OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

RESTRICTED

18841

DP/ID/SER.A/1444
22 February 1991
ORIGINAL: ENGLISH

NATIONAL PESTICIDE DEVELOPMENT CENTRE

DP/INS/89/015

INDONESIA

Technical report: Effluent control/industrial safety*

Prepared for the Government of Indonesia
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of George M. Jett, consultant in
effluent control/industrial safety

Backstopping officer: B. Sugavanam, Chemical Industries Branch

United Nations Industrial Development Organization
Vienna

---

* Mention of company names and commercial products does not imply the endorsement of the United Nations Industrial Development Organization (UNIDO). This document has not been edited.

V.91 21867

Explanatory notes:

Local currency is the Rupia. Current exchange rate is approximately 1850 Rp per 1 U.S. dollar.

Definitions:

1. A.I. = Active ingredient.
2. EPA = U.S. Environmental Protection Agency
3. MOI = Ministry of Industry
4. NPDC = National Pesticide Development Centre
5. PFF = Pesticide Formulating and Packaging
6. UNDP = United Nations Development Programme
7. UNIDO = United Nations Industrial Development Organization

ABSTRACT

Title: National Pesticide Development Center in Indonesia (DP/INS/89/11-52)

Objective: A six week assignment to provide preparatory assistance for establishment of a National Pesticide Development Center (NPDC) for the safe development of pesticides in Indonesia.

Conclusion This study is necessary to meet the demands of a rapidly expanding country and protect the health of the workers and the environment of Indonesia from possible harm caused by non- uniform worker safety standards, non-uniform effluent controls caused by the lack of enforcement provisions and the widespread use of pesticides. To meet these requirements, it is necessary to establish a National Pesticide Development Center (NPDC) to regulate, control, educate, protect and enforce standards that will result in safe manufacturing, safe development and safe use of pesticides in Indonesia.

A laboratory building currently exists near Jakarta that should provide the basic structure and is available for this purpose. The Gresik site initially proposed is unacceptable to this expert. I will explain my reasoning in the body of this report.

Funds required to initiate this center should be channeled to hiring qualified staff and equipment. Irrespective of the manner of financing it is imperative that the Center be seen as an autonomous body and quickly establish credibility for objectivity both with industry and the government. The laboratory director should be given adequate time to establish a system that can achieve this goal.

The initial phase of the center should be devoted to setting up the mechanism of operation and the management outline which will include the pertinent ministries, universities and the pesticide industry.

The area where the NPDC can achieve the greatest impact with the least cost is industrial safety. An effective program should be established in conjunction with the Act No.1 on Safety of 1970, "The Safety Act", and could be easily put in place the first year of the NPDC. Enforcement of worker safety is most important in my mind and the authority for enforcement currently exist.

Next, effluent controls, including the design and installation of an NPDC hazardous waste incineration system should be made available for the industry companies who cannot afford their own incinerator or disposal methods. The incinerator should be used, for a fee, by the plants that currently provide little or no treatment of toxic wastewater. Second year goal of the NPDC.

Dr. S.K. Khetan will address the formulation technology portion of this study in his report.

TABLE OF CONTENTS

SECTION	TITLE	PAGE
	ABSTRACT	3
I.	Introduction	5
	A. Background	5
	B. NPDC	6
	C. Major Problems	7
II.	Industry Profile	9
III.	Findings	10
	A: Industrial Safety	10
	B: Effluent Control	12
	C: Laboratory Location	14
IV.	Recommendations	15
V.	Bibliography	19

Annexes

A.	Job Description	23
B:	J18659 Project Schedule	25
C:	Plants Visited for Pesticide Development Center	26
D:	Industrial Survey	27
E:	Trip Reports	29
F:	List of Contacts	77
G.	Model Treatment Systems for Formulators	81
H:	Proposed Training Courses/Videos	88
I:	Proposed Organizational Structure of the NPDC	89
J:	UNIDO's Substantive Comments	90

I. INTRODUCTION

I was asked to investigate the Indonesian pesticide industry as a consultant in effluent control and industrial safety for a 45-day detail from the U.S. Environmental Protection Agency in Washington, D.C. The specific assignment was for the establishment of a National Pesticide Development Center for the safe development of pesticides in Indonesia. See Annex A of this report for details of the job description. This report is the basis for my findings and is only as good as the sources that provided information on the individual aspects of the report. For a detailed schedule of my assignment see Annex B.

This report will only address the industrial safety and effluent control part of the issue of safe development of pesticides in Indonesia. Dr. S.K. Khetan is preparing a separate report on safe formulations and packaging and other aspects of pesticides.

A. Background

Indonesia is relatively new to the pesticide industry having only entered the market in 1971 when the Pt. Bayer Indonesia formulation plant began operation. The Indonesian government, as I understand it, wanted to develop an agricultural market that could support Indonesia. Their primary crop is rice and their goal was to become self sufficient, which they now are. The 1987 reported rice production was 27.2 million tons. (Section V, #31)

This self sufficiency movement has not been without problems or complications. The pesticide market developed slowly in Indonesia until 1978 when the government implemented a subsidies program whereby the government paid for up to 85% of the cost of the pesticides the farmers were using. This subsidy program was intended to stimulate the market and it did. Approximately 10 formulation plants sprang up in this period and several manufacturing plants as well. See Annex I for a list of the plants the Ministry of Industry reports manufactures agricultural pesticides (approximately 300 formulation products and about a dozen active ingredients).

Annex I addresses only the products under the responsibility of the Ministry of Industry. This annex for example does not include household pesticides. They are under the responsibility of the Ministry of Health. We were unsuccessful in our attempts to meet with the Ministry of Health, the Ministry of Environment, Ministry of Manpower, and the Ministry of Agriculture, all of which have major responsibilities in the pesticide industry. Getting accurate and complete information during this study has been difficult. Out of necessity I developed an industrial survey that is included as Annex D. This provides the current basic information necessary to assess the needs of the NPDC.

The pesticide subsidy program was a graduated program; the longer it ran the lower the subsidy the government support until in 1988 the support program ended. Indonesia had achieved rice self-sufficiency but when the subsidy program ended the market fell and the plants began operating at significantly reduced capacity.

The market received a second shock in 1986 when the government instituted a ban on 57 organo-phosphate (OP) insecticides for use on rice. Several of the plants were set up to formulate mostly OP's and this apparently arbitrary decision to ban all OP's affected these plants severely.

A third problem is now developing. Useless materials ("bogus") labelled as pesticides are being introduced into the market place. Many farmers, now being familiar with using pesticides, have become victims to unscrupulous people who are packaging bogus pesticides. This has resulted in credibility problems for legitimate pesticides.

Consequently, the market for pesticide products is depressed, plants are cutting back on industrial safety needs and treatment control is often non-existent. Some plants have diversified or taken up new product lines (such as brake fluid blending and repackaging) to continue operations but the pesticide industry in Indonesia is suffering economically.

B. National Pesticide Development Center

Because of the need to maintain food self-sufficiency, the problems developing in the industry and an awareness by the government that the pesticide industry needs to be better managed in Indonesia, a program was initiated by UNIDO and the Ministry of Industry to set up a national pesticide development center for the purpose of encouraging the safe manufacture of pesticides. The National Pesticide Development Center (NPDC) is intended to determine how and what functions the center could implement to improve food production, produce safer pesticides and prevent unsafe manufacturing, use, and disposal of pesticides and their waste products in Indonesia. Safe development does not just mean better, more cost effective pesticides. It also means providing a safe work place and disposing of the waste material in a responsible manner that will not harm the environment.

My investigation has found that there are safe, well operated plants and there are plants that are poorly operated and totally unsafe. (See Annex E, my trip reports which are the basis for my findings.) Generally, the multinational companies (e.g. ICI, Bayer, and Monagro) are doing a very good job protecting their employees in the work place and preventing pollution from being discharged at unacceptable levels. The plants on the other end of the spectrum, unsafe or poorly managed, such as Alfa Abadi and Indagro would not be permitted to operate in most parts of the world if their practices were known or health and safety laws enforced. The badly operated plants have the potential to give

the entire pesticide industry a bad reputation and this would not be justified. Pesticides are designed to kill, repel and mitigate pests of various types but they can be manufactured and used safely and the waste materials they generate can be treated and disposed of safely.

The need for industrial safety and environmental pollution control are justification alone for an institution like the NPDC in Indonesia. There is time to rectify the existing problems and to proceed along safe and prudent manner in the development of the pesticide indusrtry in Indonesia. Indonesia may have the resources to make this idea become a reality but they are going to have to place a high priority on producing a center that is efficient and effective. It will take a combined effort of the three major components, the ministries who are involved in the control of pesticides, the universities and the pesticide industry for this idea to become a reality.

C. Major Problems

The major problem in the industry appears to be non-uniformity in every aspect, from the beginning of the purchase of the raw materials to final disposal of the ash from the trash burners. Health and safety and waste disposal have historically taken a back seat to profit in all industries. This is the same in Indonesia as it was in the United States when the industry began in the 1940's. We can learn from the mistakes of countries that have gone through this phase of development of the pesticide industry. The NPDC should play a vital role in ensuring that the same mistakes are not repeated. I will make my recommendations later based on observations and experience. They all need to be implemented if the center is to become a center of excellence. I also understand the needs of competing situations and funding, human needs and management approaches and that the program that I recommend will take at least ten (10) years of hard and dedicated work to achieve. It is much easier to state an idea than to make it a reality.

Funding is a second major obstacle in setting up a program such as the NPDC. The first step has been taken in the awareness of the need for the NPDC. The government will have to do more than realize an idea. The government is going to have to demonstrate financial commitment to the project. UNIDO should require more than an "in kind" commitment and the industry should not be expected to shoulder the total responsibility of supporting the safe development of pesticides. Everyone and everything in Indonesia will benefit from the NPDC and all parties envolved should shoulder the cost.

My observation is that the plants that are providing the proper health and safety conditions and meeting environmental needs will feel that they have less need of funding the NPDC. They already have their own corporate research centers and unless they see a strong commitment from the government they will experience greater difficulty in getting their management to support the center.

A third problem is the limited technical resources available in Indonesia to run the NPDC. The pesticide industry is the best technical resource the NPDC has. The NPDC will fail without their support. In our meeting with the Pesticide Association no more than four people from the industry participated and the only commitment we could get was "we will talk to our management". The hard facts are that the best of the few PhD's graduated by the universities are hired by the industry. The government will have to provide a competitive situation if they intend to have a competent staff to implement a high quality development center. Government/industry rotational assignments should be considered as a means to staff the NPDC with competent personnel. Staff salaries will also have to be competitive. Equipment will have to be state-of-the-art.

Enforcement of industrial safety and effluent controls is non-existent in Indonesia. Indonesia is now developing the environmental laws to deal with this issue. The government will have to commit to an enforcement program that demonstrates that poor or unsafe operating practices will not be tolerated.

II. Industry Profile

The pesticide industry in Indonesia is small by western standards but has the potential of growing rapidly. There are currently about thirteen (13) active formulation plant and five (5) manufacturing plants according to the MOI information. Adding about three household formulation plants we have heard of there may be no more than 16 total PFP plants. There are several other manufacturing plants projected but unless the market rebounds these plants may stay on the drawing board for some time.

The industry formulation capacity is estimated to be about 112,000 metric tons per annum but the industry is currently operating at about 40% overall. The manufacturing capacity is estimated to be about 29,000 metric tons per annum of A.I. but the actual value is estimated to be less than 10,000 metric tons per annum. About 99% of the production is for domestic use and 1% is exported.

The MOI list of agricultural chemical pesticides made is about 300 formulations but a more realistic estimate is about 200 formulations currently made. This is a direct result of the ban on the OP's. Nearly all types of the traditional formulations are done in Indonesia. See Annex I for specific listings.

Most of the A.I.s used are imported. Only about 12 A.I.s are made in Indonesia. A large percentage of the non-active ingredients are imported as well. Generally, we have been told that the raw materials produced in Indonesia do not meet the corporate specifications and the raw materials are imported. A major function of the NPDC would be to correct this situation by assisting the local manufacturers in producing high quality raw materials. Dr. Khetan's report will address this issue.

Plants vary in size from approximately 30 employees to 300 employees depending on the operation and efficiency. Because much of the formulation operations are seasonal some plant from time to time employ large numbers of temporary employees. This is a major source of concern because under the depressed economic situation it is likely that these temporary employees are not getting adequate safety and health training. Most plants operate only one shift per day and five days per week. During peak production periods some plants can run three shifts and seven days per week. All types of formulations are made, the major portion being insecticides but herbicides market is beginning to move and is estimated to eventually lead in sales and volume.

The plant water supply is generally deep-well but several surface water and city water supplies are in use.

Raw material and A.I. drums are generally washed, crushed or cut in strips for recycle to smelters. Other solid waste is disposed of via incineration or hauled from the plant site to unknown locations. Trash is usually burned on plant site.

III. FINDINGS

My investigation covered about 90 % of the capacity in Indonesia. I visited 9 of the 13 formulation plants and 4 of 5 manufacturing plants. These plants formulate all the types of formulation made in Indonesia, all active ingredients formulated and generally all the types of treatment system that are in operation in Indonesia. The emphasis has been on formulation facilities because this is where the most immediate help is needed. Please see Annex E for details of the individual trip reports. They will provide more information than these summary findings.

A. INDUSTRIAL SAFETY

Industrial safety is the first area of concern in my investigation. Pesticides are designed to kill, repel or mitigate and the first priority of manufacturers should be to protect the individual who is making these materials. It is also the most immediate area in which the NPDC can, at minimal cost, have significant impact on the safe development of pesticides in Indonesia.

The Indonesian Safety Act of 1970 requires that worker safety not be compromised. It provides for some severe penalties for violations and should be enforced. My observations are that industrial safety is currently being enforced by the plants. If the plant corporate policy requires safety to be incorporated into their normal operations then the plant generally has adequate equipment, safety programs, adequate medical support and enforcement of the rules. Unfortunately, in several plants we visited this was not the case and the industrial safety provisions were either lacking or non-existent. See Alfa Abadi and Indagro Trip Reports.

1. Plant Visits

The items I looked for were number and location of safety showers, eye wash facilities, respirators, face shields, fire extinguishers, etc. Time and time again I was told:

a. Yes we have all the proper safety equipment in place and it is checked regularly.
b. Yes we have routine safety training programs.
c. Yes we have regular medical support in case of medical emergency.
d. No we have never had an industrial exposure related accident.

On my walk through of the plants at least half the time I found that the information provided in the conference room did not match what was practiced in the plant. On one occasion I was shocked to see the conditions that the workers were exposed to.

There is no regard for the health and safety of the temporary young

people he had employed. This plant was a clear violation of the Safety Act of 1970. This situation was explained to the Government.

Most of the plants had some form of protection, sometimes minimal, but generally consisting of showers in or near the work place. Eye wash stations were not as often available or in working order. In some multilevel production areas showers were only at one level. Paper face masks were generally the extent of respiratory protection except in some multinational plants which generally had better health and safety provisions than the private companies. Plastic face shields and filtered respirators were the exception and not the norm. Many of the sites we visited had strong odors of solvents in the working area. Again, the multinationals generally had some sort of ambient air control equipment in place and the private plants did not.

Several facilities had activated carbon filters and vacuum hoods over liquid fillers and almost all facilities had dust collectors or bag houses over the powder or granular production areas.

Medical support was as non-uniform as the safety provisions. Generally, the plants that had bad or no safety programs also had poor medical support. One plant had no qualified person on the plant site to give an injection of atropine sulfate if the need arose. Another plant had a nurse who went home before noon without the plant manager being aware of his departure. Several plants had unreported exposure accidents. Every plant required reported blood testing of employees but no records were provided. The poor conditions were a direct consequence of the economic climate in the industry and the ownership of the plant.

Again, multinationals had better medical support and in one case the plant had better facilities than the local village. I estimate that about half of the industry is operating in violation of some aspect of the Ministry of Manpower Worker Safety Law of 1970.

2. Conclusion

The major conclusion is that the industrial safety practices and medical support are inconsistent from plant to plant and uniform procedures could easily and cheaply be implemented by the NPDC. Pamphlets and video tape cassettes should be made and distributed to the plants to use in training courses for the employees. They will go along way in educating the employees of the plants. The safety equipment exist. Establishing rules and procedures to implement uniform and routine training programs should be conducted by the NPDC. Because the employees very lives are involved this should be the first order of business when the center begins to function.

B. Effluent Control

1. Plant Visits

Effluent control is as variable as the industrial safety aspects of pesticide formulation and manufacturing in Indonesia. The plants that generally have poor or substandard health and safety programs have inadequate or ineffective treatment systems for effluent control. This is not a direct cause of the economic situation in the industry. The plant that designed good treatment systems into the plant management program have the good safety and health programs. Please see Annex E for details of the individual treatment, solid waste and stormwater handling systems.

Generally the volume of waste water is low for the formulation facilities but in at least half the facilities the plants wastewater is not treated correctly or at all. The primary sources of wastewater are from laundry wastewater from employee garments, showers, laboratory waste, production area cleaning wastewater and equipment washout water.

Treatability studies should be a primary function of the NPDC. No treatability studies were done at the plants. Some companies used studies developed by the parent company and these are the better designed and operated systems. A few companies assumed that land filtration was the best thing to do and this has been demonstrated to be inappropriate. (See Indagro trip report.) No soil migration studies were done, no soil biodegradability studies were done and now the local village water supply near one plant is contaminated with pesticides. The position of out-of-sight-out-of-mind will now have to be corrected and the cost may be greater than the benefit derived.

Several plants demonstrate that through good management practices pesticides can be formulated with no wastewater discharge such as the Petrokimia-Kayaku. This makes sense when you are aware that you do not want water in most formulations (powder, granular, and solvent based PFP's) and that any water in water-based formulation should be product. It cost money (profits) to clean up wastewater and discharge it. Some plants in Indonesia have demonstrated that one can have effective treatment of wastewater and still make a profit.

A basic problem is that the plants which did not do thorough research are the ones that are in trouble. Very little monitoring of wastewater is done and I did not find one case where measurement of the A.I. was required for the plants to be discharged. If it was measured it was at the discretion of the plant. Self-enforcement of effluent controls is, like industrial safety, not the course of action that should be left to the discretion of the operating plant. Some plants also believed that the solution is dilution and that is what is done. The need

for uniform effluent controls is apparent and the NPDC should assist in the development of information that will lead to safe discharges form pesticide plants.

