

European Commission, Directorate General for Environment

# ***Final Report***

Training course in the field of marine pollution:  
**“Treatment of pollution waste”**

01 - 06 December 2002 in Bremen, Germany

Grant Agreement ref: SUB 02/339683

Submitted by:



Institut für Kreislaufwirtschaft GmbH  
(Institute for Recycling and Environmental Protection)  
Neustadtswall 30  
28199 Bremen  
Germany  
Tel.: ++49-(0)421-59052326  
Fax.: ++49-(0)421-59052380  
ikrw@hs-bremen.de  
www.ikrw.de  
Director: Dr. Martin Wittmaier

and



BLG CONSULT GmbH  
Faulenstr. 23  
28195 Bremen,  
Germany,  
Tel.: ++49 (0) 421 9588030 (Secretariat)  
Fax: ++49 (0) 421 9588031  
blg-consult@blg.de  
Director: Karsten Brünings

June 2003

## Acknowledgements

This training course and the resulting final report was only possible due to the subsidy granted by the European Commission. We are grateful for the trust which has been set into us. We especially would like to thank Mrs. Head and Mr. Ferraro from the EC DG Environment from whom we received friendly support during the planning and preparations of the course.

We would like to thank Mr. Voss from the German Central Command for Maritime Emergencies (CCME) who kindly opened the course.

The following lecturers provided valuable contributions which were essential for this course:

- Capt. Brünings, BLG Consult GmbH
- Dipl.-Ing. MSc. Susanne Findeisen, (Institute for Recycling and Environmental Protection- Institut für Kreislaufwirtschaft)
- Capt. Karl Jacob, Kapitän Karl Jacob - Beratungen
- Dr. Roland Leitschuh, SAVA Sonderabfallverbrennungsanlagen GmbH,
- Dr. Michael Schlüter, Institut für Umwelt-Verfahrenstechnik
- Dr. Lars Stemmler (BLG Consult GmbH)
- Dr. René Surma, ttz-Umweltinstitut Technologie-Transfer-Zentrum at the Hochschule Bremerhaven, who stepped in for Dr. Susanne Graubner (Labor IBEN GmbH) in the last minute,
- Dipl.-Ing. Michael Riebensahm, Aguacycle GmbH
- Dr. Johanna Wesnigk (Max-Planck-Institute Marine Microbiology, Bremen, Germany)
- Dr. Martin Wittmaier (Institute for Recycling and Environmental Protection- Institut für Kreislaufwirtschaft)
- Dr. Hilke Würdemann (Universität Karlsruhe, Institute of Aquatic Environmental Engineering, Germany)
- Mr. Voss, German Central Command for Maritime Emergencies (CCME).

We would like to thank the following companies let us visit their premises and plants under their informative guidance:

- ANO GmbH & Co KG,
- Bremen Ports GmbH & Co. KG,
- Nehlsen Plump GmbH & Co. KG and
- Umweltschutz Nord GmbH & Co.

Last but not least we would like to thank the participants for their enthusiasm and dedication to contribute to the course.

## Table of content

	Page
1. Objectives	4
2. Performance of the course	5
2.1. Overall Performance	5
2.2. Lectures	7
2.3. Contributions of the Participants	10
2.4. Visit of Waste Treatment Companies	13
3. Results und Conclusion	16
3.1 Evaluation of the course	16
3.2. Overall evaluation	18
3.3 Conclusion	19
Annex 1: Course schedule	
Annex 2: Table of Contents of course folder (incl. all distributed papers within the course)	
Annex 3: a) List of participants, b) Background and Expectations for the course c) Presentation of Patrick Vermandel (Belgian Delegate) d) Presentation of the Danish Delegates e) Presentation of the Axel Rademacher (German Delegate)	
Annex 4: Certificate	
Annex 5: Simulation Exercise: Damage Evaluation a) The task, Scenarios 1 and 2 b) Group formation c) Results of the exercise from the groups 1 and 2 d) Checklist: aspects to consider when managing waste from marine pollution	
Annex 6: Evaluation sheets a) Evaluation forms (from EC and own evaluation form) b) EC Evaluation – summary of results c) IKrW /BLG Consult Evaluation – summary of results.	

