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UNITED NATIONS INDUSTRIAL  
DEVELOPMENT ORGANIZATION

Distr.  
RESTRICTED  
UNIDO/IOD.53  
2 December 1976  
ENGLISH

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Final report ,

SEMINAR

on

INDUSTRIAL DEVELOPMENT AND

ENVIRONMENTAL POLLUTION <sup>1/</sup>

Baghdad 14 - 16 November 1976 .

IS/IRQ/75/014

by

C.G. Martin  
UNIDO Expert

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id.76-6767

## Industrial Pollution Seminar in Republic of Iraq

1. This report is to be read with the progress report in the same mission, dated June 1976.
2. In this second period of the mission the aims were:
  - 2.1. To assist in running a seminar on "Industrial Development and Environmental Pollution"
  - 2.2. To provide technical assistance and advice in matters arising from the seminar.

These aims have been achieved. The seminar was very successful.

3. The seminar was held from 0900 November 14 to 2000 November 16, in the Pavilion of the Ministry of Industry and Minerals, at the Baghdad International Fair buildings. The complete program is given in Appendix 1. The standard of the papers varied greatly, but some presentations were of outstanding merit - see Appendix 2. There was lively discussion after each paper, with extensive audience participation. The seminar room was comfortable, with good lighting and acoustics, and provided seating for about 120 persons. For some sessions it was filled to capacity, and attendance was never below 60. The audience, the participants and the chairmen represented a wide cross-section of the opinion leaders of Iraq, in science, technology, commerce and government. The seminar received front-page coverage from the press and extensive coverage on radio and TV, over the full three days of the session. UNDP and UNIDO received wide and favorable publicity also.

Much of the credit for the success of this seminar must go to Eng. Kamal Tofiq Tahir, the organizing secretary. His staff-work for the seminar was so good that the whole proceedings flowed smoothly, and without apparent effort. A comprehensive program of entertainment for the participants was also arranged and papers were printed and circulated in good time. A crisis arose on the first day, when we lost the services of our two typists and a female technical assistant, who were injured in a traffic accident. This was overcome by Eng. Kamal and other members of the staff of the Iraqi Federation of Industry, who worked from 5 am to 2.30 am the next morning on the second and third days of the seminar to complete the necessary staff-work.

Special thanks are also due to Mr. Hatam Abdul Rasheed, President of the Federation and Mr. Hassan Makki, head of the technical section of the Federation. Mr. Hatam chaired an ad hoc committee which formulated the final recommendations of the seminar, and acted as chairman and discussion leader for the final session, which adopted these recommendations. Mr. Makki provided able support for the work of Eng. Kamal and other members of the Federation staff, in organizing and conducting the seminar.

Eng. Kamal also translated key papers from Arabic to English for my benefit, and provided me with simultaneous translation of the discussion periods, while also keeping a written record of the discussion in Arabic. The recommendations of the seminar were forwarded to His Excellency the Minister of Industry and Minerals, for his approval and for action and are given in full in Appendix 3.

It has been suggested that Iraq might later act as host for a regional or Pan-Arab seminar in the future. I believe that this would be very valuable and could result in Baghdad becoming the regional centre for environmental science and technology.

4. After the seminar, I was asked by the chairman of the Industrial Safety Institute of the Ministry of Social Welfare to visit the Institute, and to formulate such recommendations as might be appropriate. I did this over a period of two days and the results are given in Appendix 4. I was also asked to provide technical advice concerning specific problems of industrial pollution at the Daura Refinery, near Baghdad, and at the State Edible Oil Industries factory. Reports on these are given in Appendix 5. I also visited the Environmental Science Section of the Institute for Research on Natural Resources.

Other visits which I was asked to make and which would have been valuable, were to the Documentation Centre of the Ministry of Higher Education, to find out what sources of information on environmental matters are available in Iraq and to the Department of the Environment of the Ministry of Health, to find out the scope of their work. Unfortunately time did not permit these visits. I would also have liked to visit the Enginee-

ring College of the University of Baghdad, which has a program of applied environmental research in cooperation with industry.

At the request of the University of Technology, I gave a lunch-time lecture to a capacity audience of final-year engineering students. This lecture was based on my background paper to the seminar.

5. One of the recommendations of the Seminar was that a small Pollution Control Centre should be set up. Basically, this is the same recommendation that was made by WHO expert Mr. R.T. Douglas in his 1971 report, except that the work of the centre is not to be confined to air pollution control work. The first essential is that this Centre should become a "centre of excellence" for training engineers, disseminating knowledge and actually carrying out engineering projects in pollution control and also for advising on the pollution potential of new plants at the time when they are being planned. Two groups at the Seminar proved that they can already do this kind of work and do it successfully namely, the authors of paper A-2 (from the State Rayon Factory, Hilla) and the authors of paper T-2 (from the Federation of Industry).

Specific recommendations are given in Appendix 6.

6. My wife accompanied me on this mission, and she assisted with long hours of clerical work before the seminar.

Both my wife and I found our Iraqi counterparts and indeed the Iraqi people in general to be friendly, cooperative and courteous. During my earlier mission (in June 1976) we found the Baghdad climate very unpleasant but during November it was almost perfect.

As before, the office of the Resident Representative of the UNDP provided efficient and willing assistance and support. I acknowledge in particular the assistance of Mr. Philip Reynolds, Assistant Resident Representative.

