Daniel Catrice

Daniel Catrice is the Historian with the Historic Places Section of the Victorian Department of Natural Resources and Environment. He has worked as a consultant, specialising in heritage assessment and conservation planning for buildings, urban and rural areas, archaeological sites and historic landscapes. Since 1995 he has worked for the Department of Natural Resources and Environment. He prepared the conservation management plan for Kurth Kiln in 1996.

A processing industry in the forest: Kurth Kiln

Kurth Kiln is a remarkable and unique feature of the Gembrook forest. Built by the Forests Commission of Victoria in 1941, it was designed by Professor Ernest Kurth of the University of Tasmania and produced charcoal for use as a substitute fuel during the Second World War. Between 1946 and 1963, Kurth Kiln was the site of a forestry camp. Kurth Kiln is Victoria's largest and most elaborate charcoal kiln, and the only extant example of Kurth's revolutionary design. It illustrates an important processing industry, once common in Victoria's forests, but now obsolete.

Background

Kurth Kiln was built in response to a wartime energy crisis. Australia's entry into the war had raised immediate concerns about petroleum supplies. The nation depended on imported fuels from the Middle East and the west coast of the USA. Limited storage capacity exacerbated the situation and prompted the Commonwealth Government to introduce petrol rationing on 1 October 1940. The government's objective was an overall reduction in the level of civilian consumption by one-third of the pre-war average. The new petrol ration allowed private motorists enough petrol to drive 6500 kilometres per year. From August 1941, motorists could drive only 1600 kilometres per year, and after Japan's entry into the war in 1942 the ration was further reduced to allow motorists enough petrol to drive only 1300 kilometres per year.

For the duration of the war, the Commonwealth Government encouraged the use of substitute fuels. Shale oil, town gas and alcohol were all tried but producer gas derived from wood charcoal was found to be the best substitute. Producer gas is a combustible gas, mostly carbon monoxide, which is generated by passing a current of air through a glowing bed of coals. Between 1940 and 1945 about 56,000 producer gas units of varying design were fitted to motor cars and trucks throughout Australia. Virtually all of these units burnt charcoal.

In Victoria the Forests Commission was made responsible for ensuring adequate supplies of high-quality charcoal. In 1941 a minimum of 300 tons of graded charcoal were required each month. To meet this demand, the Commission proposed constructing about 50 charcoal burning kilns at various locations throughout Victoria, including Heywood, Dunolly, Cohuna, Ballarat, Yarram and Benalla. With the entry of Japan into the war in 1941, the Commonwealth government renewed its efforts to reduce petrol consumption. By mid-1942, 221 charcoal kilns and 12 charcoal pits were operating throughout Victoria. These kilns produced about 1000 tons of charcoal per month.

Before the war the charcoal-burning industry had been small, employing relatively few burners. These burners supplied blacksmith shops, coal depots, gasworks and powerhouses. The technology they employed had changed little since the turn of the century, being based on the slow and controlled burning of durable timbers in earthen, brick or metal kilns.
Burning methodology

The simplest method was the earthen or ‘beehive’ kiln. Beehive kilns consisted of a pile of timber stacked in a conical heap and covered with a layer of twigs or branches. The timber was stacked vertically, which allowed a free flow of air and smoke, and then covered with a layer of turf or a mixture of soil and ash. Midgley Ogden, a timber cutter and one-time charcoal burner, recalled the construction of a beehive kiln during the 1920s:

"It was very hard work building a charcoal kiln and the wood had to be more or less of standard size and length and it took us days to cut enough wood and to build it. Then the whole pile was covered with dirt and leaves. A chimney type hollow log had been placed in the centre of the kiln which was circular in shape and hot ashes were poured down this, igniting kindling wood inside at the bottom. When the fire had a good hold the chimney-like arrangement was completely covered over with dirt to stop the air from getting in."

An 'old Italian' was employed to do the burning. This character, 'stained by the dust of years of burning', lived in the open air for the next few days and tended the kiln. Little sleep was possible, 'as if the fire broke through and let the air in the whole thing would be ruined'. The production of good quality charcoal depended upon the air supply being as low as possible. As the supply of air to beehive kilns was difficult to regulate, the beehive kilns produced charcoal of uneven consistency and high ash content.

