

QUALITATIVE ASSESSMENT OF FUEL PERFORMANCE

Notes

- Trial Record Sheets - 29 received from 5 standard and 5 narrow gauge railways;
 - Brecon Mountain, Bure Valley, Chatham Dockyard, East Lancashire, Forest of Dean, Great Whipsnade, Isle of Wight, Keighley & Worth Valley, Talyllyn, Welshpool and Llanfair
- Trevithick Ovoids – 7 responses
 - Responses received from Brecon Mountain, Dean Forest, Great Whipsnade, Talyllyn and Welshpool and Llanfair
- CPL Products – 22 responses received for 4 variants
 - Responses received from Brecon Mountain, Bure Valley, East Lancashire, Isle of Wight, Keighley & Worth Valley and Talyllyn
 - Ecoal 50 has not been tested on Standard Gauge (possibly because of expense)
 - Heritage Blend 4 was tested once at the Bure Valley in November 2021.
 - It is not being offered for test as it uses bituminous coal, which is now in short supply
- Brecon Mountain are the only railway to have sent Trial Record sheets for Hargreaves (Trevithick Ovoids x 2) and CPL (Wildfire x 1) products
- Wood log based fuel – 1 response from Chatham Dockyard
 - Separated out from the anthracite fuels as it is an ‘outlier’
 - Suggests that this a viable fuel for shorter lines with smaller locomotives and loads
 - More Trial Record sheets for similar fuels from other lines needed to confirm viability
- Ffos-y-fran – 1 response
 - Test at Bure Valley included as a comparator against the manufactured fuels

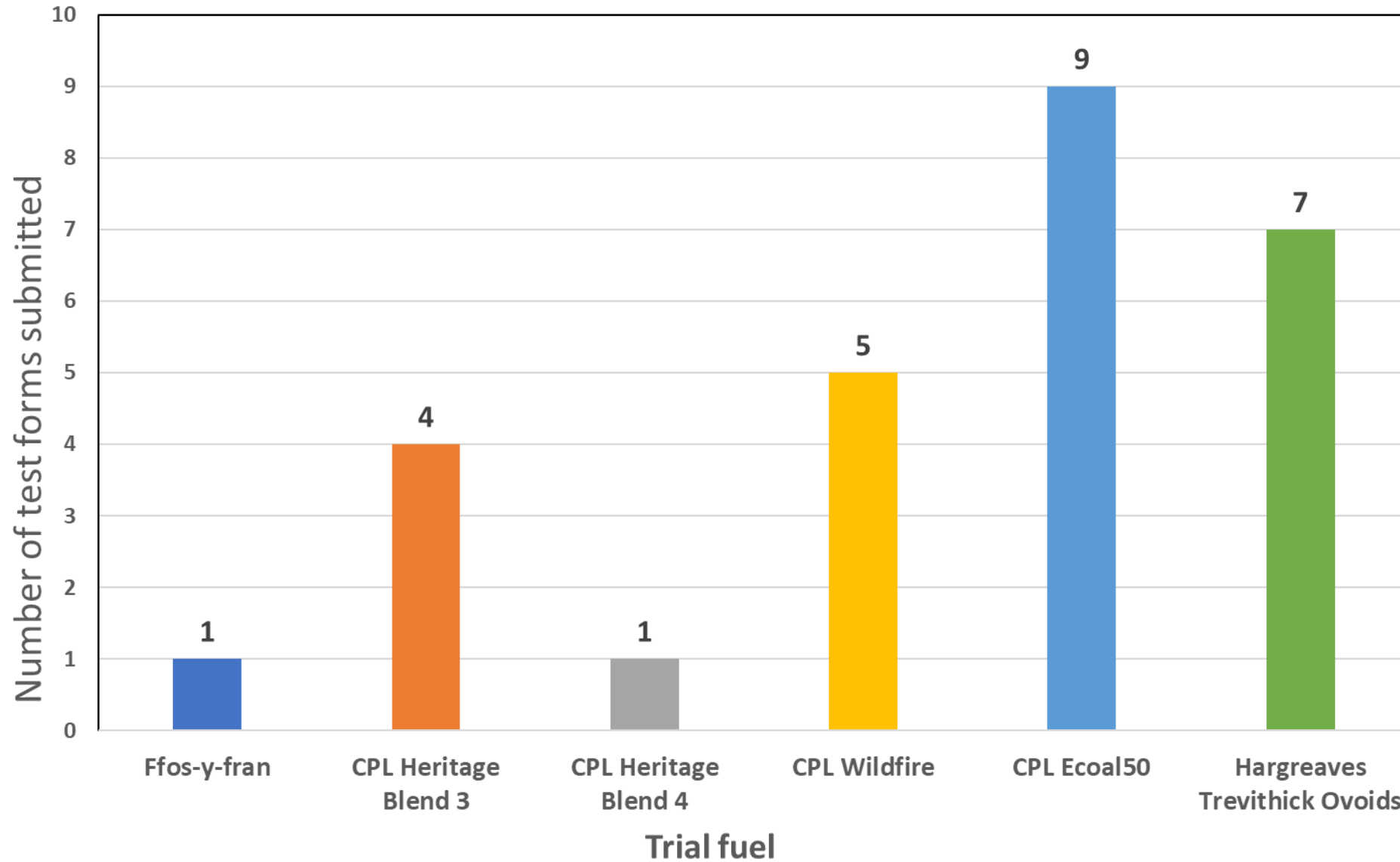
Notes

- Results were averaged for each category
- Generally good correlation between narrow and standard gauge except for:-
 - Clinker formation with CPL Blend3 and Wildfire
 - Bure Valley and Brecon Mountain had good results (3 results scoring 5 each)
 - East Lancashire, Isle of Wight and the Keighley and Worth Valley had worse results (6 results scoring 3,3,2,1,1,3)
- Results are expected to get better as crews become familiar with the fuels
- Although CPL products perform well, concerns remain that with a chlorine content higher than coal, there is a long term risk of firebox corrosion
- Benefits of sharing the information
 - Shows the current performance of different fuels without relying on hearsay
 - Helps suppliers understand how their products are performing
 - Can be used by suppliers
 - To identify characteristics for improvement
 - Benchmark a fuel during a development programme
- Thanks are due to everyone who took the time and effort to fill in a Trial Record Sheet, the results are here to see

