Health Quality Assurance Approaches for Bitumen Manufacture and Supply

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INVESTING IN OUR GREATEST ASSET: ROADS

Background

- Bitumen produced from crude oil contains low levels of PAC
  - Residual from refining process
  - PAC may be carcinogenic
- Occupational settings / hot emissions are the primary health focus
  - IARC cancer assessments (2011): Paving “possible”, mastic “possible, roofing (BURA) “probable”
  - Exposures continually reduced over time
- Product quality assurance: manage and control production and supply to assure no excessive exposures, comply with regulations

Bitumen Supply Chain QA Checkpoints

Bitumen Supply Chain

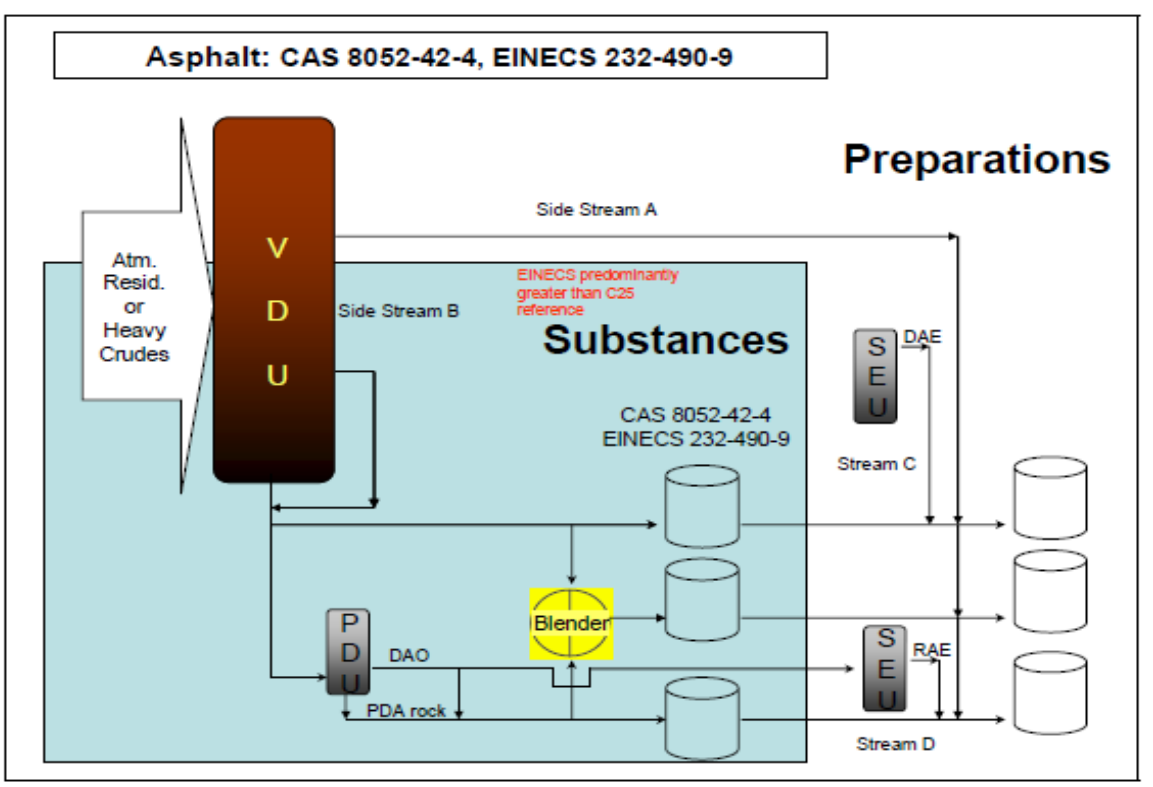
Process:

Manufacture & Supply

Refining → Supply → Modification → End Use

Potential Issues:	On-Spec (includes health criteria)	Contamination	Additives, Modifiers	Worker Safety

