AADE –02-DFWM-HO-22

Offshore Waste Containment & Disposal
Assessing the Criteria for Option Selection

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Abstract

A suite of legislative guidelines and regulations, introduced following global pressure to prevent un-necessary environmental pollution has re-shaped the contracting landscape in the UK North Sea oil and gas industry since the late 1990's as Operators developed their waste management strategies to meet regulatory compliance. The operating regime in the North Sea has spawned the birth of environmental management as a key oilfield business and in turn this has been a catalyst in the advancement of waste containment, treatment and disposal technology and services in the UK.

The objective of this paper is to share North Sea experiences and lessons learned following the evolution of this new business sector with other E+P locations that have not experienced the impact of stricter environmental legislation on drilling and production operations.

Introduction

The current high global profile of environmental protection is not driven solely by the introduction of more stringent legislative targets, or indeed a desire by many of the more responsible regimes to prevent further damage to our planet. Indeed, the importance of protecting the Earth's environment from un-necessary pollution has been with us since the dawn of time – i.e environmental protection is not a new concept.

However, a series of well-publicised incidents – particularly over the past few years, has increased public awareness of the negative impacts of pollution and as such, protection of the environment is an important agenda item for the Worlds Governments, Corporations and for Society. The importance allocated to the prevention of pollution varies from continent to continent, but it is widely recognised that offending polluters will not be allowed to carry out their future business in an environmentally unacceptable manner.
Over the past 5 years, North Sea Operators have made the move towards a policy of total containment aimed at enabling them to meet their legislative and environmental responsibilities.

The issues associated with the safe and environmentally acceptable disposal of oily-based drilled cuttings have been well publicized, and there are many service companies currently offering the E+P industry a variety of services, technologies and methods for the management of oilfield waste from work-site to final disposal.

Challenging new restrictions in the UK North Sea regarding the content of drilling waste discharged into the sea, demands considerable attention from the operating companies, and also a careful blend with optimum well design, budgetary constraints, technology, personnel availability and also schedule targets. The Operator's HS&E liabilities, and subsequently their public image, must be protected from needless exposure to risk that may emanate from the 'wrong' environmental strategy being implemented.

It is against this background that we examine the key considerations facing Operators involved with selection of the Best Practical Environmental Option (BPEO), and our paper identifies the methodologies used in the North Sea in determining the most appropriate waste management strategy.

Paper Headings

1.0 Setting the scene

As a means of illustrating the various issues that collectively determine the BPEO, we position ourselves in the role of a Project Manager with a major oil company that is aiming to balance environmental compliance with the most cost effective and risk free solution. The primary target for the Project Manager will be to develop a visible and robust waste management strategy capable of withstanding external scrutiny, whilst delivering the project objective for *"the safe, efficient and environmentally-acceptable containment, transfer and disposal of drilled cuttings".*

The key issues being targeted are HS&E, performance, future liability considerations, legislative compliance, cost and corporate reputation management - these are common denominators in most environmental projects, regardless of location.

Specific client requirements, work-site conditions and constraints, political and social elements, safety and environmental considerations all rank highly in determining the BPEO – however, there are many other factors to be considered. This is illustrated in figures. 1.1 & 1.2 (below)