## 1. Objectives

The course “Treatment of Waste from Marine Pollution”, performed in Bremen, December 01-06 2002, was one course in a series of related training activities in the field of accidental marine pollution subsidised by the European Commission’s General Directorate Environment.

The overall aims of the workshop are:

- The intensification of a wide knowledge on legal, technical and organisational aspects of dealing with marine pollution and the treatment of pollution wastes. This is especially vital as this know-how comprises a baseline for understanding problems and working out solutions in practice for every person involved.
- The promotion of the co-operation between the member countries in dealing with marine pollution and the treatment of pollution wastes by offering opportunities for becoming acquainted with all aspects and prospects of the problems.
- The enhancement of information exchange between professionals inside of the European Union and the evaluation of the experience gained in this context by offering various opportunities in the form of lectures, presentations, discussions and group work.

To reach the overall aims, the following objectives are set for the participants of the workshop:

1. Overview of marine pollution waste, including types, quantities, toxicities, sampling techniques and case studies for maritime accidents
2. Expert information on degradation and behaviour of pollution waste in the marine environment
3. Overview of the state of the art of various treatment options for solid and liquid waste and liquid contaminations of soil and sediment, including cost and benefit, constraints and duration
4. Detailed understanding of legal framework for pollution prevention and treatment waste, soil and water, on European and national levels.

## 2. Performance of the course

### 2.1. Overall Performance

The course on “Treatment of pollution waste” was executed by the Institut für Kreislaufwirtschaft GmbH (Institute for Recycling and Environmental Protection) in cooperation with the BLG Consult GmbH in Bremen in December 2002. Thirteen participants from 7 Maritime Member States participated the course (see figure 1).

The course was carried out according to the timetable given in the course folder which has been prepared for the participants (see Annex 1). The course is described in detail in the course folder. The folder consists of the following: the course programme, a list of lecturers, biographies or CV’s of lecturers, list of participants, abstracts, papers of the lectures and additional information material and brochures, which were handed out by the lecturers and participants during the course. Annex 2 lists the content of the course folder including all additional papers.

The event started on Sunday Morning, 01.12.02 at the Hotel Westfalia in Bremen. After an address of welcome by the Director of the Institut für Kreislaufwirtschaft GmbH, Dr. Wittmaier, and by Capt. Brünings from the BLG Consult GmbH, the week plan was introduced by the Course Director, Dipl.-Ing. Findeisen. The participants were offered the opportunity to introduce themselves to the group and to present their background and experience (see Annex 3: Information on the delegates). As this was notified in advance the participants had prepared short presentations. Some used the chance to use visual aids (Annex 3 c-e). To conclude the day a guided City Walk through the old City Centre of Bremen and a Welcome dinner in the evening were organised which served to acclimatise and for the group to get to know each other.

On Monday Morning the opening of the course was done by Mr. Voss from the Central Command for Maritime Emergencies (CCME) Germany. He gave an introduction on the German strategy for spill response and on the tasks of the Management Committee on Marine Pollution (figure 2).

One of the main features of the course were lectures by experts to provide the necessary theoretical background upon various aspects of Treatment of Pollution waste (see Chapter 2.2). In addition a number of opportunities were offered to the participants for own contributions and exchange of ideas and experiences (see Chapter 2.3). Thirdly four site visits to treatment plants were arranged (see Chapter 2.4).

At the end of the week the participants were asked to evaluate the course. Two evaluation sheets were filled in, one prepared by the organisers, focusing on the content of the course, and one used by the EC DG Environment for evaluation of all related training courses, focusing on the overall arrangements (Chapter 3.1). Finally every participant was handed a personal certificate which certified their participation of the training course (Annex 4).