Mr. Yacoub J. Joury, Resident Representative was kind enough to assist me with some of the finer points of Arabic etiquette in my opening paper, and he also addressed the seminar in the first session.

APPENDIX I - Seminar Program

Location: Pavilion of the Ministry of Industry and Minerals,  
Baghdad International Fair Buildings.

First day - 14 November 1976, 0900 - Introductory Speeches  
These were delivered in Arabic and  
not recorded in the seminar pro-  
ceedings.

Mr. Subhi Yasin, Undersecretary of the Ministry of Industry  
and Minerals, speaking for H. T. the Minister, who was unable  
to attend.

Mr. Hatam Abdul Raschid, President of the Executive Board,  
Iraqi Federation of Industries, and President, Administra-  
tion for State Food Industries, speaking for the Federation.

Dr. Sa'adoon Kalifa, Director - general of Preventive  
Medicine, Ministry of Health and Secretary-General of the  
Supreme Council for the Environment - speaking for the Council.

Mr. Yacoub J. Joury, Resident Representative of the UNDP  
in Baghdad, speaking for UNIDO and the UNDP.

First working session - 1600 - Chairman, Dr. Sa'adoon Kalifa.

- A-1 Background paper "Development and Problems of Pollution in Iraq" by  
Mr. C.G. Martin. This paper was published and presented in English.  
Dr. Sa'adoon gave a quite lengthy summary in Arabic.

Chairman: Mr. Madhat Khedairi, Secretary, Iraqi Union of Chemists,  
and Managing Director, Nadir Foods Co.

- A-2 "Profits from Pollutants in Industry" by Mr. Mohamed Hadi and Mr.  
Hadi Mohamed, State Factory for Industrial Rayon, Hilla. This paper  
was published and presented in Arabic.

- A-3 "Transport by Automobiles and its Effects on Pollution in Residential  
Areas", by Dr. Haidar Kammoun, Ministry for Municipalities, Government  
of Iraq. This paper was published and presented in Arabic.



Second day - 15 November 1976, 0900 - Second Working Session.

Chairman: Dr. Gazi Darwish, Professor, Institute of Science,  
University of Baghdad;

B-1 "Industrial Ventilation" by Dr. Mahmoud Omar Abdullah, Applied Science  
Research Council, College of Engineering, University of Baghdad;  
This paper was published in English and delivered in Arabic.

B-2 "Toxicity of Materials used in the State Dry Battery Factory"  
Same author, same languages.

B-3 "Treatment of Tannery Effluent in the State Leather Company, Bagh-  
dad", by Dr. Hameed Ali. University of Baghdad, Chemical Engineering  
Department. This paper was published in English and delivered in  
Arabic.

B-4 "Methyl Mercury Poisoning in Iraq", by Dr. Sa'adoon Kalifa. Director-  
General of Preventive Medicine, Ministry of Health and Secretary- Ge-  
neral, Supreme Council for the Environment. This paper was published  
in English and delivered in Arabic.

1600 - Third working session.

Chairman, Dr. Farhang Jalal, President, Administration for Industrial  
Development, Ministry of Industry.

C-1 "Treatment of Pollutants from the Daura Refinery", by Eng. Safia  
Raschid and Eng. Badri Saleh Jassem, Daura Oil Refinery, Ministry  
of Petroleum. This paper was published and delivered in Arabic.

C-2 "Effects of Air Pollution on Public Health" by Dr. Sami Abdul Jabar,  
Director of Occupational Health, Ministry of Health. This paper was  
published in English, but was not presented as the author had to  
leave Baghdad on urgent business.

C-3 "Effects of Air Pollution Inside the Factory" same author, same  
comments.

C-4 "Laws Relating to Pollution of the Environment in Iraq", by  
Mr. Abdul Razak Zubair, Ministry of Justice, Government of Iraq.  
This paper was published and delivered in Arabic.

C-6 "Pollution of Water by Industry", by Dr. Saleh Mutlak, Director, Environmental Science Group, Institute for Scientific Research on Natural Resources, Ministry of Higher Education. This paper was delivered in Arabic but not published.

C-5 "Pollution by Solid Wastes", by C.G. Martin; This paper was published and delivered in English.

Third day - 16 November 1976. 0900 - Fourth working session;

Chairman: Dr. Ibrahim Samawi, Director-General for the Environment, Ministry of Health.

D-1 "Problems of Environmental Pollution in Iraq", by Dr. Sa'adoon Kafifa (See paper B-4 and Dr. Ali Hassoun, Ministry of Health. This paper was published in English and delivered (by Dr. Hassoun) in Arabic.

Chairman: Dr. Farraj Habba, Administration of State Food Industries, Ministry of Industry.

D-2 "Suggested Guidelines for Starting an Air Pollution Programme in Iraq", by Dr. Akrawi Abdul Rahmi, Iraq Meteorological Organization, Baghdad International Airport; and Dr. R.E. Muun, Air Quality Research Branch, Atmospheric Environment Service, Downsview, Ontario, Canada. This paper was published and delivered in English, by Dr. Akrawi. Dr. Muun did not attend.