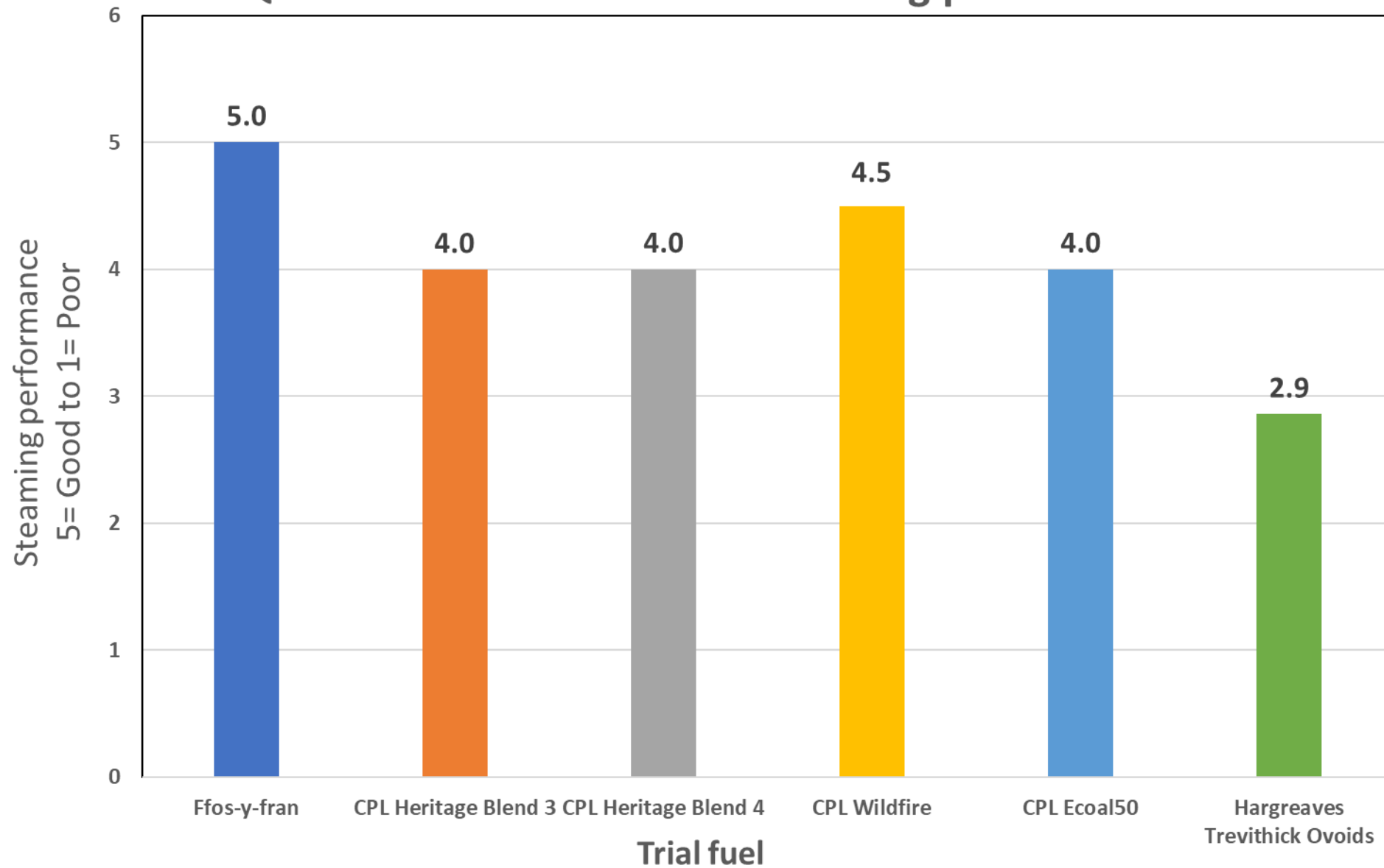
Qualitative Assessments

Anthracite based fuels

Number of test forms submitted

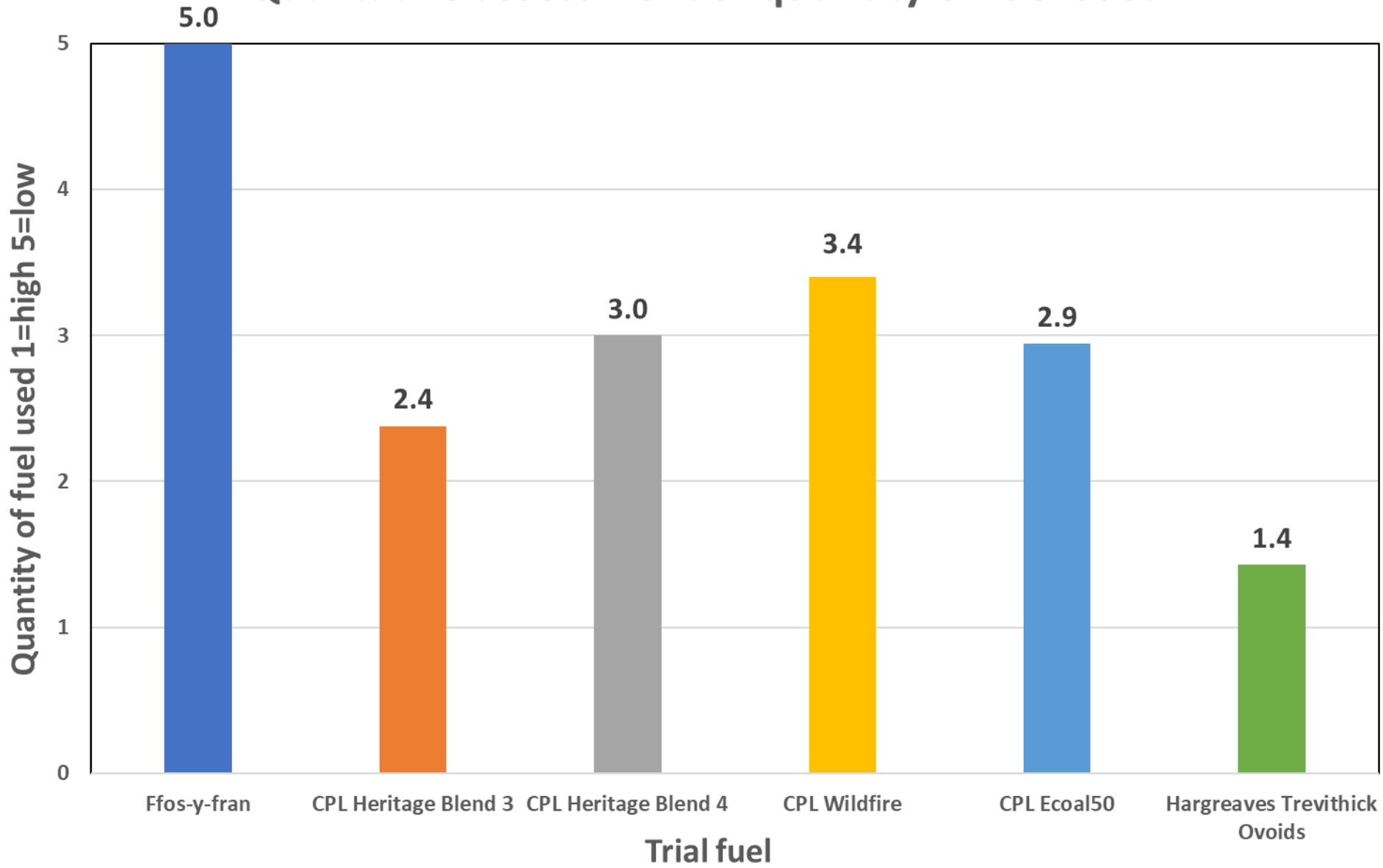


