



NATIONAL TRACTION ENGINE TRUST

Preserving our heritage with steam on the road

Coal Availability and Smoke Management

A great deal of concern is being expressed today about the lack of the correct qualities of coal available in the UK for firing our steam engines. The most common complaint is that it produces too much smoke. There are two things to understand about firing a steam engine, one is the quality of coal and the other is the method of firing. It is frequently pointed out, by very experienced engine men, that most smoke is caused by inexperience and inappropriate firing techniques. So in this article we deal with the qualities of coal and their sources and also publish an extract from Part 2 of the Engine Owners Code of Practice that deals with firing and fire management.

QUALITIES

The first thing to say about coal is that it is important to understand today's terminology.

STEAM COAL

Refers to any bituminous coal that is used for raising steam, generally in power stations, as apposed to coking (caking) coal that is used for making coke in the steel industry, and anthracite. It must also be explained that the poorer qualities and smaller sizes of coking coal can be mixed with other bituminous coal and burnt in power stations. Anthracite is also used in power stations that have been specifically design to burn it.

DRY WELSH STEAM COAL

This is a type of steam coal that was predominately used by the Great Western Railway, who designed their locomotives accordingly, and burns with little or no smoke. Sources of this type of coal in this country (Great Britain) are virtually non-existent. It is a semi-bituminous coal with about 14% volatile matter and 80% fixed carbon.

Below is a list of sources of coal suitable for steam engines with some of its properties.

BRITISH SOURCES

UKCOAL/ Coal4Energy Ltd

Two products available for steam engines are Daw Mill Large Cobbles and Thoresby Cobbles.

Daw Mill Large Cobbles: 5.0% ash, 8.0% moisture, 36.3% volatile matter, current pit head price (November 2006) £115.00 per tonne.

Thoresby Cobbles: 4.0% ash, 7.5% moisture. 34.0% volatile matter, current pit head price (November 2006) £95.00 per tonne.

Although both coals are not ideal for Steam Traction Engines (High Volatiles) the above fuels are free burning products and are used extensively in the UK by Steam Preservation Societies and large rallies.

Coal4Energy is able to quote a delivered price for bulk tipped loads (minimum load size 5 tonnes). Contact for bulk sales: - Graham Scott, Coal4Energy Ltd, Industrial Coal Sales, Mobile 07831 837088, e-mail graham.scott@coal4energy.co.uk

Scottish Coal

This company does supply coal to steam railways, but to date I have no information on any of their products.

IMPORTED SOURCES

Rudrum Holdings are major importers of coal into this country and at present they do not have any of their steam engine product, "Brunel Steam Engine Coal" due to the economic conditions in the world coal market. Web site www.rudrumholdings.co.uk

RA Fuels / Hargreaves Wholesale are importing coal from Russia and have contracts until 2008. They currently supplying around 20 Railways throughout the country including West Somerset and Great Central who report they are achieving more miles per tonne with a low smoke emission which is better than UK produced bituminous coal.

The product is not classed as Dry Steam Coal, but is a low volatile Bituminous Housecoal. Through coal merchants it has been supplied to various Steam Rallies including Great Dorset Steam Fair.

The coal is available in three sizes 30 x 50mm, 50 x 110mm and +110mm.

The coal is imported and stocked at Immingham.

The analysis is as follows: Moisture 7.9%, Volatile 28.9%, Ash 4.1%, Chlorine 0.01%, Sulphur 0.30%, Net CV 28,600 Kj/Kg.

Prices are available on application supplied in bulk lorry loads from 10 tonnes upwards.

Contact Ian Moulson, Hargreaves Wholesale, 64 London Road, Coalville, Leicester LE67 3JA, Tel: 01530 510303, Fax: 01530 831885, e-mail ian.moulson@rafuels.co.uk

WA HOLMES COAL

This company has two types of coal available at the moment, one from Russia which is high in volatile matter and the other from Poland which is relatively low in volatiles and as near Welsh Dry Steam Coal as possible at the moment.

Russian – Moisture 7 –9%, Ash 3.08%, Sulphur 0.37%, Chlorine 0.01%, Volatiles 28% and size +90mm

Polish – Moisture 6%, Ash 5%, Sulphur 0.3%, Chlorine 0.03%, Volatiles 20% and size 50 to 150mm

Andy Holmes 01778 591200

Managing the Fire

When coal is added to a fire, energy is released in two distinct phases. The first phase, releases volatile gases, which is evident by the blackness of the smoke. This requires high amounts of oxygen to aid the combustion process and also help disperse the large amounts of unburnt carbon, which can choke the tubes and dampen the fire. But, a balance needs to be found as the volatile gases also provide a significant amount of the heat, which could be wasted if exhausted too early. The second phase, evident by the vastly reduced smoke emissions, requires less oxygen to clear the unburnt carbon and also excess amounts of oxygen can create a blast furnace effect with possible overheating of firebars and firebox tube ends. Opening or closing the ash pan damper during the burn phases will regulate the fire burn rate by varying the amount of oxygen admitted.

Only open the ash pan door sufficiently to maintain a bright fire. Simply stated the following elements form a **firing cycle**, which is repeatedly undertaken along the journey;

- *read the road*
- *clean and build the fire accordingly*
- *burn the coal*
- *generate steam*
- *do the work*
- *replace the steam with water accordingly*

Each element links to the others in a balanced manner but the time taken to complete one cycle is influenced mainly by the type and size of engine, quality and amount of coal and the terrain being travelled.

A mistake that nearly all newcomers make is to over-fire. It is best to build up the fire in stages adding new layers only onto established, well burning coals, until the required depth is reached for the job in hand. Until confidence is well established and the working of a particular engine better understood a good rule to adopt is to keep the fire deep and bright; keep the damper in mid-position; load fresh coal a little at a time but often; keep the water level as high as practical in the glass - also lifting water (injector or pump) a little and often, but remember too much water may induce priming when travelling down hill.

With some types of coal clinker may form, especially after a rest period or after a long hard run. It will lie over the grate area like a semi-liquid blanket and stop the engine making steam properly. Check for clinker from time to time and remove it by raking aggressively through the fire. In hopeless circumstances when steam can't be generated, the whole fire should be thrown out and re-laid afresh.

Smoke - Black smoke from burning coal consists mostly of unburnt carbon (mainly bituminous compounds). Whilst the results look very spectacular it is technically an offence to cause emissions of smoke **that can't be consumed by the engine** - in other words; sufficiently burnt off. This rule is not aimed at the environment as such but is made to protect the rights of individuals and their property, be it bricks and mortar, livestock or items of clothing. The use of rubber tyres, inner tubes and plastics to raise black smoke for photographic effect can lead to the emission of noxious substances, which is an infringement of the Clean Air Act.

The NTET advises that the better quality less smokey **coals** should be burnt where at all possible but in any case the simple rule of firing sufficiently early to burn off the carbons, particularly when approaching built-up areas, should be followed.

Firing on the move - Before firing on the move the driver should advise the steersman of the intent in order that they can both change stance if necessary and for the steersman to indicate that he has taken full charge of the engine.

Do not let cold air onto hot firebox plates more than absolutely necessary. Charge the shovel with coal before opening the firehole door - Never feed the fire when the engine is pulling really hard. Do not allow coals to fall off the moving engine; it is an offence under the Road Traffic Act, as is throwing of stone or battings out of the bunker into the hedgerow.

Note - Where an engine is being driven single handed it is illegal to fire on the move!