D-3 "Industrial Pollution of Inland Waters in Iraq - a Fishery Problem?" by Dr. Najun Kainar Al Daham and Mr. Abdul Latif Sarcaav, University of Basrah. This paper was delivered in Arabic and not published.

D-4 "Industrial Pollution and its Relation to Natural Resources" by Dr. Mahoumed Sa'id Katana, Dr. Saleh Mutlak, and Dr. Flayah Hassan Ahmad, Institute for Scientific Research on Natural Sources, Ministry of Higher Education. This paper was presented in Arabic (by Dr. Mutlak) but not published.

1600 - Fifth and final working session  
Chairman, Mr. Hatem Abdul Raschid, President of the  
Executive Board, Iraqi Federation of Industry and President  
Administration for State Food Industries

E-1 "A Laboratory Study of Waste Water Ponds at Mosul," by Dr. Shamin  
Ahmed, Engineering College, University of Mosul. This paper was  
published and presented in English.

E-2 "Success of mechanization for Pollution Control in Private Sector  
Brick Factories", by Eng. Kamal Tofiq Tahir, Chemical Engineer,  
Iraqi Federation of Industries and Organizing Secretary of the  
Seminar and Eng. Youssuf Hassan Mahdi, Chemical Engineer, Iraqi  
Federation of Industries. This paper was published in Arabic and  
presented (by Eng. Kamal) in Arabic.

E-3 "Air Pollution in the Cement Industry" by C.G. Martin. This paper  
was published and delivered in English.

1800 - Summing-up and discussion on recommendations  
conducted by the Chairman, Mr. Hatem Abdul Raschid.

APPENDIX 2 - Comments on the Papers presented

The quality and significance of the papers presented at the Seminar varied greatly and some papers deserve comment.

The two outstanding papers were A-2, "Profits from Pollutants in Industry" by M. Hadi and H. Mohamed, of the State Factory for Industrial Rayon; and paper E-2 "Success of Mechanization for Pollution Control in Private Sector Brick Factories", by K.T. Wahir and Y.H. Mahdi of the Iraqi Federation of Industries.

The former paper describes the results of five years' work in pollution control in a large integrated rayon factory. In the course of this project, the engineers concerned were able to develop saleable by-products from pollutant streams, and overall the project not only abated pollution, but showed and continues to show, a net cash profit. The engineers concerned, and the Director of the factory, Mr. Abdullah Bermani, deserve great credit for this work.

The latter paper described a successful project to abate pollution in private sector brick factories. There are many such factories near Baghdad, all using old fashioned Hoffman-type chamber kilns. These are loaded and unloaded by hand and fired by the strange and apparently irrational system of adding straw (dried grass) and heavy fuel oil by hand, at irregular intervals, through holes in the kiln roof.

The workers become saturated with fuel oil from head to foot; each kiln produces an immense plume of black smoke. The quality of the bricks is poor and variable. Such is the demand for bricks, however, that more of these factories are being built. Over the last five years, four foreign consultants have reported on these factories as a major source of air pollution to no effect. Various more or less impractical suggestions have been made - eg. to shift the factories further from Baghdad or to fire the kilns on gas, but again without effect. There does not appear to have been any effective investigation of occupational health or working conditions. The paper presented the results of an investigation of the problem, which produced an efficient and economical solution by the use

of very simple technology. Several factories have been converted, with complete success. The converted kilns produce no smoke, use 20 % less oil, require less men. (In the Baghdad area, labour is now in short supply). The bricks are of better quality also. The authors showed that the workers in the old factories were exposed to quite excessive concentrations of carbon monoxide and sulphur dioxide and demonstrated that these hazards did not exist in the converted factories. The Ministry of Industry now has a program to pay 80 % of the conversion cost for all factories. And finally, the conversion program shows a net cash return of over 70 % per annum on investment.

Both paper A-2 and paper T-2 were published in Arabic. I recommend that the authors be invited to provide English summaries, as these could be very useful to UNIDO in dealing with similar problems in other countries.

Another very significant paper was D-1, "Problems of Environmental Pollution in Iraq", by Dr. S. Kalifa and Dr. A. Hassoun of the Ministry of Health. This paper catalogues a long list of environmental problems nearly all of which can and should be solved by using known and established technology which has been proved in other countries. This paper points up the fact that in Iraq, as in most countries, both under and over-developed, environmental pollution requires action and the use of known methods, rather than research, if successful abatement is to be achieved.

Paper D-2 "Suggested Guide-lines for Starting an Air Pollution Programme in Iraq", by Dr. A.A. Rahim and Dr. R.W. Muun, was long and scholarly, but it presents a programme with which I personally am not in agreement. Dr. Muun has not visited Iraq and the paper was based on discussions between the authors in Canada. The programme suggested is very sophisticated and based on the concept of "air quality standards", as used by the USA Environmental Protection Agency. It would require quite a lot of scientific manpower, most of whom would be engaged in collecting information on mean levels of atmospheric pollution, rather than working directly on abating known pollution sources. I have discussed my views fully with Dr. Rahim and we were able to achieve a fair measure of agreement.

APPENDIX 3 - Recommendations of the Seminar

These recommendations were agreed by the final session of the seminar and were included in a letter to His Excellency the Minister of Industry and Minerals. The English translation below has been kept as close as possible to the Arabic original. A copy of the latter is also included with the set of papers given to UNIDO.