Apart from the formal opportunities arranged during the lectures and exercises the organisers provided additional possibilities for the participants and the lecturers of the respective day to communicate and exchange views and ideas. All meals during the week were pre-organised and taken together, either on the premises of the University of applied Sciences, in restaurants or in the hotel. Additionally one to two half hour breaks per day were planned in the schedule to leave ample time for discussions within the group and/or with the lecturers.



**Figure 1: Thirteen Participants from seven member countries visiting the waste treatment company NELHSEN**

From left to right: German student, Axel Rademacher (GER), Joaquim Afonso (P), Martin Wittmaier (Director, Institute for Recycling and Environmental Protection), Athanasios Kaoutskis (GR), Eamon Hore (IRE), José Gouveia (P), Birte Gerdes (Institute for Recycling and Environmental Protection), Jens Rasmussen (DK), Susanne Findeisen (Course Director), Peter van den Dries (B), Patrick Vermandel (B), Aurelio Caligiore (I), Preben Christophersen (DK), Christos Karvounis (GR), Ilaria Masone (I), Frank Walsh (IRE).

## 2.2. Lectures

The lectures which, dealt with various aspects treatment of pollution waste were given by a number of experts (Figure 3 and 4).

### Objective 1 and 2

Dr. J. Wesnigk (Max-Planck-Institute for Marine Microbiology) introduced the topic of waste in the marine environment by giving an overview on their types, properties, quantities, origin and environmental impacts. She also pointed out typical collection of ship-generated waste, implementation deficits and waste management planning and handling options.

Examples of marine pollution incidents were presented by Capt. K. Brünings, BLG Consult GmbH, focussing on selected major accidents of the last 30 years and in particular on the “Erika” and “Prestige” accidents. He stressed the role of the involved parties, that human error is the mostly the reason for accidents. The driving force behind regulations and better practices always have been accidents.

Dipl.-Ing. René Surma from the Center for Technology Transfer- Environmental Institute in Bremerhaven stepped in for Dipl.-Chem. Susanne Graubner from Labor Iben and gave an introduction to sampling and analysis of waste. He presented sampling methods and sampling sizes for waste and soil, groundwater and soil gas, which are essential to get information on the extent of a pollution incident. He also included aspects of Analysis which are relevant for waste treatment and disposal.

### Objective 3

Dr. H. Würdemann, University of Karlsruhe gave a talk on behaviour, degradation and treatment of contamination in marine sediments. After presenting conditions and requirements for degradation of pollutants, she pointed out different options for treatment. Insitu-strategies were subject of main discussions as it represents a cost effect options but can be applied only under restricted conditions.

To broaden the view, established biological waste treatment options and their technical applications were presented by Dr. M. Wittmaier from the Institute for Recycling and Environmental Protection. He endeavoured to show the huge potential of bacteria which are generally present on polluted substrate and capable to metabolise most contaminations (see figure 5: Bacterial are ubiquitary present in the environment- result of short exeriment in the course to show the spread of microorganisms in nature). Dr. Wittmaier explained requirements, conditions and timeframe needed for biological treatment, costs and practical experiences.

Mechanical, chemical and physical waste treatment options were presented by Dipl.-Ing. Michael Riebensahm, from Aguacycle GmbH. He explained the technical options available to treat contaminated water, e.g. membrane technology.

Dr. M. Schlüter, Institut für Umwelt-Verfahrenstechnik, University of Bremen additionally talked about behaviour, degradation and treatment of contamination in marine water, focussing on treatment of oil/water mixtures and emulsions (e.g. Bilge waters).

Thermal waste treatment, which is a treatment option particularly for highly contaminated material was presented by Dr. R. Leitschuh from the SAVA Sonderabfallverbrennungsanlage GmbH. He introduced the technology from the plant operators point of view.

