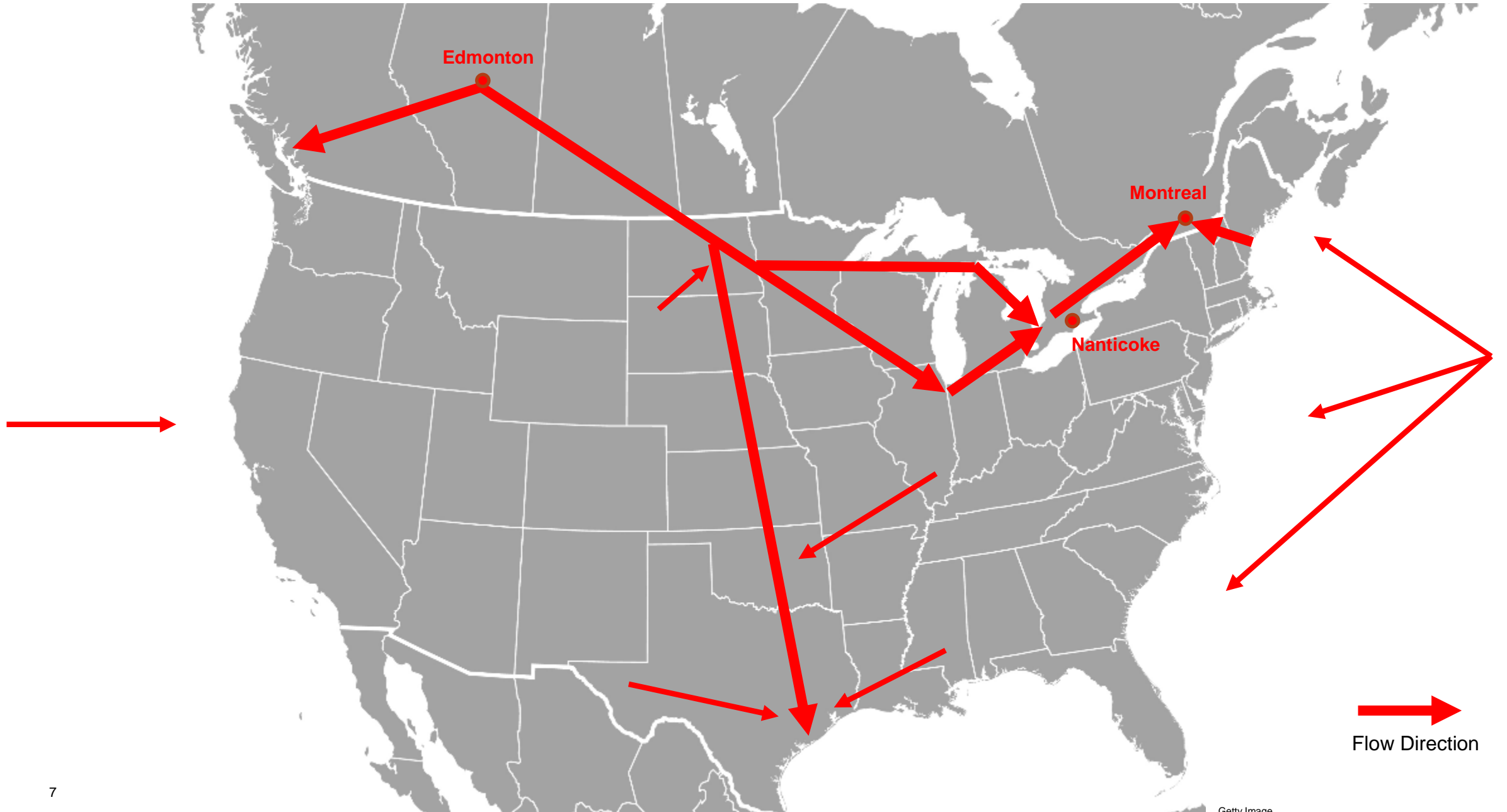
# Types of Crude Oils & Recovery Methods



