Specific bioethanol issues for the automotive industry

John Bennett

Ford Motor Company

International Conference on Biofuels Standards, 27-28 February 2007, Brussels.

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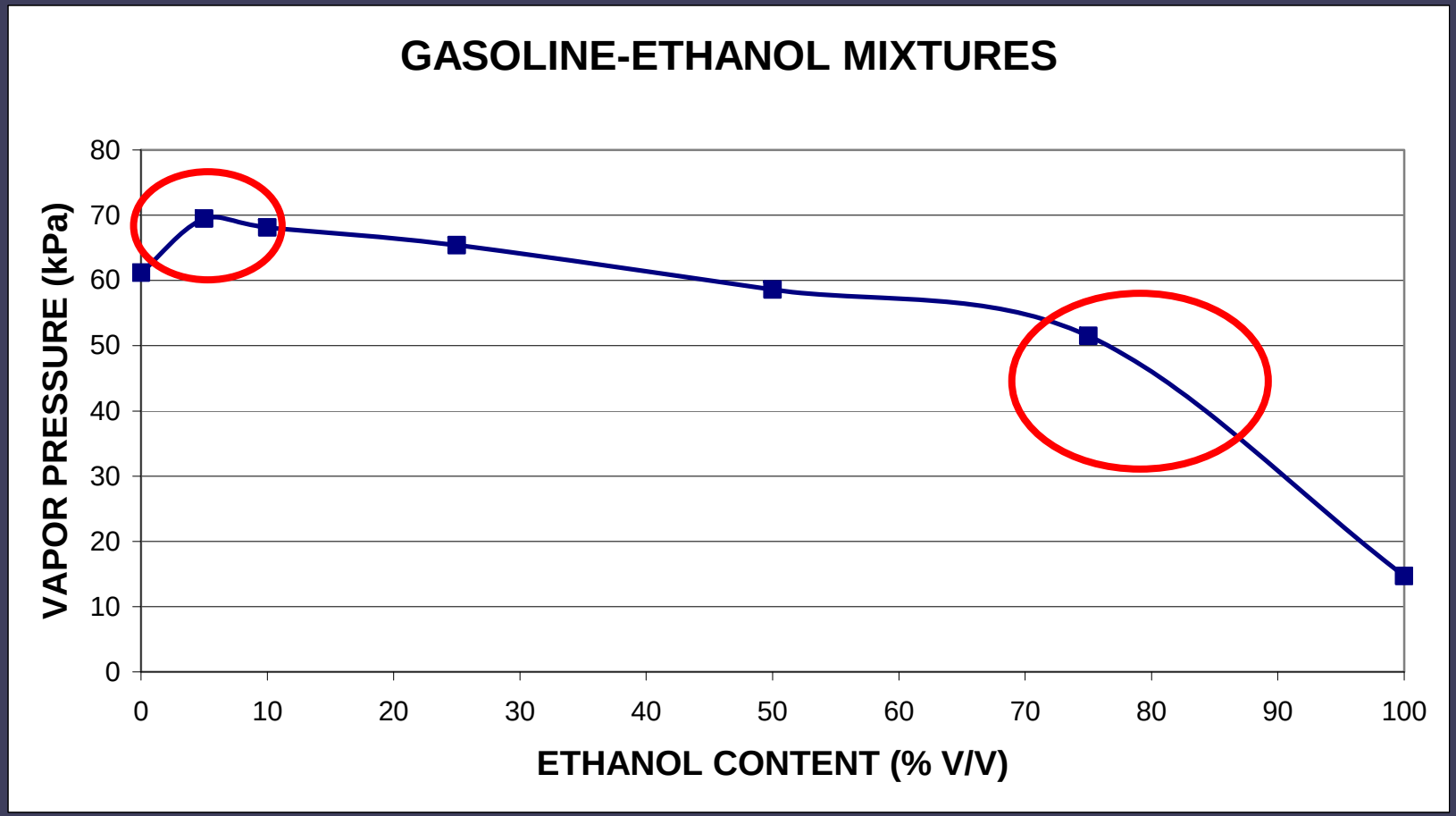
Fuel / Vehicle Interaction

- OEMs good at making standardised products (vehicles), which need standardised fuels.
- General concerns:
  - Common finished fuel specifications support common powertrain use in different markets.
  - Common ethanol specifications may ensure fuel blend quality
    - ASTM, CEN, ANP etc .
  - Some older fleet incompatibility with increasing ethanol content fuels.
  - Burden on OEMs of increasingly stringent emissions requirements versus more diverse fuel quality.
  - Lead time for new product introduction

Vapour pressure for ethanol mixtures



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Vapour pressure / Ethanol content

- Petrol (E5/E10)
  - Fuels Directive proposal allows summer maximum vapour pressure waiver for ethanol blends (up to 8 kPa at 5% ethanol).
  - **Will increase evaporative emissions.**
- Ethanol E85
  - To ensure good cold start and drive with acceptable emissions, need fuel with sufficient petrol content and vapour pressure.
  - Current FFV's have compromised cold start emissions in favour of good start/drive whilst market quality of winter 'E85' has not been assured.