Other burners opted for pits, some lined with sheet metal or bricks to prevent soil contaminating the charcoal. Pits were typically 4 metres long, either oval or rectangular in plan, 1.5 metres wide and 1.5 metres deep. These pits were stacked with timber, then covered with sheet iron and a layer of dry earth. Pit kilns were more efficient than earthen kilns and required less capital than metal kilns.

Metal kilns, sometimes recycled from boilers or drums, were generally cylindrical in shape, about 2 to 3 metres high with a diameter of about 2 metres. The kiln was stacked with timber billets which were placed horizontally in the bottom of the kiln to create a shallow cone, with the main portion of the charge stacked vertically. A lid (or roof) was then fitted. The kindling was lit through one of the air inlet holes. All inlets and outlet vents were left open to ensure that the timber was well alight. The intensity of the burn was regulated by closing the inlet vents. When the smoke became bluish, usually after eight or ten hours, depending on the size of the kiln and species of timber, the charge was correctly carbonised. All inlet vents were then sealed and the charge was left to 'cook' for several hours. The charcoal cooled for about two days, and was then loaded into hessian bags.

The Kurth Kiln

As demand for charcoal increased during the Second World War, the old techniques of charcoal production were found to be inadequate. The Forests
Commission of Victoria was therefore directed to experiment with charcoal production in order to improve quality and quantity. During 1941, Forests Commission Chairman A.V. Galbraith learned of the work of Professor Ernest Kurth, whose experiments into the pyrolysis of timber had resulted in the construction of a prototype kiln in Tasmania. Kurth sent details of his kiln to Galbraith who offered £5 for the use of the design. Kurth accepted the offer on the understanding that if commercial manufacturers adopted it, he would receive 'just consideration'.

Ernest Kurth was born in Broken Hill and raised on the goldfields of Western Australia. He attended Scotch College in Perth, then studied at the Kalgoorlie School of Mines. He went to Hobart in 1919 to join the Electrolytic Zinc...
Company. In 1923 Kurth was appointed lecturer at the University of Tasmania. In 1928 he received the degree of Bachelor of Science for his research into the chemical composition of Tasmanian and New South Wales oil shales. During the 1930s he was seconded to the Tasmanian Shale Oil Investigation Committee to investigate the potential for establishing an oil industry in Tasmania. Kurth spent several years investigating tasmanite shale oil on behalf of the committee, for which he was awarded the degree of Doctor of Science in 1934.

In 1940 Kurth turned his attention to the pyrolysis of timber. His work led to the construction of a prototype kiln, which was built at Southport, near Hobart, in 1940–41. Kurth's kiln was designed to operate continuously. Provided that an optimum load was maintained, via top loading, graded charcoal could be retrieved through the discharge chutes at the bottom of the kiln. On each side of the kiln were corrugated iron pipes that carried water to cool the charcoal. These pipes separated the production and discharge chambers and enhanced the quality of the charcoal, ensuring maximum particle size. Tests indicated that Kurth's prototype kiln produced about 1.4 tonnes of charcoal per day, compared to a single tonne produced every three days from the standard steel kiln. It also yielded 10 to 15 per cent more charcoal from the same amount of timber.

Having secured the drawings for Kurth's kiln, the Forests Commission turned its attention to the selection of a site. Successful operation of the kiln depended on three essential requirements: water, timber and sloping land. The kiln needed approximately 9100 litres of water per day for the effective use of the cooling system. Access to timber was also important, as the kiln used 103 cubic metres of timber per week. Lastly, the construction of the kiln near a slope facilitated top loading with a minimum of extra superstructure.

A site on Tomahawk Creek near Gembrook satisfied all these requirements. Mining operations had created a network of water races and dams which the Forests Commission could use to supply water to the kiln. There was also a ready supply of dry but otherwise useless timber, the result of ringbarking during the 1930s. The 'Black Friday' bushfires of 1939 had left the region 'relatively untouched'. The site also had sufficient slope to facilitate top loading of the kiln.

The contract for the construction of the kiln was awarded to Stanley and Nance in October 1941. The Forests Commission supplied the building materials. The architect was S.J.B. Hart. Kurth Kiln was completed at a cost of £1,799. The first firing of the kiln took place on 18 March 1942.