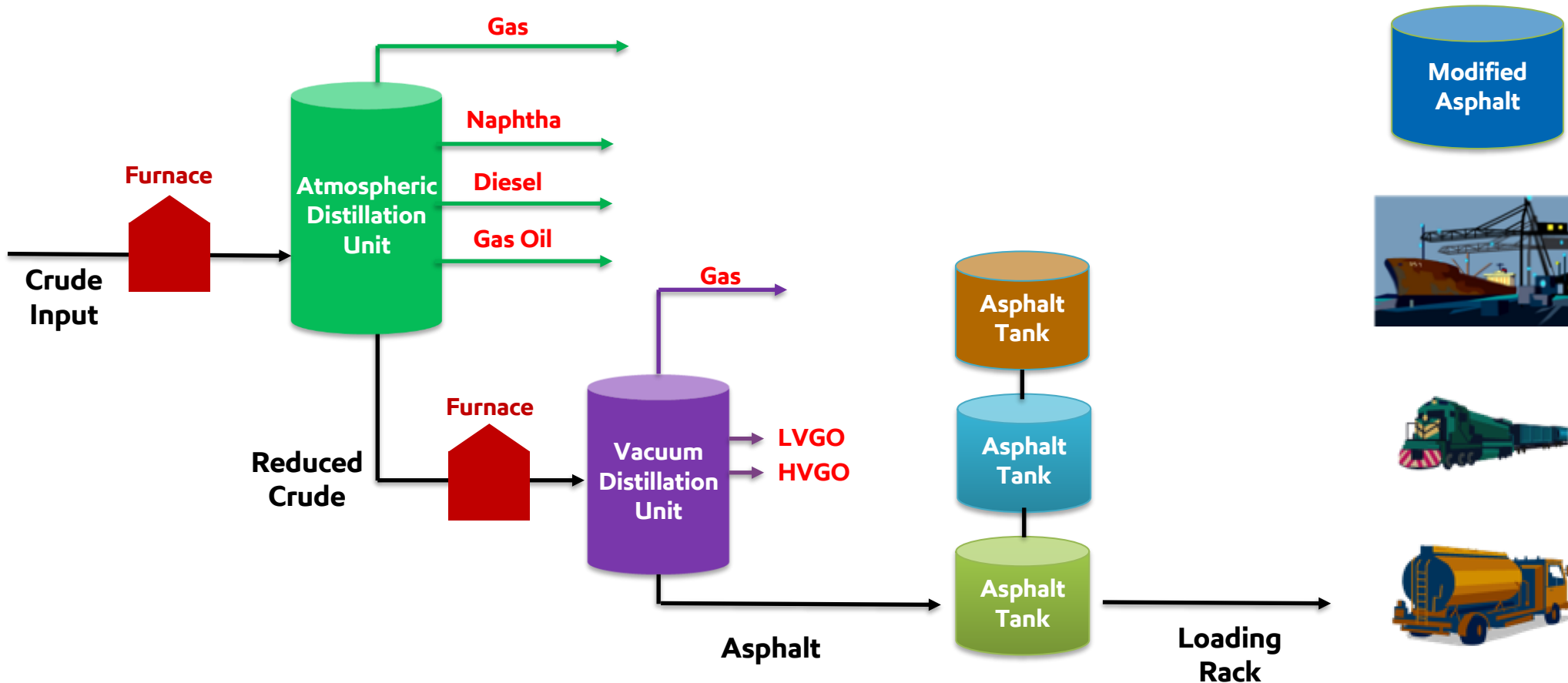
# Crudes Vary in Composition & Value



# Crude Pipeline Example



