TORREY CANYON

MEMORIES & REFLECTIONS

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A posting to Hayle in 1966, as Works Manager of an installation extracting bromine from sea-water, was seen by envious colleagues as a sinecure. In reality it became a series of challenges arising from a clear, simple brief to improve the economics of the high cost operation and sustain a viable unit for as long as possible.

The first major challenge was triggered on March 18th 1967 by the news of the stranding of the tanker Torrey Canyon on Sevenstones Reef. The potential impact on a process treating 3 million gallons of seawater per hour was considerable. Given the general lack of preparation for an event of this nature and magnitude one had to think on ones feet. There was no text-book answer.

Ed Cowan, in his book “Oil and Water”, provides an accurate and comprehensive account of the event and its aftermath but he was unable to comment on the economic impact and implications for some coastal based industries and organisations. These personal reflections will hopefully go a little way towards addressing this imbalance.

Details of the Associated Octel operation at Hayle can be found in the Journal of the Trevithick Society of 1999 and 2002. Sea water for the CEGB Power station and the bromine process was impounded on the flood tide in Carnsew reservoir, situated at the seaward end of the western lagoon of the Hayle estuary, and pumped to the station condensers for cooling purposes and then to Octel for processing. Abstraction was governed by an agreement between CEGB and the harbour owners, Harvey & Co whilst the pumping to Octel was covered by a separate agreement between CEGB and the Company. The sea water supply to Octel was under the control of the Power Station.

Hayle Power Station was a high cost generator and the last to be called upon to generate in the S W region. It was, in effect, used for peak lopping and as a stand by during maintenance shut downs in other stations. This determined the strategy of the Station Superintendent towards the threat of oil pollution. Octel had a different outlook. It was imperative that oil contamination should be avoided because a clean up would last 4 – 6 months and be a very costly exercise. At worst it could have resulted in permanent plant closure. The objective was always to optimise production and reduce downtime as far as practicable. It was a simple strategy to keep operating for as long as possible.

Then we learned on 22nd March that a sea water pump had failed at our sister plant in Anglesey, reducing their output to 70% of normal. Demand for bromine was at a peak due to the imminent departure of a bulk chemical tanker carrying finished product to refineries in South America, New Zealand and Australia. Furthermore, during the Easter-holiday week-end 24th / 25th the crisis deepened when the second of the three sea water

pumps at Amlwch failed reducing available bromine production across the Company to 35% of normal. A shut down at Hayle until the threat of oil had passed was just not possible. Our fundamental concern was the control of the supply of sea water which was in the hands of the Station Superintendent who was happy to sit it out until all risk of pollution had passed.

The news of the 18th had been received with some concern but in a relatively relaxed manner. A strong north westerly wind was blowing and the first oil slick was drifting into the English Channel. Initial emergency responses pointed to the containment of the spillage, refloating the tanker and dispersing any slicks with detergents.

As time passed prevailing south westerly winds drove a second slick toward the West Penwith coast and our concern increased considerably. From 20th to 23rd, at our daily operations meetings, we began to predict the progress of the slick along the north coast given the current and forecast tide and wind conditions. Shift Foreman Peter Casley and Day Process Foreman Arnold Wilson understood the effect of winds and tidal changes within St Ives Bay particularly well and their contribution was invaluable. On neap tides the bromine content of the sea water flowing into Carnsew was progressively diluted by our effluent and fresh river water. The water from the estuary mainly circulated around St Ives Bay with only minor “top–up” until spring tides resumed.

There was a considerable positive interest among the workforce about the unfolding events and many useful comments were received from interested employees who understood the coastal waters very well, particularly those from the St Ives area. A number had their own vessels and thus had a more personal interest in the outcomes. The second slick reached Porthmeor St Ives on the spring tides of 23rd/24th. We predicted that if oil did not enter the estuary by the 28th the risks of pollution would reduce considerably until the following spring tides. Wind direction was critical.