Recommendations of the Seminar on  
Industrial Development and Environ-  
mental Pollution

Under the direction of the Minister of Industry and Minerals, the Industrial Development and Environmental Pollution Seminar was held, with the aim of ensuring that new industries are developed for better living. This Seminar was prepared and organized by the Iraqi Federation of Industries, with the co-operation of the Supreme Council for the Environment and UNIDO.

In accordance with the aims of the Revolution, which concentrate upon the rapid economic development of our country for the benefit of the people and for the achievement of economic independence, there is concern for human life as the principle way of fulfilling socialist changes. Increased industrial activity comes with concentration upon development of our country. This activity produces positive results in social and economic development. There are also negative results accompanying this activity, such as waste products of productive operations that affect the human environment. This pollution is not yet very serious, but we must not forget the future industrial and other developments which our country is planning.

In future, we must take care in planning our economic development in general and industrial development in particular. This requires consideration of the following principles:

To protect humans from pollution by enacting and enforcing suitable laws.

The establishments concerned must take action to set scientific policies and plans to abate environmental pollution.

It is necessary for individuals to understand pollution and to cooperate with the authorities concerned.

Specially qualified persons and representatives of concerned establishments and bodies have participated in this Seminar. The papers which were presented included certain recommendations, which are listed below.

1. It is necessary to bring up to date our laws for the protection of the environment in accordance with modern trends. The laws must be suitable for the present rapid development of the country and for protecting the people from the dangers of pollution.

2. It is necessary for all existing enterprises, both industrial and social to prepare practical studies relating to abatement of any pollutants which are produced by their activities. The executives of these enterprises must then be persuaded to put into effect the recommendations of these studies, and also to take note of the necessary principles set out below, when planning new enterprises.

2.1. The effects of any pollutant which might be produced, shall be determined in each case.

2.2. Equipment must be provided to abate pollutants.

2.3. Each enterprise must be located in the most suitable place.

2.4. Technology shall be chosen which produces minimum pollution and, where possible, useful by-products.

3. Faster development of industrial estates is vitally necessary, to provide locations for industry. These estates must be provided with all necessary services. Care must be taken to ensure that suitable industries are grouped together, to facilitate control of pollution. In the case of brick factories, the use of obsolete technology creates pollution which is dangerous to workers. We strongly recommend that these factories be compelled to instal atomizing oil burners; and also that new factories be not permitted unless they comply with these recommendations to the satisfaction of the Executive Committee for Modernizing Brick Factories.

4. Because water is vital to the welfare of people, of animals, and of agriculture, it is necessary:

4.1. To assess all water resources, both surface and underground, to find out what pollutants are present.

4.2. During this assessment steps must be taken to abate any pollutants that are detected.

4.3. To provide good drinkable water for all of the people in the country.

4.4. To emphasize regional co-operation in controlling the quality of river waters which flow into Iraq.

4.5. To control wastes of all kinds, and to treat them properly before they enter the river.

5. Because there are many sources of pollution, the following measures are necessary.

5.1. Public transport should be developed, using vehicles which create the least possible pollution.

5.2. The importation of motor vehicles should be rationalized, to get better control of pollutant emission by traffic.

5.3. Provide annual compulsory inspection of all vehicles, so that those which produce excessive pollution are put off the road.

5.4. Pave all unpaved roads and footpaths and fill all depressions containing stagnant water, specially in areas which have a high population density. Also, more trees should be planted in cities.

5.5. Use modern technology to treat waste solid materials, and to produce useful by products where possible.



6. Universities, science organizations and research centres should aim to find successful solutions to problems of environmental pollution, in accordance with their type of work; and there should be closer coordination between them and others who have an interest in such matters, in order to help the economic development of our country, and to protect our people.

7. A new technical centre should be established, as an organ of the Supreme Council for the Environment. This centre should carry out practical projects on abatement of pollution in cooperation with universities, science institutions and all others having an interest in pollution or its abatement.

8. In the field of environmental pollution, we must concentrate on information, education and documentation, to get full benefit from radio, TV, school programmes, and related activities, as sources of public education. A journal on environmental matters should also be published.

9. Everywhere, strong controls are necessary to prevent pollution. It is necessary for the authorities concerned to provide health education, so that the public will be able to recognize pollution and identify its source.

APPENDIX 4 - Report on Visit to the Industrial Safety Institute  
of the Ministry for Social Welfare

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1. This Institute was apparently set up on the recommendation of an ILO expert who visited Iraq in 1971. I have not read his recommendations in full, but I was informed that the organization and facilities which have been provided were generally as he recommended.

The Institute has been criticised sharply by other visiting experts, notably WHO consultant Dr. Alan Bell (1976).

The Director of the Institute approached the Iraqi Federation of Industries, and requested that I should visit, and report. The original request was for a one week's visit, but this was not possible within the time available.

Accordingly, I spent the whole of 20 and 21 November with the staff of the Institute. In these visits I was accompanied and assisted by Eng. Kamal T. Tahir, of the Federation.

2. The Institute is housed in a large modern building, which contains offices, laboratories, a library, and a large hall which is described as "the exhibition". This latter contains an uncoordinated and incomplete display of miscellaneous industrial safety equipment.