Ethanol for EN228 vs. CWA15293

- Ethanol according to prEN15376 intended for use at only 5% blend.
- Higher ethanol concentration fuels may not be able to use prEN15376 ethanol due to impurity concentrations. These may include:
  - Water; Involatile residue; Methanol; Inorganic chloride; Copper; Phosphorus
  - Example: inorganic chloride

Inorganic Chloride content

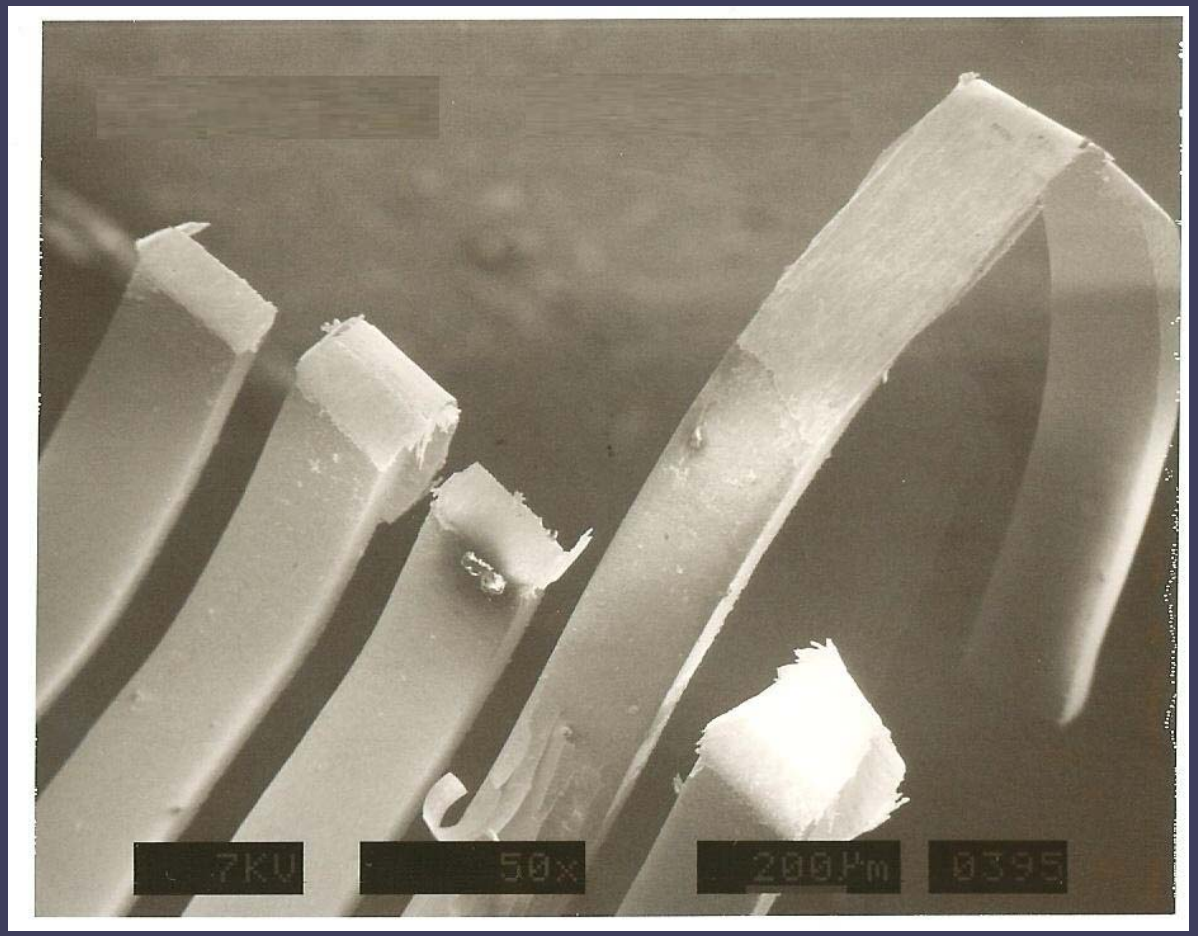
- Vehicle fuel systems only robust to 1 mg/L inorganic chloride
- CWA15293 specifies 1 mg/L max
- Ethanol sourced against prEN15376 has max 20 mg/L inorganic chloride
  = 1 mg/L @ 5% ethanol.
  = 17 mg/L @ 85% ethanol. ***Much too high!!!***