Stormwater management is a concern that most plants do not consider as an effluent that should be monitored or controlled. The plants are generally designed to have the stormwater diverted away from the plant and discharged untreated. Only two plants have put in place a system that checks the stormwater in a holding impoundment before they allow the water to be discharged. Several plants allow the stormwater to be discharged untreated and unmonitored to rice paddies.

There are no national provisions to require effluent monitoring or enforcement. We were advised by Mr. R. A. Breeze, a Canadian hazardous waste expert on loan to the Ministry of Environment, that new environmental laws are coming but would take several more years to implement.

Generally, no groundwater monitoring is done except in a few isolated cases. This should be standard operating procedure if the plant has a land filtration system, irrigation system or a landfill on the plant site.

The U.S.A. and European countries have already implemented standards for formulation plants and if Indonesia is sincere about taking the lead in Asia, they will have to prohibit the discharge of measurable levels of pesticides as well. It is technologically and economically viable.

2. Conclusion

Non-uniform effluent practices and standards are currently the norm in the pesticide industry. This has been demonstrated to cause some problems locally in Indonesia. The NPDC should take the lead in developing treatability studies, providing literature and information where available and training plant personnel in proper and safe treatment of waste effluent generated in the manufacture of pesticides. No activated carbon is currently made in Indonesia that is acceptable for treatment by the industry. One project that the Center could do would be to demonstrate to the industry that Indonesia can manufacture it's own. Or perhaps the Center could contract a firm to make the material for the industry.

A second and more direct help is that the NPDC should design or purchase and build a high temperature incinerator that will, for a fee, destroy hazardous waste generated in the industry. Most plants can not afford a system of the type currently operating at the Bayer plant but they could jointly support the system and take care of their most undesirable waste materials.

Treatability studies should also be done to demonstrate the most appropriate treatment for the particular wastewater generated at the plants. The smaller plants do not have the resources, man-

power and equipment, but the Center should and could provide this service to the industry. Stormwater management procedures should also be made available.

Hazardous waste disposal methods and procedures are also lacking in many of the plants. Education and procedures should be provided to prevent further problems from happening. Indonesia does not need any Love Canals or Bhopals and if the commitment is made they can be prevented.

C.Laboratory Location

The NPDC should be autonomous of the government, universities and the industry. It should work closely with these three bodies so information is effectively transmitted and utilized but it has to be free of outside pressures to direct the end products. The products should be credible, professional and timely. The proposed site of the NPDC was to be at the chemical complex of Petrokimia in Gresik. This is a mistake in my opinion.

Some of the parameters to be considered in selecting a site for the NPDC should be:

1. Availability of the center to the intended user.
2. An uncontaminated environment.
3. Availability of professional staff to carry out the functions of the NPDC.
4. Availability to an international airport.
5. A research atmosphere where professional can associate with their peers.
6. Autonomy from influences of the benefactors of the research.
7. Adequate space and equipment to perform the functions of the NPDC and room for future expansion.

Gresik has none of these components. The Institute for R & D located near Jakarta that Dr. Khetan visited sits idle and has all of the elements necessary for an autonomous appearance. The ministries, universities and industry are more likely to use a system located closer to them. The building is already constructed so start up time and capital outlay for the NPDC would be much less than a center in Gresik. The UNIDO funds would produce more benefit to Indonesia if this facility were selected instead of the Gresik site.

IV. RECOMMENDATIONS

1. If UNIDO decides to fund the initial phase of the NPDC I believe that it should be done over a period of years. The first year funding will be a large part of the total as equipment and staff will need to be in place for progress to be made. My recommendation is to limit the UNIDO funding the first year a maximum of 50% of the approved budget during 1991 as set out in the Formulation Framework and Project Document. Funding for 1992 and subsequent years of development should be phased in as the Center's programs are put into operation. The ministries, universities and industry need to demonstrate a financial and personnel commitment to the project.

2. Appoint Mr. Djumerman as the Director of the Center and give him a three (3) year contract to start the NPDC. (See Dr. Khetan's technical report for justification for this selection.) I propose Mr. Djufri Latif, Public Relations Manager from Monagro as an alternate to the recommendation of Mr. Djumerman.

3. The laboratory should be an autonomous body and be allowed to act independent of the Ministries, universities and the Pesticide industry.

4. The primary governing body of the NPDC should include components of the five known ministries that have responsibility in regulating pesticides, the major universities and the manufacturers and formulator companies in Indonesia. (See Annex J for my recommended organization of the NPDC.)

5. Establish a mandatory health and safety training and certification program as the first major output from the Center. It is the cheapest and fastest product the program could offer and is, in my opinion, the greatest need at present if the Center is to establish credibility in developing a safe pesticide industry in Indonesia. This could be done through a series of video tapes, lectures, pamphlets and training sessions at the plant sites,followed by exams. Annual recertification should also be incorporated in the program. Any plant that chooses not to participate in the health and safety certification program could be prohibited from manufactureing pesticides in Indonesia.

6. Implement training programs for routine, scheduled and non-scheduled inspections of safety equipment in the workplace. Inspection forms should be developed by the NPDC with a quarterly reporting frequency. Data, frequency and inspection forms could easily be maintained at the Center.

Enforcement of the health and safety awareness is essential if the training program is to work. The legal mechanism exists in "The Safety Act of 1970. Unscheduled plant visits should be a key element in keeping the plant honest. Routine inspection by certified safety inspectors should be done and the results submitted to the Ministry of Manpower and the NPDC. A system of fines and penalties, including the jailing of the offending plant

personnel, is provided in "The Safety Act" of 1970 but currently appears to be ignored in some plants .

7. Require all pesticide exposure incidents to be documented and reported to the Ministry of Manpower and the NPDC. Institute severe penalties for unreported exposure accident. Set up a free hot-line where anonymous information on exposure accidents can be reported. During my investigation I have found several attempts to cover up accidents and unless the reporting party is freely allowed to give the information with no fear of retribution, the exposure incidence will go unreported. A complete report of the exposure accident should be filled with the Ministry of Manpower and the NPDC.

8. Assist in the training of routine cholin-esterase blood tests, atropine sulfate antidote injections, CPR, and other basic medical procedures for inclusion in the safety and health training courses. The needs and procedures for the testing and handing an exposure accident is lacking in several plants. Each plant should be required to have a certified safety and health inspector. This should also include, where appropriate, monitoring of local villagers who live in the near vicinity of the plants. The Ministry of Health should work closely with this program.

9. Design, build and operated a high temperature incineration system at a centralized location to treat hazardous and toxic wastewaters and other waste materials produced by the pesticide industry. Use of this system would require a fee based on the quantity and quality of the material being burned. The system should have an effective scrubber system as an integral part of the unit operation. Ash from the system should be contained in a hazardous waste landfill with a double liner.

Because the industry is economically depressed as a consequence of termination of the subsidies program, the ban of organo-phosphates in rice paddy application and the introduction of counterfeit pesticides, the plants generally do not have the capital to set up their own incineration system. A NPDC incineration system would be much cheaper as a contract program to handle the industry's hazardous and toxic waste than to deal with it themselves. This approach would solve a serious problem in the development of safe pesticides in Indonesia and bring in needed funding to the NPDC.

10. Develop treatability studies on all major groups of pesticides manufactured and formulated in Indonesia. The studies should group pesticides according to which particular treatment technology is most effective. All the traditional treatment techniques should be performed on bench scale at first, then, if deemed potentially useful, expanded into pilot scale studies. Much of this information has been developed in other parts of the world so a thorough review of the technical literature available should be the starting point.

Suggested technologies to investigate are hydrolysis, activated carbon absorption, activated sludge, peroxide destruction, soil biodegradability, spray irrigation and percolation. In conjunction with the land biodegradability studies, pesticide soil migration information will also need to be determined.

The recommended treatment train is detoxification, equalization and biological treatment if wastewater exists in the industrial sector. Land filtration should be strictly controlled. Ground water monitoring, pesticide soil migration and soil biological degradation studies should be demonstrated before approval to begin operation. The Ministry of Environment should disseminate this information.

11. Develop and publish recommended procedures for safe disposal of unused, out of date, and bogus pesticides. Distribute this information through the Ministry of Agriculture.

12 Develop a waste minimization program for the pesticide industry. The less they generate the less capital outlay will be required for waste treatment and abatement.

13. Establish an integrated pest management program. Output would be in the form of pamphlets which will provide the needed information to better utilize this method of agriculture. Field tests will have to demonstrate successful techniques.

14. Institute a permit program that would require monitoring of the discharge of wastewater from the plants, including monitoring for the pesticide active ingredients. This may become a requirement if the new environmental laws I learned of 15 September get signed. The Center should educate and train the plant personnel in understanding this permitting process. The next phase would be to implement enforcement procedures for facilities that violate the permits which should prohibit the discharge of untreated pesticides wastewater.

15. Investigate all types of formulation equipment to determine which is the safest to use under operating conditions. From this study publish a recommended equipment list for types or categories of pesticide formulation. Specify safe operating parameters, air flow rate, orifice diameter, material of construction, etc.

16. Publish recommended or required, if the legal statute exist, procedures for handling and disposal of solid waste generated in the pesticide plants.

17. Establish and publish national procedures for handling stormwater runoff from pesticide plants.

18 Establish ground water monitoring procedures of pesticides at the plants that choose to use land filtration systems to treat pesticide wastewater. This should also be required for facili-

ties that have or currently utilize on-site landfills of pesticides. If the plant in is a residential area, local village water supplies should also be annually monitored.

19. Develop a library retrievable system that will generate a thorough literature search on all aspects of pesticide manufacturing, development, formulation, health & safety, treatment, disposal, water quality criteria, application, runoff, groundwater impacts, etc. The ultimate objective is for the NPDC to be a clearing house of information (for a fee) to any party, industry, public, or government. The library would have access to Toxline, Medline, Aquire, Center for Disease Control Center, etc. and be able in a short turn around time provide what information is available in the literature or health services available.

20. Develop procedures and mechanisms for the protection of industrial proprietary information. This could insure confidence and participation by the industry sector.

21. Publish an NPDC newsletter to keep the interested parties informed of the progress of the Center and the services available.

22. Present workshops to interested parties in all phases of the pesticide industry in order to provide the most current information available. This could be done live or on video tape. Subjects should include the impact of the new environmental law on various plants, what one needs to do, the need for safety inspections and safe new pesticide formulations being developed.

23. Provide approved analytical methods for all media, test industry methods to determine accuracy, minimum detection limits, and applicability. The EPA is developing a method (Method 1618: Organo-halide Pesticides, Organo-phosphorus Pesticides, and Phenoxy-acid Herbicides by Wide Bore Capillary Column Gas Chromatography with Selective Detectors) which will measure over 100 pesticides by a single procedure. I will send this method to the Indonesian government for consideration and evaluation.

24. Define which pesticide should be restricted to certified applicators.

25. A satellite center should be considered for the Surabaya area if the NPDC is successful. I project that this satellite center could be operational in 10 years from the startup of the NPDC.

SECTION V - BIBLIOGRAPHY

HEALTH & SAFETY/EFFLUENT CONTROL

1. Emergency Medical Treatment for Acute Pesticide Poisoning; United States Navy, Disease Vector Control Center, Jacksonville, Florida 32212; Misc. 348, July 1969; pp.1-2.

2. Ground Disposal of Pesticides: The Problem and Criteria For Guidelines; PB 197 144; Working Group on Pesticides, Washington, D.C.; March 1970; pp. 1-54.

3. Pollution Control Technology for Pesticide Formulators and Packagers; EPA-660/2-74-094; National Environmental Research Center, Office of Research and Development, U.S. Environmental Protection Agency, Corvallis, Oregon 97330; January 1975;pp. 1-150.

4. Development Document for Effluent Limitations Guidelines for the Pesticide Chemicals Manufacturing Point Source Category; P.B.-285 480; Edited by George M. Jett; U.S Environmental Protection Agency, Washington, D.C. 20460; April 1978; pp.1-316.

5. Public Law 92-500; The Clean Water Act of 1977 as Amended; U.S. Government Printing Office, Washington, D.C., December 1977.

6. 40 CFR Part 455, Pesticide Chemical Effluent Limitations Guidelines, Final Rule; 43 FR 17776 - 17787, Tuesday, April 25, 1978.

7. FIFRA (Federal Insecticide, Fungicide, Rodenticide Act) Registration Division Contact Information Sheet, March 03, 1982. Example structure of effective pesticide registration system.

8. 40 CFR Part 455; Guidelines Establishing Test Procedures for the Analysis of Nonconventional Pesticide Pollutants in the Pesticide Industry; 48 FR 6250-6266, Thursday, February 10, 1983.

9. Proposed Effluent Guidelines, Rulemaking for the Pesticide Chemicals Category, A pamphlet explaining proposed Best Available Technology Regulations, Office of Water, Washington, D.C. 20460, Winter 1983; pp. 1-11.

10. 40 CFR Part 455, Pesticides Chemicals Category; Effluent Limitation Guidelines, Pretreatment Standards, and New Source Performance Standards;Notice of Availability; 49 FR 24492-24507; Wednesday, June 13, 1984.

11. 40 CFR Part 158, Data Requirements for Pesticide Registration; Final Rule; 49 FR 42856 - 42905; Wednesday, October 24, 1984.

12. Suspended, Canceled and Restricted Pesticides; U.S. Environmental Protection Agency. 3rd Edition, 401 M Street, S.W., Washington, D.C 20460; January 1985; pp.1-29.

13. Document Relating to the Process of Environmental Impact Analysis in Indonesia; Unofficial Translation, Environmental Management, Development in Indonesia; No. 29, 1986.

14. Summary of Treatment Effectiveness (mg/l); Ernst P. Hall; July 03, 1986; Lime & Settle; Lime, Settle & Filtration and Sulfide & Filter Technologies for about 40 toxic pollutants.

15. Cross-Program Summary: Pesticides Under EPA Statutes; U.S. Environmental Protection Agency, Office of Ground-Water Protection and Office of Pesticide Programs, Washington, D.C. 20460; February 1987.

16. Registration Standard Guidance Packages; a list of documents published to support the registration for approximately 200 active ingredients with NTIS stock numbers, June 30, 1987.

17. ADI Tracking Report; A list of reference doses, NOEL, LEL, etc. for chronic and acute for about 650 active ingredient study type, effects, etc dated July 06, 1987 form the Office of Pesticide Programs of the U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460.

18. Industrial Technology Division; Technical Publications Available Report, U.S. Environmental Protection Agency, (WH-552) Washington, D.C. 20460; September 1987.

20. Glossary of Environmental Terms; U.S. Environmental Protection Agency; Public Affairs (A-107); Washington, D.C. 20460; March 1988.

21. Country Paper of Indonesia; Presented at the Seminar on Environmental Aspects of Production and Use of Pesticides; Held in Jakarta, Indonesia, 28 November - 2 December 1988.

22. PENYAJIAN EVALUASE LINGKUNGAN (PEL); Representative report; PT ICI PESTISIDA INDONESIA, GUNUNG PUTRI, BOGOR, JAWA BARAT, KOMISI PUSAT AMDAL, DEPARTEMEN PERINDUSTRIAN, 1989.

23. How to Access EPA ERL-Duluth's AQUIRE Database, April 05, 1989, Fact Sheet.

24. Methods for Aquatic Toxicity Identification Evaluations:, Nelson Thomas, National Effluent Toxicity Assessment Center, Environmental Research Laboratory, 6201 Congdon Boulevard, Duluth, MN 5804; May, 1989.

25. U.S. Environmental Protection Agency, Industrial Technology Division FY89 Analytical Cost Estimates; Bill Telliard, Chief, Analysis and Analytical Support Branch, Industrial Technical Division (WH-552); 401 M Street, S.W., Washington, D.C. 20460.

26. Toxicity of Effluent: A Status Report; U.S. Environmental Protection Agency, National Effluent Toxicity Assessment Center, Environmental Research Laboratory - Duluth; 6201 Congdon Boulevard, Duluth, MN 55804; November 1989.

27. Alternative Agriculture by Bette Hileman, Chemical and Engineering News, Vol. 68, No.10, March 10, 1990; pp. 26-40.

28. Water Quality Criteria; U.S. Environmental Protection Agency, Office of Water Regulations and Standards, Criteria and Standards Division, (WH-585); 401 M Street, S.W., Washington, D.C. 20460; May 1, 1990.

29. Pesticides and Food Safety; EPA Journal, U.S. Environmental Protection Agency, Office of Communications and Public Affairs; Vol 16, No.3; May/June 1990;

30. Decision Matrix for Ground Disposal of Pesticide Wastes; U.S. Geological Survey; Waste Parameters; Prepared by Morris Deutsch, U.S. Geological Survey for the Federal Committee on Pest Control, Suitland, MD; undated.

31. Act No.1 of 1970 on Safety; Insert in Indoline NEWS LETTER, Bureau of Public Relations, Department of Manpower, Jl. Gotot Subroto Kav. 51, Jakarta, Indonesia,Special Edition, Vol. 1, No. 2, March 1990.

32. Pesticide Manufacturing and Toxic Materials Control Encyclopedia; Chemical Technology Review No. 168, Environmental Health Rewiew No.3, Pollution Technology Review No. 69; Edited by Maarshall Sittig; Noyes Data Corporation, Park Ridge, New Jersey, U.S.A.; 1980.

33. Pesticide Disposal and Detoxification, Processes and Techniques; Pollution Technology Review No. 81; Edited by A.P. Dillon; Noyes Data Corporation, Park Ridge, New Jersey, U.S.A.; 1981.

34. Pesticide Manual; Basic Information on the Chemicals used as Active Components of Pesticides; 3rd Edition, Edited by Hubert Martin, D.Sc., A.R.C.S., F.R.I.C.; Issued by the British Crop Protection Council; 1972.

Annexes

A. Job Description

B: J18659 Project Schedule

C: Plants Visited for Pesticide Development Center

D: Industrial Survey

E: Trip Reports

F: List of Contacts

G. Model Treatment Systems for Formulators

H: Proposed Training Courses/Videos

I: Ministry of Industry List of Products by Company

J: NPDC Proposed Organizational Outline

ANNEX A

Job Description

DP/INS/89/015/11-52

Post title: Consultant in effluent control/industrial safety.