Qualitative assessment of steaming performance

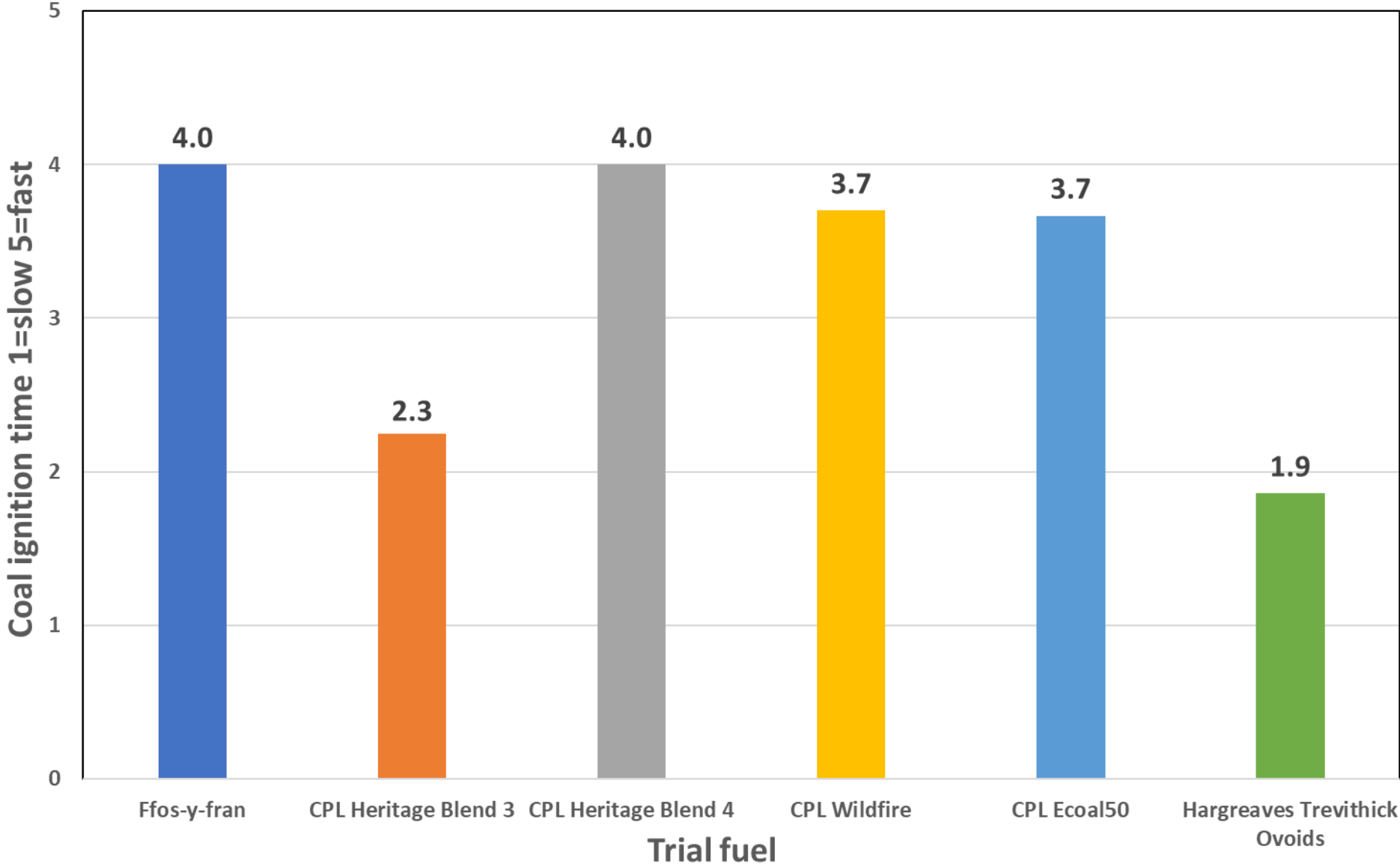


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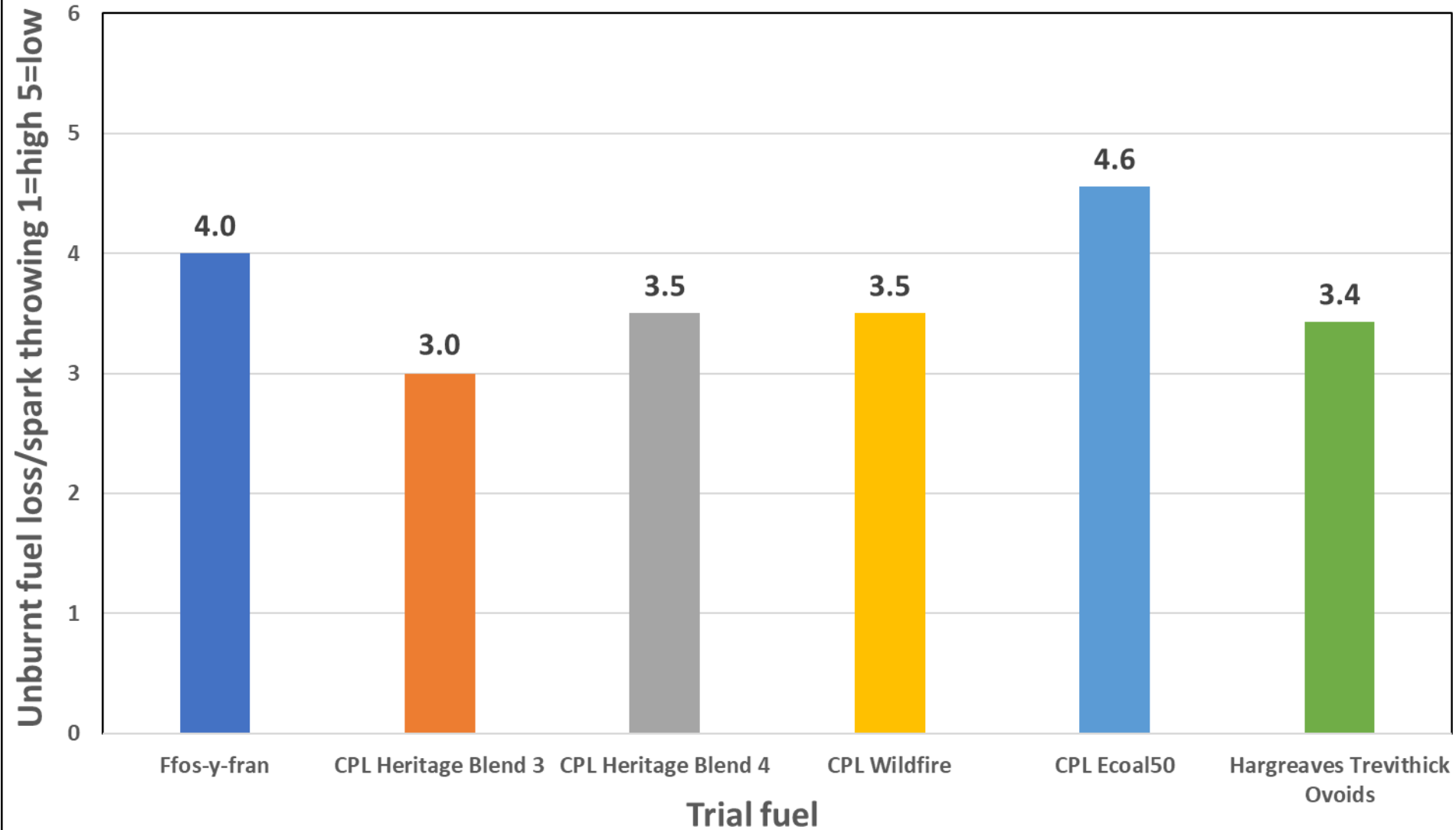