Chloride impact on fuel sender

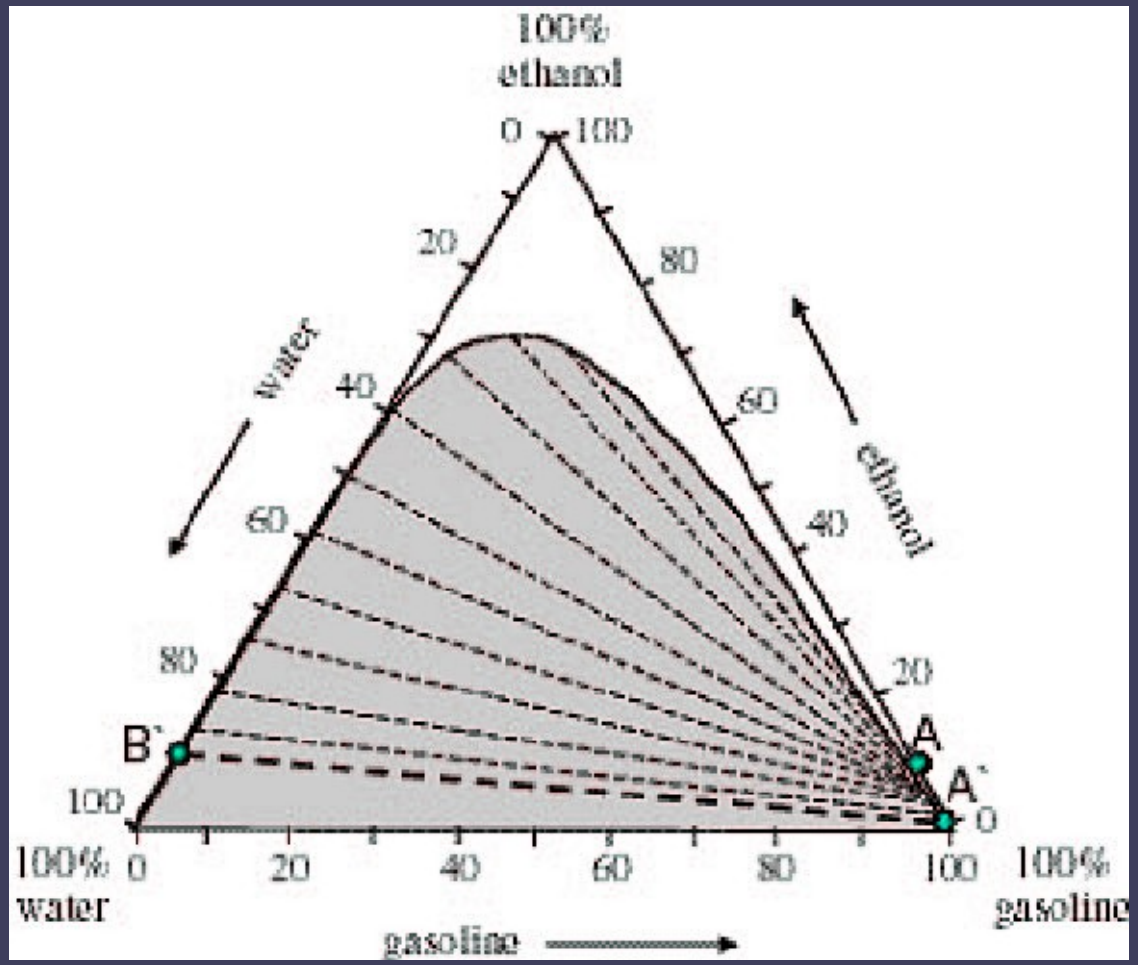
Chloride: 11mg/L.

Extreme failure @ 15,000km.

“Robust” gold wiper



Water-Petrol-Ethanol Solubility



Tolerance for water decreases with reducing ethanol content.

EU petrol may have no ethanol content.

