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AVAILABLE MEANS FOR THE MINIMISATION OF WASTE ARISINGS

Kevin Colcomb - Senior Scientist
Counter Pollution Branch
Maritime and Coastguard Agency

Bay 1/2
Spring Place
105 Commercial Road
Southampton
SO15 1EG

Tel: +44 (0) 23 8032 9411
Fax: +44 (0) 23 8032 9485
e-mail: colcomb@mcagency.org.uk

Executive Summary

In the event of a major shoreline pollution incident in the United Kingdom it is likely that a Shoreline Response Centre (SRC) would be set up to provide the organisational framework through which local authorities can discharge their responsibilities for preventing and mitigating pollution of the shoreline. It is for the local authorities affected to take the management lead in the SRC with support from MCA and all other bodies with a role to play.

The Management Team of the SRC is responsible for determining the overall strategy for the clean up. The SRC Technical Team is responsible for implementing that strategy on the shore, and in turn is provided with environmental advice by the Environment Group. The Technical Team is composed of personnel expert in shoreline protection and clean-up from a wide range of organisations. A primary objective of the SRC must be the minimisation of oily waste generated by the clean up operation.

There are three primary areas where the opportunity to minimise waste arisings exist:

Firstly the overall management strategy adopted by the SRC will clearly determine the overall success of the operation in its widest sense, including control of good working practise.

Secondly the technical approach and tightness of supervision on the shoreline will determine the quantity and nature of the waste generated. The skill competencies of beachmasters and overall operations supervisors backed up with accurate communications lines in order to translate and implement the clean-up strategy of the Management Team through to the beach operations cannot be understated.

Thirdly, the use of sound waste separation procedures and the adoption of primary treatment and recovery techniques can significantly reduce the quantity of waste generated by those clean up techniques adopted.

AVAILABLE MEANSFOR THE MINIMISATION OF WASTE ARISINGS

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1. Background. The role of MCA and local authorities in maritime pollution incident response.

The Maritime and Coastguard Agency (MCA) is an Executive Agency of the Department of Environment, Transport and the Regions (DETR) and has overall responsibility for the implementation of the National Contingency Plan for Marine Pollution from Shipping and Offshore Installations.

The MCA is responsible for:

- Minimising loss of life amongst seafarers and coastal users;
- Responding to maritime emergencies 24 hours a day;
- Developing, promoting and enforcing high standards of maritime safety and pollution prevention for ships; and
- When pollution occurs, minimising the impact on UK interests.

An immediate response to reported marine pollution is important. Any organisation receiving a report of marine pollution should send that information immediately to HMCG. HMCG then contacts the MCA duty Principal Counter Pollution and Salvage Officer (PCPSO). MCA Counter Pollution Branch based at HQ in Southampton provides scientific, technical and administrative support to the four PCPSO's.

Local authorities have no statutory responsibility to plan for, or carry out shoreline clean up required as a result of a marine pollution incident, but have accepted a voluntary commitment to do so. MCA provides support to local authorities by maintaining stockpiles of beach cleaning equipment; provides training courses on oil spill response and contingency planning; by providing hands on training in the use of beach cleaning equipment and coastal protection booming; and by participating in local authority oil spill response training exercises.

2. Introduction

Response to a major maritime oil spill on the shoreline will invariably produce significant quantities of oily waste. The management of the clean-up operation will strongly influence the quantity and the nature of the waste generated. We have already heard from the Environmental Regulator for England and Wales that the options for final disposal of oily waste will become progressively more difficult over the next few years. Oily waste is classified as a special waste and as such is subject to strict controls with respect to final disposal. The disposal option is regarded as less environmentally sound as recovery and recycling. Disposal of special waste is not cheap.

Clearly on grounds of environmental best practise and economy there must be an incentive to minimise the quantity of waste generated by a clean-up operation and to manage waste segregation in a way which will enhance the fraction of oil available for recovery and recycling.

3. Minimisation of waste arisings – overall management of the Operation

The response to a major shoreline oiling in the UK is managed by a Shoreline Response Centre (SRC), a multi agency co-operative effort led by the affected local authoritiy or authorities. It is for the Management Team of the SRC to orchestrate the response through determination of the overall strategy and agreeing with the Technical Team the appropriate clean-up techniques. The Environment Group will advise on issues of best environmental practice. The principle of minimisation of waste arisings on the shoreline is therefore in the hands of the SRC Management Team. Tight supervision of the activities of the task groups is clearly crucial if the clean-up operation is to meet its key objectives.

The recommended structure of the SRC was significantly modified after the SEA EMPRESS incident incorporating new sub-groups: A Strategy sub-group of the management team and a Waste Disposal sub-group of the Technical Team. Waste minimisation is a key response objective and must be high on the agenda of each of the two new task groups.