Dipl.-Ing. Susanne Findeisen from the Institute for Recycling and Environmental Protection (Institut für Kreislaufwirtschaft) presented lab-, pilot- and field studies of ex-situ bioremediation of TBT-contaminated harbour sediment which have been carried out by the Institute. Although TBT is not introduced into the marine environment by accidents, it is a chronic and very toxic pollutant most countries are confronted with. She presented the way to approach the problem of sediment contamination and how to find scientific correct and economic viable treatment options. This strategy can be adopted to other pollutants (e.g. oil contamination) as well.

One of the challenges pollution combating forces are confronted with is how to recover, store and transport large quantities of pollution waste, particularly generated from spills. Capt. K. Jacob (Jacob –Beratungen) gave practical insight information on technical equipment, organisational procedures and legal requirements. Furthermore he gave practical guidance on systematic procedures for treating waste.

#### Objective 4

Relevant regulation on European and national level concerning pollution response, off-site treatment processes, on-site treatment processes as well as liability and injunction orders were presented by Dr. L. Stemmler, BLG Consult GmbH (figure 3). In addition Capt. K. Jacob presented aspects on pollution prevention.



**Figure 2: Mr. Voss from the Central Command for Maritime Emergencies (CCME) Germany gave an introduction on the German strategy for spill response**

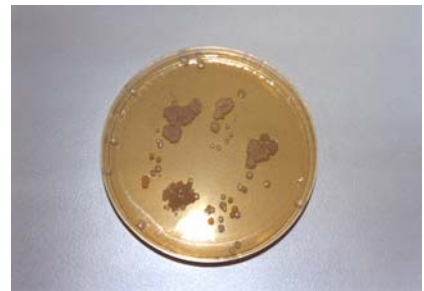


**Figure 3: Dr. Stemmler, BLG Consult, presenting legal requirements in relation to waste treatment and disposal**



**Figure 4: The participants in the in the seminar room**

**Figure 5: Demonstration on the potential of biological treatment strategies: Bacteria are present everywhere**



## 2.3. Contribution by the participants

### Simulation exercise about management of waste from marine pollution.

Apart from the introductory round at the beginning of the course, the participants were asked to contribute actively at a simulation exercise about management of waste from marine pollution.

Dr. Johanna Wesnigk, Dipl.-Ing. Susanne Findeisen and Dr. Martin Wittmaier formulated and moderated a practical exercise for the participants. The exercise was set in the context that an incident had occurred, salvage operations and emergency / contingency plans were in operation, and a command and control team had been set up to deal with the strategic response. As part of the national response plan, a team had been specifically tasked to manage the waste generated.

The exercise was designed as an integral component of the course and to be an important step in the progression of learning through knowledge, understanding and synthesis. The participants should further their skills in integrating the factors that feed into the decision-making process concerning the options on treatment of pollution waste. The objectives of the exercise were:

- to provide realistic scenarios within which participants can recommend appropriate options for waste treatment,
- to encourage a multidisciplinary, team-based approach to the implementation of selected response options,
- to demonstrate the significance of science-based evidence and the quality of information required in developing management plans,
- to provide the opportunity for participants to develop own checklists and flow charts on procedures necessary.

In real life, a number of different parties are involved to plan, coordinate and execute the management of the waste arising from the incident. Therefore this was essentially a role-play exercise. The team represented a typical task force made up of members from different departments, organizations and specializations.

Each participant of your group was designated to play a specific role:

- a) Liason officer from combating team
- b) Volunteer (Oil spill fighter)
- c) Waste / Environmental Authority
- d) Waste Management/Disposal Company
- e) Logistic /Transport Company or officer.

The exercise was divided into two different scenarios: 1: Helgoland Island, 2: River Weser Estuary. Therefore the participants were split into groups of 6, with different nationalities, professional backgrounds and levels of experience, so that each group could deal effectively with one scenario.

The groups were provided with:

- Charts of the effected coastlines
- Description and situation report of the declared incident
- Information on the various treatment techniques and related requirements for waste in your course folder (Lectures)
- A lists of aspects / requirements to be considered for flow chart/checklist:
- Overhead transparencies, pens, and flip-chart as aids to presentation
- Rulers and pencils (for chart work).

