
A Scientific Exegesis of 'Youth' by Joseph Conrad

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The novelist Joseph Conrad, whose most famous work is probably 'Lord Jim', himself worked at sea between the ages of 14 and 40, and in a short work entitled 'Youth' [1] gives a biographical account of a voyage in the 1880s from England to Bangkok with a coal-bearing vessel. In the event, there was spontaneous heating of the coal and consequent shipwreck. The author of this note has been interested in spontaneous heating of coals for many years but was unaware of this account until recently.

Though steam vessels were in use by the time of the Conrad story, the coal-bearing vessel ('barque') was propelled by sails only. It is clear from Conrad's account that seamen accustomed to working with coal as cargo could sometimes judge intuitively, from appearance and possibly background odour, whether a particular shipment they had been assigned was or was not susceptible to spontaneous heating. Some weeks after leaving England, by which time the vessel was in the Indian Ocean, the consignment of coal began, in Conrad's words, to 'smoke in earnest'. There had previously been detection, purely by olfactory means, of released gases and vapour, but it was the appearance of smoke which caused the vessel's crew to go into 'emergency mode'.

The captain of the vessel made a decision to continue for Bangkok instead of putting in at an intermediate port, and continuous admittance of sea water to the cargo of coal led to cessation of smoke

and apparent extinguishment. By this time the vessel was close to Java. It was the following day that all control of the situation was lost. There was escalation of combustion, leading to a dust explosion which destroyed part of the barque and also fire in some of the parts not destroyed by the dust explosion. The barque, in this pitiful condition, was spotted by the crew of a steamer heading for Singapore from Western Australia, who offered to tow the barque as far as Singapore thereby saving the lives of its crew and possibly delivering the barque in Singapore in salvageable condition. However, the rescuing steamer was intrinsically a much faster vessel than the barque. Towing of the barque at steamer speeds caused acceleration of combustion by enhanced air supply, and there would have been total burnout of the barque had towing been continued for long.

The crew of the barque here made what we must regard (bearing in mind that Conrad's narrative is factual) as a heroic decision. They had a formal duty towards the underwriters, in the event of shipwreck, to retain as much of the ship's gear as possible in order to minimise the total loss. They took to view that to allow the barque to burn out completely whilst being towed would be in dereliction of this duty. They parted company with the steamer, thereby placing their own lives at risk, and returned to the barque. They launched the small boats which were installed on the barque for rescue purposes and set off for Singapore in those, with as much of the ship's gear as the boats had been able to hold. They did in fact arrive safely in Singapore.

Let us review the parts of this story of professional interest to fire specialists.

- (i) The spontaneous heating hazard of coals in transport was well known at the time of Conrad's story, and experienced seamen could often distinguish, using only the senses of sight and smell, a susceptible coal from a less susceptible one.
- (ii) Volatile release preceded active combustion. This is widely known and acted upon in today's world where, in storage of coal and coal products, detectable volatile release is taken to signify incipient spontaneous combustion.
- (iii) Admittance of seawater led to stoppage of smoke but not to full extinguishment.
- (iv) There was escalation whereby other forms of combustion behaviour – a dust explosion and several cabin fires – ensued.
- (v) Towing of the barque by a much faster vessel led to transition from fairly mild, quiescent combustion to more rapid because of the

greater air supply. This is of course entirely analogous to 'smouldering to flaming transitions' which are commonly observed in fire fighting.

There is a great deal in Conrad's narrative to interest the combustion scientist, especially the specialist in spontaneous heating. Tests, approved by bodies including ISO and the UN [2], for predicting in advance the spontaneous heating tendencies of coals and carbons came into use in about 1968. In the event of a fire in a ship carrying such a material, to have established that the material 'passed' the test is a defence (not necessarily a sufficient one) in any subsequent litigation. One wonders whether, had the coal in Conrad's barque been subjected to such a test beforehand, the shipwreck might have been prevented. The present author has been a fairly vocal critic of these tests in recent years [3–7] and is by no means convinced that the coal being carried in the barque would not comfortably have 'passed' the test and been declared safe to ship. But we shall never know!

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