The laboratories are well equipped with facilities for industrial analysis, including portable dust, chemical, and flammable gas testers, spectrophotometers, electrical measuring instruments, and some specialized equipment <sup>and/</sup> reagents for estimation of lead in human blood. The library contains a few useful books, but is generally out-of-date and incomplete.

There is a staff of 21 persons, including 10 graduates. These are - one medical officer (male); one engineer with 3 year's experience in the textile industry (female); 2 biologists (female); one biologist specializing in clinical haematology (male); 4

chemists (female): one mechanical engineer (male). The last-named was out of Iraq at the time of my visit. All the others attended our meetings, with the exception of the female engineer, who was in the building but did not attend.

3. The staff see their duty, and the purpose of the Institute, as promoting safe and healthy working conditions in industry. They work to the best of their ability, and they have in fact produced some admirable results - notably, a very well-produced series of booklets for worker education on industrial safety. They understand that visiting and inspecting factories is the most important single part of their work, and for these visits they are divided into four teams, each specializing in one group of industries, as follows:

- Team 1 - Lead processing, printing, petroleum industries.
- Team 2 - Textile and food industries.
- Team 3 - Mechanical and construction industries.
- Team 4 - Leather, plastics and chemical industries.

The Institute has only one motor vehicle, and for this reason only one of these teams can visit at a time.

In fact, most of these visits produce no useful results. Three of the teams are all-female, and it is quite difficult for young girls to try to inspect a factory. None of the inspecting staff have any knowledge of industrial technology, so in many cases they do not know what they are looking at. None of them understood the necessity for obtaining a description or flow-sheet of the process carried out in the factory, and none of them had any real knowledge of industrial mechanical risks, such as dangerous or unguarded machinery. All these points became very clear when I accompanied them on a visit to the State Wet Battery Factory on November 21.

Furthermore, they had accepted incorrect information on a number of industrial risks and processes. For example, the whole staff was apparently convinced that workers in textile factories were at grave risk from silicosis. This misconception arose

through a badly-worded entry in an ILO publication (ILO/20 p. 342 - entry "vegetal and animal dust") and no-one had questioned it. Similarly, there seemed to be considerable confusion between vinyl chloride monomer, which is carcinogenic, and polyvinylchloride resin, which is not.

The staff told me that they spend more of their time on the textile industry than on any other, mainly looking for silicosis.

4. In defence of the staff, they are all very much aware that they lack practical knowledge, and they would all welcome technical instruction. They also lack the knowledge, and the authority, to recommend and enforce remedial measures, when a specific industrial hazard is identified. For example, they were aware of the massive air pollution by respirable silica and fuel oil smoke that is emitted by many asphalt paving plants around Baghdad but they could do nothing about it. In fact, simple and low-cost dust control equipment can be fitted to these plants, and should be fitted. The smoke emission is caused simply by bad and careless operation. Without this knowledge, however, the Safety Institute staff could only suggest that the plant operators wear respirators, and they were not even in a position to enforce this, except perhaps in the case of some private sector plants.

I asked the staff for their recommendation as to improvements required at the Institute, and the unanimous request was "technical guidance".

5. Before accepting that this or any other change should be made I believe that it is necessary to re-define the purpose of the Institute. As I see it, that purpose is to provide information to industry on safe and healthy working practices in factories; and to identify and correct unsafe and unhealthy working conditions. If this definition is correct, the purpose of the Institute is substantially identical with that of the Factories Inspectorate in Britain, or the Ministry of Labour Factories Branch in New Zealand. Both these organizations provide a regular, authoritative and informed service of factory inspection in the interests of worker health and safety. Both have legislative sanctions to enforce their recommendations, in the case of continuing unsafe or unhealthy practices. Neither carries out scientific or analytical work, which is done on demand by other organizations better equipped for this.

For example, in New Zealand, a factory inspector is normally an experienced technician with several years of industrial experience. He undergoes a special course of training, and can call on the services of medical officers, chemists and engineers whenever he requires them. He has legal authority, fully backed by the Courts, to enforce his findings, or even to close an offending factory. The factory inspector spends practically all of his time visiting factories, not doing desk-work in an office or laboratory.

6. I am not prepared to make firm recommendations as to the future of the Institute on such a short and superficial investigation, but as I have been asked to give my views, I offer the following very tentative suggestions for the future.

6.1 The Ministry of Social Welfare cannot promote safe and healthy working conditions unless it has on its staff, or available to it, some persons who are skilled and knowledgeable in this subject. Such people must have a background in industrial technology, and must have practical experience in industry. The difficulties which arise when a person without these skills attempts to investigate an industrial hazard were well illustrated in Appendix 3 to my report on the first part of this mission.

Suitable people can only be obtained in Iraq by transferring working engineers or technicians of proven merit from industry. A full time Chief Factories Inspector or Technical Director of Inspection would be required. He should be an industrial chemical or mechanical engineer of proved ability, with a minimum of ten years experience in industry. His pay and status should be at least on the level of that of Director-General of a large State enterprise. Other men would be required to work under him. Again, they must come from industry, and it might not be easy to get industry to release them.

I suggest that this could be done on a short-term basis for, say two years only. An assignment to the Factory Inspectorate should be regarded as a reward for good work in that it would provide invaluable management training, and would improve the promotability of the man concerned.