On 23rd the Station Superintendent, in his customary relaxed manner, refused to pump from Carnsew. Following a hard discussion it was agreed that pumping would continue during daylight hours with Octel providing “look outs” at the old ferry crossing point near the Hayle Bar. Pumping ceased during the hours of darkness, although the heavy smell of crude oil would have been an adequate signal of approaching problems. This compromise situation continued until March 29th but, however, with the loss of 50 tonnes of bromine when sea water flows would have been most favourable.

The tanker broke up on Saturday 25th with its remaining cargo spilling into the sea in a third slick drifting into the English Channel. Given the bromine production problems and with the increasing risk of pollution a serious crisis loomed for Octel. On 26th, Easter Day, the situation was again reviewed and all possible options reconsidered. Up to date information on wind speed and direction was needed as well as the position of the slicks along the north coast. I approached RAF St Mawgan and RNAS Culdrose. When contact was eventually made with the duty staff in the Culdrose Control Room the information was far from encouraging, the slick was approaching St Ives Bay and NE winds were forecast. In retrospect, the exercise was quite frustrating because the duty personnel were, initially, not convinced of the integrity of my request. They were unaware that the factory they regularly flew over on training flights was engaged in bromine manufacture. They had assumed that the enquiry was from a newspaper reporter. When they were assured of the importance of the information they were very helpful.

Assuming that the Station Superintendent would maintain his declared position and that CEGB would not call upon the Hayle station to generate any future action had to be independent of CEGB. The Octel Works Engineer was detailed to explore ways and means of constructing and launching a protective boom across the inlet to Carnsew reservoir, between the western wall of South Quay and the eastern bank of the reservoir. This exercise was carried out with the assistance of Maintenance Superintendent Trevor Cowls.

Firstly, it was necessary to establish what suitable but limited materials were available. We could lay our hands on a stock of 5 gallon drums was surplus to operating requirements. Steel reinforcing rods, sufficient to span the harbour if welded together end to end, were also available. Hessian sacking was plentiful. The drums were attached to the steel rod with wire and draped with Hessian sacking to form a skirt. Scaffolding, secured to the harbour walls, was used to provide the means for the boom to rise and fall with the tide and provide a seal at both ends of the boom. Recovery of any oil and residues caught on the boom was provided for by securing the suction hoses from a shore based portable pump to a raft made from more 5 galls drums. A crude boom had been designed and constructed and all that remained was to launch it into position before any oil arrived.

Permission to launch and for the whole exercise to be carried out was readily given by Mr David Spring, local manager of Harvey & Co. Harvey's also built and launched a secondary boom to protect the inlet to Blackhouse sluice. This was constructed from blocks of polystyrene and timber. The entire operations took place on 28th when Octel employees, assisted by Jim Inch, owner of the nearby engineering business, descended on the quay. Harvey & Co worked with similar enthusiasm. Both booms were in position by nightfall. These were the first and only such protective devices to be put in position in Cornwall during the emergency.

More help was provided by the local fire brigade for a further 10 days. On the incoming tides hoses were played on the seaward side of the boom to reduce the risk of any oil passing the booms. Mr Grieve, Clerk to West Penwith RDC had previously offered any assistance that his authority could provide and he was true to his word.

The critical tide was on the evening of the 28th, after which a temporary reprieve was expected. Oil did come in on this tide but the booms provided an effective defence. The degree of pollution was limited and Carnsew remained free from oil.

Early on the 29th the Power Station was instructed by Regional HQ at Bristol to stop pumping until further notice. On the afternoon of the 28th the Octel Works Engineer briefed the Superintendent on the activities on the Quay and of our intention to protect the inlet to the reservoir with a boom. He showed a complete lack of interest and declined to resume normal pumping when the boom was in position. When we were told about the Regional HQ instruction local Octel representatives emphasised to the Power Station staff that the boom was an effective protection. A request for the HQ staff to be informed of this and a request that in the circumstances normal pumping should be resumed. The response was dismissive.