Duration: 45 Days

Duty Station: Jakarta with travel within Indonesia

Purpose: To provide preparatory assistance for the establishment of a National Pesticide Development Center for the safe development of pesticides in Indonesia.

Duties: Assess the requirements for setting up of a National Pesticide Development Center for the benefit of pesticide producers and users in the country which could also eventually become a regional center for giving advice and assistance for dealing with the environmental aspects for pesticide production and use and application technologies. Specific assignments are expected to include:

- Visit and assess the existing facilities and draw out a broad based scheme for expanding it to become a center of excellence in the development of pesticides with emphasis on formulation using locally available raw materials and in monitoring and developing effluent control methods in pesticide production;

- Take into account the overall situation of the pesticide industry and their present and future needs;

- Advise on the staff requirements, their training needs and the external consultants needed;

- Consider the type of R & D that should be carried out in the country to promote import substitution and application technology;

- Propose the type of institutional arrangements needed to have maximum interaction between the proposed center and industries/institutions;

- Propose mechanisms for the institute to take up contract work with industries in order to generate revenue to run the pesticide development center;

- Advise as to how the Center can provide on a regional basis assistance to various countries in the region on effluent control/industrial safety and application technology.

Based on the findings, submit a report and a project document and a Project Formulation Framework (PFF) in UNDP format in consultation with UNIDO headquarters for the follow-up phase.

ANNEX B: INDONESIAN PESTICIDE DEVELOPMENT CENTER SCHEDULE

DATE	DAY	FUNCTION
13/8	MON	Arrive UNIDO, Visit Min. of Industry (MOI)
14/8	TUE	Visit ICI plant at Bogor w/ MOI
15/8	WED	UNIDO/BANK/UNIDO
16/8	THU	Visit Indagro plant at Bogor w/ MOI
17/8	FRI	UNIDO - Begin reports, memos, FAX EPA
18/8	SAT	Meet w/ Dir. Sri Ambar at MOI - Proj. Sched.
19/8	SUN	Fly to Surabaya and on to Gresik
20/8	MON	Pesticide Research Facility (PRF) Gresik Lab has not been built. Develop industry survey at guesthouse.
21/8	TUE	Visit Petrosida (manufacturer) and Petrokimia -Kayaku (formulator), Gresik. Write plant reports.
22/8	WED	Visit Agrocarb, Surabaya; write plant report.
23/8	THU	Visit Inkita Makmur, Surabaya, write report.
24/8	FRI	Meet Dr. Khetan - Brief him on Project
25/8	SAT	OFF
26/8	SUN	Fly to Jakarta; Rm. Marcopolo
27/8	MON	Visit Bayer, Jakarta w/ MOI; Submit industry survey to Sir. Ambar for plants not scheduled for visits. Bank
28/8	TUE	Visit Dharma & Maskitani in Bekasi
29/8	WED	Visit Alfa Abadi & Kartini in Cirebon
30/8	THU	Visit Monagro in Tanggerang
31/8	FRI	UNIDO - Brief Narasimham, revise schedule, Khetan to Medan, travel agent.
01/9	SAT	Plant report writing - UNIDO
02/9	SUN	Plant report writing - UNIDO
03/9	MON	Plant report writing - UNIDO, Package for Sugavanam.
04/9	Tue	Plant report writing - UNIDO
05/9	WED	Plant report writing - UNIDO
06/9	THU	Brief Sri. Ambar 8:00; Plant report writing - UNIDO
07/9	FRI	Meet with Pesticide Ass.; Report writing at UNIDO
08/9	SAT	OFF
09/9	SUN	OFF
10/9	MON	Plant reports writing -UNIDO
11/9	TUE	Plant reports writing -UNIDO
12/9	WED	Plant reports writing -UNIDO
13/9	THU	Technical report writing - UNIDO
14/9	FRI	Ministry of Environment/Bank/UNIDO
15/9	SAT	Technical report writing - UNIDO
16/9	SUN	Project Document
17/9	MON	Project Formulation Framework Report
18/9	TUE	Unscheduled period. Review progress and revise project reports in conjunction w/ Dr. Khetan.
19/9	WED	ditto
20/9	THU	Leave for U.S.A.

ANNEX C

Plants Visited for Pesticide Development Center

File: PLTvisit
DP/INS/89/015/11-52/J13426

George M. Jett
UNIDO No.S.A. 18659
Date: September 6, 1990

Manufacturers

	Plant	Locations
1.	Petrosida	Gresik
2.	Indagro	Bogor
3.	Kartini	Cirebon
4.	Monagro	Tanggerang

Formulators

1.	Bayer	Jakarta
2.	ICI Pestisida	Bogor
3.	Petrokimia-Kayaku	Gresik
4.	Agrocarb	Surabaya
5.	Inkita Makmur	Mojokerto
6.	Indagro	Bogor
7.	Alfa Abadi	Cirebon
8.	Maskitani	Bekasi
9	Dhrama Ardha	Bekasi
10	Monagor-Kimia	Tanggerang

ANNEX D - FIELD VISIT SURVEY

HEALTH & SAFETY/EFFLUENT CONTROL

Subject: Field Visit to on August , 1990.

From: George M. Jett

To: The Record

Purpose:

On August , 1990 I visited the formulation/manufacturing plant at , Indonesia. The purpose of the visit was to study the formulation/manufacturing plant as part of my assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendations for the National Pesticide Development Center. Dr. Kethan and I met with Mr. , the.

Plant Visit: Basic information; date plant started operation, historical operations, size of plant, # of employees, # of shifts, does penyajian evaluasi lingkungan (plant evaluation report) exits, etc.

Water Supply Source and characteristics, used for both process and human consumption, etc.

Production Operation: Names of pesticides formulated and manufactured. Types of formulations, (powder, granular, liquid, solvent, water based, etc.), percentage of each, domestic sales and export,percentage, use local raw materials, import raw materitorsls, same for manufacturing - import or made in INDONESIA, dedicated equipment, production scheduled - seasonal, storage installation, production area under roof or oper., etc.

Health and Safety: Training program, showers in work place, eye wash, picture instruction, equipment in workplace such as resporiators, proper ventalation, health unit, trained nurse or doctor at plant during all shifts, closest hospital, weekly (frequency) blood test to monitor health of employees, fire training, employees given periodic refresher courses, emergency procedure , etc.

Wastewater and Treatment : Source, flow and characteristics, treatability studies historical data, treatment installed and operated, treatment plant diagram, shock load holding pond/tank, trained operators, etc.

Effluent Data: Performance data, upset and bypass, monitoring frequency, flow, point of effluent (no discharge, indirect discharge, direct discharge), baseline monitoring of recieving stream if exist. If no discharge how achieved; recycle, reuse, land filtration, contract haul, incineration, etc.

Laboratory Does it exits, what level of qualifications of staff, what equipment exist, test methods used, minimum detection levels, how maintained, calibration, etc.

Groundwater Monitoring Baseline characteristics, monitoring points and frequency (especilly around treatment plant if land filtration).

Air Pollution Control How handled, scrubbers, fan ventalation, etc,.

Solid Waste Disposal On site, contract haul, drum crushing, drum washing, incineration, segregation of hazardous from non hazardous, paper, plastics, etc.

Stormwater Handling What procedure used, bypass, hold and test before release, treat, allowed to run off without treatment, etc.

Problems Observed, anticipated, acknowledged. Procedure for handling. Corrective actions taken in the past.

Recommendations and Conclusions

ANNEX E - Trip Reports

		PAGE
1.	Agrocarb.822	31
2.	Alfabadi.829	36
3.	Bayer.827	41
4.	Dhrama.828	45
5.	ICI-Trip.814	50
6.	Indagro.816	54
7.	Inkitama.823	58
8.	Maskitan.828	63
9.	Monagro.830	67
10.	Pertokim.821	71
11.	Petrosid.821	75

12. P.T. Pacific Chemicals Indonesia Questionaire (left original in package provided to Dr. S.K. Khetan in Jakarta on September 21, 1990.)

Subject: Plant Trip Report for Agrocarb, Surabaya, Indonesia for August 22, 1990 Visit.

Form: George M. Jett

To: The Record

Purpose: On August 22, 1990 I visited the Agrocarb formulation plant at Surabaya, Indonesia with personnel from Petrokimia, Gresik. The purpose of the visit was to study the formulation facility as part of my assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendations for the National Pesticide Development Center.

Plant Visit:

We arrived at the facility about 10:00 A.M. and met with Mr. Komarudin G., Process Manager and Mr. Ruddy A.J. Akay, Production Manager. The Petrokimia lead person was Mr. Sidi Pranyoto.

The plant, which began operation in 1977, employs about 60 permanent workers and from 25 to 75 temporary employee depending on the production demands. The facility is situated on 1.5 hectares and the plant personnel estimated Agrocarb is operating at about 50% capacity. The Indonesian government has eliminated the farm subsidies program, the farmers are buying less pesticides and Agrocarb, like most other pesticide facilities in Indonesia, is operating at reduced capacity.

Water Supply

The water supply is from the city of Surabaya. It is used for all operations requiring water at the plant. No water pretreatment is provided at the plant.

Production Operation:

The plant operates from one to three shift per day, five days per week depending on the demand and the season. Mr. Komarudin provided for me a current list of about 47 products that the plant formulates. The plant currently formulates solvent and water based liquids formulations, granular and powder formulations. The current list includes insecticides, herbicides, fungicides, rodenticides and others. About 80% of the production is for domestic use and the rest is exported. All production and storage areas are under some kind of roof.

Most active ingredients are purchased form outside Indonesia except a few that are purchased form Petrosida. The filler materials, like kaolin, sand, xylene and kerosene are purchased in Indonesia. The equipment is dedicated to the type of formulation, ie. liquid formulation is done only in one area. The unit operations are cleaned between dedicated pesticide runs and the wastewater is discharged to a pit.

During the cleaning step recycled and reuse of rinse solvents are used when possible. If the pesticide is blended with kerosene, the kerosene is collected in a drum and saved to be used in the next batch of that particular pesticide when it is formulated. Powder and granular material that escapes packaging are dry vacuumed in that production area and put in the next batch of that formulation.

Health and Safety:

The plant personnel advised me that they had scheduled training session for the employees in health and safety procedures. When new hires come on board they receive training and all take refresher courses once per year. The plant also has designated fire control personnel which receive additional training. I was advised that the production areas had safety showers and eye wash units. During my walk through of the plant I observed that there were usually eye wash units close to the production operations but very few safety showers. I advised the plant personnel that I thought that more showers should be installed. The basis for this comment was that some formulation units were void of showers. I also saw no face shields or respirators in use in the production area that were in operation. Several operations were not in operation because this is the slack season and the reduction in the government subsidies program mentioned above.

The nurse in the plant clinic advised me that the last reported accident was September 1989 when a plumber reported to the clinic with symptoms of cholin-esterase inhibition. He was exposed to pesticide dust and developed systems that required two ampules of atropine sulfate. When he stabilized he was sent home. The nurse also advised me that all employees, both permanent and temporary, are given blood tests once per two months. No data was provided.

The plant was being upgraded in several areas. A new herbicide areas was under construction and I assume to replace the older 2,4-D facility at the rear of the plant. Neither areas had safety showers so I recommended that showers be installed. The back section of the plant where the old herbicide operation is situated could be upgraded significantly by installing a safety shower and providing adequate face protection and a general cleaning of the area.

There appeared to be adequate fire extinguishers in the production area. Respirators and gas masks were in the administration office. No smoking in the production area was required and no food or drink was allowed. The production area seemed to be adequately ventilated. All employees are required to shower after leaving the production area and the plant provides overhauls and cotton face masks. A nurse was on staff for all shifts and a doctor was at the plant three day per week I was advised.

Wastewater and Treatment:

The source of the wastewater is formulation vessel wash water, shower and laundry wastewater, sanitary and laboratory wastewater. The reported flow is 360 cubic meters per month. The plant discharges all wastewater to the SIER (Surabaya Industrial Estate Rungkud) treatment system . Before discharge the waste is collected in small pits, adjusted to a pH of about 12, mixed and pumped to a storage concrete tank that is closed. The tank has a 10 cubic meter capacity. The waste is stored in the concrete tank until the pesticides are presumed broken down, the BOB, COD and other parameters are measured and discharged to the central treatment system. The plant showed me representative samples of the wastewater analysis. No pesticides are monitored in the effluent stream or tank. The fee the SIER charges is determined by the quantity and quality of the waste the plant discharges.

The drum washing area did not appear to be effective for proper cleaning. Two men were setting on top of the 55 gallon drum with a 5/8 inch hose and running water into the drum until it was full. They would then dump the contents of the drum into the pit located in that area of the plant. I was advised that there was a caustic rinse prior to this water wash. There was some white liquid on the floor of this area but the area was not well maintained. No treatability studies have been done. The treatment system has operated since the plant began operation in 1977. There was no provision for shock loadings such as spills or upsets. The plant personnel reported that they use sawdust to clean up liquid spills. The sawdust/diesel mixture is burned in the plant incinerator.

Laboratory

The laboratory is mainly for quality control, contains a gas chromatograph, one HPLC, a spectrometer, and the usual other equipment such as pH monitors, balances and glassware. The laboratory also stores representative production samples for up to two years in case there are any questions about a particular production run. Trained chemist were on staff. Reported analytical minimum detection limits were in the 1.0 ppm range. The methods were provided by the A.I. manufacturers.

Effluent Data:

See wastewater section above for information on effluent data and how it is handled. There is no baseline monitoring required. Generally no discharge was the reported norm for the production operations except as reported above. This is reported from recycle and reuse. No land filtration systems were in place.

Groundwater Monitoring

The plant was required by the local authorities to do groundwater monitoring several years ago around the landfill site. The plant drilled three meter test holes and analysis the water. The water table was reported to be one meter. No pesticides were reported from these tests. This was a one time deal. The ten test holes are currently not in use.

Air Pollution Control

Air pollutants in the newer production area are handled by air scrubber systems. In the liquid formulation area the air is pulled through a carbon filtration system before being pulled through the caustic scrubber. The wastewater from these scrubbers goes to the treatment tank and the scrubbed air is discharge to the atmosphere. In the older section of the plant fan ventilation was provided and these sections of the plant were open for free air flow.

Solid Waste Disposal

The solid wastes are currently stored on the plant site. The plant had a landfill on the plant site but it is full and closed. The plant is waiting for the government to open a landfill so they can dispose of the stored material. Paper, trash and plastic is burned in the plannt incinerator. The plant incinerator produces about one barrel of ash per day. The metal drums are currently cut into strips for reuse or crushed for recycle by a metal reclaimer.

Stormwater Handling

Stormwater is collected into pond and discharged without monitoring or treatment to the city storm sewer. This includes the roof drains.

Problems .

Inadequate shower facilities, inadequate face protection on some production lines, poorly maintained drum washing area and storage of hazardous materials in open areas.

Recommendations and Conclusions

Implement a clean up process for the rear area of the plant. Install safety showers and enforce safely equipment procedures in all production areas. Set up an effective and safe drum washing facility. Store hazardous materials in a roofed and dyked area to prevent stormwater or other runoff.

Subject: Field Visit to Alfa Abadi/Kartini Joint Formulation/Manufacturing plant at Cirebon, Indonesia.

From: George M. Jett

To: The Record

Purpose:

On August 29, 1990 I visited with Dr. Khetan and Mr. Agus Wahyudi of the Ministry of Industry the joint privately owned Alfa Abadi-Kartini formulation/manufacturing plant at Cirebon, Indonesia. The purpose of the visit was to study the formulation /manufacturing plant as part of my assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendations for the National Pesticide Development Center.

Plant Visit:

We arrived at the plant at 1:00 P.M. and met with Mr. Deni P. Satari and Mr. Beni Septiono. Mr Satari, the assistant plant manager, advised the plant began the formulation operation in 1978 and manufacturing in 1986. One shift per day five days per week is currently the production mode. The plant has employed up to 200 permanent employees and as many as 500 temporary employees when the plant was fully operational. The plant is situated on 4.5 hectares in a residential section of Cirebon next to a shrimp packaging plant.

Water Supply

The plant water supply is from the City of Cirebon and receives no pretreatment prior to use. No water analysis is done on the water supply. The water supply is used for all plant needs both personal and industrial.

Production Operation:

The plant formulates and manufactures monocrotophos, carbofuran and BPMC as well as other active ingredients intermittently according to the plant personnel. Mr. Satari reviewed and corrected the plant product list that the Ministry of Industry provided and indicated which products were still formulated. Non-active ingredients are both imported and purchased locally if acceptable to the finished product specifications. The plant formulates mostly liquid and granular organo-phosphate insecticides. Most of the production, we were advised, is for domestic sales.

The plant was reported to be designed by the Kartini personnel with help form Mitsubishi, Nissan and some Chinese assistance.

On our walk through I observed that no manufacturing was being done. The only formulation in operation was a make-shift monocrotophos liquid formulation line that was being operated in an unsafe manner. This will be addressed in detail under the health and safety section of this report. The plant appeared to have little production or formulation business. The granular line was also not in operation.

Much of the storage area of raw materials, the production area and the storage of the finished product and supplies was roofed but there were containers every where on the plant site.

Health and Safety:

Mr. Satari advised us that the plant had routine safety and fire training, showers, eye wash stations and other safety equipment in the work place. The operators, both male and female, were also reported to have shower facilities, protective clothing and not allowed to eat or smoke in the production area. A doctor was reported to visit the plant weekly. Bimonthly cholinesterase (CE) tests and baseline CE levels on new employees were reported by Mr. Satari. No data was provided.

On our walk through of the plant none of this information appeared to be correct. The entire plant appeared to be in a state of general disarray; barrels (some open, some closed, some under roof, many damaged and rusting) of product, trash and unknown materials were randomly left at many areas of the plant. Every portion of the plant I visited appeared to be unclean, disorganized and unsafe. Limited safety features, some of which did not work when checked, were available. Apparently the ban on organo-phosphates and the end to the subsidies program has resulted in major problems for this plant.