6.2 Given that the Ministry of Social Welfare can obtain the services of some first-class people, they need also an instructor to start the program. It is absolutely essential that the instructor should be a man who is actually engaged in the work of factory inspection, not an administrator or a researcher. I believe that a suitable instructor might be obtained through UNDP from the New Zealand Ministry of Labour, and I would be happy to suggest some names.

6.3 The scientific and analytical work now carried out by the Institute should be consolidated with similar work in other organizations. The clinical haematology should go to the Ministry of Health, and the air pollution and dust survey work should go to the proposed Pollution Control Unit - see Appendix 6.

The Factories Inspectorate would then call on these organizations for scientific support as required. It is of course essential that the Inspectorate have the authority to obtain prompt co-operation and service.

6.4 The Factories Inspectorate should exchange information and experience on a continuing basis with similar organizations in other countries. Every industrial hazard encountered in Iraq has been encountered elsewhere. Similarly, staff should be encouraged to use the literature. The Documentation Unit of the Ministry of Higher Education should be helpful in this matter.

6.5 The Government of Iraq has made it clear that its programme of industrial and economic development aims to promote the well-being of all of the people of the country. It is surely incompatible with these aims to permit unsafe and unhealthy conditions in factories, and I have seen ample evidence, from my own visits, that such conditions exist in a few places. A man spends much of his adult life at his place of work, which is therefore a major component of his environment. The aims and recommendations of the Seminar on Pollution might therefore be extended by recommending that an effective Factories Inspection Service be set up in Iraq.

As I see it, this would start from small beginnings - one Director, with clerical staff, and four or five short-term inspectors seconded from industry as part of their training for senior management posts. Serious hazards should be corrected before time is spent on relatively minor ones, and even such a very small unit could achieve a great deal to further the well-being of the people of Iraq. In addition, it would cost less to operate than the existing Safety Institute.

Appendix 5 - Visits to Daura Refinery and State Edible Oil

Industries Company

A. As a result of paper C-1 on "Pollution from the Daura Refinery" and also because of my earlier visit in June, I was asked to spend a day with the Refinery to advise on specific pollution control measures. The main items discussed were:

1. Abatement of oil pollution of the Tigris River by water from the refinery. The existing API separators are clearly too small to handle the present water flow, but they could be much improved, at quite low cost, by installing inclined plate packs in the existing concrete structures. This is well within the competence of the engineering staff and I recommend that it be done forthwith. If experience has shown that steel does not corrode too rapidly in these separators, the **plates** could be of flat steel. There is no special advantage in having the plates corrugated.

2. Much of the smell from the refinery originates in mercaptan emissions. Three of the main sources appear to be the blow-down vessel, the vacuum ejector condenser sump of the vacuum distillation unit, and leakages from pumps in the same unit. The leakages can and should be corrected. For gland-packed pumps, I recommend Union Carbides "UCAR" carbon fibre tape packing. For seal-equipped pumps, simple seal maintenance, or perhaps a programme of seal standardization is required.

The gases from the blow-down vessel and from the vacuum sump can only be controlled by incineration. The incinerator should provide a minimum holding time of 0.5 sec. at a minimum temperature of 750° C and in the case of the blow-down vessel, a safety waterseal and excess discharge vent stack would be necessary, in the interests of safety. I provided the refinery staff with a copy of my proprietary design procedure for fume incinerators.



3. It is proposed to instal a ground-level enclosed flare to replace the present elevated flare , as a pollution-control measure. Tenders have been called and proposals received. In my experience, purchasing this type of equipment against a specification is a very risky business unless the purchaser has the skill to check the design which is offered. The success rate of environmental control installations, even in the most developed countries, is only about 50 %, largely for this reason. The experience of the Baghdad Cement Factory in purchasing an electrostatic precepitation is not untypical. I strongly recommend that the Refinery should have such equipment offers evaluated by an experienced consultant, until such time as one of their own engineers has the experience to do this. In the present case, if the flare should prove unsatisfactory it could set back the cause of pollution control in the Iraqui Petroleum Industry by a considerable period.

4. The sulphuric acid plant at the refinery has given some trouble with plugging of the catalyst bed. I designed a gravel filter for installation on the sulphur dioxide gas main, to correct this condition.

B. As a result of an earlier visit in June, I was aksed to visit the State Edible Oil Industries Company to advise on some pollution problems as below:

1. The effluent water from the refinery carries an excessive amount of entrained fat and no effective separation devices are provided. I strongly recommend that a water usage survey be carried out promptly to ensure that the effluent stream is not greater than necessary and to identify the source of fatty pollution. In the case of the contact condensers of the vacuum systems, closed circuit cooling is feasible and economical.

I do not recommend that this water be circulated through open spray towers, however, as this will inevitably cause complaints of air pollution by rancid fatty odours. The alternatives available seem to be:

A. Closed circuit cooling against river-water in counter-current plate-type heat exchangers with on-line steam cleaning

B. Continue with the open system as at present but provide efficient effluent treatment preferably by inclined plate fat interceptors. Without further investigation I could not make a definite recommendation but my preference is for the latter option because fat interceptors will be required in any case to deal with incidental losses of fatty matter. Inclined plate collectors are easily designed and built and can be very efficient.