All groups were working very actively and dedicated and presented the results afterwards to the other participants (figures 6 and 7). On completion of the exercise after three hours, the groups had

1. defined the scope of functions/ duties for each participant
2. developed a concept for Waste Treatment as a team, considering
  - Separation of wastes (storage, treatment train) in regard to different materials and different concentrations of contamination
  - Interim storage where needed and possible
  - onsite and/or offsite treatment
  - all (pre-) treatment options, including biological, mechanical, chemical / physical, thermal treatment
  - Recycling (i.e. burning as fuel substitute; introduction of treated sediment into road construction, etc.)
  - Disposal (of treated or untreated material, i.e. landfill)
  - Logistics for the execution
  - Flow of Information
  - Costs
  - Regulation /Permits
  - Environmental requirements
3. drafted a flow chart on the decision/working process
4. developed in parallel a more general and complete structured checklist what to consider / what information is needed when being involved in the treatment of pollution waste
5. presented the results to all participants of the course.

The moderators found that the exercise was successful in harnessing the talents and professional experience of the participants and complementing the information provided during the course itself. In conclusion, it may be suggested that the simulation provided a vivid insight into the challenges of identifying relevant criteria which need to be considered in the treatment of pollution waste and the problems on decision-making whilst working in an international forum within strict time limits.



**Figure 6: The participants worked in groups on a simulation exercise**



**Figure 7: The presentation and justification of the results of the simulation exercise on the “River Weser Estuary“-Scenario**

## Summary of the course and final discussion

To conclude the course a final discussion session which was moderated by Dip.-Ing. Susanne Findeisen und Dr. Johanna Wesnigk. The main outcomes of the course were identified.

- There are various techniques available for dealing with pollution waste. Options for (pre)-treatment, recycling and disposal have to be selected considering technical and legal requirements, costs, local conditions and environmental factors.
- Management of pollution waste should be an integrated approach, i.e. has to consist of different solutions for different types and qualities of waste.
- Source separation of waste is a requirement for integrated waste management.
- The separated treatment of different waste streams has to be planned at the recovery stage and needs to be considered for collection, storage and transport.
- The management of waste from pollution accidents is complex and challenging due to the need for dealing with large quantities in short periods of time and the number of parties involved.
- Every incident is different, so there is often no experience with this particular situation.
- Planning of the management of pollution waste is absolutely necessary.

Together a checklist was prepared which listed aspects to consider at the management of waste from marine pollution (Annex 5 d).

## **2.4. Visit of Waste Treatment and Bioremediation Companies**

Four companies and their treatment plants were visited during the course. The treatment and disposal of harbour sediment (Bremen Ports GmbH & Co. KG) was visited at first (figure 8 and 9). Harbour sediment from Bremen waterways, which is usually contaminated with TBT and heavy metals, is pumped into lagoons where it dewatered naturally. The dry sediment is deposited on a special landfill situated on the same premises.

The second company visited was Umweltschutz Nord GmbH & Co. which is a leading company for bioremediation of contaminated soil in Germany. Dr. Killer explained the biological treatment of soil and sediment which is contaminated by oil, other hydrocarbons or chemical substances. The treatment is carried out in large treatment halls. The principle of bioremediation involves the optimisation of the conditions for the microorganisms which degrade the pollutants. The soil is piled to “windrows” and is intermittently mechanically mixed to provide aeration for the microorganisms and to homogenise conditions throughout the windrows (figure 10). Biofilters absorb emissions and the final product of the bioremediation, CO<sub>2</sub>. Another treatment option for highly contaminated material was explained: the thermal treatment plant (figure 11). The treatment principle bases on desorption and catalytic oxidation at high temperatures. Dr. Killer explained the advantages of the treatment options and the conditions under which they are applied.