When the situation was reported to the Octel Production HQ at Ellesmere Port our Production Manager immediately contacted the CEGB Regional Chairman. A rather

robust conversation ensued during which the question was posed" What will you do if the oil reaches Hinkley B (nuclear) Station?" Within the hour the instruction had been given to resume pumping "in order to gain experience of any oil contamination on the water side of the condensers". A few days later a very gracious and diplomatic letter was received from the Chairman ending with the statement "good will is a tender plant which must be carefully nurtured". A point had been made.

The third and final slick moved into the channel, aided by the northerly winds. No further meaningful contamination of the Harbour was noted and normal uninterrupted production was resumed from the 29th. A strong smell of Kerosene persisted in the plant for about 6 weeks but the traces of dispersant in the sea water did not adversely affect the process or product quality.
As the process was continuous operating on a 24/7 basis it meant that the bromine losses were irrecoverable. Rescheduling of deliveries to UK refineries and amendments to the tanker sailing plans reduced the impact of these unforeseen events on the Octel business

A black tide mark was visible along the upper quay walls but being in sheltered water no oil residues were observed because oil entering on the flood tide had largely dispersed on the ebb tide. To the casual observer we had been most fortunate and had escaped relatively lightly. Some damage must have been occurred from use of dispersant but the effect of the fresh water flow down the Hayle River may have reduced its impact in the estuary. Nutrient in the detergent and other damage to the marine environment was held to be responsible for the rapid and boundless growth of a bright green weed on the rocks and sea walls during the following summer months. The mechanical clean up of the local beaches had been more effective than the use of dispersants.

Clean up and oil recovery was equally important but for Octel not nearly as problematic as it was for the local authorities who were responsible for the clean up of the rocky coastline and beaches. A similar innovative if "heath robinson" approach was adopted but when all the contaminated material had been recovered disposal by burning was achieved only when using a supplementary supply of oxygen.

Good relationships between Octel and Power Station were quickly restored and sealed by an agreement to jointly purchase a commercially manufactured boom as a resource for any further oil pollution crisis. It is, however, more pertinent to reflect on the lessons learned from the Torrey Canyon incident than merely to present a chronological record of the events important though this might be for the archivists.

The first major oil spillage in the world inevitably produced a steep learning curve. An event of such magnitude, involving 108,000 tones of crude, resulted in many knee-jerk reactions. First hand experience certainly informed the future judgements of many practitioners in their approach to pollution issues. The writer certainly "benefited" from the experience later in his career when faced with the proposed installation of a single buoy mooring 1 mile off shore from the Octel bromine plant in Anglesey. The Torrey Canyon episode makes a graphic reference point for judgements relating to the movement of dangerous goods by sea and also to the containment and recovery of chemical spillages from open seas and inland waters. The "Sea Empress" incident in Milford Haven (1996) and the "Braer" incident in Shetlands (1992) brought an immediate

memory recall but also an understanding and appreciation of the effectiveness of present day response systems.

The Clerk to West Penwith RDC described the local, on-shore situation very succinctly when he commented that he had a Council made up of hoteliers and farmers who had no experience or idea how to respond to such a crisis. This was also reflected in the response of the Chair of Hayle Parish Council who predicted a total collapse of the tourist industry in the area. He failed to recognise the circumstances in which two major employers found themselves rather than their self help initiatives. The hard work of Mr Grieve in initiating and coordinating local responses made his award in a subsequent honours list very well deserved.

Neither CEGB nor Octel had ever contemplated an incident of this kind. Nowadays a complete risk assessment would be “de rigueur” with detailed contingency plans in place and “desk top” training exercises a fact of life. In retrospect, an elegant solution to the Hayle problem, given a better mutual understanding of the circumstances, would have been to place a boom across the inlet to the intake shaft in Carnsew. In enclosed waters removal and recovery of any oil contamination would have been a relatively easy exercise. The Torrey Canyon was never envisaged when the original agreements to abstract water from the reservoir and pump to the Octel plant were drawn up. One suspects that the usual “force-majeure” clauses would have been invoked very quickly.