The showers and eye wash stations were either out of order, locked, or non-existent. No safety equipment was in use and operators were working with the liquid monocrotophos formulation without protective gloves, face masks or coveralls. There were no hoods or other protective equipment in this area. The 35 or so temporary employees were working in the street clothe with exposed hands and feet. We observed cleaning up of the monocrotophcs spills with cotton rags and bare hands.

Mr. Wahyudi confirmed that their were no shower facility for the temporary female employees and that they were working in their street clothe. The only facilities available to them was a spigot and some soap outside the filler station so they could wash their hands and feet after the shift was over. The average age of the young woman running the filling line was estimated to be about 17 by Mr. Satari. He explained that the local customs prevented him from enforcing the safety

requirements.

Mr. Satari advised us that the plant had never had a pesticide exposure accident since the plant started operations. I asked Mr. Satari to see the clinic and the doctors office, the atropine sulfate antidote supply and the nurse. The doctors office was a bedroom that was in much disarray. The plant did have a clinic but no atropine sulfate could be found there. We visited the men's shower facilities which is where we found the male nurse and the atropine sulfate supply.

The plant nurse advise me that he had given two atropine sulfate injections to a female employee in July of 1990. The exposed employee was not taken to the hospital which was estimated to be 3 kilometers from the plant. She was allowed to stabilize and sent home. The nurse advise that the plant procedure is to keep the employee out of the production area for a few days and then allow the employee to return. No cholinesterase tests are done on the exposed employee before he or she is permitted to return to the production area.

Wastewater and Treatment:

The wastewater sources in the plant are from sanitary water, male employee showers, employee garment laundry, laboratory waste and manufacturing wastewater. The production and formulation areas were reported to be washed down once per shift.

The wastewater treatment system was reported to be a conventional activated sludge system preceded by physical chemical removal by alum and ferrous sulfate. The system was reported to be designed by a professor at Bandung University. The reported BOD and COD removal was 98 and 95 %, respectively. No treatability studies were done to determine the performance levels of the system. The system was installed in 1986. The treatment system had a low flow during our visit with several units not in service. Sludge was reported landfilled on plant site. The effluent from the treatment plant is mixed in ponds at the back of the plant with sea water and discharged to the ocean by the tidal action.

The formulation flow was reported to be 1 % of the total flow from the plant. The total flow from the treatment system was reported to be 200 m^3 per day at peak production. Spills are cleaned up with a sawdust/ diesel mixture and burned at the plant site in open pits.

Effluent Data:

No effluent data was provided. Generally the plant does not monitor the A.I. in the effluent wastestream.

Laboratory

Dr. Khetan visited the laboratory while I looked for the atropine

sulfate supply. The plant personnel reported that both gas chromatography and HPLC equipment where in use in the laboratory. A full time chemist was also reported on staff but I did not see the chemist or the equipment. We were advised that the primary purpose to the laboratory is to insure product quality for the reported two year shelf life.

I assume that the laboratory does the conventional BOD and COD tests if they are required before discharge to the ocean. No sampling station was observed on our walk through. A.I. methods detection limits were reported in the 0.1 ppm. range.

Groundwater Monitoring

No groundwater monitoring was reported. No data was provided.

Air Pollution Control

The air pollution control handling system in granular formulation was a dust collection system but it was shut down as no production was being done. Large qualities of pesticide granular material was observed on the granular production area floor.

Solid Waste Handling

The plant looked like a hazardous waste site. Open drums of formulated pesticides and who knows what else were exposed to the elements. Used drums and trash were spread all over the plant in uncontained areas. Solid waste was apparently dumped at random.

Stormwater Handling

The stormwater handling procedure is to bypass the treatment system and runs uncontrolled to the sea Contaminated rainwater could easily be discharged from this facility. No monitoring of the stormwater is done.

Problems

The major problem observed was worker safety. The treatment system did not appear to be functioning effectively as well and stormwater runoff could produce serious environmental problems. The plant was in a general state of decay.

Recommendations and Conclusions

Enforce the Act No. 1 of 1970 on Safety at this plant. The formulation procedures we observed could easily kill one of these untrained, uneducated, young people. The plant is not operating in a safe manner and the control of the effluents from the plant site are substandard or non-existent.

The plant operations indicate lack of concern for the safety of the people Alfa Abadi has employed.

This single plant has the capability of giving the entire Indonesian pesticide industry a reputation that will be difficult to correct. This plant represents many of the needs for a national pesticide research center but the more immediate problem is the need of enforcement of worker safety procedures. This plant is in direct violation of Act No. 1 of 1970 on Safety.

Subject: Field Visit to Bayer Indonesia, Jakarta, Indonesia

From: George M. Jett

To: The Record

Purpose:

On August 27, 1990 I visited with Dr. Khetan the pesticide formulation plant in Jakarta, Indonesia. The purpose of the visit was to study the plant as part of my assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendations for the National Pesticide Development Center.

Plant Visit:

Dr. Khetan and I arrived at the plant at 10:00 A.M. and met with Mr. Manfred Adrian, plant manager. We were accompanied by Mr. Agus Wahyudi of the Ministry of Industry and Ms. Widodo from Petrokimia.

The original plant, the first formulation facility in Indonesia, began operation in 1972 but Bayer built the current facility to German standards in 1981. The current plant employs 260 permanent employees and as many as 30-40 temporary employees during peak seasons. The plant is situated on 5 hectares in Jakarta and formulates both household and agricultural pesticides. The facility operates usually three shifts per day and sometimes six days per week. The plant has a licensed capacity of 50,000 metric tons per year but seldom achieve that level of production.

Water Supply

The plant water supply is from a the city of Jakarta but due to the erratic availability the plant is installing their own 275 meter deep well. The new well is expected to be operational in September 1990. Because of the unreliable water source the plant maintains a large volume of water on plant site for fire safety.

The plant currently pretreats by demineralizing the water supply before using in the process. The water was analyzed when the plant began operation by the local authorities for safety but no pesticides residue analysis have ever been done on the water supply. The water supply is used for all plant needs including potability and process use. The water that is used for human consumption is first boiled.

Production Operation:

Mr. Adrian checked the Ministry of Industry list of products and indicated which were still in the manufacturing operations. The plant formulates about fifteen agricultural pesticides and an unspecified number of household pesticides. The plant imports the active ingredients from Bayer in Germany. Filler materials are generally imported unless locally available materials meet plant specifications. One example of this process is the emulsions used are imported form Bayer in Germany. The plant was reported to be the largest pesticide formulation plant in Indonesia.

The major categories formulated are emulsifiable concentrates, granular, solvent based liquids and wettable powders. A large percentage of the household formulations are aerosols. The approximate breakout of the formulation products are 25% liquid, 65 % granular and 10% powder. Production is scheduled so when the agro-chemicals are not in demand the household pesticides are formulated. This keeps the plant running year round.

The plant export a large portion of their household pesticides throughout Asia. The agro-chemicals are sold domestically.

All storage of raw materials, the production area and the storage of the finished product and supplies are under roof. The entire plant raw material storage, production and finished products areas are dyed and all spills are contained.

Health and Safety:

The plant personnel indicated that the plant workers have routine health and safety training. The fire team participates in routine practices and annual competition during safety month exercises. Mr. Adrian advised that there were safety showers and eye wash units in or near the production area and in the laboratory. The eye wash system were the boric acid canister type. Signs are posted in the production area as reminders that no smoking is allowed in the production area, safety protection is required, etc. Respirators, face shields and other necessary protective equipment are also in the production area we were advised. Our walk through confirmed this information. We also observed a sprinkler systems, smoke alarms and automatic door locking fire prevention measures. The production area immediately around the filler lines are under hoods that remove the vapors from the production site to a central exhaust system. The effluent from these air handling systems are scrubbed and the gases vented to the atmosphere.

The plant maintains a clinic on plant site and a full time nurse for all production shifts while formulations are done. A doctor visits the plant regularly. Bimonthly cholinesterase (CE) tests are run on the production workers according to Mr. Adrian. The plant does baseline CE levels on new employees we were advised. The plant also has a contract with the local hospital located 5 kilometers from the plant for any emergency situations. No pesticide exposure related accidents have been reported since the plant started up in 1981. The plant appears to have a good safety program.

During our walking tour of the production area we observed what appeared to be a well organized plant with very good safety practiced. The operators were wearing the prescribed equipment and showers, etc. were generally located near the production areas. The clinic seemed fully stocked and qualified for an emergency. The air handling systems were in working order as well as the showers, etc.

Wastewater and Treatment :

The wastewater sources in the plant are from sanitary water, employee showers, laboratory waste, aerosol water bath testing, drum washing and manufacturing wastewater. The laundry is done at the Bayer pharmaceutical plant nearby. The wastewater is collected and treated by an extensive treatment system. The plant uses COD as the control parameter. Mr. Adrian estimated that the sanitary waste amounted to about 99% of the flow to the waste treatment plant. The drum washing wastewater is incinerated because of the fuel value and toxicity.

The wastewater system was installed in 1984. It consists of hydrolysis system that operates at pH 12, followed by activated carbon filters, followed by activated sludge. All concentrated waste, such as the 5 m3 laboratory waste, are incinerated. The treatment system was designed by Bayer. The plant has excess incineration capacity so they are able to, for a fee, burn some of the waste material generated by other plants in the industry.

The procedure for shock loading or spill is to absorb the material with a diesel/sawdust mixture and this material is burned in the plant high temperature incinerator.

Effluent Data:

No effluent data was provided. The plant has measured for the pesticides A.I. in the effluent and we were advised that there are no detectable pesticides in the effluent. The detection limits are reported in the ppm (parts per million) range. The plant discharges the treated wastewater to a receiving stream making it a direct discharging facility.

Waste liquids (solvent rinse) are collected and reused in the process at a later date were possible. The formulation area is generally not washed down, is either dry vacuumed or swept with a broom.

Laboratory

The plant has a fully equipped and staffed laboratory. The laboratory is primarily maintained for product quality control but is also used to monitor the A.I. in the effluents. The major equipment utilized for A.I. analysis is a gas chromatograph. The lab had no HPLC. The lab on occasions also analysis for A.I. in wastewaters. The traditional analysis such as BOD, COD and TSS are routinely run at the lab. The pesticide methods were provided by the parent company and generally have detection limits in the ppm. (parts per million) range. The laboratory methods are run by a trained chemist and technician. The laboratory has safety hoods, a shower and eye wash stations.

Groundwater Monitoring

No groundwater monitoring has been done at the plant.

Air Pollution Control

The air pollution control handling system consists of a liquid scrubber in the solvent area and dust baghouse in the powder and granular areas. These systems appeared to be well maintained.

Solid Waste Disposal

The only solid waste generated was ash from the incinerator which is hauled off by the local authorities, presumably to some kind of landfill. The plant burns all concentrated waste, all trash, sawdust, unused containers, etc. No landfill is done on the plant site.

Stormwater Handling

The stormwater handling procedure is to collect the rainwater into a concrete pond, measure the pond for control parameters and if acceptable discharge the water.

Problems

The plant was generally well run, had a good treatment system and had the proper safety equipment. In some areas the noise level appeared to be higher than might be considered safe for prolonged exposure. This should be measured and if found to be high, hearing protection should be required in these areas.

Recommendations and Conclusions

See problems above.

Subject: Field Visit to Dhrama Ardha, Bekasi, Indonesia.

From: George M. Jett

To: The Record

Purpose:

On August 28, 1990 I visited with Dr. Khetan, Mr. Agus Wahyudi of the Ministry of Industry and Ms. Widodo of Petrokimia the Dhrama Ardha formulation plant at Bekasi, Indonesia. The purpose of the visit was to study the formulation plant as part of my assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendations for the National Pesticide Development Center.

Plant Visit:

We arrived at the plant at 10:00 A.M. and met with Mr. Hisjam Djawahir, the plant manager and Mr. E. Muchlis, his assistant. Dhrama Ardha Forma is a Shell joint venture company (49 % Shell/ 51 % local ownership). The plant began production operation in 1984. It employs 50 permanent employees and as many as 20 temporary employees. The formulation plant is situated on 6.0 hectares in a residential area. Only 2 hectares are currently in use, the remaining are available for expansion if the market demands grow.

Water Supply

The plant water supply is from a 120 meter deep well with no pretreatment prior to use. The water was analyzed when the plant began operation by the local authorities for safe use but no pesticides residue analysis have been done on the water supply. The water supply is used for all plant needs including potability and process use.

Production Operation:

The plant operates one shift per day, five days per week and formulates mostly liquid formulations with a small portion of powder formulation. The plant manager reviewed the Industry of Ministry list and provided an update of the current production products. These products include carbamates and chlorinated hydrocarbons. No granular is formulated at this plant.

The 1988 ban on organo-phosphates severely affected the plant product mix and economics. The plant subsequently diversified. Dhrama now formulates brake fluid as a major production line and are switching over to household pesticides such as aerosol concentrates on contract basis for other companies.

All production is for domestic sales. Most of the active ingredients (A.I.) are imported from Shell with the exception of when monocrotophos was formulated. The monocrotophos was provided by Kartini at Cirebon. Monocrotophos is no longer formulated at the plant. The filler materials, solvents and other non-active ingredients, that are used in the formulations are purchased locally if they meet Shell specification. If not they are imported. An example is the polykao which is imported from Belgium.

The plant, with the diversification, now operates year round at an estimated capacity of 70 %. Some of the agricultural products are seasonal but the household contract work and brake fluid operations fill in the rest of the year. All storage of raw materials, the production area and the storage of the finished product and supplies are under roof.

Waste liquids (solvent rinse) are collected and reused in the same formulation process at a later date. This pratice reduces the need to discharge wastewater and improves the economics of the formulation process.

The production and storage areas are dyed or below ground level so no spills can leave the specific site. Spills, etc. are generally cleaned with diesel/sawdust mixture or are dry cleaned. The plant was very clean and appeared well organized.

Health and Safety:

The plant personnel indicated that the plant workers have routine health and safety training. The fire team participates in routine practices and annual competition during safety month exercises. Mr. Djawahir advised that there were safety showers and eye wash units in or near the production area and in the laboratory. This equipment are routinely checked by the plant safety engineer. Signs are posted in the production area as reminders that no smoking is allowed in the production area, safety protection is required, etc. Respirators, face shields and other necessary protective equipment are also in the production area we were advised. A sprinkler system is scheduled for installation in the future.

The production area immediately around the pesticide filler lines are under hoods that remove the vapors from the production site. The effluent from these air handling systems are scrubbed and vented to the atmosphere. This information was confirmed on our plant walk through.

The plant maintains a clinic on plant site and a full time nurse for all production shifts while formulations are done. A doctor visits the plant 2 days a week. Bimonthly cholinesterase (CE) tests are run on the production workers according to Mr. Djawahir. The plant does baseline CE levels on new employees we were advised. The procedure for worker exposure is to remove the employee from the line and when he recovers to test him. If he is sensitive to the pesticide he will be relocated in an area of the plant that does not have the particular pesticide. The closest hospital to the plant is 15 kilometers.

The only exposure accident the plant has had, according to Mr. Djawahir, was in the loading area in 1984 when a new working was exposed to carbamates during startup operations.

With the regularity that we have been advised of the colinesterase test frequency it appears that this may be a government requirement in order to formulate certain pesticide groups such as carbamates and organo-phosphates.

The plant maintains a 100 m^3 water tank in reserve for fire fighting.

Wastewater and Treatment:

The wastewater sources in the plant are from sanitary water, employee showers, employee garment laundry, laboratory waste and manufacturing wastewater. The laundry, shower and sanitary wastewater is collected in a holding pond which has some aeration before overflowing to a lined holding pond. The pond is tested for conventional pollutants and if acceptable discharged.

The production unit and laboratory wastewater is collected in an 27 m^2 evaporation pond that is roofed. The reported flow to this system was about 100 liters per day. Prior to evaporation the wastewater is pretreated by adjusting the pH to 3.0, mixing for a period of time, readjusting the pH to 12.0, mixing again then readjusting the pH to 9.0 and then collected in the evaporation pond.

This pretreatment is intended to destroy the pesticide content in the wastewater. No treatability studies were done to determine the performance levels or operation conditions of the system. The system was installed in 1984 and is probably effective on the carbamates but not on the chlorinated hydrocarbons such as dieldrin and endosulfan. Once the liquid if totally evaporated the sludge is removed and burned in the plant incinerator. The incinerator has no scrubber and is not design for high temperature distruction of waste materials.

Effluent Data:

No effluent data was provided. The plant directly discharge wastewater to a local stream after some treatment. Conventional pollutants like BOD and TSS are monitored but not the A.I. The limits for the effluent reported was 200 ppm. BOD and 200 ppm. COD. The plant also run a four day goldfish test on the effluent. They expose goldfish in a sample of the effluent pond water for four days. If they live they can discharge the effluent to the river. Mr. Djawahir reported that no goldfish had died yet since this procedure began.

Laboratory

The laboratory is primarily maintained for product quality control. The shelf life of the finished product is generally considered to be two years. The major equipment utilized for A.I. analysis is a gas chromatograph. The lab on occasions also analysis for A.I. in wastewaters. The traditional analysis such as BOD and COD and also run at the lab. A.I. methods were provided by Shell and have detection limits in the ppm. (parts per million) range. The laboratory methods are run by a trained chemist and technician. The laboratory has proper safety equipment including a shower and eye wash station and the extraction procedures are performed under a vented hood.

Groundwater Monitoring

No groundwater monitoring is done. No data was available.

Air Pollution Control

The air pollution control handling system consists of hoods in the production area which are vented to the outside. The solvent line vapors are vented through a caustic scrubber followed by a activated carbon filter before being vented to the atmosphere. The carbon filter is changed approximately yearly without measurement of the effluent gases. The powder line is connected to a bag filter to recover the vented material for recycle. The plant does not monitor the vented gases for A.I.

Solid Waste Disposal

All solid waste disposal is handled by the same method. It is collected and burned at the plant site in a conventional incinerator which has no scrubber. The ash is removed by the local authorities to presumably a landfill. Used drums are washed, crushed and sent to a smelter for recycle. The wash water are sent to the treatment plant. All liquid spills are cleaned up with a sawdust/diesel mixture and burned in the incinerator. Dry spills are either vacuumed or swept up depending on the spill material. The plant is intending to install an advanced incinerator such as the one we saw at the Bayer plant in Jakarta. This is scheduled for 1991. .pa

Stormwater Handling .

