

**4. STRENGTHENING OF MEPA's
MARINE MONITORING CAPABILITY**

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4.1 Operation of MEPA's laboratory

With the full cooperation of MEPA Eastern Province, the laboratory and field equipment were purchased in the Kingdom during the 2nd work stage, and all items were installed in the laboratory during the 3rd work stage (see Table 8).

Thereafter, preliminary technology transfer was started between counterparts from the JICA Team to MEPA personnel. The official inspection for the installed equipment was completed satisfactorily by JICA personnel from Riyadh on November 17, 1999.

The installed equipment was used for sampling and analyses of water and sediment during the 3rd and 4th work stages. Most of these equipment have enough capacity to analyze many sea water/effluent quality parameters, including nutrients and organic substances.

On the other hand, some of the equipment do not have enough capacity to analyze a few but important parameters which require very low reporting limits for the purpose of marine ecosystem protection. For such parameters, the reporting limit had to be set temporarily, at a higher level than the environmental standard. This was caused by the fact that the installed equipment was not totally matched to trace substance analysis but for efficient laboratory skill improvement. At the beginning stage of any laboratory operation, it is natural that the skill progress of technicians has to come before the purchase of very expensive, delicate and, in some cases, potentially dangerous high-class equipment. Once analysis skills are improved, then the high-class equipment can be safely installed and operated in an efficient manner..

In order to maintain and/or improve the capacity of the MEPA E.P. laboratory in the future, the following four issues will need to be resolved at the earliest opportunity:

- (1) Personnel arrangement,
- (2) Continuous improvement of analytical skill,
- (3) Installation or upgrade to high-level equipment,
- (4) Close collaboration with other organizations specialized in environmental chemical analyses at very low reporting limits.

4.2 Recommendation about organization and administration

Data collection and interview about organization structure, tasks and management of Environmental Division of MEPA were conducted during from the 2nd to the 4th work stages.

Table 8 Equipment List of Laboratory

Equipment	Maker/Model	Q'ty	Notes
1 Gas Chromatograph	Shimadzu GC17A	1	FID, Headspace sampler
2 Atomic Absorption Spectrometer	Varian Spectra 220	1	vapor generator unit
3 Spectrophotometer	Shimadzu UV1240	1	UV and visible
4 Benchtop pH meter	Metrohm 744	1	
5 Benchtop EC meter	EC-CON-500/23	1	
6 TOC meter	Shimadzu TOC5000A	1	solid sample module
7 Oil Content meter	Horiba OCMA300	1	
8 Microbiological System	Millipore Milliflex	1	for total coliform
9 Microscope	Nikon Alphaphot 2	1	for plankton analysis
10 Multiprobe meter	Hydrolab Surveyor 4	1	pH, temperature, salinity, turbidity and DO
11 ORP meter	Model 3071	1	
12 Microkjeldahl Asseby	Fisher Scientific	5	distillation flask, condenser
13 Cyanide Distill Assembly	Wilkens-Anderson	3	distillation flask, condenser and heating mantle
14 Phenol Distill Assembly	Wilkens-Anderson	3	distillation flask, condenser
15 Autoclave	ALP Japan KI 30S	1	
16 Shaker	SGM-200-010-F	1	
17 Centrifuge	LIG/UK	1	3000rpm
18 COD digestion vessel	Fisher Scientific	1	condenser and flask
19 Hotplate	SD3DI	1	
20 Ultrasonic cleaner	Neytech 19B	1	
21 Fume hood	Nuair NU 164-424G	1	acid -resistent type
22 Water Purification	Milli-Q 'Academic'	1	
23 Refregator	Thermolyne	1	500 liter
24 Desktop type	Intel Pentium II	1	Windows, CPU Pentium II 350, 15" CRT
25 Laptop type	Acer Extensa 711TE	1	Windows, CPU Pentium II 266, 13.1TFT CRT
26 Printer	HP 895Cxi Color	1	Ink-jet type, A4 size
27 Outside memory	Jazz Driver 2GB	1	Hard Disk 2 GB

It is considered that MEPA E. P. needs to improve the following items to enhance its marine monitoring capability.

- to clarify the precise marine management objectives and strategy of the MEPA E.P.;
- to define and balance budget needs and constraints;
- to collaborate, coordinate and integrate with other environmental related organizations;
- to review and develop its strategy, policies and legislative basis for marine environmental management; and
- to collaborate with other Gulf countries to conserve Gulf environment.

4.3 Technology Transfer

Based on the discussions and preparations in 2nd work stage, the practical technology transfer was started in 3rd work stage. The following technology transfer works have been established under the name of 'On-the-Job-Training' (OJT), lectures and discussion with C/P. Transferred items, details and conclusions were recorded on technology transfer record sheets.

Field monitoring works

- Basics of monitoring plan design
- Health and Safety Planning for field work
- Sampling plan design
- Sample management methods
- Data analysis (calculation and Data handling)
- Preparation works for field monitoring
- Recording of field monitoring results
- Chain of custody procedures

Laboratory works

- Basics of chemistry and laboratory work
- Laboratory Health and Safety procedures
- Sample receiving and sample custody method
- Chemical analysis work
- Data analysis (calculation and Data handling)
- Reporting of results

Other management items

Administrative work

- Discussion with MEPA E. P. staffs about the administration and management system of

MEPA.

Satellite Image Analysis

-Basic theory of the Satellite Image Analysis

During the 4th Stage, the marine monitoring study was led by MEPA and the Team will play a supportive role. Technology transfer emphasized on the basics of professional laboratory analysis and data analysis. Satellite image analysis was also conducted at Jeddha using MEPA's computer facilities. In order to keep the level of monitoring technology, technology transfer and training of MEPA personnel will have to be continued at least three years after completion of this project.

5. DOCUMENTATION

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The following documentation will be supplied to MEPA under the guise of this project. Some of them have already been supplied.

5.1 Reports

- Main report: Explanation of the analytical results of the survey and the recommendations about MEPA's future marine monitoring requirements along the Arabian Gulf coastal water
- Summary report: Summary of the Main report
- Supporting reports: Technical Guideline for Sea Water/Sediment monitoring
Analysis Procedure Flow Sheet
Equipment Maintenance and calibration check lists
- Database: Computer Spreadsheet
Records of the monitoring and analysis results.
- Report of Technology transfer: The records and contents of the technology transfer, experience of each C/P in this survey, and description of the estimated results of technology transfer.

5.2 Documents / Templates for Monitoring works

- Health and Safety Plans for Laboratory and Field Work
- Sample Management Plan
- Sampling list
- Check list for Field Equipment
- Field Record Sheet
- Chain of Custody Sheet
- Sample check list for Laboratory works
- Data Sheets for each analysis items
- Reporting forms for analysis results

5.3 Database

PC database for storing and managing the monitoring results, based on the use of "Microsoft Excel" and "Statistica" data management and analysis software.

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