Asphalt, CAS# 8052-42-4/EINECS 232-490-4

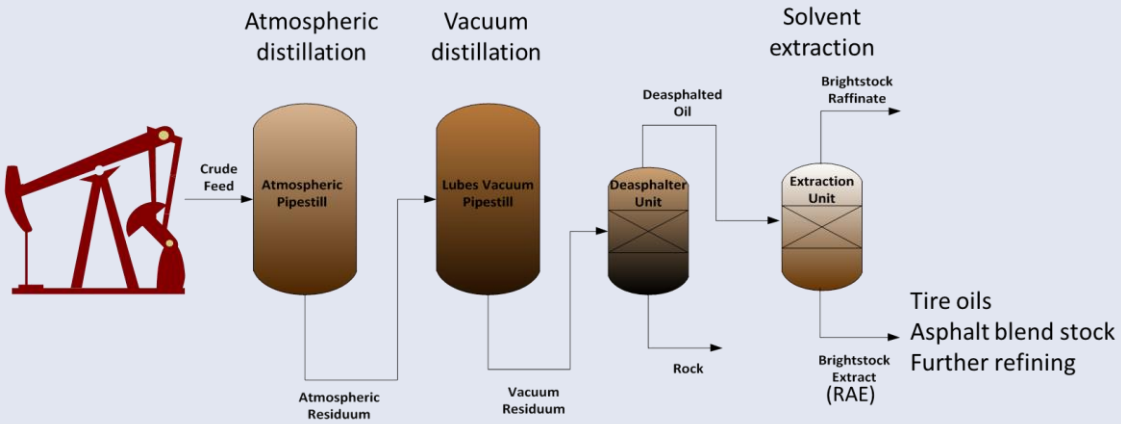


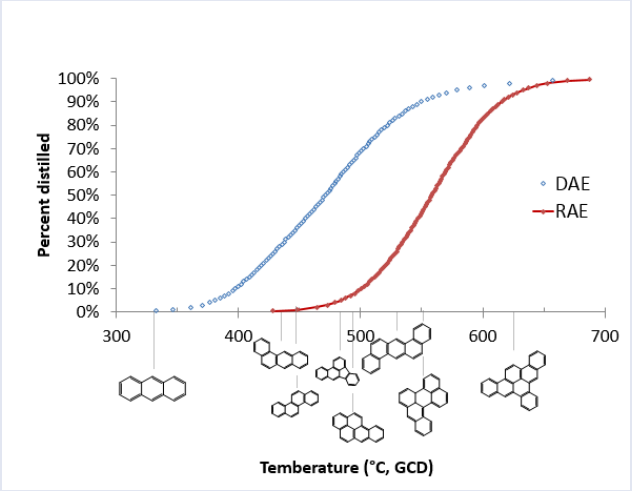
Manufacturing Principles – Eurobitume Guidance (Asphalt, CAS# 8052-42-4/EINECS 232-490-4)

- A very complex combination of high molecular weight organic compounds containing a relatively high proportion of hydrocarbons having carbon numbers predominantly greater than C25 with high carbon to hydrogen ratios. It also contains a small amount of various metals such as nickel, iron or vanadium. It is obtained as the non-volatile residue from distillation of crude oil or by separation as the raffinate from a residual oil in a deasphalting or decarbonisation process.
- Predominantly: 51% - 99%; is it important? 80/20 rule?
  - Helps manage light-ends distribution….including PAC
  - Provide consistency across refinery streams

Residual Aromatic Extract (CASRN 64742-10-5, EC 265-110-5)

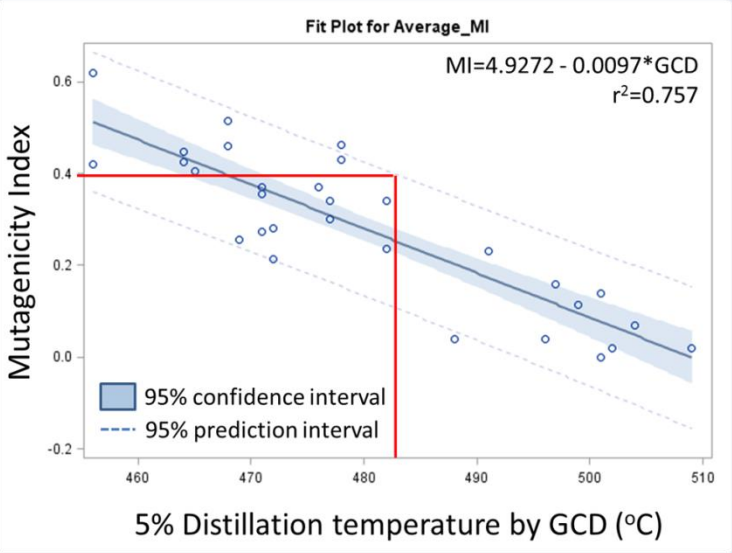
- Potential blend stream to SR asphalt, flux for air-blowing
- Aromatic oil derived from vacuum residuum, less toxic than distillate aromatic extract



