



Alternative fuels for Sandstone's steam powered machines.

Although the use of steam powered machinery is limited worldwide, there is still a great deal of use of such machinery, either mobile or static, in the Heritage arena. At Sandstone we are very conscious of the environment and have been looking at readily available sources of alternative fuel. In South Africa the availability of coal is not in question as it is, say in the UK, but the quality and emission properties of the coal available for steam locomotives in South Africa are very poor. The best quality disappears at speed to Richards Bay for export to China and India.

Probably the best comparison we can make in South Africa is to the UK Heritage Railway system where alternative fuels such as biomass and compressed coal dust briquettes, as well as other matter, have been tried but with careful locomotive handling good low emission property coal that can be sourced for the UK market, is still used. It is a fact, though, that with no active coal mines left in the UK, such coal must be imported. It is the import chain that caused the most pollution! In the UK the Heritage Railway Industry uses 35000 tons per annum, basically one ship load from Russia! As yet, coal has not been abandoned.

There are also many other proposals for alternative fuels worldwide but not all practical such as hydrogen, liquid gas, ammonia and bio methane. There are even proposals to produce an electric steam locomotive using an electric heating element to produce steam. Once running the locomotive would then produce its own electricity to heat the water to produce steam. Perhaps a bit too complex!

So what is the state of play in South Africa? Here the pressures on pollution are not as strict as some parts of the world but most operators, and Sandstone is one of them, take a measured approach to minimise pollution but the various pollutants emitted are the main cause of pollution. These comprise (amongst many others), carbon monoxide, carbon dioxide, sulphur dioxide, nitric oxide, particulates such as soot and small particles, heavy metals such as mercury and lead and various chemicals such as benzene and formaldehyde. When faced with such information it is folly not to look towards a solution.

In South Africa, as in many countries using steam locomotives, oil firing was tried many years ago but abandoned. With so much cheap coal available, why bother? Experiments with used engine oil by Transnet from their diesel fleet were tried in the 1990s in the early days of steam preservation in South Africa. However this fell foul of a law that requires all used oil to be recycled, so a cheap form of fuel disappeared overnight! A couple of Heritage operators in South Africa still use oil fired engines from these last experiments but the fuel is expensive.

At Sandstone, with the limited usage of our locos, converting to oil firing is not a viable alternative financially. Unlike the UK we do not have a large number of companies investigating and researching alternative fuels in South Africa, although there are some, but such research is in its infancy. To import such products in the quantities required is also not financially viable. Nevertheless we are in contact with these South African companies and await developments, at present, one is looking promising.

Rather than just wait and see we decided to try some alternatives at Sandstone with mixed success. Results differed significantly between our steam locomotive and road steam fleet and static engines. With hundreds of pine trees on the Estate, pine cones were our first option but in the various trials they burned so quickly as to exhaust the supply in no time. This of course, was worse in moving machinery such as a steam locomotive, where the draught on the fire is much more intense and was well illustrated with our second alternative fuel, mealie cobs. At our Summer Steam event in 2023 and our Cherry Festival event in November 2024, we successfully fired a static portable engine on mealie cobs for the three days of the event. This was a great step forward as it proved it could be done!



We also tried some running with a small Avonside locomotive on Seb's Heart of Africa Railway in 2023 but this exhausted the fuel supply quickly and also produced quite hectic sparks. A subsequent trial done by mixing coal with mealie cobs was more successful but still used up the mealie cobs quickly. The draught of the fire also drew sparks with the mixture. On a larger locomotive, such as a NGG16 Garratt, we are concerned with the risks of excessive sparks and fuel consumption. Whichever route is taken the spark arresting systems on our locos will need to be examined and probably modified.



Avonside 1624 "Xanthe" running on a mixture of coal and mealie cobs in November 2023



A further test with "Xanthe" in July 2024

However, all is not lost, as we are now working with one particular supplier in South Africa who is rapidly developing a form of viable, inexpensive and practical alternative to coal. Being locally produced it is hoped that this will be easily obtained in quantity and not at the premium price of imported products. We are awaiting a first supply of this material to enable to run some tests.

We would also like to appeal to our readers, particularly in South Africa, that as this is an ongoing project, we are interested in any inputs from you regarding what alternatives exist. If you can assist please e mail Dave Richardson at Sandstone, daver@sandstone.co.za