Qualitative assessment of quantity of fuel used



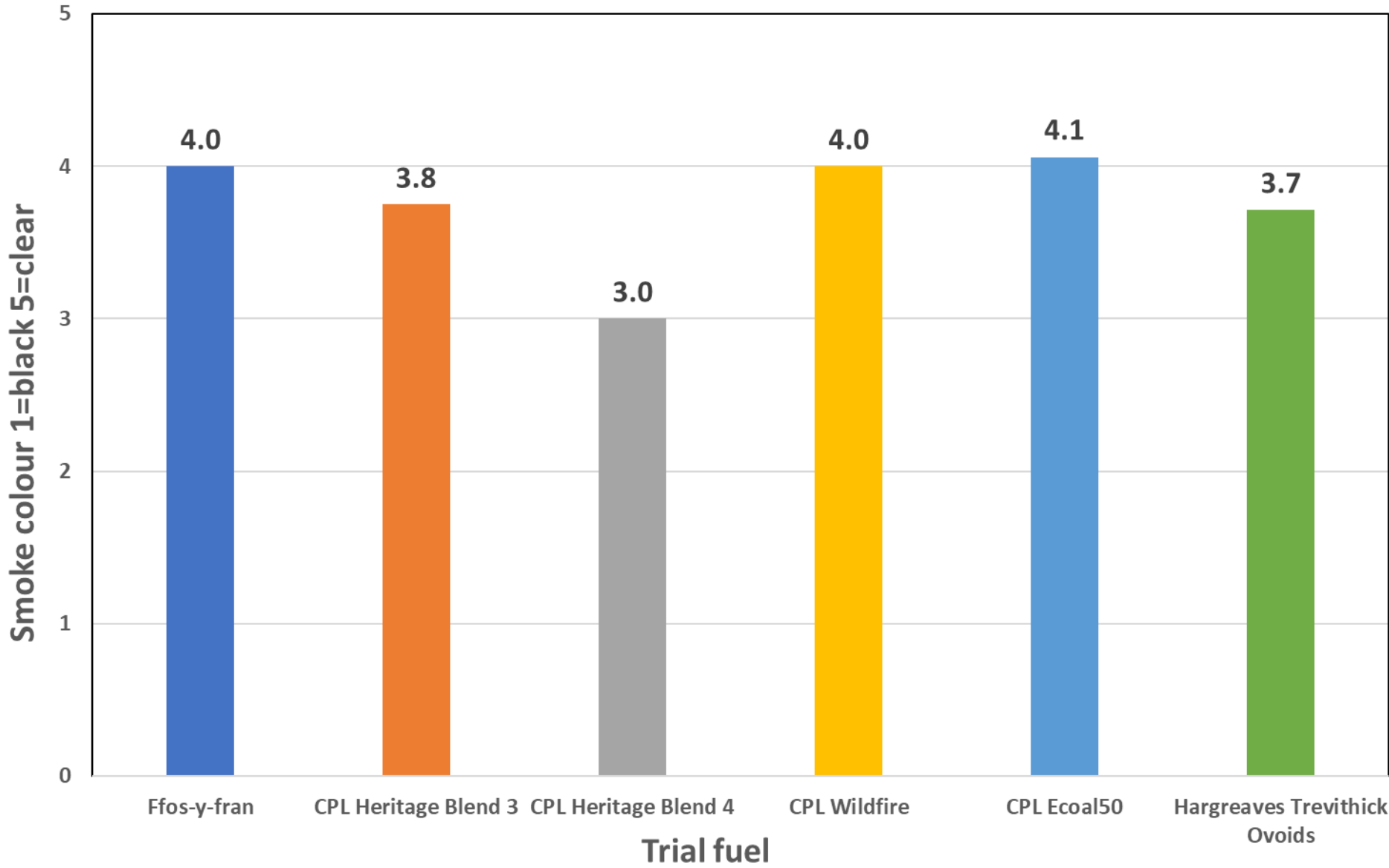
Qualitative assessment of coal ignition time