The stormwater handling procedure is to divert the water away from the treatment plant and allow it to run to the local receiving stream untreated. The plant has a series of ditches interconnected throughout the plant for this purpose. Because all production related facilities are under roof the plant personnel felt little pesticide contamination would occur. No monitoring of the stormwater is done.

Problems

No major problems were observed.

Recommendations and Conclusions

The plant should monitor for active ingredients in the plant wastewater effluent and stormwater runoff before discharging.

Subject: Trip Report of Field Visit to ICI Pestisida Indonesia.

From: George M. Jett

To: The Record

Purpose

On August 14, 1990 I visited the ICI Pestisida formulation plant near Bogor, Indonesia with about a dozen members of the Ministry of Industry as part of my assignment as a consultant in effluent control/industrial safety for UNIDO. I was advised by my ministry counterpart, Mr. Agus Wahyudi, that the group comprised the pesticide committee that was investigating the pesticide industry.

Plant Visit

We arrived at the plant about 10:00 A.M. where we met with the ICI plant manager, Mr. Thomas Widyatmodjo and several of his staff. We were presented a briefing by the production manager, Ms. E. Indrawati and Mr. Widyatmodjo. The plant appeared modern by any standards, was generally clean and well run. The staff was very professional in their presentations and knowledge of their responsibilities.

The plant is situated on about 2 hectares situated in the community and has been in operation since 1983. The plant employs about 140 people and operates generally three shifts per day for most products. The employees uniforms are color coded to designate their specific function in the plant such as fire fighting, etc. All lines in the plant were color coded to indicate there use. The plant was will designed and laid out.

Mr. Wahyudi showed me a copy of an April 1990 report submitted by ICI to the Ministry which was a complete review of the Bogor facility. I requested and received a copy of this report.

Water Supply

The plant has a deep well that supplies the entire plant needs including potable water. The ground water is pretreated before used. The water supply was approved by the Ministry of Health and no other analysis have been done on the water supply.

Production Operations

The facility is reported to formulate about 17 pesticides activated ingredients (A.I.) into about 57 formulations. The plant formulates insecticides, herbicides, fungicides, rodenticides and other products. The three basic types of formulations are liquids, granular and powders. The plant, to eliminate the volume of wastewater, attempt to dedicate equipment to specific types of formulations and run the specific formulation until the inventory requirements are satisfied. This results in less wash out requirements.

The plant uses local raw materials mostly but imports the majority of the active ingredients from the United Kingdom. The plant make some formulations for export such as rodenticides for Maylasia. Most products are used in Indonesia.

Health and Safety

The plant reported that they have an excellent safety record operating for almost five (5) years without a loose man day. In that period the plant has reported only two minor injuries. No pesticide exposure incidence have been reported.

Safety showers and equipment was available and convenient to the work stations. Fire and safety training was provided and routine refresher courses were carried out. The process lines and employees uniforms were color coded to assist in the specific function. At each work station reminder charts demonstrated the safety requirements and procedures. A full time nurse was on staff and what appeared to be a fully supplied health unit. A backup emergency unit was also available. Employees are given weekly blood tests to determine exposure levels as well as baseline monitoring when they are hired.

Wastewater and Treatment

The major source of wastewater is from reaction (mixing/blending) vessel washout between runs. Laundry, shower wastewater and laboratory wastewater are collected and pumped through the treatment system, also.

The wastewater treatment system was installed in 1985. It consists of a physical/chemical system for flocculation, followed by a sand filter followed by three activated carbon columns. The floc that is settled out is placed in sludge drying beds before going to incineration. The activated carbon effluent is pumped through an open line and into a land peculation system where the liquid is allowed to drain into the earth and is also used as irrigation for the garden plot that is on the plant property. The plant does not discharge wastewater directly to a receiving stream.

One carbon filter tank is change per year and normally based on production throughput. The activated carbon is imported form the Netherlands. The beds are run by the up-flow manner. When replacement carbon is required the first tank in the series operation is taken off service, to be replaced by the second tank. The new tank becomes number three in the series.

The wastewater flow treated is estimated at 6000 liter/week at maximum production.

Laboratory

Baseline monitoring for the river, stormwater runoff pond analysis, peculation pond and product quality analysis are performed at the plant laboratory. The laboratory had a full time chemist who managed at least two gas chromatograms, one HPLC, accelerator ovens to determine shelf life of the finished formulation and many other state-the-art analytical equipment. The laboratory had the proper safety equipment in place.

Effluent Data

The facility uses COD (chemical oxygen demand) as the primary control parameter. The pesticides are monitored in several location mentioned above. The method detection limit varies with the pesticide being monitored but generally is in the 0,5 to 1.0 part per million range. The methods were provided by ICI in the U.K.

Air Pollution Control

The production area has a forced air system which pumps the production area air through a collection/scrubber system. The discharge is vented to the atmosphere.

Solid Waste Management

Contaminated drums are washed and crushed to be recycled by a local smelter. The drum wash water is sent to the treatment system.

Stormwater

The entire production area is under roof therefore stormwater does not generally mix with the production area wash water. The only water that is discharged from the plant is stormwater. The stormwater is collected in a pond and analyzed for pesticides. If none are detected the pond is allowed to be discharged to the river. If the stormwater is contaminated it is pumped to the treatment system and not discharged.

Problems

None observed.

Recommendations

Install groundwater monitoring wells around the land filtration system to insure no migration of pesticides into the local aquifer.

Subject: Trip Report of Field Visit to p.t. Indagro, Inc., Bogor, Indonesia.

From: George M. Jett

To: The Record

Purpose

On August 16, 1990 I visited the p.t. Indagro formulation plant near Bogor, Indonesia with Mr. Agus Wahyudi and Ms. Rasmi Widyani of the Ministry of Industry (MOI) and Ms. Zainab of p.t. Petrokimia as part of my assignment as a consultant in effluent control/industrial safety for UNIDO. My counterpart at the MOI, Mr. Agus Wahyudi lead the group.

Plant Visit

We arrived at the plant about 10:30 A.M. where we met with the Indagro plant manager, Mr. Sandiana Hoyaranda. We were presented a short briefing by Mr Hoyaranda and then took a walking tour of the facilities. The plant appeared generally unclean and not well run. Mr. Hoyaranda was the only staff person we spoke with.

Indagro is a privately owned plant occupying 15 hectares situated in the center of the community of Bogor. 6 hectares are currently in use. The plant started operation in 1977 and manufactures Etefon and formulates 5 different activated ingredients into 10 formulations for sale. The plant employs about 140 people and operates only one shift per day for five day per week. The plant was reported to be operating about 40% capacity. The formulation of metanoidofos, metomil, BPMC and diflubenzuron has been discontinued. Mr. Wahyudi advised me that the plant had submitted a plant evaluation report to the MOI by Indagro. The report presented a detailed discussion of the Bogor plant and should be reviewed in regards to this report.

Water Supply

The plant takes it's water supply from a deep well that was estimated to be 40 meters below the surface. This water is used untreated as both drinking and process water. The plant could not provide analysis of the characteristics of this water source although I was advised that it had been sampled and was safe for human consumption. This water is also used for the laboratory, shower and laundry operations.

Production

The plant currently only formulates because the market is depressed by the elimination of the subsidies program and the ban on organo-phosphates for use on rice. Very little active ingredient is still made at the plant. The formulation equipment is dedicated to the type of formulation products.

Ethofon was reported to be manufactured by the Ministry of Industry information but due to the ban on organo-phosphates this process was intermittently operating. The plant currently imports most of the A.I. that are formulated and buys the non A.I. locally if possible.

Health and Safety

The production area appeared dusty and had no forced air exhaust systems. All production areas are under sheet metal roofs. The roofed buildings were open at both ends for a cross draft. Some operators in the formulation area used paper masks and all wore cotton overalls. In the formulation of organo-phosphates this would be considered minimal protection. I observed no face shields or respirators in operation.

There were several showers in the formulation/manufacturing production building and they worked when tested. I saw no eye wash stations. All production employees were in the same uniforms. Mr. Hoyaranda advised me that each employee is given weekly blood test on Wednesday to determine if he or she had been exposed to pesticides. He indicated that their had been no pesticide exposure related accidents since the plant began in 1978.

Wastewater Treatment

The primary source of wastewater from the formulation is the rinsing of the formulation units after the end of a run. This was estimated at 250 liters per washing. This waste stream, the sanitation, shower wastewater and laboratory wastewater are all collected in the plant treatment system. The only wastewater from the ethofon manufacturing was the rinsing of the reaction vessel.

The plant central treatment system was installed in 1978 when the plant started operation. The treatment system consists of a series of concrete ditches which collects all plant wastewater. The wastewater runs down a central collection shoot where caustic is dripped into the combined stream. The intention is to adjust the stream to a pH of about 12 before the wastewater is collected into a series of collection basin.

The system looked very crude and had no pH control meter that I could see. From the collection basin the wastewater overflows, without pH adjustment to a aeration basin where biological

activity was reported to take place. No data was available to document removal of this system. No treatability studies were done to determine if the system was appropriate or effective.

The wastewater overflows from the aeration basin through what was identified as a activated carbon filter. This wire mesh block was filled with burnt coconut shells. The shells were burnt in an open fire at the plant site and no chemical treatment of the charcoal was done before filling the wire mesh filter. The filter was approximately two feet by three feet by six inches. I was informed that the filter is changed every other day. No test were run on the effluent to determine the removal or efficiency of this filter element or the overall treatment plant performance.

The basins are allowed to drain to the earth via percolation. The plant assumed that the pesticide levels were below the ppm (part per million) detection limits of their methods.

Effluent Data

The plant provided no effluent data, including active ingredients, as they felt that the facility was a no discharge plant and no data was required.

Stormwater

Stormwater is mechanically diverted away from the treatment system in a storm event. When it rains a metal plate is placed in the open concrete drainage lines and the stormwater is diverted off the property. It is eventually absorbed into the earth in the plant vicinity?

Laboratory

All analytical methods are done by outside contractor. The plant laboratory is only used for product specification checks we were advised. The laboratory appeared to by unused and substandard with little support equipment. There was no chemist available, no gas chromatgraph, etc.

Groundwater Monitoring

I was advised that monitoring of groundwater was not done at the plant. The local community water supply has been monitored and found to contain pesticides according to Mr. Wahyudi of the MOI. He could not tell me if the pesticides found were the same pesticides manufactured at the Indagro plant. This needs to be investigated.

Solid Waste Disposal

The plant has a trash burner that has a water cooled scrubber attached. All plant waste material is burned in this trash burner. The ash is hauled off plant site to a local landfill. Drums are crushed and sent to a local smelter.

Problems

The local drinking water supply of the housing development next to the plant has been showed to be contaminated with pesticides according to the Mr. Wahyuhi. This may be a direct result of the land filtration system the plant has been operating since 1978 or the stormwater runoff handling procedure.

The plant health and safety procedures and requirement were substandard.

The wastewater treatment and the stormwater handling systems needs improvements to remove the waste load generated by the plant and effectively segregate the stormwater from the treatment system.

Recommendations:

Plant health and safety should be upgraded if the plant continues to operate.

Ground water monitoring should be done around the treatment system and the waste disposal area. There appears to be a serious problem with the ground water supply of the local community. If it can be isolated to the plant as the source the treatment plant should be immediately closed and corrective actions taken to provide safe drinking water for the local community.

The treatment system should be monitored to demonstrate performance and effectiveness and upgraded if required. The carbon filter probably does little in waste removal as well as the aeration system.

The stormwater handling system should have installed an alarm system to remind the plant operators to insert the metal plate to divert the stormwater in a storm event.

Subject Trip Report To Inkita Makmur, Mojokerto, Indonesia

From: George M. Jett

To: The Record

Purpose:

On August 23, 1990 I traveled to the Inkita Makmur formulation plant at Mojokerto, Indonesia with two members of the Petrokimia, Gresik plant as part of the assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendation for the National Pesticide Development Center. The lead Petrokimia person, Mr. Noviar, provided a letter of introduction to the plant manager, Mr. Kuddah, explaining the purpose of the visit. I explained my role in the visit and we began the discussion.

Plant Visit:

We arrived at the plant about 10:00 A.M. and began our visit. Historically the plant began granular operation in 1978, shortly after the Indonesian pesticide subsidies program started. In 1983 the plant was expanded to formulate liquid formulation and again in 1986. The total plant area is approximately 2.9 hectares. The original portion is 0.9 HA and the remaining 2.0 HA is a result of the expansions. The plant has about 85 permanent employees, no temporary employees and operates one shift per day for six days for a 40 hours per week schedule.

Water Supply

The water supply is a 75 meter deep well on the plant site. The water is used for all needs in the plant, both process and human consumption without pretreatment. The plant had no analysis of the water source. It was checked by the government for safety when it began operation in 1977 and has been used since. The water supply is maintained in a 200 meter cubed storage tank.

Production Operation:

The plant formulates about 15 products for domestic sales. The two major formulation types currently done are granular and emulsifiable concentrate formulations. Mr. Kuddah checked the list of pesticides from the Ministry of Industry list that I showed him. He provided the current list of products formulated. The plant is operating at reduced capacity, estimated to be 5 %, because of the elimination of the subsidies program and appeared

to be under severe economic constraints. The plant formulates about half granular and half liquid formulations for domestic sales only at about the 5 % for each. No water based pesticides are formulated. Most active ingredients are imported except for two from Petrosida, Gresik.

Most of the 1986 expansion segment sites idle because in 1986 the government banned the use of organo-phosphate insecticides on rice. This was two weeks after the facility was completed and the facility, consequently, has never been used. The major function of this part of the plant was to produce liquid formulations of organo-phosphates.

The solvents, such as castor oil, used in the production area are purchased from an exporter. The granular filler is purchased locally except for silicate which is imported.

The production, storage and finished product areas are all under roof. The electrical supply was from the city with two backup generators on plant site if required.

Health and Safety:

Mr. Kuddah advised me that the plant personnel have routine health and safety training when they are hired and are given annual refresher courses. Mr. Kuddah advised me that the plant has never had a lose day to exposure or safety problems since the plant began operations. Some minor accidents have been reported.

Fire training is provided to designated personnel (the safety committee) and emergency practices are routinely done. The safety committee is scheduled to meet once per month and has annual completion during national safety month. Showers facilities and other safety equipment were reported maintained in the production area. No eye wash facilities were not reported in production area, only in the laboratory.

Routine blood analysis for cholinesterase were reported to be bimonthly. Mr. Kuddah also advised me that if new hires come on board they are given baseline monitor checks. The plant maintains medical support six day per week, three day a doctor is at the plant and three day a nurse is at the plant.

The granular production area was generally open but there was a strong odor of organic chemicals. Mr. Kuddah advised me that this was from the raw materials supplied in containers that are not lined with plastic. The granular section of the plant uses a baghouse filtration system on the production line. The liquid formulation area had a vacuum hood over the filler station and the vapors were exhausted to the outside therefore no strong odor was present.

When we had the plant walk through I observed that there was little health and safety equipment such as respirator, face

shields and showers in use or located in the production area. Only cloth face protectors were wore by some operators and plastic gloves were worn only by the liquid formulation filler personnel. No protection was worn by the other personnel. No smoking was posted and enforced in the production area

On visiting the clinic I was advised that the nurse on duty had gone home for the day. This was before noon and the clinic was closed and locked. The plant had no medical support during my visit. I did not see the inside of the clinic so I could not determine if adequate antidotes for cholinesterase reaction existed. The nearest hospital was reported to be five (5) kilometers from the plant.

Between the older granular part of the plant and the newer liquid formulation plant there was a small potable restaurant. This appeared to be a direct contradiction to what I was told in the morning meeting about eating in the production area.

Wastewater and Treatment:

Mr. Kuddah indicated that the plant did not generate process formulation wastewater. When the production site finishes a product run the operators will rinse the line with the solvent that was used in the formulation before the next formulation is started. This solvent rinse is collected, saved and used in the next batch of the product formulation that was rinsed. If it is a dry process the line rinse solvent is burned by the plant. Liquid spills are absorbed with sawdust (probably mixed with diesel fuel) which is also reported to be burned.

Mr. Kuddah reported that the production area are not washed down with water. During my walk through of the liquid formulation area it appeared that this production site had just been rinsed down by the operators. The rinse water is washed to the stormwater drainage ditch and probably discharge to the local creek without treatment or monitoring. Mr. Kuddah explained that the Indonesian do not like a dusty work place.

The only production related wastewater is from the personnel showers, laundry and the laboratory. The shower and laundry waste is reported to be discharged directly to an irrigation ditch that is used to water the plant area. The laboratory waste was reported to be used as irrigation water also. On inspection it looked like the laundry, shower and laboratory waste were all discharged either to the septic pit or into the ditch that ran to the stream next to the plant property. Kitchen waste and sanitary waste are discharged to the a septic tank and this appears to overflow to the local stream. I was advised that the septic system is pumped out once per two months.

The plant has no treatment before discharge of any process related wastewater. No treatability studies were ever done by the facility, no wastewater characterizations were ever performed, no shock loading or spill prevention facilities such as retainment

walls or dikes have been erected.

The plant incinerator was dismantled about 1986 and has not been rebuilt. The burning of trash, sawdust, spent solvent and other materials in done in an open area in the back of the plant.

Laboratory

The plant laboratory does only product quality testing using the method from the active ingredient manufacturer. The laboratory had a gas-liquid chromatograph and related equipment. A full time chemist was reported to be on staff. The minimum detection limits were estimated to be in the ppm (part per million) range.

Effluent Data: .

No effluent data exist or no baseline monitoring reports were prepared. The plant reports that all waste liquid generated in the production area is either recycled or burned. No flow monitoring is done therefore no information was provided.

Groundwater Monitoring

No groundwater monitoring is done at the plant. No data was available. Mr. Kuddah advised that the government analyzed the water supply for the local village, which is physically next to plant, and have not found any pesticides at measurable levels. These test were reported to be performed annually.

Air Pollution Control

Air pollution in the work area was described above. Once the plant had air samples taken in the work plant and the government indicated that the air was free of pesticides. No dry vacuuming was done. The operators swept dry material with a broom and pan.

Solid Waste Disposal

No contract hauling is done except metal drums that are rinsed with solvent. The solvent was reported to be reused in the process and the drums are recycled by the solvent manufacturer.