2. The large boiler installation is presently discharging flue gas through a battery of very short stacks, thus causing excessive concentrations of sulphur dioxide at ground level. One or more tall stacks should be provided and the British Memorandum on Chimney Heights provides a simple and reliable design basis. Eng. Kamal T. Tahir who accompanied me on these visits, is familiar with the procedure, and has the necessary references.

3. There are many other minor pollution control problems in the Edible Oil Industries factory, which is really a large complex of separate manufacturing units and I could perhaps have assisted with some of these problems had time allowed.

Appendix 6 - Recommendations Concerning The Proposed Environmental Control Centre.

Recommendation no. 7 of the seminar (see appendix 3) states: "A new Technical Centre should be established, as an organ of The Supreme Council for The Environment. The Centre should carry out practical projects on abatement of pollution, in cooperation with universities, science institution, and all others having an interest in pollution or its abatement".

Mr. R.T. Douglas, WHO consultant, recommended in 1971 that a small air pollution control group should be set up in Baghdad, and specified the training and qualifications of the staff. He suggested initially two men, only, who should be industrial chemical engineers of at least 30 years of age, and having at least 5 years of industrial experience. I have discussed these recommendations with him, and he had in mind a group capable of technical enforcement - i.e., locating sources of pollution, and insisting, with legislative backing, that they be abated. Mr. Douglas is the senior officer of The New Zealand Government's Air Pollution Control Branch, and has been very successful in his work. However, the weakest part of the New Zealand air pollution control program has been, and remains, the chain of events that occurs after the Government Inspector has identified a source of pollution, and ruled that it must be abated.

My own estimate is that over 50% of the abatement projects go wrong, or have to be done again, or fail completely, or cost far more than they should. The weak link, in fact, is finding out what to do about pollution, then doing it. <sup>It</sup> is easy to locate a source of pollution, and it is easy to enact a law stating that pollution shall cease. It is quite another matter actually to abate the pollution.

This pattern has recurred in every country that has introduced a pollution control program, and there is no reason to believe that Iraq will be different. Iraq needs laws to prohibit needless pollution, and it needs people to enforce those laws. But to get the greatest benefit from these reforms, there must be a readily available and authoritative source of engineering information on what to do in each specific case, to actually abate the pollution.

This sequence of operations is completely essential in controlling almost any industrial pollution problem. It has two useful byproducts - usually, it shows substantial cost savings or productivity increases in the process investigated, and it provides the best possible training for really top-class engineers and technical managers. Thus a successful pollution control centre rapidly becomes a centre of excellence in engineering and in engineering education.

Iraq is very well supplied and perhaps even oversupplied, with scientists and research engineers holding high academic qualifications, but it is certainly not oversupplied with experienced engineers who can grapple with real life problems, and produce socially and economically acceptable engineering solutions.

A successful pollution control centre, especially if it is used also as a senior post-graduate training facility, would go far towards correcting this apparent imbalance.

The success or failure of the centre will depend largely upon the personality and ability of its first Director. He should be a mature chemical or mechanical engineer, of at least 40 years of age, and with at least 10 years of varied industrial experience, which must include some degree of responsibility for successful design projects. He must be an enthusiastic professional, prepared to work long hours, often under dirty or otherwise unpleasant conditions in industry.

As I noted in Section (5) of the main report, two groups of engineers who presented papers at the seminar showed that they have this sort of ability. (Paper A-2, M. Hadi and H. Mohamed of The State Rayon factory and paper E-2, K.T. Tahir and Y.H. Mahdi, of the Federation of Industries). The Director should have at least the pay and status of a Director-General of a major State industry.

The man selected as director of the centre should be given a short period of training overseas. I would prefer him to visit Singapore, Australia and New Zealand, which would present a very wide range of pollution problems, and abatement schemes. These countries would offer more problems at the stage of development of Iraq than would, for example,

North America or Western Europe. It is very important that some of the visit should be spent with industrial companies that have actual pollution problems, and some with makers of pollution control equipment, as well as with government enforcement authorities.

I would be happy to cooperate with UNIDO in setting up a suitable program, should they be asked to assist. Three months would be long enough for the initial training period.

The director should have a considerable amount of freedom in choosing his staff, because such a small unit must work very closely and harmoniously. Initially, I would envisage the unit as consisting of the director, two or three trainee engineers (seconded from industry for say 2 years) and supporting staff. One competent draftsman would also be very useful.

Later, it might be desirable to appoint a full-time deputy-director. I do not envisage that laboratory or research staff would ever be required. This work could be done very efficiently, when required, by the existing Environmental Laboratory of the Institute for Research on Natural Resources, which is part of the Ministry of Higher Education.

Once the centre is established, and has proved that it can handle pollution abatement projects, inspection and law enforcement can be added to its duties. These activities would require a further two or three experienced engineers, and possibly a technician or helper to set up equipment, take samples, etc. Again, all laboratory and scientific work, and all legal support, should be provided by existing facilities.

I would be happy to assist further on these matters if required.