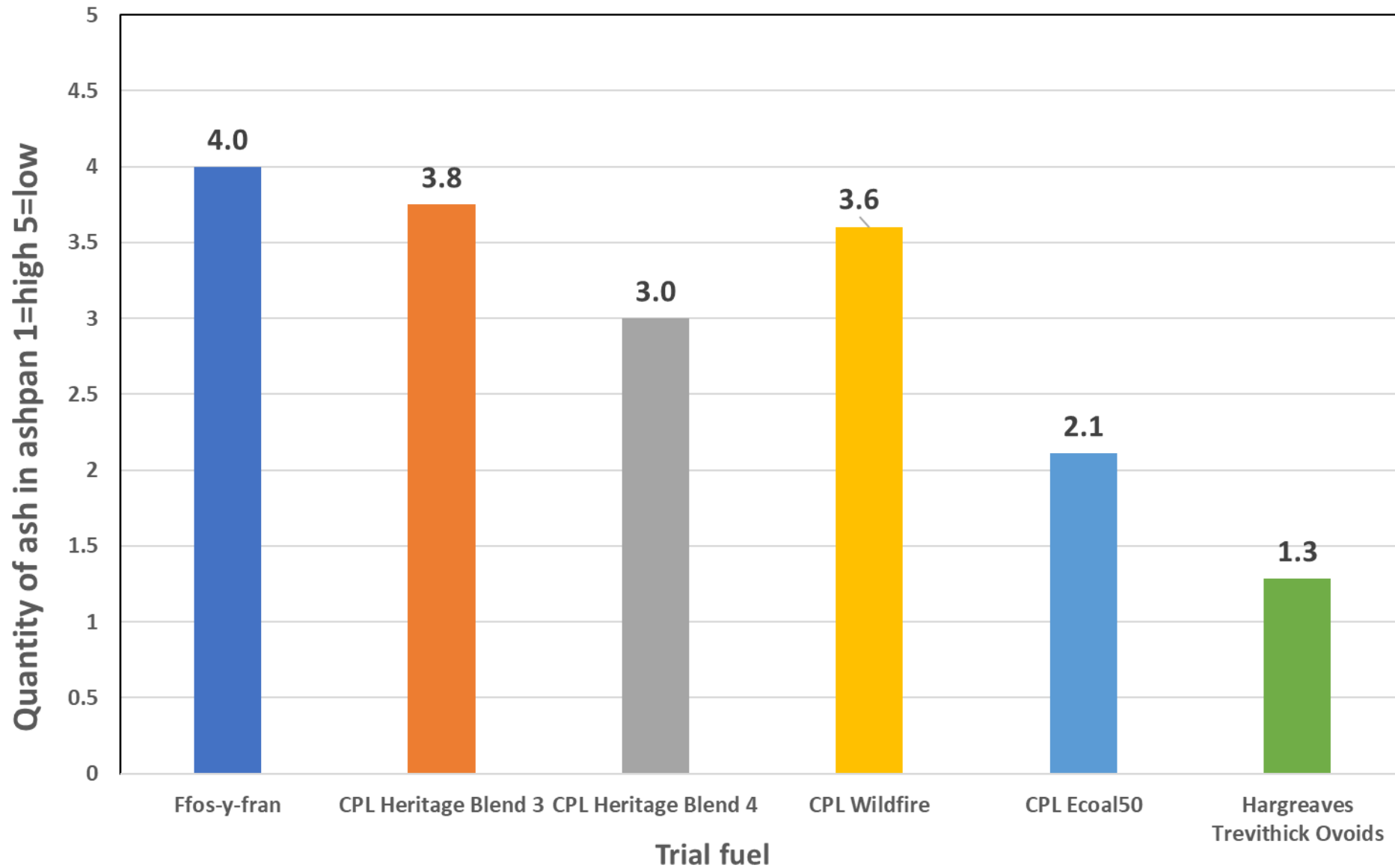
Qualitative assessment of unburnt fuel loss/spark throwing