Stormwater Handling

No stormwater handling process has been built into the plant. When it rains the stormwater run to the drainage ditch to the river. The stormwater has never been measured for pesticide content.

Problems

See above.

Recommendations and Conclusions

Test villagers for cholinesterase level due to the close proximity of the plant to the village. Close the portable restaurant on the plant. Install the incineration unit a safely dispose of trash and other material generated by the plant. Use dry vacuum to clean the production areas, not water wash down as observed. Keep a full time medical personnel on the plant during all production periods. Require the medical personnel to report to the plant manager if he or she needs to leave the plant during the production day. Install eye wash stations in the production areas and require monthly testing for them as well as the showers.

Subject: Field Visit to Maskitani Chemicals Industries, Bekasi, Indonesia.

From: George M. Jett

To: The Record

Purpose:

On August 28, 1990 I visited with Dr. Khetan, Mr. Agus Wahyudi and Ms. Widodo of Petrokimia the Maskitani formulation plant at Bekasi, Indonesia. The purpose of the visit was to study the formulation plant as part of my assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendations for the National Pesticide Development Center.

Plant Visit:

Dr. Khetan and I arrived at the plant at 1:00 P.M. and met with Mr. Arifin S. Idham, the technical director and the laboratory chemist, Ms. Kemala Dewi. The plant started operation in 1983. The facility is situated on about 1.4 hectares site in a residential area. The facility is affiliated with Hoechst of West Germany who designed and assisted in the construction. The plant operates one shift per day five days per week. It employs 63 permanent employees and as many as 12 temporary employees. This plant, like most pesticide plants in the industry, has been effected by the government ban on organo-phosphates and is operating at about 50% capacity.

Water Supply

The plant water supply is from a 65 meter deep well with a backup shallow well at 8 meters. Sand filtration is the only pretreatment done on the water supply before use. The water was analyzed when the plant began operation by the local authorities for safe use but no pesticides residue analysis have been done on the water supply. The water supply is used for all plant needs including potability and process use.

Production Operation:

The plant formulates only liquid formulations of agricultural chemicals (insecticides, fungicides, and rodenticides). Most of the production is for domestic sales but one BPMC product is manufactured for export. The plant formulates about 20 products currently with most active ingredients (A.I.) being imported from Hoechst. One A.I.,BPMC, is purchased from

Petrokimia. The filler materials (the non active ingredient ingredients) are generally imported because of the Hoechst specifications cannot be met with local suppliers.

The production is not seasonal and the equipment lines are dedicated. All storage of raw materials, the production area and the storage of the finished product and supplies are under roof. The plant areas are dyed and all spills are contained. Cleaning of spills is with a sawdust-diesel mixture which is burned at the plant. Some dry vacuum, if appropriate for the spill, is done.

New products are sent to Frankfurt for testing and approval. No local testing and development is done in Indonesia. Perhaps this is an area that the pesticide research center could provide assistance on the local level.

Health and Safety:

The plant personnel indicated that the plant workers have routine health and safety training. The fire team participates in routine practices and annual competition during safety month exercises. Mr. Idham advised that there were safety showers and eye wash units in or near the production area and in the laboratory. Signs are posted in the production area as reminders that no smoking or food is allowed in the production area and safety protection is required. Respirators, face shields and other necessary protective equipment were reported in the production area.

The production area immediately around the filler lines are under hoods that remove the vapors from the production site. The effluent from these air handling systems are scrubbed using bleach and vented to the atmosphere. No sprinkler system was in place or anticipated by Mr. Idham. Mr Idham advised that the plant did not have a backup electrical system. The city of Tanggerang provide this utility at present.

The plant did maintain a clinic but no qualified nurse or certified individual was available to give an antidote atropine sulfate injection if an accident resulted from exposure. A doctor visits the plant one day a week. The closest hospital to the plant is 5 kilometers from the plant.

Bimonthly cholinesterase (CE) tests are run on the production workers who handle the related pesticides according to Mr. Idham. The plant does baseline CE levels on new employees we were advised. With the regularity this information was provided it appears that this may be a requirement in order to formulate certain pesticide groups such as carbamates and organophosphates.

During our walking tour of the production area I observed that safety was not as complete as Mr. Idham indicated. There were some showers, etc. but not generally is use.

The plant maintains a 200 m^3 storage tank of water for fire control.

Wastewater and Treatment :

No water is used in the process so the bulk of the wastewater is form sanitary water, employee showers, employee garment laundry, and laboratory waste.

The plant discharge all plant process related waste to the septic system. The wastewater treatment system consist of a large dry well septic type system on plant site. No pretreatment is done at the plant prior to being pumped to the septic system. The plant does not pretreat the wastewater or monitor for the A.I. in the effluent waste to the septic system. Waste liquids (solvent rinse) are collected and reused in the process at a later date.

The system had problems in 1988 during the rainy season and had to be pumped out. This system is above the stormwater drainage and has leaked into the discharge when the overflow occurred. There is no pesticide treatment facility at the plant site. No treatability studies have been done to determine the performance levels of the septic system.

The formulation area is generally not washed down, Some dry vacuuming and sweeping is done to clean dry formulations and dry spills. The procedure for handling liquid spills and upsets in the process area is to absorb the material with a sawdust/diesel fuel mixture. The absorbent material and liquid pesticide mixture is swept into a container and remove from the production site to be burned in the plant incinerator.

Effluent Data:

No effluent data was provided.

Laboratory

The laboratory is primarily maintained for product quality control. The major equipment utilized for A.I. analysis is a gas chromatograph and a spectrophotometer. The methods were provided by the parent company and generally have detection limits in the ppm. (parts per million) range. The laboratory methods are run by a trained chemist and technicians. The laboratory has safety shower and a boric acid eye wash system. The pesticide extraction system was in a separate room and done under hoods.

Groundwater Monitoring

No groundwater monitoring is currently done and no data was available.

Air Pollution Control

The air pollution control handling system in the production area consists of bleach (sodium hyperchlorite) scrubber. The scrubber air is vented to the atmosphere. The plant has not monitored this effluent source for A.I.

Solid Waste Disposal:

The plant has no landfill on site. All trash is burned at the plant incinerator and the ash is hauled out to presumably a local landfill. The plant incinerator has no scrubber. Small quantities of solid waste are sent to Bayer for burning in their high temperature incinerator. Used drums are wash, crushed and recycled to a smelter.

Stormwater Handling

The stormwater handling procedure is to bypassed the production area using concrete drainage ditches allowing the stormwater to be discharged untreated.

Problems

The septic system has already demonstrated (1988 upset) that it is not adequate for handling the plant effluent in all cases.

The plant does not have a trained person on the plant during production cycles that can administer proper medical assistance in an emergency.

Several areas were void of adequate safety equipment.

Recommendations and Conclusions

Recommend installation of a treatment system that will treat the pesticide wastewater to non detectable levels. Upgrade the safety in the production area.

Have a certified, qualified person in the plant during all production periods that can give antidote for cholinesterase reaction, administer CPR and other basis life saving procedures. Accidents are not planned and the distance to the hospital in bad traffic could result in a fatality in an emergency situation.

Subject: Field Visit to Monagro Kimia, Tanggerang, Indonesia

From: George M. Jett

To: The Record

Purpose:

On August 30, 1990 I visited with Dr. Khetan and Mr. Agus Wahyudi of the Ministry of Industry the Monagro-Kimia formulation/manufacturing plant at Tanggerang, Indonesia. The purpose of the visit was to study the formulation /manufacturing plant as part of my assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendations for the National Pesticide Development Center.

Plant Visit: .

We arrived at the plant at 11:00 A.M. and met with Mr. Budi Sarwano, the plant manager, Mr. Djufri Latif, marketing manager and Mr. Hendrawan Rusli, the laboratory chemist. The plant is a joint venture with Monsanto from the United States. The plant began operation in 1988 and currently employs 27 permanent employees and only a few temporary employees. The plant is situated on 2 hectares in an industrial complex. The facility primarily manufacturers and formulates glyphosate.

Water Supply

The plant water supply is from a 105 meter deep well. The well water is chlorinated before storage in a large 10 meter diameter holding tank which also acts up as a fire water storage facility. The water was analyzed when the plant began operation by the local authorities for safe use but no pesticides residue analysis have been done on the water supply. The water supply is used for all plant needs including potability and process use.

Production Operation:

The plant operates one shift per day, five days per week and manufactures glyphosate and formulates it into Roundup. The only other formulation done is called Wallup, which is a mixture of glyphosate and dicamba. Both are water based formulation and no wastewater is discharged from these operations. The same is true for the glyphosate manufacturing. If after testing the material it is found to be off specification the plant will recycle the material back to the reaction vessel and rework the product until it meets specifications.

All of the production is for domestic use in Indonesia. The plant does the final reaction step, the amination with isopropyl amine, to produce the glyphosate. The IPA is manufactured at a Monsanto joint venture plant in Merak, Indonesia. They then formulate all material in a water media for sale. The dicamba is imported for the Wallup.

The production is not seasonal and the equipment is dedicated. All storage of raw materials, the production area and the storage of the finished product and supplies are under roof. The production area is curbed and dyked to prevent product from being discharged. Any spills are recovered for rework if the oil content is acceptable recycle.

The herbicide market is starting to grow rapidly at about a 40 % rate. The government was the original customer but now the commercial sector is taking over most of the sales. The plant is anticipating manufacturing Butachlor in the future but they need to get clearance from the Indonesian government.

The surfactants are imported because the plant cannot get these materials in Indonesia to meet the Monsanto specifications.

Health and Safety:

The plant personnel indicated that the plant workers have routine health and safety training. The fire team participates in routine practices and annual completion during safety month exercises. Mr. Budi advised that there were safety showers and eye wash units in or near the production area and in the laboratory. On our walk through this was confirmed. Safety signs were posted and the operators were warring the proper safety equipment. No smoking signs and fire extinguishers were properly situated. Safety precautions seemed to be implemented. Respirators, face shields and other necessary protective equipment was also in the production area. The production area immediately around the filler lines are under hoods that remove the vapors from the production site. The effluent from these air handling systems are scrubbed and vented to the atmosphere.

The plant did not maintains a clinic on plant site and no full time nurse or doctor for all production shifts while manufacturing or formulations are done. Because glyphosate is not a cholinesterase (CE) inhibitor, no blood tests are done on the employees. I suggested that the plant personnel should be given basic life supporting training because the nearest hospital is 8 kilometers away. CPR administered at the right time will save a life. Employees are given an annual physical checkup for routine medical information. Mr. Budi reported that the plant has a two year safety record.

Wastewater and Treatment :

This total operation results in approximately 4 to 6 m^3 of wastewater per day being discharged to the industrial complex

sewer system. The wastewater sources in the plant are from sanitary water, employee showers, employee garment laundry, laboratory waste and some manufacturing wastewater such as washing down a spill after the majority of the spill had been recovered for recycle. The dry spills are dry cleaned and returned to the rework tank.

The production areas had overhead sprinkler system and if used this water would be discharged to discharge ditch if after measurement it was found to be below 0.2 ppm glyphosate.

All wastewater and waste product is collected in a pit and measured for glyphosate. If the wastewater has a 0.2 ppm residue or higher the plant will pretreat the wastewater with sodium hyperchloride for 24 hours, carbon filter the wastewater until it is below the 0.2 ppm then discharge the wastewater to the discharge ditch. The treatment system is in 55 gallon drums due to the low volume of wastewater generated.

The plant personnel indicated that the industrial park management had not yet built the treatment system. Presumably the wastewater is eventually discharged to some surface water body near the plant. This system has been in operation since the plant began. The technology came from Monsanto in the U.S.A. and no treatability studies were done locally.

IPA drums are not rinsed and discarded. They are returned to Merak for refill and returned to Tanggerang. The plastic bags are also recycled.

Effluent Data:

No effluent data was provided. The plant generally has little discharge for the production area we were advised. Generally the plant does not monitor the A.I. for the local authorities in the effluent waste but monitor for BOD, COD and TSS. The plant limits are 100 ppm. for BOD and 200 for COD. The discharge flow from the plant was observed to be very low.

Laboratory

The laboratory is primarily maintained for product quality control. The major equipment utilized for A.I. analysis is a gas chromatograph. The lab also used a HPLC and spectrophotometer. The lab on occasions also analysis for A.I. in wastewaters if there is a spill. The traditional analysis such as BOD and COD and also run at the lab. The methods were provided by the parent company and generally have detection limits in the ppm. (parts per million) range. The laboratory methods are run by a trained chemist. The laboratory has the proper safety equipment.

Groundwater Monitoring

Groundwater monitoring is done at two location in the plant. The ground water is monitored for glyphosate and the surfactants

used. No data was provided for the testing and we were advised that no glyphosate or surfactants had been detected to date.

Air Pollution Control .

The air pollution control handling system appeared to be adequate for the manufacturing and formulation operations.

Solid Waste Disposal

There is little in the way of solid waste because most material and containers are recycled. The incinerator burns the trash and the ash is taken to a landfill by the local authorities.

Stormwater Handling

The stormwater handling procedure is to allow the rain water to be collected by the plant drainage system and discharged to the plant effluent ditch without treatment. Rainwater has little opportunity to commingle with the production or storage areas.

Problems

The following potential problems were observed. The plant should provide routine medical training for a specific number of personnel in the event of an emergency. Because they have less than 50 employees they are not required to have a clinic but they should provide basic life saving training for the personnel.

Recommendations and Conclusions

See problems above.

Subject: Field Visit to Petrokimia-Kayaku at Gresik, Indonesia

From: George M. Jett

To: The Record

Purpose:

On August 21, 1990 I visited the Petrokimia-Kayaku formulation plant at Gresik, Indonesia. The purpose of the visit was to study the formulation plant as part of my assignment as a consultant in effluent control/industrial safety for UNIDO in preparation for making recommendations for the National Pesticide Development Center.

Plant Visit:

I arrived at the plant at 1:00. P.M. and met with Mr. Amirul Djujus Aziz and Mr. Shin-ichi Sakai. We were accompanied Mr. Sidi Pranyoto and others from Petrokimia, Gresik. The plant began operation in July 1977 as a joint venture of Japanese and Indonesian companies. The plant employs 45 permanent employees and has seasonal production which mirrors the rice growing seasons. The plant is situated on 1.5 hectares in the middle of the Petrokimia chemical complex.

Water Supply

The plant water supply is from the Surabaya River which is treated at the central Petrokimia water treatment complex. See Petrosida trip report for details.

Production Operation:

The plant is a joint Indonesian and Japanese facility that appeared well designed and operated. The plant formulates liquid, powders and granular formulations. The plant formulates the active ingredients (A.I.) made by Petrosida and the imported A.I. into about eighteen formulation. Most of the production is for domestic sales but a small portion (1.0%) is exported. Non active ingredients are purchased locally were available but in some cases have to be imported. The plant personnel reviewed the list of formulations from Ministry of Industry and made corrections where appropriate. (See Annex I.)

The production is seasonal and the equipment is dedicated. All storage of raw materials, the production area and the storage of the finished product and supplies are under roof. The production and handling of the formulation operation appeared to be well organized with little opportunity for contamination in

the workplace. The production areas were dyked and all spills contained.

Health and Safety:

The plant personnel indicated that the plant workers have routine health and safety training. The fire team participates in routine practices and annual completion during safety month exercises. Mr. Aziz advised that there were safety showers and eye wash units in or near the production area and in the laboratory. Signs are posted in the production area as reminders that no smoking is allowed in the production area, safety protection is required, etc. Respirators, face shields and other necessary protective equipment are also in the production area we were advised. The production area immediately around the filler lines are under hoods that remove the vapors from the production site. The effluent from these air handling systems are scrubbed and vented to the atmosphere.

The formulation plant clinic is the central clinic at Pt. Petrokimia complex. A full time nurse is available for all production shifts while formulations are done. A doctor visits the plant during the week. Bimonthly cholinesterase (CE) tests are run on the production workers according to Mr. Aziz. The employees are checked for baseline CE levels when they are hired we were advised. With the regularity this information was provided it appears that this may be a requirement in order to formulate certain pesticide groups such as carbamates and organo-phosphates. The closest hospital to the plant is less than one kilometer. The plant maintains a contract with the local hospital in the event there is an emergency.

During my walking tour of the production area I observed that the plant had the safety equipment installed and in use. The plant looked very well maintained and prepared if there was an accident. A fire management system was in place.

Wastewater and Treatment :

The wastewater sources in the plant are from sanitary water, employee showers, employee garment laundry, and laboratory waste. The sanitary waste is disposed of in the plant general treatment system. The concentrated laboratory waste is contained and disposed of elsewhere but not to the central treatment system. The plant personnel indicated that their was no production related manufacturing wastewater. The formulation lines are rinsed with solvents between formulation and reused and recycled. No treatment system was in place as no water was included in the process. Powder and granular spills are dry vacuumed and either recycled or disposed to a landfill.

Effluent Data:

No effluent data was provided. The plant personnel reported no discharge for the production area and consequently does not

monitor for pollutants. The formulation area is generally not washed down. All materials were reported contained and consumed in the process. The procedure for handling spills and upsets in the process is to absorb the material with sawdust/diesel mixture and to swept the material into a container and remove from the production site. The sawdust absorbent is burned in the plant incinerator.

Laboratory

The laboratory is primarily maintained for product quality control. The major equipment utilized for A.I. analysis is a gas chromatograph. The lab also used a HPLC and spectrophotometer. The methods were provided by the active ingredient manufacturers and generally have detection limits in the ppm. (parts per million) range. The laboratory methods are run by a trained chemists and technicians. The laboratory has safety shower and eye wash facilities. Like the plant, the laboratory was well organized and maintained.

Groundwater Monitoring

Groundwater monitoring is the same as the Petrosida plant write up. Please refer to that trip report.

Air Pollution Control

The air pollution control handling system consists of a dust collector for the powder and granular area. The liquid formulation appeared to have no air scrubber system but was free of solvent vapors.

Solid Waste Disposal

Little contaminated solid waste is generated so handled problems are a minimum. Used drums are recycled or sent to a smelter for metal recovery. The complex incinerator burns the trash and the ash is landfilled on the complex.

Stormwater Handling

The stormwater handling procedure is to bypass the Petrokimia treatment plant and directly discharged without monitoring. No monitoring of the stormwater is done because the system stormwater is isolated from the pesticide facility where contamination could occur.