During its first year of operation the kiln suffered major structural problems. At the first firing Hart reported that the loading doors to the kiln had buckled and had to be removed. Several months later operations at the kiln were again suspended because sections of the brick work in the vicinity of the inspection doors had loosened. The damage was inspected in September 1942 and sections of the mortar were replaced with asbestos fibre. Despite these initial failures, a
charcoal grader was installed and, according to the District Forester W. Griggs, operated most satisfactorily with power supplied from a waterwheel.\(^9\)

Wood from the surrounding forests was cut into metre-long lengths called billets and transported to the kiln where it was loaded into the kiln at regular intervals. To facilitate loading, a ramp was constructed from the embankment to the top of the kiln. Rails were laid onto the decking of the ramp and skips were used to bring the billets to the loading doors, which were located either side of the flue. The kiln held a maximum of 25 tonnes of wood per load and produced 20 tonnes of charcoal a week when operated in continuous eight hour shifts. A two-roomed accommodation hut – since demolished – was erected for men stationed at the kiln.\(^20\)

In February 1943 the economic viability of Kurth Kiln was assessed and proven by the Forests Commission. During a three week period, the kiln produced 35.5 tons of charcoal from 172.5 tons of wood for an operating cost of £228. The charcoal was valued at £341, giving a surplus of £112.\(^21\)

Unfortunately the proof of the kiln’s viability, after a succession of problems, came too late to ensure a significant place for Kurth Kiln in war-time charcoal production. By 1943 charcoal was no longer seen as the most effective substitute for petrol. Charcoal required people to be ‘both driver and stoker’. It produced 40 per cent less power than petrol. The cost of installing a gas producer unit was about £100, or eighteen times the average weekly wage. Many units proved to be unsafe, with newspapers carrying regular reports of cars catching fire or drivers becoming asphyxiated by the fumes. Sparks from the units were also blamed for starting bushfires.\(^22\)

By 1944 a mere 6.5 per cent of vehicles had installed gas producer units. As District Forester Griggs stated in his annual report of 1942-43: ‘owing to a slackening demand for charcoal, operations at the Kurth Kiln were suspended over most of the year’.\(^21\) In 1944 Griggs reported that operations for the production of charcoal had been suspended for the greater part of the year. The demand had been such that a fortnight’s run every four months of the Kurth Kiln produced enough to meet the limited although regular demand of local users. About 100 tons of charcoal was produced in 1943-44. A mere 28 tons were produced in 1944-45, the final year of the kiln’s operation.

After the Second World War the Forests Commission turned its attention from charcoal production to forest maintenance operations, initiating a major program of works, including new access roads, fire protection plans and plantation extensions, to compensate for the war-time neglect of the forest estate. Camps were established throughout Victoria. Kurth Kiln was selected as the site for the main base camp for the Kallista Forest District, housing 80–100 men.\(^24\) Eighteen 15 feet x 12 feet ‘masonite’ huts were purchased from the Army and erected on a site east of the kiln. This and other forest camps throughout Victoria were established by the Commission to house its permanent work force, but also to house the large numbers of ‘displaced persons’ who migrated to...
Australia in the 1940s and 1950s. The workers in these camps cut firewood, established hardwood and softwood plantations, undertook silvicultural work and constructed and maintained roads.

During the 1960s the Commission scaled down its operations around Gembrook. By 1963 Kurth Kiln was being used as a base camp for fire-fighting activities. Ten of the original huts had been removed; there were eight workers' huts and one open-sided hut 'used for storing materials of minor value'. Three of the huts were destroyed by fire on 8 January 1963. The ablutions hut was re-built with a 'set of double compartment cement wash-troughs, fuel copper, chip bath heater and galvanised iron bath'. With the exception of the bath, these items remain in the existing hut. At the same time all of the existing huts were lined with masonite. New galvanised-iron chimneys were also built, each with new brick fireplaces.

In 1982 the Forests Commission recommended the development of the Kurth Kiln site for recreational use. Funding was obtained under a Commonwealth Employment Project scheme and from 1982 to 1985 the site was redeveloped as a picnic and camping ground, with corral facilities for horse-riders. During this period three more huts were dismantled. Funds ran out in 1985, causing work on the project to cease.

Since 1985, the kiln has been used as a picnic area and camping ground. The Department of Natural Resources and Environment has prepared a conservation management plan for the site. It is currently undertaking conservation repairs and is investigating options to interpret the site to visitors. Kurth Kiln is a remarkable and unique feature of the forest. It serves to illustrate that our forests have long harboured the sites of processing industries, and that the relics of this activity are an important part of our cultural heritage.