Also the company Nehlsen Plump GmbH & Co. KG was visited. The company deals with different kinds of hazardous waste by applying different physical and chemical treatment methods. Mr. Winkelmann explained relevant treatment options. A special truck was shown

to the participants, which was equipped to perform oil- water-separation in order to minimise the amount of water to be transported (figure 12). It was also explained how oil-water emulsions are broken and the recovered oil is given to a recovering plant for waste oils. The facilities for solid and liquid ship waste disposal at the pier of the company were shown. Finally the Cryogen-plant has been introduced which separates toxic waste from recyclable material (e.g. viscous oil and metal containers- figure 13) by applying a special process involving freezing.

Finally the waste incineration plant (MHW Bremen) from the company ANO GmbH was visited (figure 14 and 15), which is a modern plant producing energy from waste (community heat).



**Figure 8: Site visit to the harbour sediment treatment facility in Bremen/Seehausen operated by BremenPorts GmbH & Co. KG- one of several dewatering lagoons for harbour sediment**



**Figure 9: Site visit to the harbour sediment treatment facility in Bremen/Seehausen operated by BremenPorts GmbH & Co. KG - the Participants learn about harbour sediment treatment at the plant of BremenPorts GmbH & Co KG.**



**Figure 10: Site visit to Umweltschutz Nord GmbH & Co. - Biological Treatment of oil-contaminated soil in big halls**



**Figure 11: Site visit to Umweltschutz Nord GmbH & Co. - Thermal Treatment plant for highly contaminated soil**



**Figure 12: Site visit to company Nehlsen Plump- a special truck for oil-water separation**



**Figure 13: Site visit to company Nehlsen Plump- this waste can be introduced into the Cryogen plant, in which toxic waste can be separated from recyclable material**



**Figure 14: Site visit to the incineration plant of ANO GmbH & Co. KG- Storage area for waste prior incineration**



**Figure 15: Site visit to the incineration plant of ANO GmbH & Co. KG- Visual Control of the incineration process**

## 3. Results and Conclusions

### 3.1 Evaluation of the course

The participants were asked to evaluate the course according to an own evaluation sheet from the organisers and the DG Environment's course evaluation sheet (Annex 6 a, b). The scale of the organisers evaluation ranged from "good", "adequate" to "poor". The scale of the DG Environment evaluation was different with every question, using 4 or 5 grades. For detailed results please see Annex 6 c. In addition some of the delegates provided an own evaluation with comments and suggestions.

#### Objectives

All participants felt that the objectives of the event were met well (10 from 13) or completely (EC Questionnaire, Question 1).

#### Own Objectives

The evaluation shows that the objectives of a few participants were slightly different than those set for the course. Please see Annex 6 b for the own objectives for the training stated by the participants. Two objectives were only partly met, :

- "Case studies on marine pollution"
- "Sampling and monitoring in the case of environmental pollution at sea "

One objective was not very well met:

- general information on the improvement of the environmental condition after an accident.

Still, 12 participants found that their objectives have been met by the course well or completely.

*Comment: Two participants marked several answers (for different objectives they had) so that the overall number of answers is higher than the number of participants.*

#### Content

The content was considered relevant (7 times) or even very relevant for their jobs (6 times) (EC Questionnaire, Qu. 3a). According to the EC Questionnaire, the level of content was about right for most participants (10 times) (EC Questionnaire, Qu. 3c). Only 3 participant found that the level was too advanced.

The content of each lecture was evaluated on the IKrW Evaluation sheet. The content of the topics altogether received mainly the best mark "good" (11 times out of 13) (IKrW Qu. A). The majority of the participants found that the content of all lectures deserved "good" (here: best mark).

Some critical comments were given concerning the content. Firstly it was stated that some lectures, whilst interesting, did not focus on the stated subject matter – i.e. oil pollution at sea. It was suggested that more case studies would have been useful. There was a suggestion to include on-site health & safety issue and environmental impact in future

courses. Excursions to a harbour with reference to oil pollution would have been received well from some participants. Finally more information on sampling procedures were found necessary.