It is all very well for the Management Team to get the overall strategy right but if the message does not get to the operational beachhead with the appropriate emphases then the overall objective may never be achieved. What it is, therefore, of paramount importance, are clear and sound communication lines between the Management Team and the Technical Team who will relay instructions to the Forward Control Centres and/or beachmasters. The skill competencies of individual beachmasters will be instrumental to translating clean-up strategy into technically reasonable operations on the beach. Waste minimisation begins on the shoreline. Clean-up techniques must be technically reasonable and must not cause more damage than adopting a strategy of "leave alone and monitor". A primary aspect of technical reasonableness is, of course, waste minimisation.

In order to maintain a check on accurate delivery of operational control and consistency of operational approach during the SEA EMPRESS response, operations supervisors were detailed to patrol sections of shoreline. Operational supervisors provided overall advice to beachmasters in the implementation of the clean-up strategy generically and specifically for individual beach cleaning operations. In addition, operational supervisors provided what ultimately became an additional but important feedback link to the SRC Management and Technical Teams.

4. Minimisation of waste arisings – the available clean up techniques

To achieve true waste minimisation the techniques adopted on the shoreline must be carefully evaluated and agreed as being the most appropriate and most critically be closely supervised by experienced beachmasters.

- **Bulk oil removal**

In most major shoreline oilings the clearance of bulk oil is the first priority before that oil can be remobilised and possibly impacting a greater length and conceivably more sensitive coastline. Where possible oil should be removed in liquid form. Secondary cleaning is next, significant remaining oil should be removed carefully with minimum beach material. Lastly, final polishing techniques to remove very small amounts of oil may be required in specific areas such as beaches of very high amenity value.

The most appropriate cleaning technique will depend on a number of factors: Most importantly: Access to the site, oil characteristics, shoreline substrate and the manpower and equipment available. The overall aim of the clean-up operation should seek to remove as much oil as possible with the minimum of beach substrate or debris.

Bulk liquid oil recovery can be achieved by a number of proven techniques. Vacuum recovery often proves to be the most successful. Floating oil can be recovered at the waters edge. Vacuum tankers, tractor vacuum units have the greatest recovery potential where access is possible. Smaller portable units may provide vacuum recovery where access is more difficult. Lightweight Vaculite units were used extensively to recover liquid oil in isolated coves during the SEA EMPRESS response. The vacuum units were delivered to the coves by clifftop sited cranes. Care was taken to use appropriate suction heads to minimise water and beach material/debris pick up.

Where pockets of bulk oil exist on the shoreline in areas difficult to access with vacuum recovery devices or skimmers, typically rocky shore and boulder beaches, flushing may be the most appropriate option. High volume flushing with seawater may serve both to remobilise oil which has penetrated boulder beaches and direct towards an area where bulk oil recovery is possible. Recovered bulk oil will of course require some form of in-situ temporary storage facility.

Temporary storage may involve the digging of pits. Good practise in pit preparation such as avoiding steep sides and the use of liners will help to minimise the incorporation of beach substrate into liquid oil bunds/pits thereby assisting in waste segregation and improving the possibilities of recovery and re-use.

- **Sandy beaches**

In general, mechanical clean-up techniques using conventional plant such as front loading shovels and excavators have great potential for generating excessive quantities of oily waste, particularly if poorly supervised and/or carried out by inexperienced machine operators. In many cases manual techniques using conventional hand tools may be the best option with respect to clearing light to moderately oiled shorelines whilst minimising the waste generated.

The nature of the substrate will determine the most appropriate strategy. Time spent carefully evaluating the site and possible strategies will be time well spent.

On hard sand, gently sloping beaches, trenching followed by scraping may be the most appropriate technique to remove large quantities of oil in short time. The use

of mechanical scrapers to push oil into shallow trenches carefully excavated with gently shelving sides can be one effective means of clearing large quantities of pollutant. This technique is most effective on very hard beaches with a high water table. Only a well-managed operation will give good results. It is important that all plant operatives are fully briefed with the overall objective of waste minimisation, most plant operators will not have worked to this regime before. Failure to plan for subsequent high waters may result in oil filled trenches being overwhelmed by the sea resulting in lines of buried oil. Similarly care must be taken to scaling the operation, filling more trenches with liquid oil than can be evacuated can result in difficult subsequent response options.
Recovery of buried oil inevitably results in unnecessary large quantities of sand mixed in with the liquid oil. This problem was experienced at a number of beach sites in Pembrokeshire during the SEA EMPRESS response.

Clearance of moderately oiled beaches can often be more effectively cleaned using simple manual techniques. Small well-organised teams of clean up staff supported by front loading shovels can clear significant quantities of oil using conventional hand tools. Again, the quality of supervision of these operations is crucial to the successful minimisation of waste.