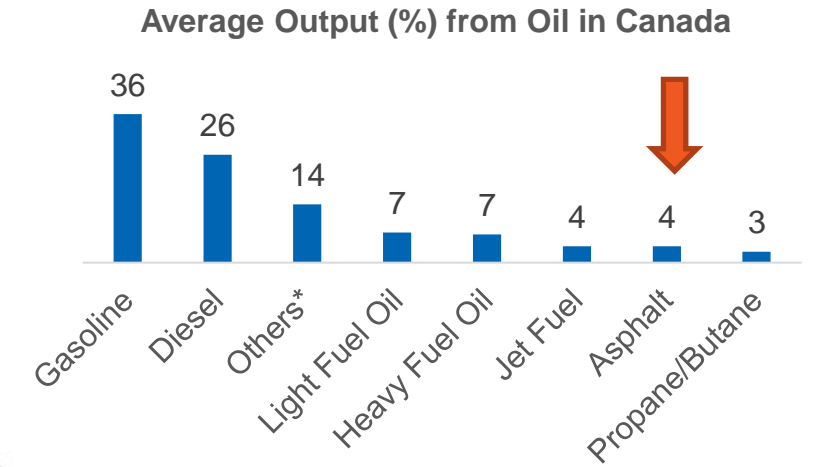
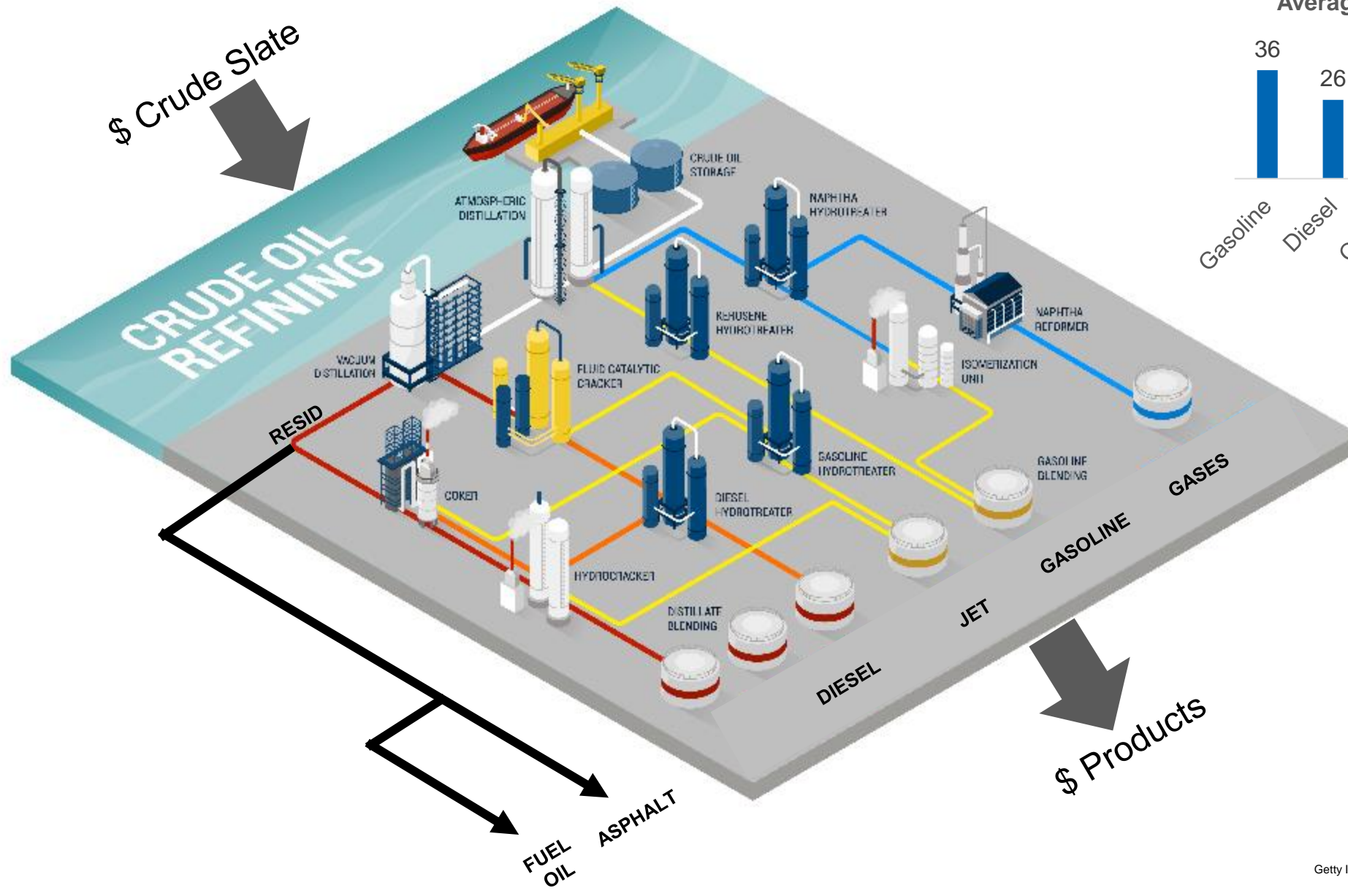
# Straight-run Asphalt = Vacuum Distillation Residue



