



TOGETHER
for a sustainable future

OCCASION

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



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

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

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

RESTRICTED

20115

DP/ID/SER.A/1639
26 March 1993
ORIGINAL: ENGLISH

STRENGTHENING OF PESTICIDE DEVELOPMENT CENTRE

DP/IND/89/128

INDIA

Technical report: Pesticide formulation technology*

Prepared for the Government of India
by the United Nations Industrial Development Organization,
acting as Executing Agency for the United Nations Development Programme

Based on the work of A. R. Woodford, consultant in
pesticide formulation technology

Backstopping Officer: B. Sugavanam
Chemical Industries Branch

United Nations Industrial Development Organization
Vienna

* This document has not been edited.

Table of Contents

	<i>Page</i>
Acknowledgement	1
Introduction	1
Main Objective of Visit	2
i) Visit to Bombay - 25-27 Sept.	3
ii) Period 28th Sept to 7th Oct.	4
iii) Training Seminar 8-17th Oct.	4
Recommendations	6
UNIDO comments	14

Acknowledgement

The author would like to thank all the staff at the Institute of Pesticide Formulation Technology for the help and assistance given to him throughout his stay. He would particularly like to thank Dr. Kawal Dhari for his help in general matters and also UNDP for all other administrative arrangements. He would also like to thank Dr. Ramdas for his help on a day to day basis.

He would also like to thank Mr. Pillai, EDP Supervisor for his help in preparing copies of the presentation given to the seminar and this report.

Introduction

The Institute of Pesticide Formulation Technology (IPFT) was started as a joint UNDP. Indian Government sponsored project in close cooperation with HIL who provided the site and staff. This project has now been running for approximately 7 years and a wide range of experts have visited the site making recommendations for equipment and training in the areas of formulation development, analysis and biological testing.

Many of the recommendations were taken up and today, the Centre is very well equipped for the development of wide range of formulation type as well as for analysis of pesticide and their formulaiton.

Main Objectives of Visit

This visit was made as a follow up to several previous visits but was also made with the objective of assisting at two seminars, one arranged by M/s Excel Ltd. and the other a training seminar organised at IPFT. No specific formulation projects were envisaged initially although two arose during the visit. In addition, it was felt that contact with as many industry business as possible should be sought.

1. Visit to Bombay 25-27th September, 1992.

This visit had a prime objective to take part in an in-house seminar arranged by M/s Excel Industries Ltd. Additionally, the opportunity was used to meet Mr. Dave of AIMCO Pesticides Ltd. for whom the centre is carrying out a project on sulphur and Mr. Ajay Shah of Anand Engineering to discuss their project on milling graphite.

- a) **Excel Seminar** - The programme is given in Appendix I. The first day was devoted to packaging topics and this is covered in Mr. Kuzia's report.

The second day was devoted to Agrochemical Formulation and two papers were given, one 'A Formulation Overview and the second on 'Controlled Release'. The programme was very well attended as can be seen from the list of participants and many questions arose.

During the lunch with Mr. A C Shroff, there was much discussion about IPFT and its place in the industry. Mr. Shroff was very supportive of the project and supported giving special projects to IPFT. He did, however, point out that training seminars should be in the early part of the year since most manufacturers are very busy at this time of year. He was also in favour of the new structure separated from HIL.

b) **Visit to AIMCO re flowable sulphur with Dr. Ramdas**

Although a visit was made to AIMCO, Mr. Dave was only free for a very short time and apart from being introduced to him, there was no possibility for technical discussion. However, Mr. Dave is President of the Pesticides Manufacturers Association and we were invited to a dinner they were giving at the Taj Mahal Hotel in Bombay. This was a very useful opportunity and several manufacturers were met during this dinner. It was an excellent chance to promote IPFT and to hear their comments. It was clear from these meetings that IPFT needs to more widely publicise its activities and capabilities.

c) **Visit to Anand Engineering re flowable graphite with Dr. Ramdas**

This was a follow up to some work carried out by IPFT during the previous visit. Mr. Ajay Shah of Anand engineering had obtained good results with the process we had provided but found the suspension settled too quickly. After some discussion, a work programme was proposed using Xanthan gum thickness and this work will start after the training seminar.

The laboratories of Anand Engineering where they were milling the graphite were very clean. They had a Dyno mill and mono pump both of which had been recently used and both of which were very clean. They also had an aerosol filling line.

2. **Period 28th Sept to 7th October.**

- a) As no pre-warning had been given before this visit, of the lecture subjects required, much of the time was spent in preparing the

three lectures. The lectures given to Excel had been put together very quickly and both of these had to be polished up for the training programme. In addition, a third paper had to be prepared on "Water Dispersible Granules".

- b) A visit to the pilot scale Aeromatic unit at IPFT showed that the unit was still not in a working condition and is awaiting some modifications prepared by a previous expert. It is unfortunate that this unit is still not in working condition as it is holding up further development of granular formulation for which the Institute has a sponsor.

