AS 4156.1.1:2018, Coal preparation, Part 1.1: Higher rank coal — Float and sink testing

• Use & Importance
  – Washability of a coal
  – Economic viability of a resource
  – Coal Preparation Plant design
  – Evaluate CPP equipment performance

• Current Standard Published in 1994
Higher rank coal — Float and sink testing

• Float Sink Working Group
  – Michael Campbell - Project Leader
  – Graham Wells
  – Daniel Barry
  – Noel Lennox
  – Bruce Atkinson
Higher rank coal — Float and sink testing

Possible structure of the density separation (washability determination ??) documents:

• AS4156.1.0 Guide to density separations
• **AS4156.1.1 Float Sink Testing**
• AS4156.1.2 Elutriation
• AS4156.1.3 Jigging
• AS4156.1.4 Coal Grain Analysis
Higher rank coal — Float and sink testing

• Float Sink
  – The separation of a sample into discrete relative density fractions
  – The reason for “2000 particles” per standard size fraction (?)
Higher rank coal — Float and sink testing

A number of ACARP reports were helpful in the revision of the document eg:

- C7047  Caesium Formate
- C15057  Zirconium Dioxide
- C17045  OH&S Review
- C18010  Options for Float Sink
- C18038  Zirconium Dioxide
Higher rank coal — Float and sink testing

- Coarse coal apparatus

- Fine Coal Apparatus

- More detail and clarity around procedures
Higher rank coal — Float and sink testing

• Sampling
  – Minimum Mass Table revised (minor changes)
  – Example table re sub-dividing and sufficient reserve masses
  – Challenges of borecore samples (small masses)
• Pre-treatment (Informative Appendix)
  – Wet Tumbling (stayed in for now!)
• Sample Preparation – more discussion of issues
• Dense Media
  – Inorganic Solutions (Caesium Formate)
  – Aqueous Suspensions (Zirconium Dioxide)
  – Preparation, rinsing, recovery, limitations
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• Guide to the Safe use of Organic Solutions
  – Risk Assessment
  – Workplace Design
  – Hazard Control
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• Presentation of Results
  – moisture basis
  – starting and ending masses
• Test Report Requirements
  – descending density order ‘reportable’
• Separation Efficiency
  – Reference to ISO923
• Validation of Data
  – Mass Recovery
  – Ash vs Density
    (beware of being ‘too clever’)
Higher rank coal — Float and sink testing


<table>
<thead>
<tr>
<th>Category</th>
<th>Reproducibility, Grams, as a Function of Starting Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1.40 RD</td>
<td>490</td>
</tr>
<tr>
<td>1.40 to 1.65 RD</td>
<td>0.296 x (mass in fraction, g) +17</td>
</tr>
<tr>
<td>Over 1.65 RD</td>
<td>0.181 x (mass in fraction, g) -16</td>
</tr>
</tbody>
</table>

F/S of -6.3+1.18 mm fraction (ASTM)

Estimate is that error bar range increases by ~50% for +31.5 mm
Higher rank coal — Float and sink testing

SUMMARY

• Inorganic alternatives to organic liquids but significant limitations.

• **Big financial decisions arise from the results of float and sink testing.**

• Need to allow much more labour time (and hence $$\text{\$\$\$}\text{\$}\$$) for float and sink testing to be done properly with appropriate masses.

• Consider replicate sampling and F/S testing for critical data.