### Format

The amount of topics covered was about right (9 times) (EC Questionnaire, Qu. 3b). Only one person found that too little was covered, three persons found that too much was covered. Reflecting this, 12 persons found the length of the event about right, one person found the course too long (EC Questionnaire, Qu. 3d).

The majority of the participants evaluated the skills of all speakers to be very good (EC Questionnaire, Qu. 4). According to the IKrW Questionnaire (Qu. C) all delegates summarised that the quality of the lecturers deserved the highest mark. In addition almost all participants thought that their performance and methodology used was very good (EC Questionnaire, Qu. 5; IKrW Questionnaire, Qu. B).

### Organisation

The seminar organisation and administration received the best mark (IKrW Questionnaire, Qu. E) from all participants and this was repeated several times in the “own comments” section.

### Overall

According to the EC questionnaire (Qu. 6) the overall event was found to be very good (10 times) or good (3 times). Everybody would recommend this type of event.

Suggestions were made to provide short synopsis of the lectures to be provided to participants *before* decisions are made to take part in course.

### **Organisers comments on the evaluation by the participants**

The participants had a wide range of backgrounds, experiences and professional interests so that expectations and evaluations concerning quality and the set emphasis of the presentations or some parts of the course differed (Please see Annex 3 b for the background of the participants). Some participants, for example, missed more information about sampling although it was dealt with in one of the lectures. The divers background of participants however was very valuable and used well in the group works.

Not everybody's objectives was similar to the set objectives for the course. It was stated, for example, that oil pollution at sea was seen as the main subject of the course, therefore site visits and contents should have been more focussed. However the topic of the course was “Treatment of Pollution Waste” which also includes other waste than oil. This course was planned to offer information and exchange on a wide spectrum of topics and to improve the link between two very different fields of action: “waste management” and “response to marine pollution”. As it is not possible to include all interesting aspects of this topic the organisers tried to focus on subjects which seemed to be particularly relevant from their point of view.

Generally some information on the objectives and the course content before registration might be helpful in the future. According to the suggestions of the participants, there seem to be demand for further courses which include other topics as well (e.g. health and safety aspects). Altogether the evaluation shows that the course has been received well.

### **3.2 Overall evaluation**

At the end of the course the participants got the opportunity for a final evaluation of the course. Some delegates were commenting on the new perspectives they gained within the week, e.g. that waste management in the context of marine pollution and spill incidents is a complex and challenging task.

Most participants also commented on the course itself and the experience they had. They found the exchange of experiences with other professionals very important and used the opportunity to acquire new knowledge and ideas. It was stated that there is the need for further courses. The course was found balanced and it provided dynamic learning. The site visits and the simulation exercise were well received.

### 3.3 Conclusion

Everything went very well from the organisational point of view due to the engaged lecturers and due to the interest, openness and the lively contributions of all participants. The group was heterogeneous. But the diverse background of participants was very valuable and used well in the group works. Everybody was actively involved in the simulation exercise and in the information exchange throughout the course. Although there was a range of objectives and expectations from the participants the course has been received well.

The participants used the time during the lectures, the group work and breaks for the exchange of professional experience intensely. The joint meals gave extra time for that which was received well.

With completion of the course, the participants increased their theoretical and practical knowledge about relevant treatment options for different kinds of waste from marine pollution. They also expanded their knowledge on the European and national legislative framework in which the treatment of pollution waste needs to be carried out. After lectures, site visits, discussions and exercises they became acquainted with or expanded their knowledge on a wide range of aspects which need to be considered when managing waste from marine pollution. One of the main outcomes was that it might be a complex and challenging task which needs to be incorporated sufficiently in contingency planning.

Bremen, June 2003

**BLG Consult GmbH**

**Institut für Kreislaufwirtschaft GmbH**

i.A. Dipl.-Ing. Susanne Findeisen, MSc  
Course Director

Dr. rer.nat. Martin Wittmaier  
Director