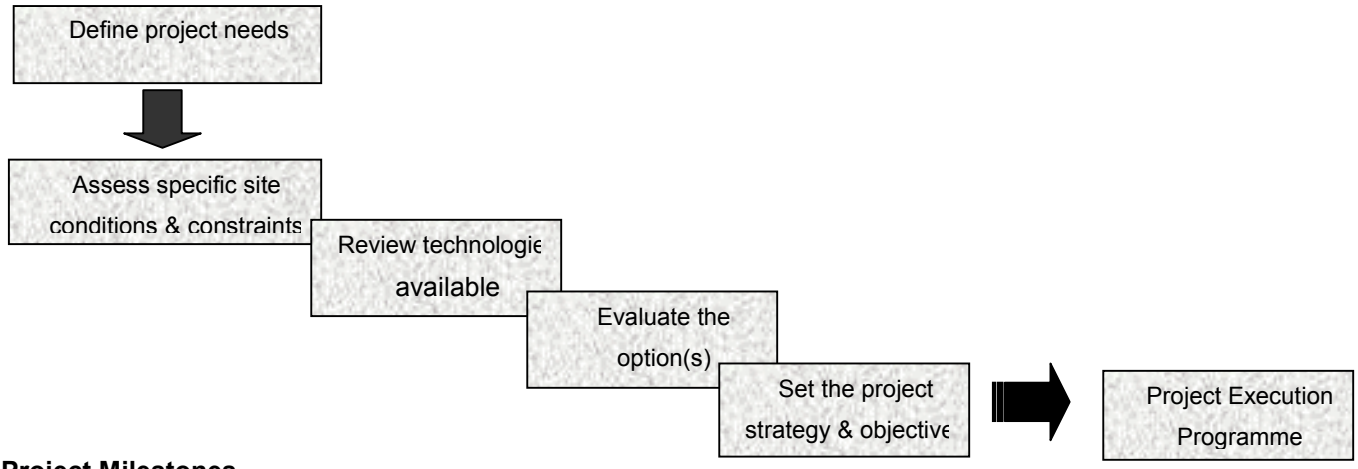


Fig. 1.1 Project Milestones

It can be generally assumed that there will be limited knowledge available at the outset of the project to identify the BPEO, and by inference it would be premature at this point for the company to express a preference (or worse still to select) a particular waste management solution or equipment hardware option. The waste management option can only be ultimately selected after evaluation of the project's key drivers and other relevant considerations*and will be the means by which the Clients environmental responsibilities will be discharged.

(* These are identified in more detail Fig 1.2)

Unfortunately, there are very few Client sites in the offshore oil and gas industry that are identical, and as such it is predictable that the hardware most suited to the particular waste management solution and/ or the platform (or rig) facilities will require adaptation or modification in some form, prior to it being taken into operational service.

It will be incumbent on the Client's waste project manager (or contractor) to quantify cost and schedule issues, and also specific the site conditions and constraints, since any one or a combination of these events will have a significant bearing on the waste management option ultimately selected.

The waste management technologies currently available to the E+P industry have their roots in the agricultural business, and there have been relatively few advanced technology developments of industrial waste disposal systems – most of which were originally evolved in the early 1950's. In an industry where downtime is extremely disruptive and expensive, the deployment of traditional equipment with proven performance is an attractive option for Operators, particularly in view of the demanding legislative regime now operating in most E+P locations.

Imminent deadlines, may lead to the most appropriate BPEO being prejudiced by schedule pressures, and unless this is recognised as early as possible, the opportunity cost of selecting a solution or system for the "wrong" reasons could

compromise the BPEO - and possibly lead to future downstream problems for the Client.
It is of paramount importance to the global oil and gas industry that in determining the way forward, Operators retain an open mind to innovative solutions and alternative options as past custom and practice is not necessarily the way that the business will be carried out in the future - and the correct balance between innovation and risk must be achieved when assessing the BPEO.
Operators ignore at our peril the influence and pressures placed on operating and drilling companies by various external organisations – e.g. Friends of the Earth, Greenpeace, etc; and there also needs to be recognition of the expectations of a more environmentally aware global populace.

Operators must not establish their BPEO in isolation, they also need to consider the possible consequences i.e. damage to corporate reputations, loss of shareholder support, impact on share price, costs of any remedial work, etc; of not getting it right first time around, because un-necessary environmental pollution is not an option.