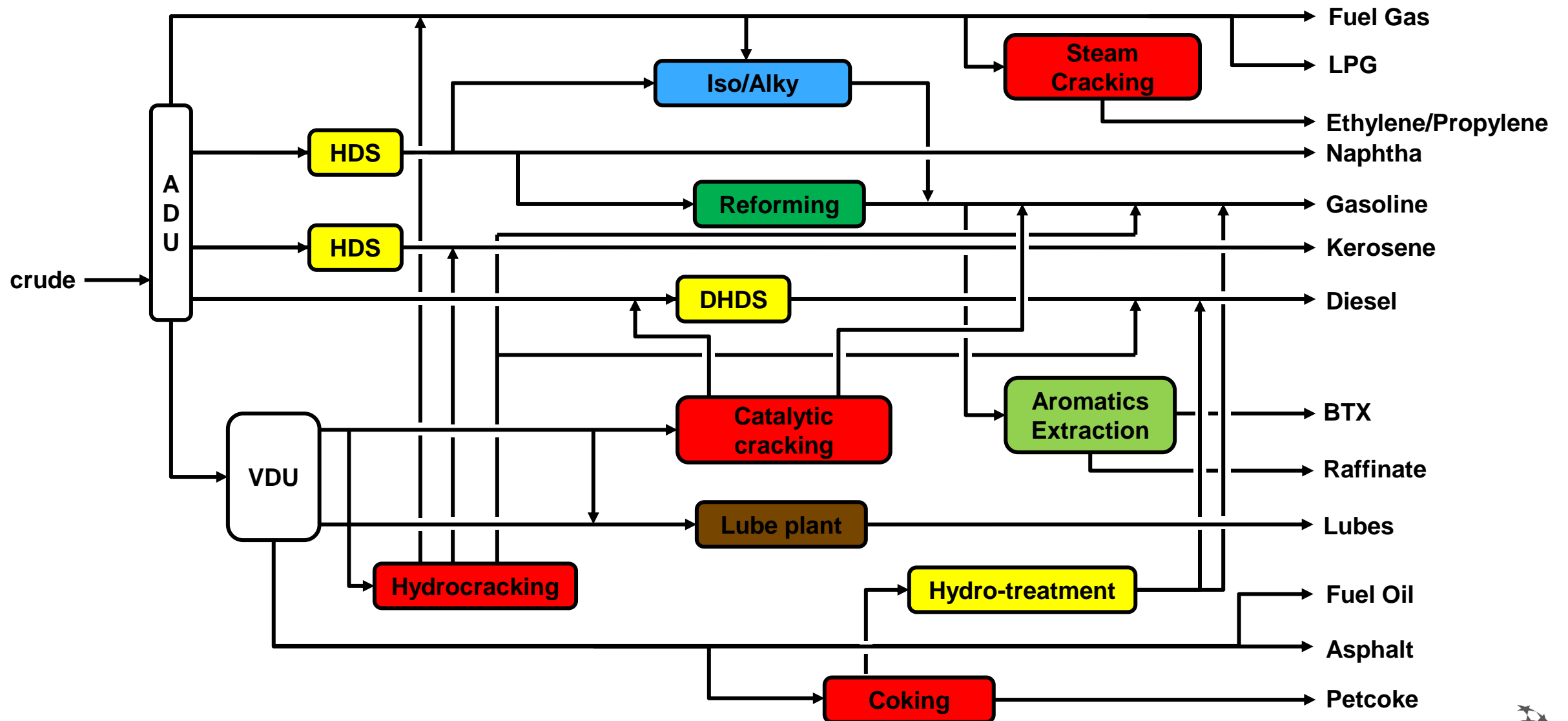
Refinery Operation Relies on Throughput



