The bunker blending course was attended by e.g. trading managers of the refinery in New Zealand, a bunker blending manager from the Kuwait petroleum association, private traders and others working in the field of bunker blending.

Besides obtaining fundamental knowledge about bunker blending and tools for linear and in particular non-linear blending calculations, the course also contributed with the following list of interesting perspectives.

Main points of interest from our perspective:
- Bunker is basically a crude oil residue with a little gasoil that reduces viscosity and density of the blend. The fossil residues generally contain a lot of sulfur which is ok for high sulfur (>1wt% S) bunkers. However, when blending 0.15 bunkers for ECA areas, it is not possible to blend in straight run residue without desulphurisation. Instead, most blenders avoid using residues and use light cycle oils and diesel like streams for the low sulfur bunker and thereby accept a viscosity and density 'give away' (give away = when fuel properties are better than they have to in order to meet specifications). This is where our products become interesting.
- In relation to the 'give away', when ships switch from heavy gas oil to low sulfur gas oil entering an ECA region problems related to the switch due to differences in fuel specs may occur, e.g. high viscosity bunker (380cSt) to low viscosity 0.1S fuel. Again, use of our products as blend components will reduce viscosity and density 'give away' on the final fuel and thereby potentially reduce these switching problems.
- Bunker is can be thought of as a colloidal mixture of maltenes and asphaltenes (solids) in diluent (lighter aromatics and parrafsins). Aromatics are good in marine as a solvent, because they stabilise the emulsion with asphaltenes and keep them in solution. Due to the aromaticity, FCC slurry is a very attractive bunker blend. Likewise, I expect our products to be good stabilisers because of the aromatics we find among especially the higher boiling compounds. Based on this, it could be interesting to test if the bio-compounds improve blend stability.
- In ECA areas you can use any fuel as long as it is low enough sulfur. Bulk Crude oil is mentioned as a potential low sulfur marine fuel. Sweet crudes are on-spec for sulfur above 0.5wt%, but not for 0,1wt% S. Thus, there is no other way than using relatively expensive low sulfur distillates for blending. As a result, the price of a 0,1S bunker is significantly higher than the high sulfur equivalent. The speaker said that generally the price is at least 100$/ton higher than the high sulfur stuff. However, looking through prices it seems to be more like 200$/ton higher for a 0.1S bunker, which is equivalent to an additional 32$/barrel.
- A few slides that emphasizes my points above (Note: Prices in these slides are before the dramatic reduction in oil prices)

**Categories of Bunkers to make:**
- LSFO 1%, LSFO 0.5%, LSFO 0.1%

**Requires LS Residue: How?**
- Blend down Sulfur with low Sulfur blendstocks
  - OK for 1%S, marginal availability for 0.5%S
- Use special “low Sulfur” crudes: limited supply
  - Adds premium of $20 to $50 bbl
- Desulfurize “normal” crude resid:
  - adds $250 to $300/MT to the price of IFD 380
My ideas:
The course gave me the impression that our products, and in particular our distillation residue is likely to prove a very nice blend component for 0.1S bunker. This is because our residue is characterised as a 100ppm sulfur residue with high viscosity, high density and high aromaticity. This is unlike any fossil equivalent. 0.1S bunker is usually characterised as a diesel like fuel with viscosity and density 'give away' and where the constraining parameter is the sulfur content. By blending in our residue the viscosity and density give away is reduced without being off spec on sulfur and the price tag for this fuel is relatively high due to the high desulphurisation expenses related to processing of fossil products. The additional bio-benefit comes on top of that. To prove my point i have simulated our product properties in a blend calculator and made an on spec 0.1S biobunker with 20vol% bio-residue. I have used light cycle oil (LCO) to correct the density and could even include some cheap visbreaker heavy gas oil to reduce the sulfur give away. Please dont mind the prices for now since i havent updated them, but appreciate the fact that we can associate the residue with a relatively high price tag while still making a final blend that matches the market price.

Blending Down with LS Blendstocks

• LS Blendstocks are used to DILUTE Sulfur
  – OK for 1%S and 0.5%S
  – NOT OK for 0.1%S – Essentially MDO, like ECA Fuels

• Typical LS Blendstocks:
  – SR LSFO, e.g. Russian M100 at 0.5 or 1% S
  – Kerosene, Diesels (ADO, MDO, etc), MGO
  – LCO, Slurries and CBFS
  – Other LS Blendstocks: Hvy Aromatics, HCN, Cracker Bottoms, Solvents, etc.

Blending LS Blendstocks is Tricky!

• We need to meet SIMULTANEOUSLY 16 specs of ISO 8217 (2012)
• LS Blends are riskier:
  – LS Blendstocks frequently come from Paraffinic Crudes with high pour point
  – Mixing Paraffinic and Aromatic Blendstocks may cause Stability and Compatibility problems, and missing Pour Point specs

• IT IS IMPERATIVE THAT BLENDSTOCK PROPERTIES ARE MEASURED IN A LAB BEFORE BLENDING
Now the above is only theory and the non-linear blend calculations of especially viscosity needs to be verified in practice. Even more important, we need to test if the residue is actually soluble in e.g. light cycle oil (LCO) or another similar solvent. Furthermore, the CCAI (cetane equivalent) and stability measures need to be made in order to verify the above.

I would be happy to carry out such a study?

Please comment

Regards,

Claus