Fig. 1.2 - B.P.E.O. considerations

The BPEO Project Strategy will identify:

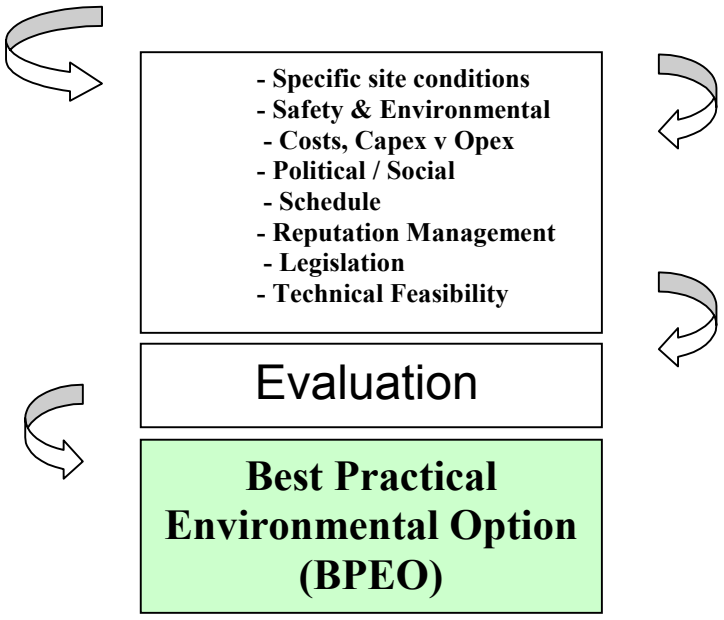
WHAT…….needs to be done

WHY……it is required

HOW……this will be achieved

WHO……will be the responsible person(s)

WHEN…….it will be carried out



Learning Point #1
The BPEO determines the methodology & technology to be used and Operators should not retain pre-determined solutions or place restrictions on any alternative pragmatic option available to them.

2.0 Work-site interfaces.

The waste management technology identified in the BPEO will interface with existing work-site services, utilities and equipment, and there will be an impact on the ongoing operational activities of other groups. Not least, it will also require a Safety Case Impact Assessment* (SCIA) to be carried out.

** We shall focus on the interface with existing services, utilities and equipment – the SCIA impact of installing a waste disposal management system will be examined in the next section of this paper.*

The majority of existing offshore platforms and rigs operating in the UK North Sea were designed without any meaningful allowance for the retrospective installation of a waste disposal or containment system. Yet this facility is now considered an integral part of operational activities with equal importance to more traditional drilling facilities (e.g. mud pumps, shale shakers, centrifuges, etc;)
Unless allowed for in the original design basis, Operators may expect the following aspects to be problematic -

2.1 The maximum lift weight of the waste system will be determined by:

The lifting capacity of the platform / rig cranes
The capability of the deck area to sustain significant additional loading

2.2 Lay down space will be at a premium

In general terms, there are very few sites with excessive free lay down space, and it is possible that extensive engineering modifications, reconfiguration of existing plant and equipment layouts, or removal of redundant equipment will be required to facilitate the introduction of an onsite waste disposal system. This modification work may create significant disruption to ongoing work-site operations and possibly even require a partial shutdown to carry out any critical hot work activities.

It should also be acknowledged that the allocation of space for the waste disposal system could have an impact on the storage capability for normal freight (e.g.skips, containers, etc;) and result in additional transportation support costs.

2.3 Power supplies to the waste disposal system may be restrictive

Depending on the type of system installed and its demand for an electric supply power to drive its equipment, the following may be problematic:
There is insufficient platform / rig power available (in which case a standalone power generator will be required – this further impacts on the lay down – deck-space demands.

Existing work-site power shutdown and maintenance philosophies will need to be reviewed (and possibly amended) if supplies to the waste disposal system are likely to be affected by either low level alarms elsewhere at the site.
Frequent spurious power failures created by an unreliable power generation source - or non-availability due to routine maintenance or repair – will also require careful consideration, as this may lead to a partial or full drilling shutdown depending on the type of operations being carried out on the drill floor at that time. There are significant cost implications* associated with unplanned downtime.

** Note: Spurious power shutdowns that lead to process downtime may also impact commercially on the drilling company (e.g. if they are on an incentive payment scheme and the shutdown was caused by events out with their own sphere of control).*

The waste disposal equipment – whether cuttings re-injection, skip and ship containers or bulk transfer pods, will invariably require work-site utilities such as air, water, power etc; and the system interfaces with existing supplies will have to be designed and engineered to the appropriate Clients specification.