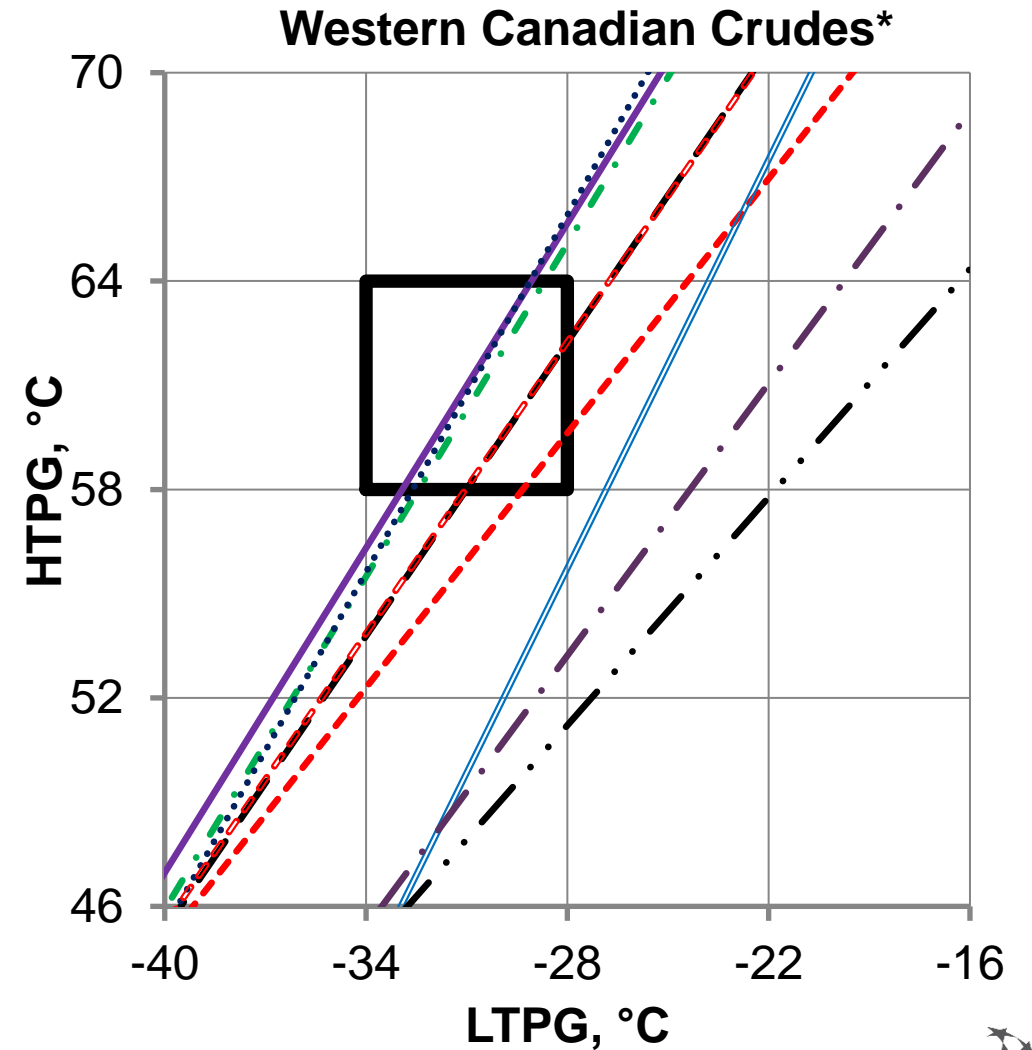
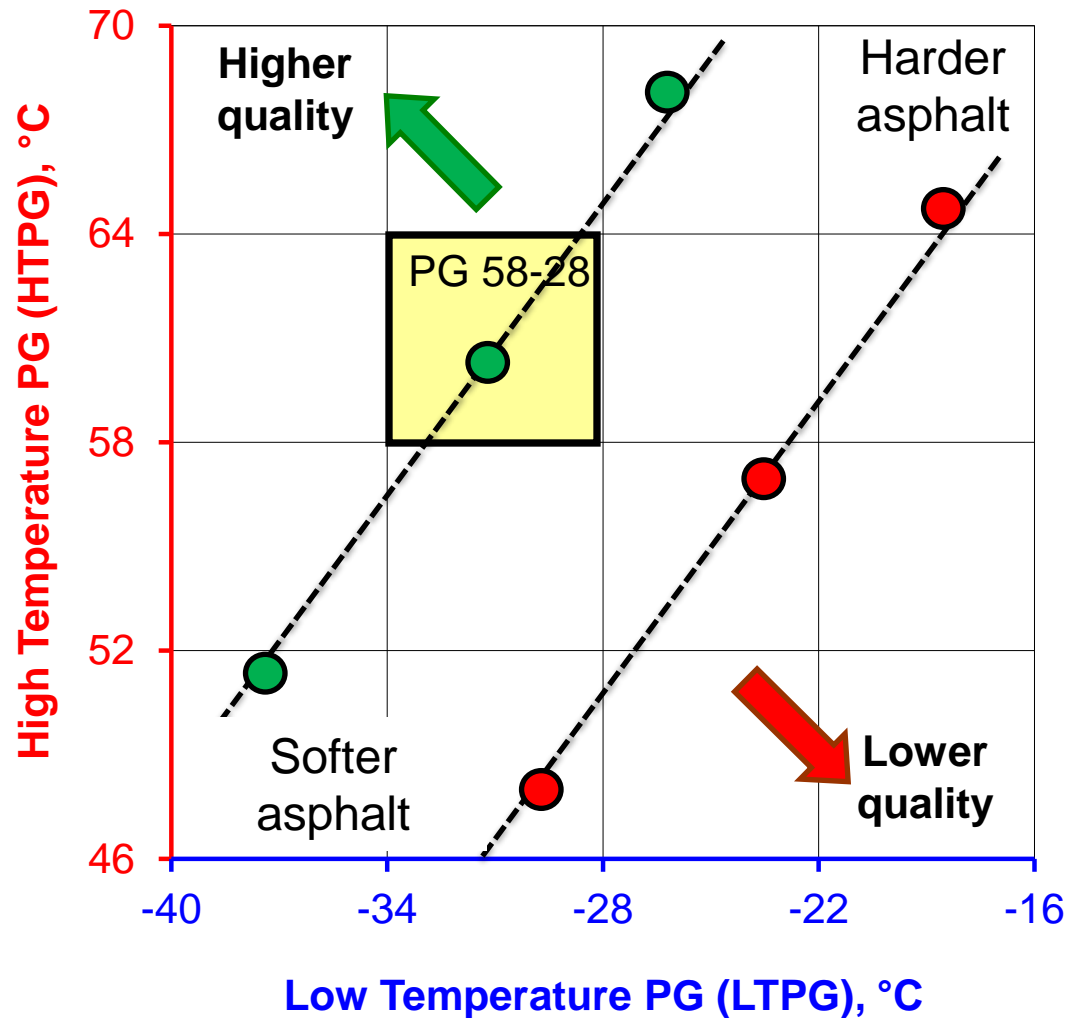
# Refineries Optimize Inputs & Outputs, Configuration Limited