Problems

No problems were observed. The plant is well maintained and run from the visual appearance that I had.

Subject: Draft Trip Report of Field Visit to Petrosida, Gresik, Indonesia.

From: George M. Jett

To: The Record

Purpose:

On August 21, 1990 I visited the Petrosida manufacturing plant in Gresik, Indonesia with several members of Petrokimia staff. Petrokimia is the parent company Petrosida. The purpose of the visit was to review the manufacturing site as part of my assignment as a consultant in effluent control/industrial safety for UNIDO.

Plant Visit:

A meeting began in the office of the Director, Fatimano Mendrofa at about 8:30 A.M. with numerous members of staff of Petrokimia and Petrosida. My lead contact for Pt. Petrokimia was Mr. Sidi Pranyoto. We went through the survey questionnaire that I had previously developed for this assignment with Mr. Mendrofa.

Petrosida is a government owned company that began operation in October, 1984 under licence from Japan. The pesticide plant employees about 175 persons and operates three shift per day when production demands are high. The manufacturing plant site is about 1.5 hectares located within the 450 hectare compound of Pt. Petrokimia, the parent company.

Mr. Mendrofa was enthusiastic about the possibility of a NPDC. He was of the opinion that the research center was, in part, to be used to show his company how to make new pesticides. I indicated that there were several significant goals of the UNIDO visit in regards to the research center and new pesticide development was only one aspect. My primary expertise was in effluent control and industrial safety and that is why UNIDO asked me to Indonesia. My recommendations would address those areas only.

Water Supply

The water supply is from the Surabaya River. The Pt. Petrokimia complex pretreats the river water for the entire industrial complex at a central treatment plant and distributes the water to the production processes and whatever purposes the individual plant requires, such as drinking water, laundry, showers. etc. Petrokimia has analyzed the water supply but no data was

provided. I was advised that no pesticides were measured for in the water supply. Only the traditional parameters like alkalinity are measured.

Production Operation:

The manufacturing site currently produce five active ingredients (A.I.); BPMC, Carbaryl, Carbofuran, Diazinon, and MIPC. All A.I. are batch reactions. Production is down because of the seasonal nature of pesticides. More production takes place during the rainy season, normally October tc April. Most of the production is for domestic use but about 10 % is exported. A few raw materials are made, such as the methyl isocyanate but most are still imported.

The production units are dedicated but only two A.I. can be made at once. The Petrosida company supplies A.I. to about nine formulators including it's own sister company Petrokimia-Kayaku. All raw materials and finished product production is under roof and protected from stormwater runoff. The production area seemed generally clean and reasonably organized.

Health and Safety:

I was advised that the plant had operated for six years without a lose man-day. Only minor injuries were reported during the entire history of the production of the pesticides. The plant personnel reported the manufacturing facility had showers and eye wash units in the production area. The personnel were given periodic refresher courses in safety and fire training.

The production operators were reported given regular blood test to determine if they had any exposure problems with the pesticides they were making. It was unclear to me what the frequency of these test were. I was told once per three month, once per six month and once per year depending whom I asked the question. This should be standardized for the operators who are involved in carbamates or organo-phosphates production at Petrosida.

The medical unit facilities are centrally located in the Petrokimia complex. I did not see the central medical facility. The facilities was reported to be a small hospital, an ambulance service with a doctor is on staff. The plant personnel reported round the clock medical support was available. No medical facilities are located in the separate production area.

On my visit to the production area I observed that there was only one shower and eye wash unit on each floor. This I believe is inadequate for the complexity of this production area and the hazard of the chemical in use. In the event of an accident the employee may have to quickly move with impaired vision through a maze of reactors, vessels and pipes to get to these safety facilities.

I recommend at least two showers and eye wash units on each floor. If one is out of service there would be a back up system as well as being closer to the operating units. The production area did have a few safety reminders like a face with a respirator or a no smoking sign but I saw only paper masks in service. Depending on the product step, this may not be adequate for proper respiratory protection. This is an area where improvements should be made.

The production area was roofed and open and appeared to have adequate ventilation. A sprinkler system was installed in the production area and clearly coded in red.

Wastewater and Treatment :

The production area had a treatment system that consisted of physical/chemical removal for solid, followed by a three stage activated sludge system. I requested a diagram of the treatment system but was advised that this was proprietary. The treatment system utilized a vacuum filter to remove the sludge. The sludge normally is sent to an incineration system. After the final clarifier the wastewater effluent is pumped to the combined Petrokimia plant effluent and discharged to the ocean. The treatment system was designed in Japan. Petrokimia had no treatability studies and have operated both the production and treatment unit as a combined model since it was installed.

During my visit to the treatment plant, the sludge filter was under repair and the incinerator was off. I was advised that the filter had been down for four weeks and the incinerator for two weeks. I did not see a sample of the final effluent that was being discharged from the treatment plant nor was I given any data. It did not appear to me that the system was well maintained or running correctly.

The plant does not measure for pesticides. The plant monitors BOD and COD once per day as the controlling parameters. The plant also monitors TSS. The state monitors these parameters once per month. It may be that these are the parameters at the combined plant effluent, not at the pesticide manufacturing area. This was unclear to me. The pesticide treatment plant control the pH to between 7.0 and 7.5, I was advised, before pumping to the combined effluent line. The pesticide treatment plant flow was estimated to be 70 cubic meters per day.

I was advised that there was a shock pond used for spills but I did not see this facility. Waste from this pond would be bled into the pesticide wastewater treatment plant as space and capacity allowed.

Laboratory

The laboratory is used for product quality control as well as the controlling parameters BOD and TSS but no pesticides are monitored in the effluents. The laboratory has a full time

chemist and the pesticide methods have been provided by the parent companies. The equipment used mostly was gas chromatography. There were about three units at the laboratory. The laboratory had the usual ancillary equipment necessary to carry out routine testing such as COD, etc.

Effluent Data:

The pesticide manufacturing plant maintained no effluent data and none was provided.

Groundwater Monitoring

The Petrokimia complex, I was advised, has a groundwater monitoring well system. This system allows the company to monitor infiltration from only the combined complex. No wells currently exist for the individual plants within the complex.

Air Pollution Control

No special air pollution control system were in-place at the manufacturing site as the production site was open. Air was allowed to flow freely through the plant as the building was roofed but not walled.

Solid Waste Disposal

Metal drums are cleaned and sold to a local smelter. The ash from the incinerator is hauled off site when the incinerator is in use.

Stormwater Handling

Stormwater is diverted off plant site without treatment or monitoring.

Problems and Recommendations

Additional safety equipment should be installed in critical areas of the production facility.

The treatment system should be fully operational if effective treatment is to be accomplished. The filter and the incinerator should be fixed and put back in service. It is hard to believe that the system can be fully effective if the solids removal portion is out of service as long as the plant indicated.

ANNEX F

Names of Contacts for National Pesticide Development Center

UNIDO

Dr. G. L. Narasimhan, UNIDO Country Dir., UNIDO, Jl. M.H. Thamrin 14, P.O. Box 2338, Jakarta, 10001 Indonesia; Tel. 321308; FAX 3105251; Telx.44178 UNDEVPRO IA.

Paivi Korvenmaa, JPO, same as Narasimhan.

Mr. Mario Mustafa, Sr. Program Ass., same as Narasimhan.

Dr. B. Sugavanam, UNIDO, Chief, Agro-Chemical Ind. Unit, Chemical Industries Branch, P.O. Box 300, Vienna, Austria; 21131-3940(O), 2558333 (H).

Dr. Sushil K. Khetan; General Manager, Hindustan Insecticides Limited, SCOPE Complex, Core-6, 2nd Floor, 7 Lodi Road, New Delhi 110003; tele.: 011-362116 (work); Res.: 6894100.

Mr. George M. Jett; U.S. Environmental Protection Agency, Industrial Technology Division (WH-552), 401 M Street, S.W., Washington, D.C. 20460; 0011 202-382-7151.

Ministry of the Environment

Mr. R. A. Breeze, P.Eng., Manager Waste Management Policy Section, Waste Management Branch, 5th Floor, 40 St. Clair Avenue West, Toronto, Ontario M4V1P5; tel. 416 323-5223. on loan from Canada for hazardous waste help. Spoke with no one in the Ministry of the Environment. They were unavailable for the scheduled meeting on September 14, 1990.

Ministry of Industry

Mrs. Sri Ambar Suryosunarko, Director of Agrochemical Industry, Jakarta, Indonesia; (Departemem Perindustrian) 11th Floor, Jalan Gotot Subroto Kav. 52-53, Jakarta Selatan 513260

Mr. Agus Wahyudi, Ministry of Industry, same as Sri Ambar.

Ms. Haryati, 513526, Same as Wahyudi.

Mr. Wardijasa, Director General, Ministry of Industry, Directorate General for Basic Chemical Industry, same as Wahyudi except phone 511132.

Agrocarb

Mr. Komarudin G., Process Managaer, Agrocarb, Rhone-Poulenc Group, Pt. Agrocarb Indonesia; Jl. Rungkut Industry, 1/12. P.O. Box 20, Surabaya, 60401, Indonesia; 031-811627.

Mr. Ruddy A.J. Akay, Production Manager, same as Komarudin.

Bayer

Dipl. Ing. Manfred Adrian, Plant Manager, P.T. Bayer Indonesia, Jl. Rawa Sumur No. 12, P.O. Box 2507, Jakarta, Indonesia 100001; 4892856, 4890446.

Pt. Dharma Ardha Forma A Shell Subsidiary.

Mr. Hisjam Djawahir, Plant Manager; Pt. DBharma Ardha Forma, Cibitung Km. 46, Bekasi Jawa Barat; phone: 99.71023; in Jakarta 12920-Pl.O. Box 344/KBY; 517434; Jl. H.R. Rasuna Said, Kuningan.

Mr. E. Muchlis; same as Mr. Djawahir.

PT ICI Pestisida Indonesia Formulator:

Ir. Thomas Widyatomodjo, Works Manager, Works Department, PT ICI Pestisida Indonesia, S. Widjojo Centre, 10th floor, P.O. Box 2158, Jl. Jend Sudirman 71, Jakarta 10001, Indonesia; tel. 021-583488/9, 584571-4, Telx. 45855 ICI IA, FAX. :021-588814; plant: Jl. Raya Tlajung Udik, Gunung Putri - Bogor; tel. (99) 82825, 82776.

Dra. E. Indrawati L, Production Manager, Works Department, PT ICI Pestisida Indonesia, rest same as Mr. Thomas.

PT Inagro Inc., Manufacturing and Formulation:

Ir. Sandiana Hoyaranda, Plant Manager, PT Inagro Inc., 52 jalan tanjung, P.O. Box 3314/jkt, Jakarta, Indonesia; tel. 347008; telex: 46390 ingro; Plant: cimanggis jl. raya Jakarta - Bogor km 35 bogor; tel. 870386-87; telex: 48331 ingro i a.

Inkita Makmur

Drs. A.S. Kuddah, Factory Manager, Inkita Makmur - Ciba Geigy, Agrochemicals Formulation Company, Lengkong, Puri, Mojokerto 61301, P.O. Box No. 5, Phone 0321-22301.

Katrini

Mr. Deni P Satari, Ass. Plant Manager, Pt. Kartini Perintis Agro Industries; Jl. Raya Pegangsaan II Km. 4.4, Pulogadung, Jakarta Utara; 4880893-6; P.O. Box 48 JKUKG; Jl. Raya Mundu Pesisir No. 23-25m, Cirebon; tele. 4155,6340.

Mr. Beni Septiono; same as Satari.

Maskitani (Hoechst)

Dipl. Ing. Hadi Taufik Rahayu; Plant Manager, P.T. Maskitani; Jl. Cempaka Putih, Tengah XVII/F9. Bekasi, Indonesia; 410770.

Mr. Arifin S. Idham, Technical Director, pt. Maskitani, plant: Kamp. Jati, Desa Jatimulya, Bekasi, phone: (99) - 72372.

P.T. Monagro Kimia

Mr. Budi Sarwono, Plant Manager, Pt. Monagro Kimia, Kawasan Industri Manis, Desa Jatake Jatiuwung, Tanggerang 15136; tel. (082) 123-037. A Monsanto Subsidiary.

Mr. Djufri Latif, Public Relation Manager; same as Mr. Sarwono.

Mr. Hendrawan Rusli, Chief of Laboratory, same as Mr. Sarwono.

PT.Petrokimia Parant Company:

Ir. Sidi Pranyoto, PT. Petrokimia Gresik, Jl. A. Yani Kotak Pos 2, Gresik, Indonesia; Tel. 0319-81811-14; telex 31477 Petro GS IA.

Ir. Agus Pramono, PT. Petrokimia Gresik, Product and Marketing R&D, same as Sidi; Telex 31477 Petro GS. IA.

Ir. Agus Widartono, PT. Petrokimia Gresik, same as Mr. Sidi.

Ir. Y. Rus Isdiyatna, same as Mr. Sidi.

Ms. Sri Widodo, Research and Development General Manager, PT Petrodimia Gresik, Jl. Jend. A Yani Gresik,, 81811-81814

Pt. Petrosida Gresik Manufacturing:

Fatimanc Mendrofa, Director, Pt. Petrosida Gresik, Pabrik Bahan Aktif Pestisida, Jl. Jend. A. Yani, Gresik, Jatim; Telex 31509 Pesida IA; Tele. :(0319) 81701-81722, 81811-81814; Ext. 632. Manufacturing site.

Pt. Petrokimia Kayaku Formulator:

Amirul Kjujus Azia, Director, Jl. J. Jend. A Yani Kotak Pos 7 Gresik, 61101; (0319) 81815, 81831, 81989; Telex 31006 Petrka IA; FAX (0319) 81830.

Shin - Ichi Sakai, Director, Same as Aziz.

Pt. Yunawati

Djati Soeroso, Jl. Let. Jen. S. Parman 109 Jakarta 11440 Indonesia; phone 596781; Pesticide association contact.