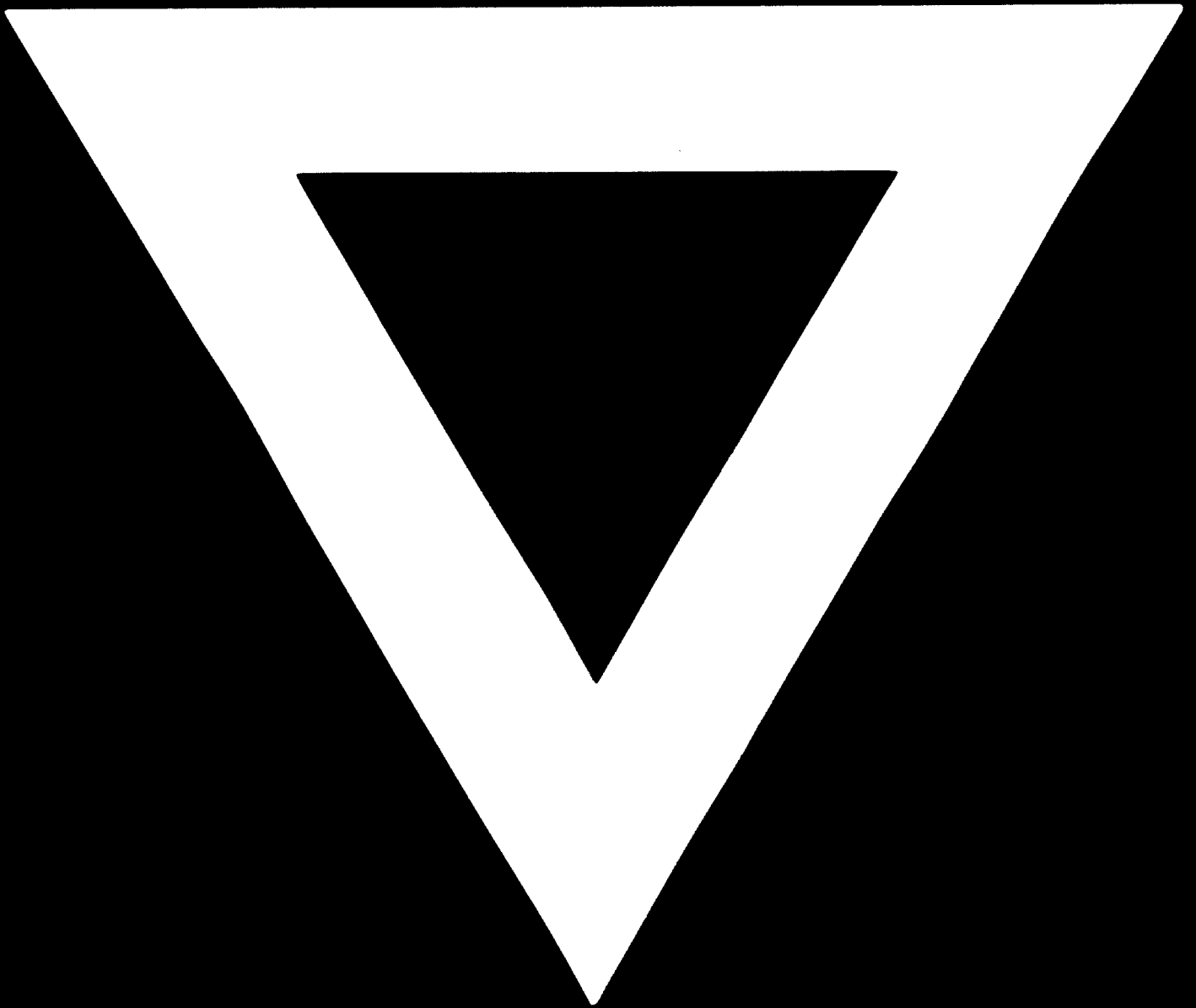


I do not know enough about the structure of Iraqi government and society to offer any comment on whether or not the pollution centre should be an organ of the Supreme Council for the Environment. I do say, however, that the Centre must be so placed that it can and will consult with, and be consulted by, the powerful organizations of Iraqi industry - notably The Ministry of Industry and Minerals, The Ministry of Petroleum, The Ministry of Planning, The Ministry of High Education, and The Federation of Industries, representing the mixed and private sectors of the economy.

The way that the Centre should work is best illustrated by a case study. Paper B-3 of the seminar "Treatment of Tannery Effluent from the State Leather Factory, Baghdad," provides a good example. The author of this paper was given a problem, namely, how to settle the solids from an average flow of 300 m<sup>3</sup>/h of tannery liquid effluent. He did a great deal of work on this, and his paper suggests some answers. Unfortunately, the question that he was asked by the tannery is not the right question. The first step in any and every pollution control investigation is to ask "Why is this pollutant formed in the first place, and can the process be amended so that the pollutant emission is made less?" In a tannery, I know from experience that it is usually possible to make large reductions in the amount of water used, and to save money in the process. Thus the first action which would be taken by a comprehensive pollution control centre would be to optimise the tannery process, and minimise the amount of pollution that is formed. This would require a knowledge of chemical engineering, a knowledge of Industrial economics, and a knowledge of leather chemistry - the latter being obtained, in all probability, from the tannery staff.

Having completed this phase of the operation, the pollution control team would find out what control measures are being applied at similar tanneries in other countries. There are thousands of tanneries in the world, and the problems of the Iraqi industry are certainly not original. In other words, the solution requires reading, and perhaps travel, but not experiment or research. The team would then design suitable pollution control equipment, and either have it constructed locally, or buy it against full design and performance specifications. Finally, the team would commission the equipment, and teach the tannery staff how to operate and to maintain it.

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