# Refinery Configuration Drives Input & Output Choices

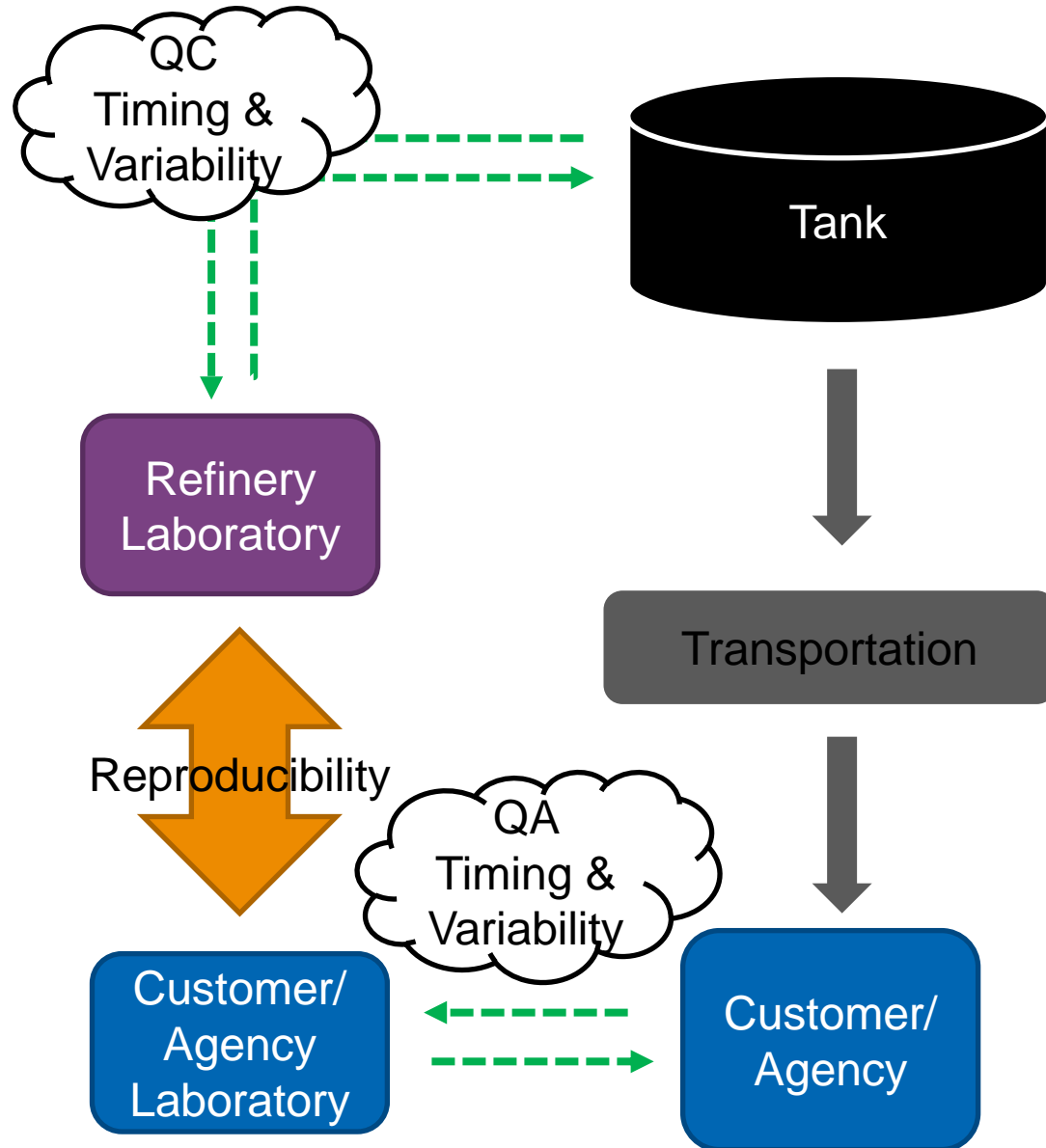


# Asphaltic Crude Quality & Distillation Target = The Two Levers to Target a PG Asphalt



\*Kriz, P. et al, CTAA 2012

# Quality Assurance & Testing



Testing needs to be based on science & field validation,  
& also must be fast, practical & reproducible

Test duration & variability increase cost

- More tanks, heating, corrections, delays, disputes etc.

# Key Takeaways

- Canadian oil sands yield top tier asphaltic feedstock
- Straight-run refinery operation yield premium asphalt grades
- Crude oil and asphalt binder are complicated materials
- Refineries exist to produce fuels, asphalt is 4% → maximize residual molecule uplift
- Crude extraction and refinery operation continue to see advancements
- Asphalt requires specific handling requirements and must be respected accordingly
- Support science based, field validated, practical & reproducible specifications

# Thanks for your attention!



**Chris Campbell**

**Global Asphalt Group Lead & NA Technical Lead**

**Imperial Oil, an affiliate of ExxonMobil Technology  
and Engineering Company**

453 Christina Street South, Sarnia, ON, N7T 8C8

(c) 519 520 5247

[christopher.campbell@esso.ca](mailto:christopher.campbell@esso.ca)