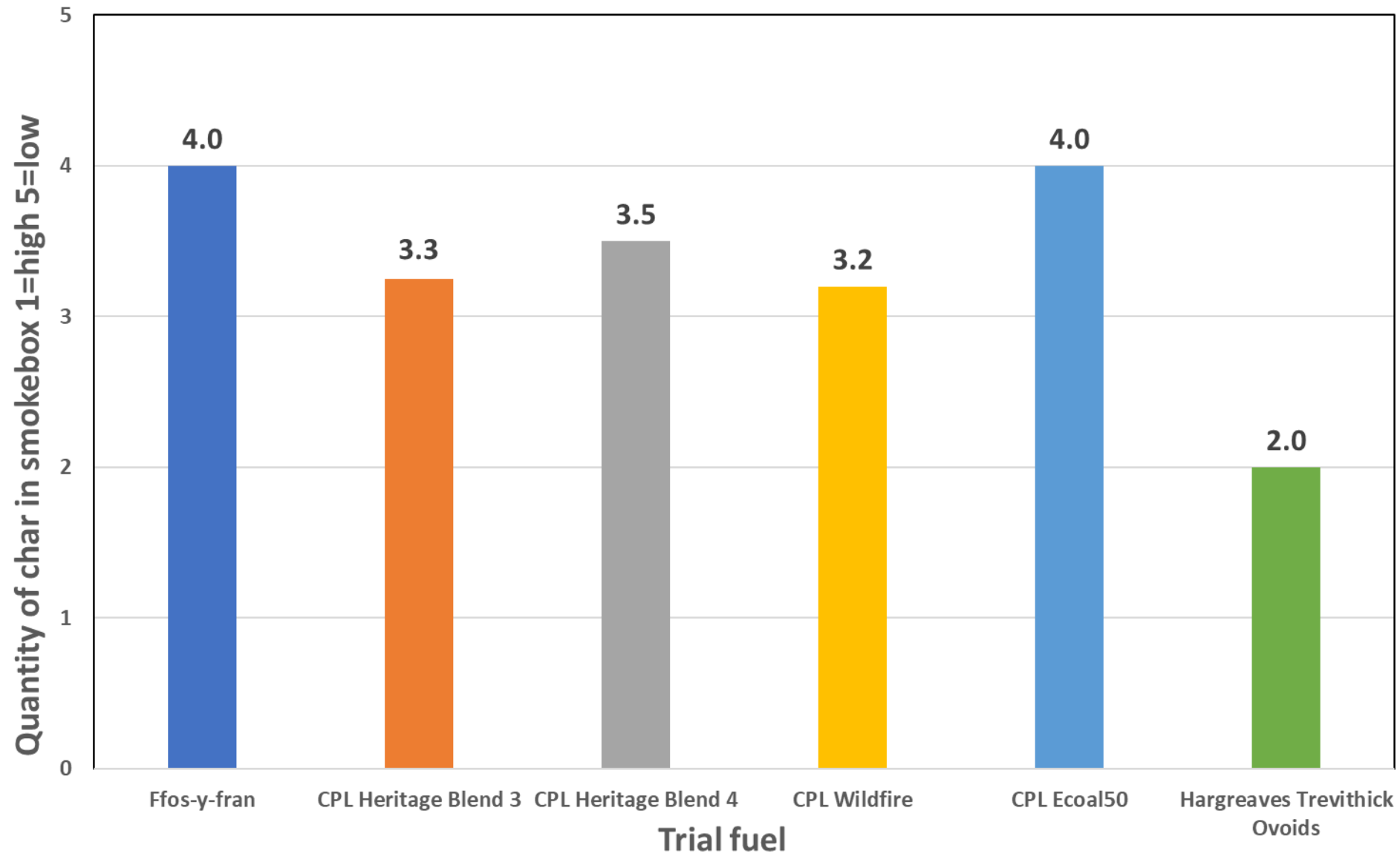
Qualitative assessment of smoke colour



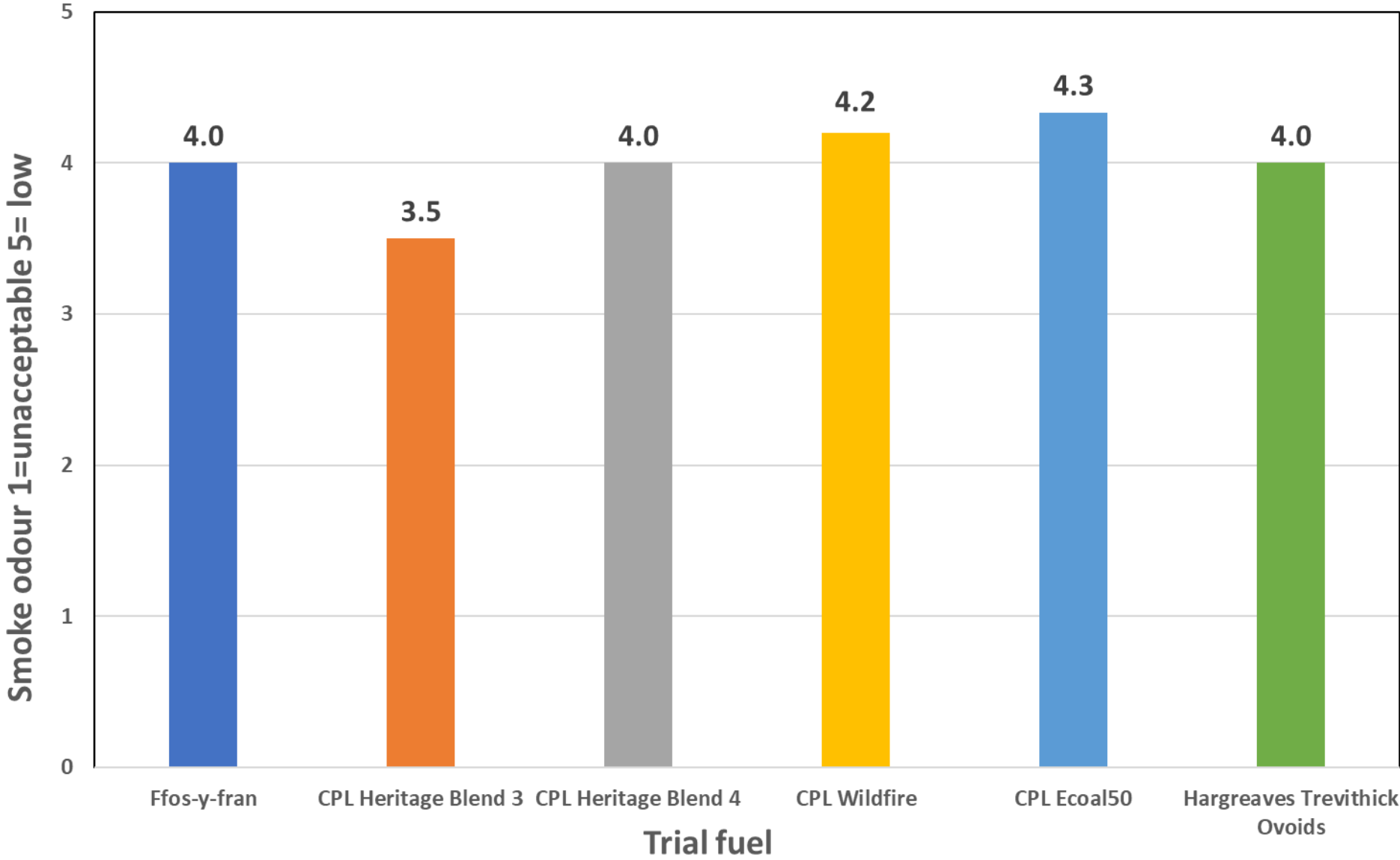
Qualitative assessment of quantity of ash in ashpan