The clearance of bulk oil in Tenby resulted in small but significant quantities of oil driven into the surface beach substrate. Light but significant oiling in the beach at Tenby Harbour was dealt with using a novel technique developed during the clean up operation. Sectors of approximately 30m square were identified and a trench composed of 3 sides of a square was created prior to a low pressure flushing operation. Oil was flushed through the beach surface and recovered from sumps situated at the downstream edge. That oil was subsequently transported to the main liquid oil bund at the refinery. Alternatives in this case would have been either the sufferance of chronic pollution over some time or to remove the oiled sediment for washing or disposal.

- **Rocky shore clean-up**

On sheltered rocky shores flushing with large volumes of water may prove most effective provided that access allows the introduction of suitable pumping equipment and oil on water recovery equipment. For particularly heavy oils impacted on rock high pressure washing may prove the most effective. An environmental impact assessment must be included in planning such operations. One technique adopted during the ERIKA response was to inject compressed air into a high-pressure water line in order to remove heavy oil contamination from rock, boulder and cobble. Floating oil was then recovered using vacuum oil recovery equipment. This technique clearly separated oil from cobble and boulders in a controlled way thereby minimising the possible reflotation of oil onto adjacent shorelines which may have been more sensitive, more difficult to clean or access.

- **Cobble beach clean-up – Berm relocation**

During the SEA EMPRESS clean-up operation considerable lengths of cobble beaches were impacted with large quantities of oil. Investigations into the nature of

the forties crude were carried out by contractors to the MCA. Tests carried out showed that in some areas the emulsified crude oil held a quantity of mineral fines. Past experience had demonstrated that the presence of some types of mineral fines (clay) may have a similar effect to that of oil surfactants. A proposal was put forward by the technical team of the SRC to carry out a trial to relocate a test area of contaminated cobble into the surf zone during a period of high sea energy, the objective being to disperse the oil in the surf zone and monitor its fate. The trial was successful and a significant length of oil impacted cobble shoreline was cleaned, the oil dispersing rapidly into the sea. No adverse environmental impact was detected.

5. Recover and re-use

Re-use of recovered oil is covered by Ged Davies in his paper: Waste Arisings, Disposal Options and Regulations.

Despite best efforts many major beach-cleaning operations will unavoidably generate large quantities of oily waste. In addition to the good management of operations and the close supervision of best available techniques there are invariably the options of recovery of oil from oiled beach material. Recovery techniques can be key to the minimisation of the ultimate quantity of waste destined for final disposal. Recovery of oil is always technically easier if good segregation practise is observed at all stages of the clean-up operation.

There are many oil recovery techniques currently available and most have been proven in recent incident response. The SEA EMPRESS incident response produced some noteworthy methods for the reduction of waste otherwise requiring costly treatment or disposal.

- **In-situ cobble washing**

A number of cobble beaches were impacted in Pembrokeshire. Emulsified oil was found to demulsify as air temperatures rose during the spring of 1996 resulting in penetration of oil into the cobble berms. Some of these beaches were in or close to high amenity areas and a decision was made to remove the worst of the oil. Clearly the option of removal for disposal of large quantities of cobble was both impractical and probably not the most cost effective. Washing operations were set up in situ using lined pits and/or skips as washing vessels. Considerable quantities of cobble were washed successfully at a number of locations thus minimising the generation of further quantities of oily waste, and further leaching of oil into the marine environment and onto adjacent beaches.

- **Shingle washing**

Washing of oiled shingle in cement mixers is a well-established technique. A number of shingle washing stations were set up during the SEA EMPRESS clean up operation. Shingle was initially separated from fines using a vibrating screen then fed into cement mixers for washing in seawater with the help of oil releasing

agents. Cleaned material was then returned to the beach and the oil and oily water generated by the operation was taken to the liquid oil bund at the refinery.
Though the shingle washing operation carried out during the SEA EMPRESS response was seen as generally successful, there may be scope to refine the techniques used to increase efficiency and reduce overall costs.

- **Sand washing**

The MCA have two sand scrubber machines in the UK National beachcleaning stockpile. The machines use jet pump technology to separate oil from oily sand and can deal with material up to 20mm in size. Washing capacities of the machines are approximately 6 and 70 te per hour. A small trial was carried out at Caistor-next-the Sea, Norfolk in 1999, using the smaller machine, washing oily sand generated during the ELENI V incident response over 20 years ago. The oil was a heavy fuel oil and the trial was judged a success by the Environment Agency who supervised the operation and deemed the washed sand to be clean enough to be returned to the beach. Recovered oil was removed from site to a recycling facility. The operation was featured on BBC 1 television the Tomorrows World programme last year.
MCA hope to further prove the technology through a future multi-agency trial using the larger of the two machines to wash a greater quantity of oiled beach material.

6. Conclusion

Greater focus is required at all levels of the oil spill response hierarchy on the minimisation of waste generated by oil spill clean-up operations. Guidance on how best to achieve minimisation of oily waste should be incorporated into all oil spill response contingency plans and guidance notes for the setting up and management of Shoreline Response Centres.