Lack of preparedness for such a first event was understandable but of greater concern was the apparent lack of knowledge about the behaviour of oil slicks in open seas. In such circumstances between 30 – 40% of the volume can be lost due to the evaporation of the lighter, more volatile components. The heavier components weather and are broken up by the action of the sea, sinking and beginning the slow process of bio-degradation. The biggest problem around the coast of Cornwall was the formation of a very stable “chocolate mousse”, resistant to the action of dispersants. The “mousse” is a water-in-oil emulsion, of considerable volume comprising 80% water. 10,000 tonnes of dispersant, largely the aggressive detergent BP 1002 was sprayed indiscriminately from 42 vessels on the slicks and the shoreline. Most of it had little effect on the oil but was toxic to marine life even at concentrations as low as 10ppm. The dispersant was responsible for the major part of the longer term damage to marine life and to the flora in coastal areas.

The use of dispersants still remains controversial. Since 1974 all dispersants used in the UK have to be licensed by the appropriate Government Agency to ensure effectiveness and to demonstrate low toxicity to marine life. There are now different formulations for use at sea, on beaches and on rocky foreshores. Use is governed by legislation such as the Food and Environmental Protection Act 1985.Scientists have concluded that under most conditions at sea modern dispersant formulations result in little ecological damage. In shore the situation is much more delicate and problematical. In some situations there is a strong economic case for use of the right dispersant in clean up of beaches but for remote rocky shores the longer term natural degradation may be the correct course of action.

Dispersants act by reducing the cohesiveness of the slick so that the oil can be broken up into small droplets by wind, wave and current action. The dispersant stabilises the droplets so that they remain in suspension and disperse with currents and tides,

breaking down more swiftly through microbial action. Removal of oil from the surface reduces the threat to bird life and the shore-line but increases the concentration of oil in the water. We now know that dispersants have to be applied when the oil is still fresh, before the loss of the volatile components and before weathering makes the slick immune to dispersants and when it becomes futile to spray. Spraying from vessels has been replaced by fast response, aerial spraying.

Containment was also part of the initial response strategy, when the re-floating of the tanker was still a viable option. Aeropreen Ltd of Ellesmere Port was commissioned to produce and deliver a polystyrene boom with the utmost urgency. The use of this material and a boom of the size required in the open sea were viewed with scepticism. If the boom was effective the recovery problem had still to be faced. The boom was successfully delivered but when put in position it was quite ineffective, bobbing up and down on the surface of the sea. Here was an example of knee-jerk reactions without thinking the problem through. Given the state of knowledge at the time it was an excusable reaction.

Warren Springs Government Laboratory undertook research in the Camel estuary into the effectiveness of booms during the summer of 1967. Booms were found to be ineffective in sheltered waters where the current exceeded 3 – 4 knots. Experience gained in subsequent major spillages suggested that booms on the open sea are ineffective at currents over 1-1.5 knots and at wave heights above 6 – 9 ft.

In retrospect the aftermath of the Torrey Canyon stranding could have been much more severe along the Cornish coast. Two of the three slicks drifted into the Channel, the biggest impact coming from the second slick. Wind conditions at the time were favourable for the most part with some commentators suggesting that as much as 50% of the slicks were dispersed at sea

The Torrey Canyon certainly focussed minds, particularly within the international maritime community and within the United Nations in particular. The introduction of the marine pollution convention (MARPOL) was certainly speeded up. Progress since the 70's has also been impressive. The response to the Sea Empress and Braer incidents illustrates the technical sophistication and effectiveness of the present day response to major spillages. Much has been achieved in providing for the transfer of cargo form stricken tankers, for a rapid response to dispersal by aerial spraying and in the availability of a range of techniques for shore line clean up. The remedial effects of Mother Nature should not be ignored either. The sea state was a major factor in limiting the adverse effects from the Braer spillage.

We need to acknowledge and understand the progress made over the past 40 years but always hoping that the need for the latest response techniques will be very limited.