ANNEX G

MODEL TREATMENT SYSTEMS FOR FORMULATORS

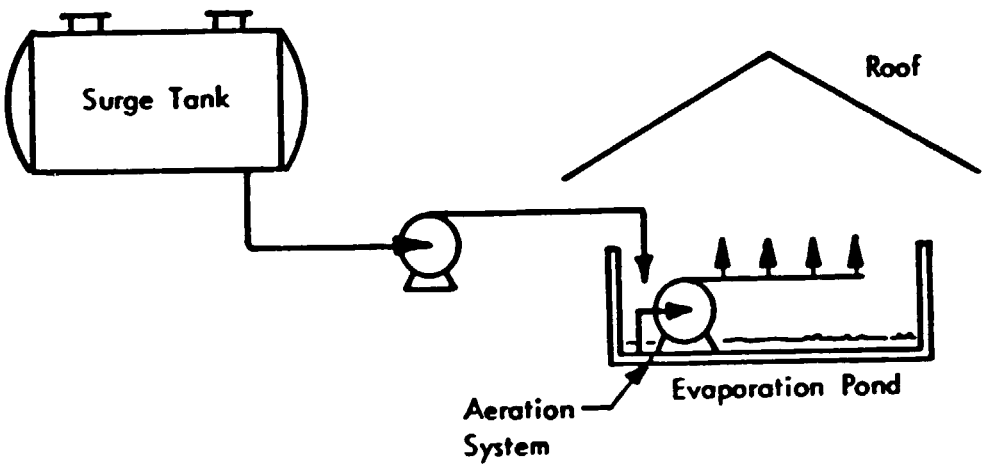


Figure 14 - Evaporative Wastewater Treatment

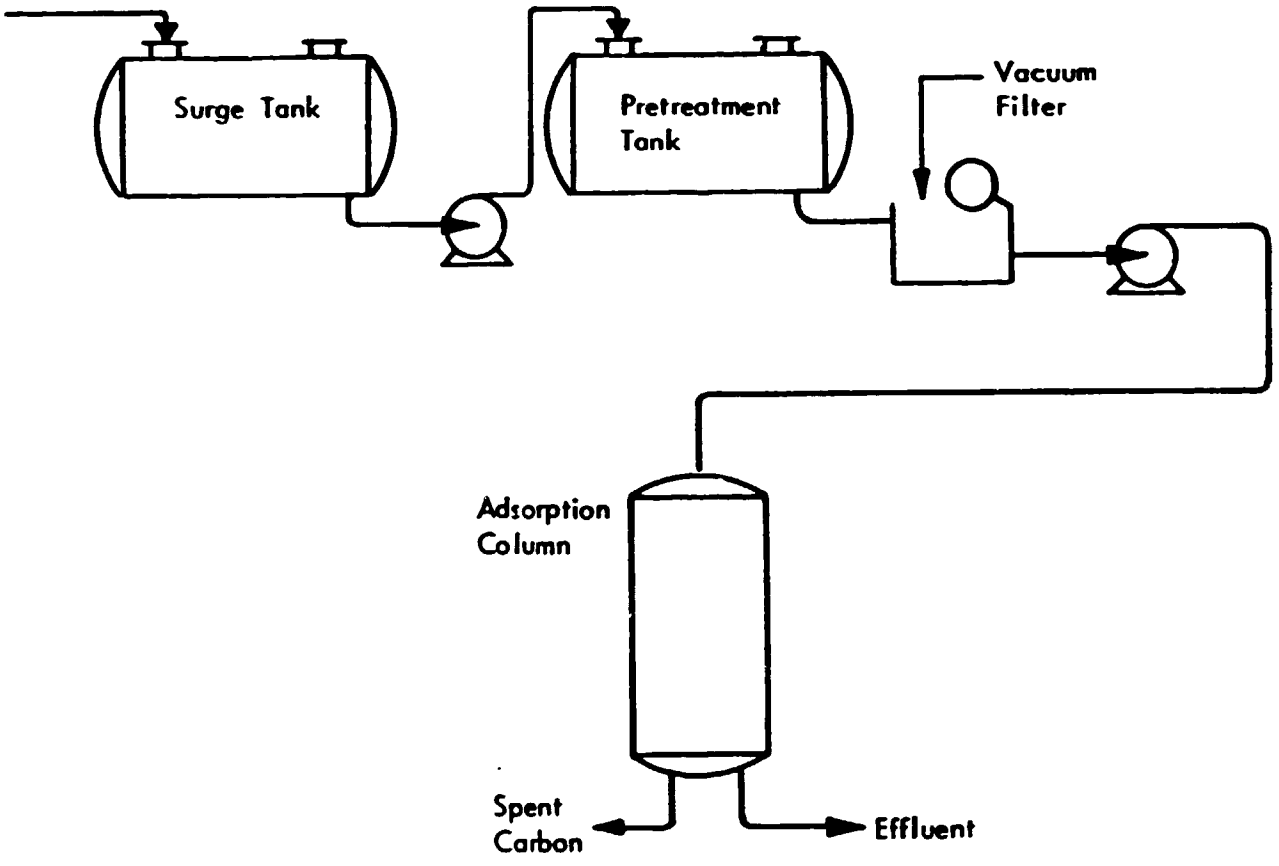
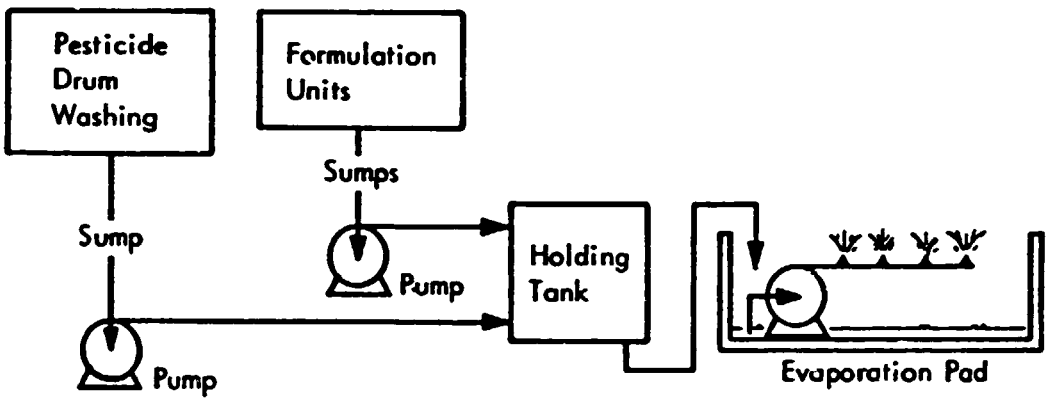
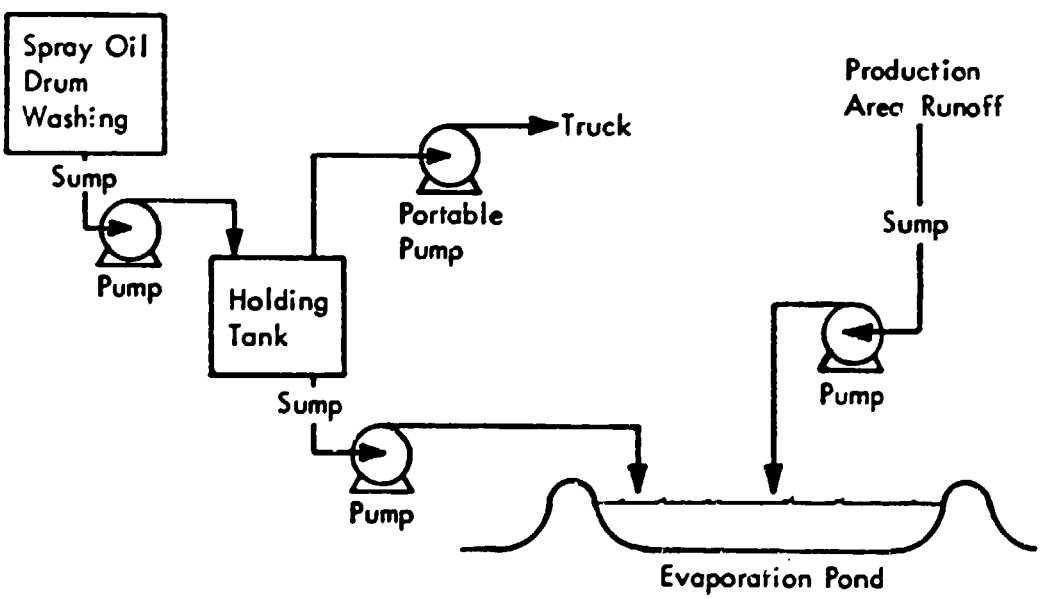


Figure 15 - Pretreatment-Filtration-Adsorption Systems



a) Process Wastewater Evaporation System



b) Evaporation Pond System

Figure A-2 - Water Handling Systems

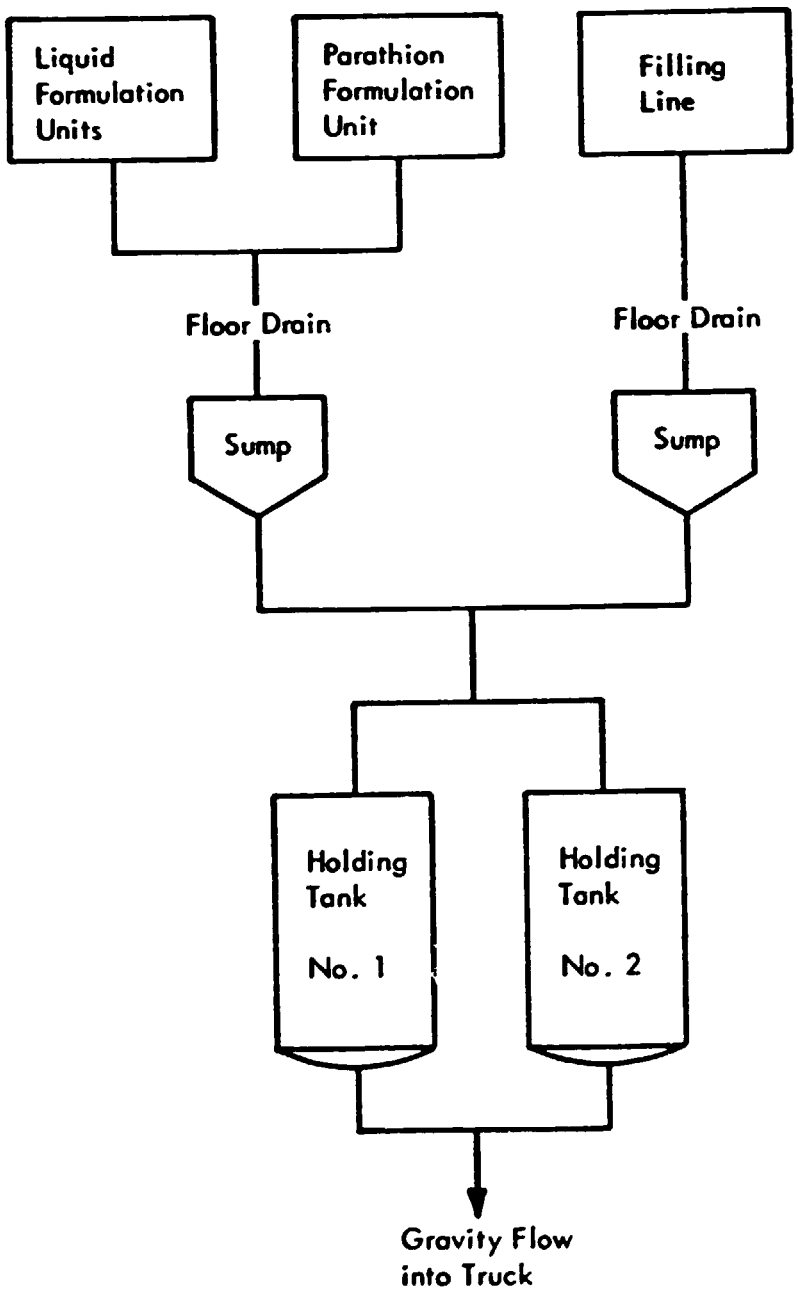


Figure A-3 - Process Wastewater

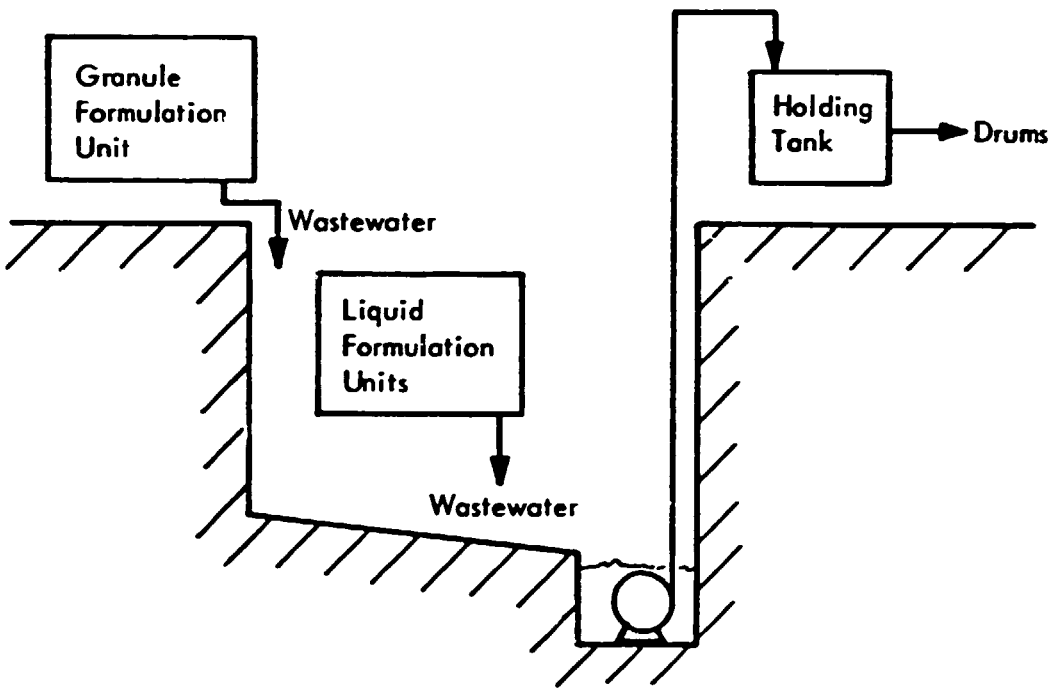


Figure A-4 - Waste Handling System

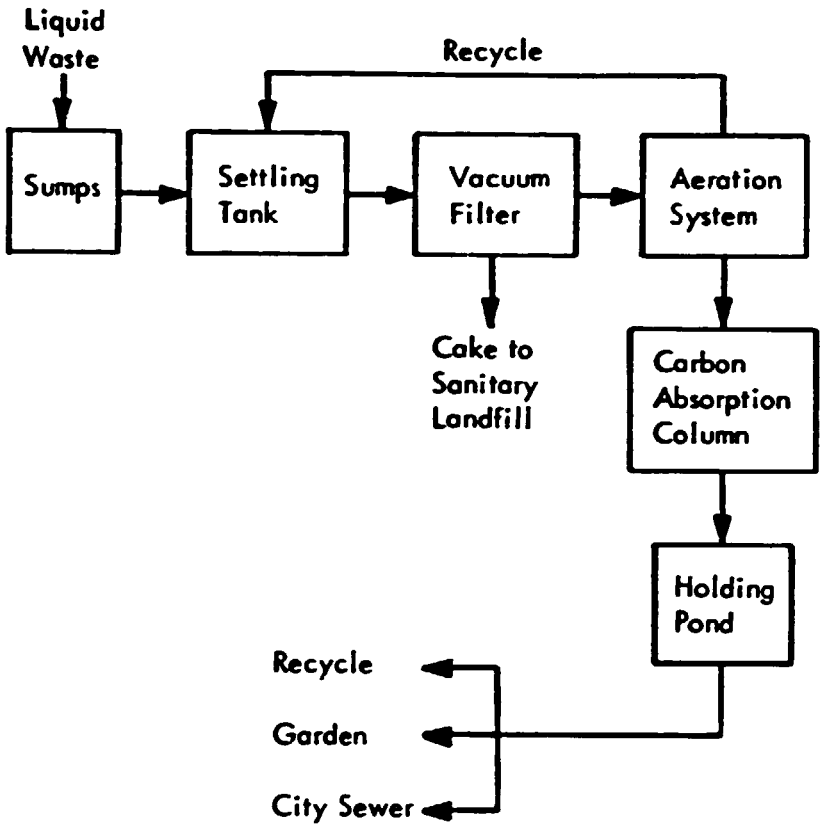


Figure A-5 - Pilot Absorption System

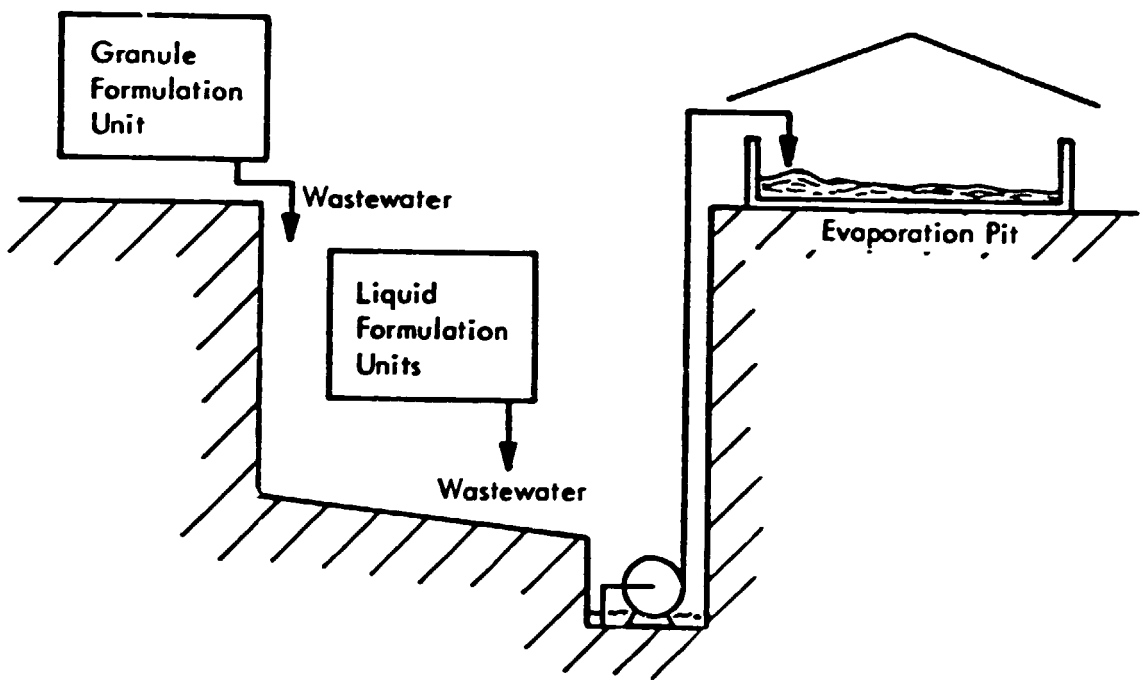


Figure A-6 - Wastewater System

ANNEX H

Proposed Training Courses/Video for the NPDC

A. INDUSTRIAL SAFETY

1. Safe storage and handling procedures for formulation and manufacturing raw materials and finished products.
2. Proper safety equipment for the workplace.
3. Hygiene and safety in the workplace.
4. Fire and other emergency safety procedures.
5. Laboratory safety.
6. Waste treatment safety.
7. How to recognize an exposure incident and what to do.
8. Safety awareness, reporting violations and preventive safety procedures
9. Routine safety inspections.
10. Health and safety certification procedure.

B. EFFLUENT CONTROLS

1. How to setup and run a pilot wastewater treatment plant study.
2. Selecting the right treatment system, start-up and routine maintenance of effective treatment systems.
3. Upset, out-of-control or bypass handling procedures.
4. Proper clean-up and disposal method of spills in the work place.
5. Effective management of stormwater runoff.
6. Effluent control monitoring; Standard Methods.
7. Quality assurance in the laboratory.
8. Air pollution control handling procedures.
9. Solid waste pollution control handling procedures.
10. Reporting violations.
11. Recycle/reuse wastewater procedures as a waste minimization incentives - Case studies save money.
12. Waste incineration - the right way.
13. Waste segregation - all wastes are not equal.
14. Waste treatment certification procedure.

ANNEX-

PROPOSED ORGANIZATIONAL STRUCTURE OF THE NPDC

National Project Director - UNIDO

Ministries:	Industries	Universities
Agriculture	Manufacturing	Bandung
Environment	Formulation	Bogor
Health	Agricultural	Yogyoarta
Industry	Household	
Manpower		

Key Elements

1. Each major input element; ministries, industry and university should have a coordinator. The coordinator should be a responsible, representative member, which could be on a rotational basis or detail, who participates in the development center.

2. Salaries have to be competitive with industry market to attract quality employees to fill the position. Also, industry should consider providing staff initially on either rotational assignments or details for one year.

3. Level of education will vary with the specific function of the staff member.

4. Non Indonesian should be considered for key staff positions if none are available in the country. Two year assignments should be considered.

5. Equipment, whether laboratory, library or the offices, should be state-of-the-art and maintained.

6. Each major function, industrial safety, effluent control, product development, etc. should have its line item in the budget. This should help insure that all the components of the development center are addressed.

UNIDO'S SUBSTANTIVE COMMENTS

DP/INS/89/015

NATIONAL PESTICIDE DEVELOPMENT CENTRE

Technical report of Mr George M. Jett

Introduction

At the request of the Government of Indonesia, UNIDO assigned Mr. Jett from the Environment Protection Agency (EPA), USA to assess the effluent control and waste management in pesticide industries and make suitable recommendations.

Comments

The author along with another expert visited a number of pesticide industries in Indonesia and also held discussions with the Government officials. His extensive visits to different industries clearly revealed that adherence to safety and effluent treatment differed from company to company. He has made a number of recommendations to be followed and these should be incorporated into the proposed Pesticide Development Centre.

Following this assignment, the expert also participated in a workshop organized by the Ministry of Industry and explained his organization's (EPA) guidelines for waste water treatment.

Overall his findings and recommendations along with his fellow expert's (Mr. Khetan) findings on pesticide formulation should be used as a framework for the functioning of the Pesticide Development Centre.

All these have been included in the project document for the Pesticide Development Centre and submitted to the Government for their clearance.