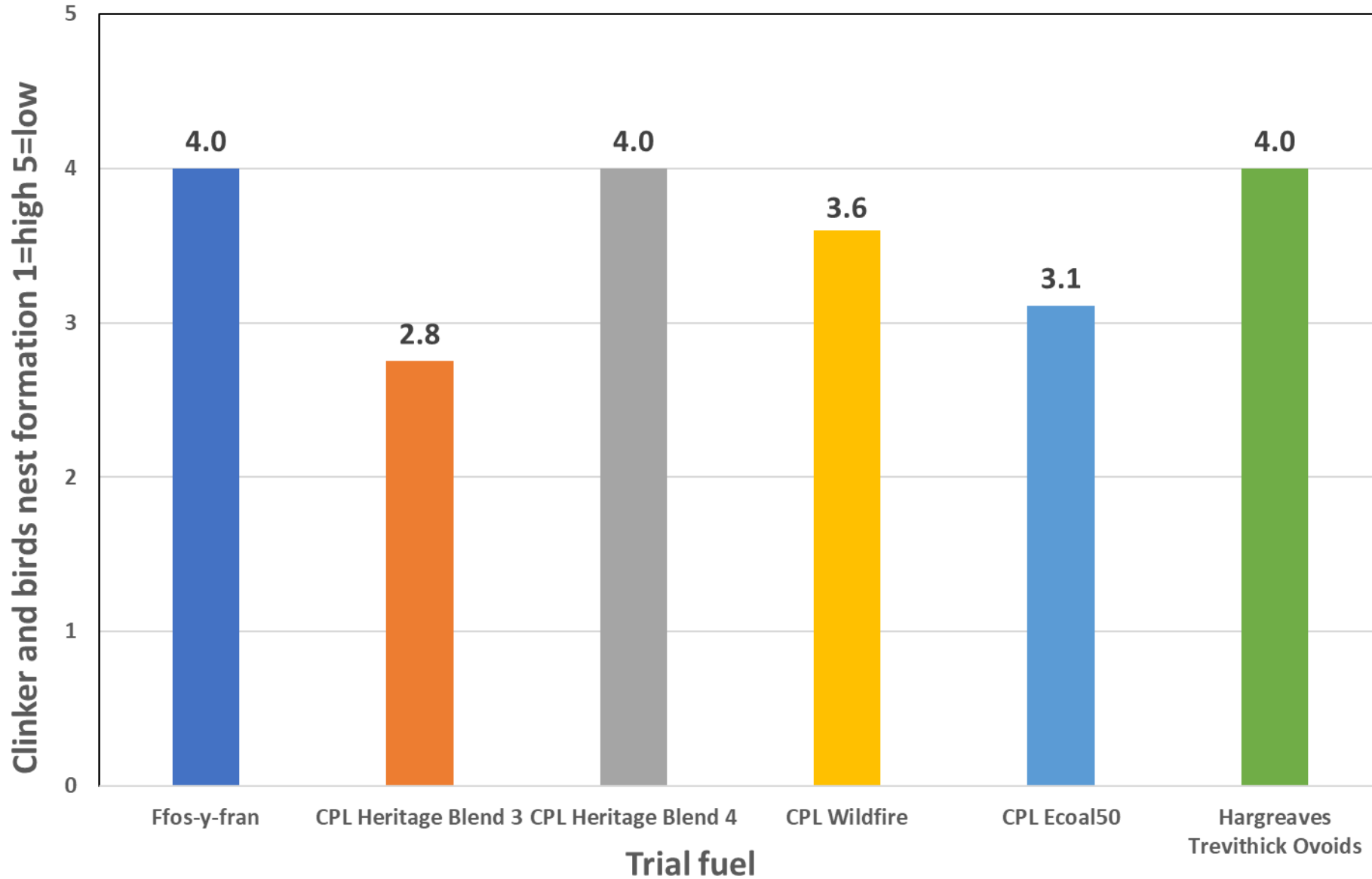
Qualitative assessment of quantity of char in smokebox