Note:
The author acknowledges that there may be further interfaces to be considered, however the paper has tried to focus on the type of issues that are commonplace across most sites, regardless of Operator, Drilling Contractor or country.

2.4 Impact on Safety Case

The aim of this section is to provide clarity on the more apparent issues associated with retrofitting a waste management system on a mature offshore platform or rig. To facilitate the impact of the equipment on platform activities, operations, equipment and personnel, the characteristics of the preferred waste disposal system should be analysed prior to final selection:

- Describe the overall process, with specific details of interfaces with existing systems, operations or personnel
- Ensure there is a formal set of operational and maintenance work procedures for the system and equipment
- Identify any HS&E risks and remedial actions associated with normal waste disposal operations
- Identify the HS&E risks and remedial actions associated with unplanned system or equipment failure
- Establish contingency / emergency procedures

In analysing each of the above, the waste project manager must retain a suite of “what ifs” that consider the impact of this system on normal operations and personnel safety, and also the impact on the waste disposal process in the event of an abnormal situation at the work-site.

The waste project manager must also retain a set of emergency follow-up procedures in the event of accidental pollution spill from the waste disposal system. It is of the utmost importance that these written procedures are comprehensive, relevant, well publicised and readily available to all staff.

Learning Point #2
We strongly recommend that the operating procedures and “what if” contingency follow-on actions are reviewed for applicability on an ongoing basis.

The risks presented by the waste management system should be represented in a Cause and Effect matrix (or similar) and supported by a set of formal procedures, all of which will be integrated within the existing work-site Safety Case.

Finally, there will be a requirement to ensure that all operations and maintenance staff – whether company or contractor personnel are assessed on a regular basis for competency, as this is an important aspect for any waste management system and cannot be over-stated.

In implementing the above, we should remember that "*PREVENTION*" is always preferable to "*CURE*"

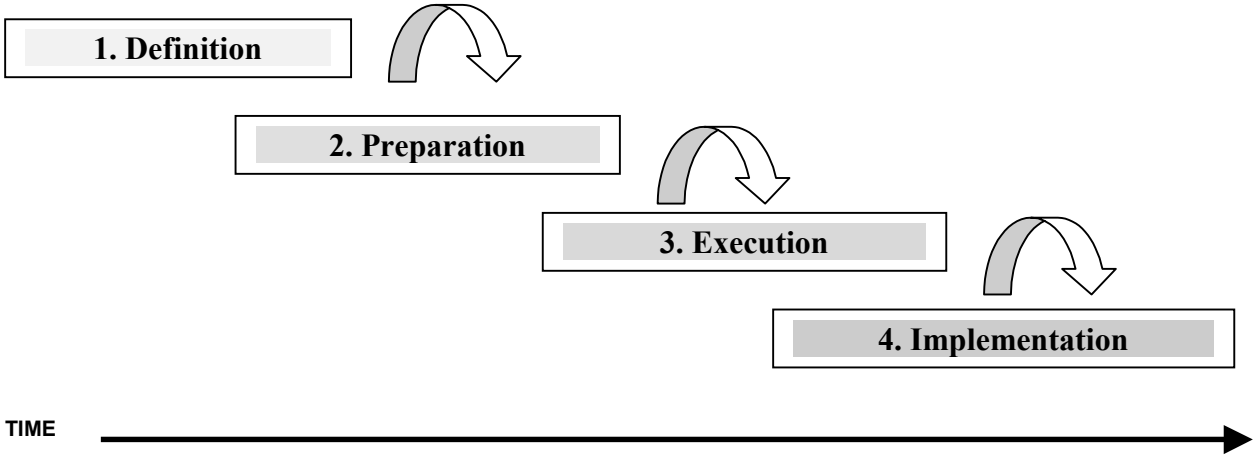
3.0 Project Management Strategy

The creation of a robust and visible environmental management strategy is the foundation of the BPEO, and it is fundamental to the future success of the project that this strategy is openly communicated at all levels within the company.
The means by which the BPEO will be delivered, shall normally involve the utilization of tried and tested project planning techniques, and cost control and progress reporting procedures widely used by industry. It will be the degree of pre-planning and compliance that determines a successful (or otherwise) project.