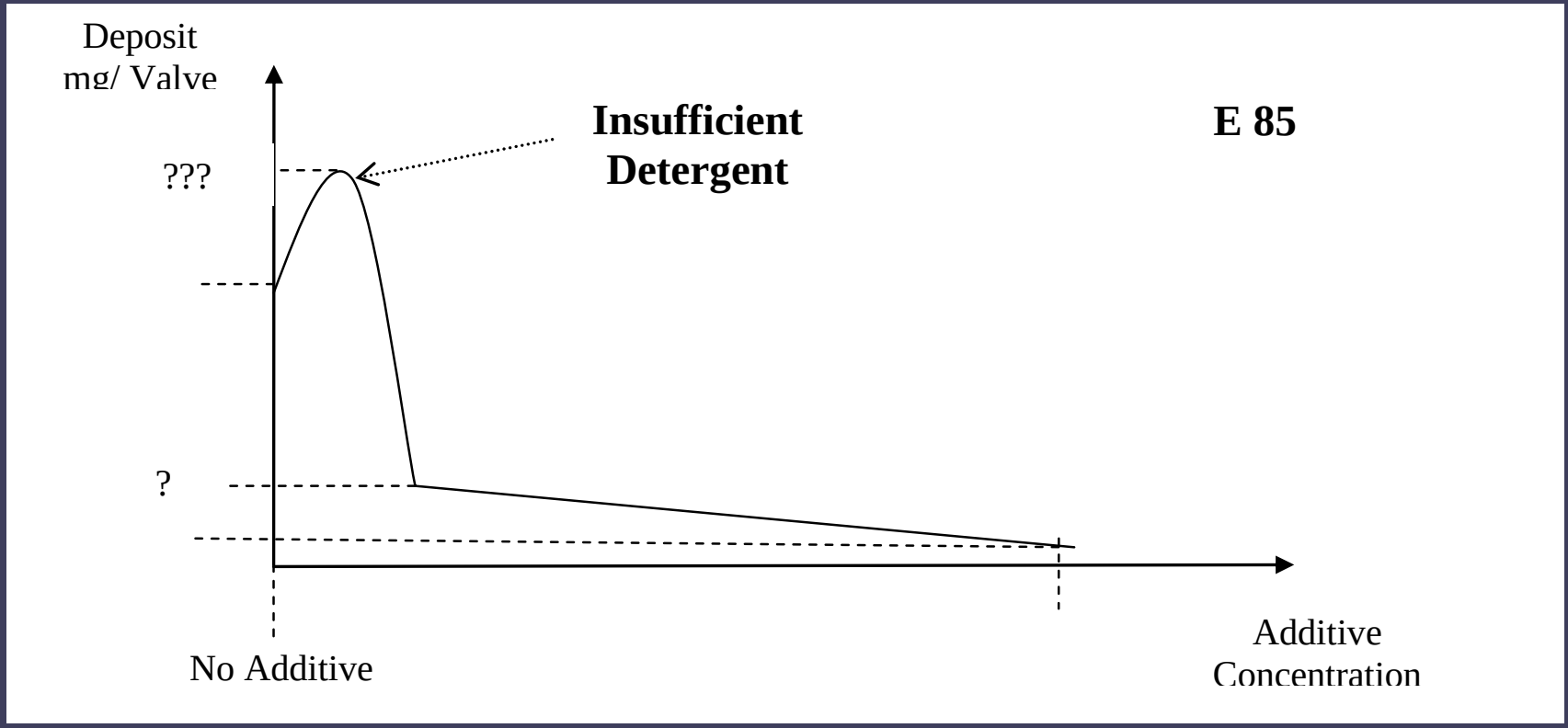
All ethanol supplied for fuel blending should have minimal water content to minimise risk of subsequent phase separation.

Note – Brazil situation (no alcohol–free petrol) is unique.

Detergent Additives

- Petrol and E85 both develop intake valve deposits (IVD) etc.
  - Solved by appropriate detergent use.
- Indications that some current additives may need re-optimising for ethanol blends.
- Some detergent types relatively insoluble in E85.
  - Addressed by selection of detergent type

Detergent Additives in E85



E85 based on additised petrol will contain a small amount of additive - likely to be the worst case for intake valve deposits unless supplemented.

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Detergent Additives

- Residual detergent from 15% petrol in E85 may increase IVD
  - *e.g. 400 ppm additive in 15% petrol gives 60 ppm in E85; possibly worst case for IVD.*
  - Use detergent free petrol for blending

  Or
  - **Use full detergent package in finished E85 (preferred solution)**

Ongoing concerns: Sulphates and pHe

- To be addressed via prEN15376:

  "A maximum sulphate content limit will be added once a test method standard (momentarily under development) has been published."

  "To adequately limit the strong acidity and the alkaline substance, which cannot be sufficiently determined via pHe [9], test method(s) are under development in CEN and a limit will be added once test method standards have been published"

Sulphates from ethanol blending in gasoline

- Problem identified and addressed by ASTM:

Other Concerns

- Other concerns are likely to arise with increasing ethanol use.
- Increasing powertrain sophistication may highlight previously unidentified problems
  - Potential issues include ethanol related contaminants affecting aftertreatment systems (note - in-use compliance mileages are increasing).

Conclusion

- All parties to the use of ethanol in road transport must remain engaged and work in cooperation to ensure end user satisfaction as ethanol use increases.