Qualitative assessment of smoke odour



Qualitative assessment of clinker and birds nest formation

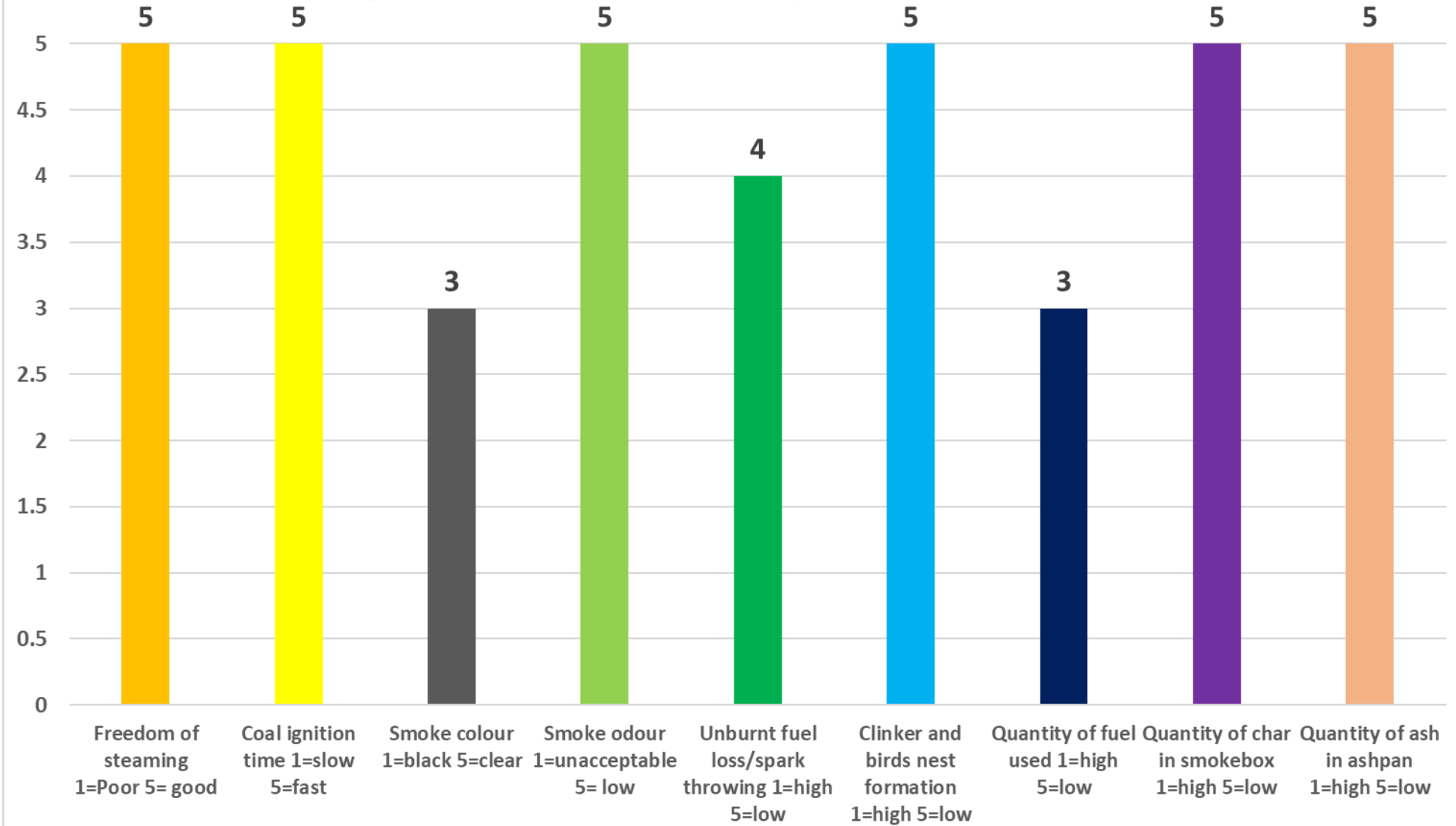


Qualitative Assessments

Chatham Dockyard - Wood log based fuel

Chatham Dockyard

Wood Logs - Chiminea and Firepit - Blazer Fuel



Example Fuel Trial Record Sheet

Welshpool and Llanfair Railway

[Return to coal@bvrw.co.uk](mailto:Return%20to%20coal@bvrw.co.uk)

Fuel Trial Record

Fuel being tested	Trevithick Steam Ovoids
Test Railway	Welshpool and Lanfair Light Railway
Date of Test	04/04/22
Locomotive type, Name and Number	Beyer Peacock 0-6-0, 822/No.1 "The Earl"
Description of train consist	6.5 unit train (average train weight for the line)
Driver	Phillip Ellis
Fireman	Joe Gunby
Test Observer	James Mander (W&LLR Engineering Manager)

Observations and footplate crew comments

Locomotive preparation

Lighting up including <ul style="list-style-type: none"> Ease of ignition Time to raise steam Smoke generation 	<ul style="list-style-type: none"> A large wood fire is required to ignite this fuel; although more difficult to light than traditional steam coal, it produces plenty of heat. 1hr to start boiling, 3hrs to raise full pressure (typical for this loco) Some very light white smoke.
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Operation

Train haulage including <ul style="list-style-type: none"> Under load Coasting Run round Smoke colour and odour Rapidity of ignition of fresh coal Freedom of steaming Evidence of clinker Evidence of unburnt fuel loss/spark throwing Fire shape used e.g. saucer, level, wedge, haycock etc Is locomotive fitted with a brickarch? Was secondary air used? 	<ul style="list-style-type: none"> Initially, working the arduous gradients of the W&L, the engine steamed very well indeed - up near the red line of 160psi. More firing was needed (about double that of traditional Welsh steam coal), but the boiler pressure would increase against the boiler feed. After 8 miles (half a round trip) it was clear that there was a problem with the fire, through no fault of the crew, the engine was not steaming well and pressure was down to 100psi, so had to stop for two x 15min blow ups. It would not keep schedule. The fuel generates a vast quantity of ash which, accumulates on longer runs, isn't combustible and will not fall through the fire grate. Instead it forms a glowing fluidised fire bed with pea sized ash, which hinders air flow. It is very difficult to remove this from the fire without a lot of raking. Running a wedge fire Brick arch is fitted Smoke was minimal, light blue haze at times Odour, minimal, similar to anthracite used on miniatures Some secondary air was used, not beneficial when the struggling for steam.
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Disposal	
Smokebox <ul style="list-style-type: none"> Quantity of char Evidence of blocked tubes Unusual deposits on internal surfaces 	<ul style="list-style-type: none"> Usual quantity of char No blocked tubes No unusual deposits
Firebox <ul style="list-style-type: none"> Evidence of clinker Evidence of birds nests Unusual deposits on internal Surfaces 	<ul style="list-style-type: none"> Some evidence of clinker setting if the fire is left to cool – minimal however. No birds nests No unusual deposits
Ashpan <ul style="list-style-type: none"> Quantity of ash Evidence of unburnt fuel particles 	<ul style="list-style-type: none"> Quantity of ash completely filled ash pan after 1 round trip. Approximately 5 times the amount of ash compared to conventional steam coal Much of this ash was still glowing, pea sized particles, assumed unburned fuel.
Qualitative scoring of fuel performance by footplate crew	
Freedom of steaming 1=poor 5= good	4 – initially, 1-after half a trip (8 miles)
Coal ignition time 1=slow 5=fast	3
Smoke colour 1=black 5=clear	4
Smoke odour 1=unacceptable 5= low	5
Unburnt fuel loss/spark throwing 1=high 5=low	4
Clinker and birds nest formation 1=high 5=low	4
Quantity of fuel used 1=high 5=low	1 (excessive)
Quantity of char in smokebox 1=high 5=low	3
Quantity of ash in ashpan 1=high 5=low	1 (excessive)
Other Observations/Comments	
<ul style="list-style-type: none"> This is an initial report; further testing will be conducted. Additional tests will be with firebars removed, to aid ash flow out and air flow in. Testing on modified draught arrangements also planned. 	
<p>Summary</p> <p>This fuel does show potential to steam well, however modified arrangements are required to handle ash and allow continuous reliable steaming.</p>	