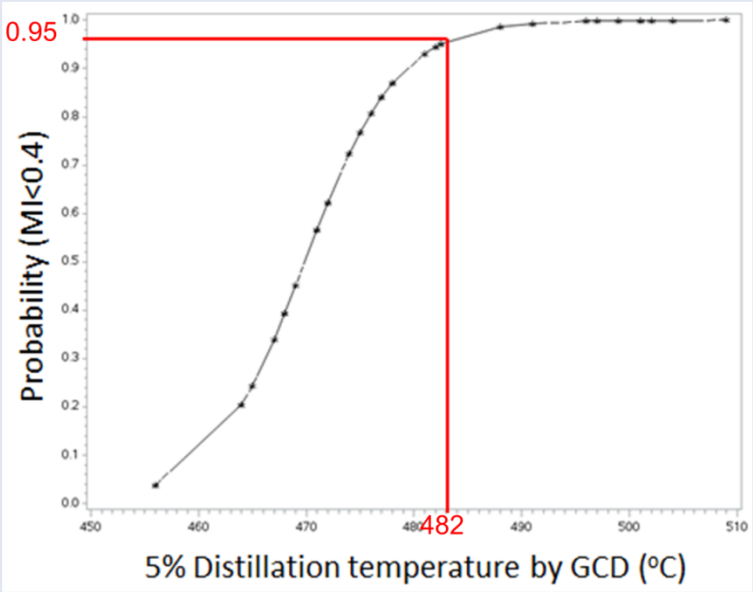


Non-Carcinogenic RAE Quality Control

Correlation of MI with 5% GCD vaporization temperature



Use of GCD/MI correlation to set real-time cutoff criteria



Supply Issues

Bitumen Supply Chain

Manufacture & Supply

Return Supply

Process:

Refining → Supply → Modification → End Use

Potential Issues:

- On-Spec (includes health criteria)
- Contamination
- Additives, Modifiers
- Worker Safety

GHS – Global Harmonized System

- Mixtures classified based upon components (e.g.CAS / EINECS #)
  - Generally, >0.1 for carcinogens
- Manufactured products comply; assure *supplied* products do
- Case for action – prior cargoes
  - HFO, Waste oil, crude, etc
  - How much remains? Can it be measured? >0.1%?
- Quality Assurance approaches include, but not limited to
  - Dedicated vessels
  - Cleaning vessels
  - Quantitative risk assessment

Summary

- Assure confidence and high level of safety performance
- Scenarios presented on approaches to quality assurance in manufacturing and supply
- Discussion topics – also Poster #338; ***please visit***
- Further detail on the EM work on RAE was presented at the Society of Toxicology in San Diego (2014), a scientific paper for publication pending, and a US patent has been obtained

Thank You

References

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- Kung, MH, KO Goyak, CA Sircar, K. Aldous, JJ Freeman (2014). Vacuum Tower Temperature as a Means to Control Carcinogenicity of Residual Aromatic Extracts. The Toxicologist. P. 265, Paper #265, 2014 Annual Meeting of the Society of Toxicology.

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Introduction

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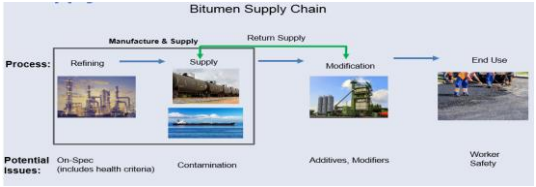

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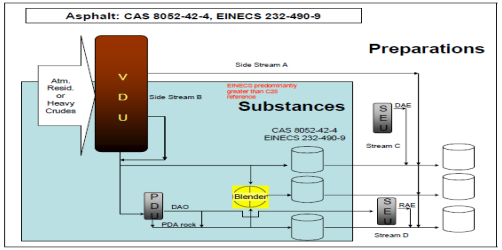

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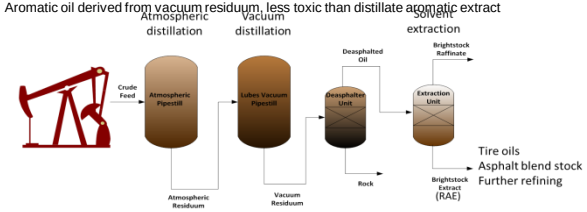

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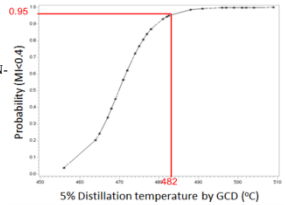

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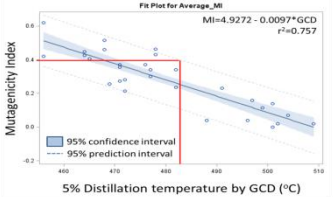

Summary

Overall Goal- Assure product safety through the supply chain
Manufacturing control minimizes PAC-content
- Includes blend stocks such as RAE

Principles of GHS are applicable to transport
Quality assurance for transport may be important

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