3.1 Project Planning framework

- Understanding the needs
- Identifying the project deliverables
- Setting project objectives
- Establishing the project team
- Convening a kick-off meeting with BPEO "shareholders"
- Issuing a Statement of Requirements
- Preparing the project schedule (must be realistic at Day 1)
- Identifying project expenditure and measurement tools / controls
- Allocating responsibilities and actions

The life cycle of the waste project will typically evolve over 4 major phases –



3.2 Project Development Phases

Several learning points taken from previous experiences in waste disposal projects are identified below:

Create a project checklist to test your findings – i.e.

What are we trying to achieve?	(i.e. the project objectives/ deliverables, work scope, etc;)
Why are we doing this?	(e.g. legislative, image, economics, HS&E, etc;)
How will we achieve the project objective(s)?	(i.e. the project strategy, plan, etc;)
What are the alternatives?	(e.g. other solutions, risks, costs, etc;)
What will we require?	(e.g. resources, technology, funding, peer commitment, etc;)
When will we deliver?	(i.e. the project schedule)
Who are the BPEO project "shareholders"?	(e.g. Directors, Managers, Operators, Government, Public, Scientists/environmentalists, Contractors, Equipment Vendors, Offshore crews, etc;)
How will we communicate our achievements?	(e.g. "open communication" policy) and to whom do we report progress – e.g. shareholders – who else?

The success of the BPEO project is directly proportional to the extent of pre-project preparation and planning carried out and whilst this checklist is not totally inclusive of all major considerations, it does offer the Project Manager a practical and simple framework of the main issues. In adopting this (or a broadly similar) methodology project risks can be identified, assessed and addressed at an early stage – thus removing un-necessary downstream threats.

Learning Point #3
Plainly speaking, corporate and personal reputations, careers, performance, even profit and loss are all affected by incorrect decisions – hence the requirement to consider the whole life cycle cost associated with selecting the Best Practical Environmental Option and waste management strategy.

4.0 Conclusions

The final section of our paper aims to highlight the need for Operators, Drilling Contractors and Project Managers to ensure that the costs of the preferred waste management disposal system are based on the whole life cycle economics over several wells and that the choice of BPEO must not be made solely on short-term economics or based on front-end equipment CAPEX costs.

For this reason, it would be logical when selecting the BPEO to consider whether the investment forms an integral part of a broader waste management policy – e.g. if water based mud discharges were also restricted in future could the system selected under the BPEO cope? It is this type of thought process that should replace short-term business strategies.

A marketing technique practised by some service companies is to offer Clients a "tailor-made" solution that satisfies front-end budgetary constraints, knowing full well that (expensive) equipment add-ons will be required in future to overcome system limitations. 'Good money can follow bad' under these circumstances.

5.0 Closing Message

It is worth considering that in spite of the technological achievements and successes of the oil and gas industry, perhaps the greatest legacy we can leave for future generations is a global commitment to prevent un-necessary pollution. It is never too late to clean up the environment!

"Being ready – more than anything else – is the secret of success" (Henry Ford)

Nomenclature

BATNEEC	Best available technology not entailing excessive cost
BEP	Best environmental practice
BPEO	Best practical environmental option
DTI	Department of Trade and Industry
EIA	Environmental Impact Assessment
LSA	Low specific activity scale
NGO	Non-government organisation
OBM	Oil based mud
OSPAR	Oslo Paris Convention
PARCOM	Paris Commission
PPC	Pollution prevention and control
PPM	Parts per million
POBM	Psuedo (Synthetic) oil based mud
SEBA	OSPAR workgroup on sea-based activities
SEPA	Scottish Environmental Protection Agency
SME	Small to Medium sized Enterprise
UKCS	United Kingdom continental shelf
UKOOA	United Kingdom offshore operators association
WBM	Water based mud

Acknowledgments

The author wishes to thank the many people at the AADE for their support, co-operation and patience during the compilation and submission of this paper.

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