A comparison of dimensions of the Unit with a similar unit known to be fully operational showed that the spray chamber of the unit may be too short and the spray head needs to be at least 0.5 m. further away from the granulator bed.

- c) During this period, one of the regular meetings of Department Heads took place chaired by Dr. Dhua. These meetings are a good step forward for the Institute as they encourage open exchange between the Departments and help to progress such matters as laboratory safety and labelling. In this respect, there has been a significant improvement in these areas.

The budgeted purchases proposed by each Department were openly discussed and by common consent they were prioritised or dropped to meet the proposed level of expenditure. Some assistance was given to Dr. Pandey concerning a proposed purchase of another G.C. and Dr. Ramdas concerning his proposed purchases.

The opportunity was taken at this time to emphasise the

importance of keeping the main function of the Institute in mind, that is Formulation Development and to ensure that all the essential equipment such as the Malvern are kept up to date and in good working condition. The same applies to the pilot scale unit.

- d) A problem arose in HIL for flocculation of Dicofol on dilution and the Institute was asked to investigate this problem. After some tests on the decanted product, it was shown that this material was satisfactory. However, when the container was rinsed and the washing were added to the suspension, there was immediate flocculation. This was then traced to the use of unlacquered, unanodised aluminium containers. Further, they had not been properly washed. Even after three washings, the water still had a pH2 which was causing the flocculation. The problem was the result of not using the packaging recommended by ISI.
 - e) At the request of Mr. R P Sharma, a small meeting was held to discuss some problem of HIL in the manufacture of DDT water dispersible powder. From a description of the plant used and the process, it was difficult to see the cause of the problem. However, after some discussion concerning the height of the flue between mill and collector and the moisture content of the compressed air, it was suggested that some basic data was necessary from each stage of the process and to relate these to the quality of the finished product. With such data to hand then a more useful appraisal can be made. There was no further contact on this subject.
3. The expert took active participation in a Training Programme on Pesticide Formulation Technology arranged for the benefit of the local pesticide formulators.

The programme went according to schedule except that on two occasions, the intended Chairman was not available and the author stood in their place.

The seminar was fairly well attended being about 13 persons. According to several people, this would have been more if had taken place around January-March as October is a busy time from most Agrochemical companies. Nevertheless, the participants showed a great interest in the subject matter of all the lectures and asked many questions both after each talk and during the lunch and tea break. There were also lively exchanges between the participants.

Despite the somewhat limited numbers, the Training programme was very successful. The only other comment received was that most companies would have preferred the course to fit within a week i.e. 5 or 6 days so as to reduce the time the participants are away from their work place. All seemed to agree that the cost was no restriction.

RECOMMENDATIONS

1. The regular meetings of Department Heads must continue and although Dr.Dhua is the current Chairman, if he is absent for long periods, they should still continue even if necessity on a slightly lower key.
2. There should be a continuation of the improvements made so far. There are still areas where more improvement is needed.
3. The pilot scale area should be looked at from the point of view of dust hazards. Proper extraction is needed over all the mills and such extraction should be to the exterior of the building and at a

high level. If possible, because the Institute is in an agricultural area, all extraction should be via a scrubber.

4. In future, training programmes should only be held in the February-March period or thereabouts and should only last for 5 or 6 days. This is to fit in with the slack period in the Agrochemical industry.
5. Even more publicity should be given to the Institute. One suggestion is to make special presentations to meetings etc., for example, "The Pesticide Formulation Association of India" and the "Association of Manufacturers of Pesticides". This could possibly lead to the Institute drawing some regular financial support from these Associations.
6. All pilot plant must be maintained in full operational alert so that when demands arise, they can be met quickly. Often time is limited when companies are wanting to start field trials.
7. With respect to the above, a small run should be carried out at least one a month not only to ensure that the unit is working correctly but also to keep up the experience in using the unit and perhaps to suggest and try out some improvements. It is not necessary to use costly actions for this purpose and inert fillers can equally well be used. This applies to wettable powders, flowables and granules.
8. The author is aware that some of the above recommendations require regular local funding which could be difficult. However, this is an important subject for the success of the Institute and should be progressed at the Management Committee level.

EXCEL INDUSTRIES LIMITED
BOMBAY

INTRODUCTION TO NEW GENERATION PESTICIDE FORMULATIONS

International Trends in Packaging (September 25, 1992)

MORNING SESSION

SESSION CHAIRMAN: MR. A KUZIA

9.45 - 10.00	Course outline : A Kuzia
10.00 - 10.45	International trends in packaging and their relation to pesticide packages. A. Kuzia
10.45 - 11.00	Discussion
11.00 - 11.30	Safety & labeling requirements - S. Kumar
11.45 - 12.15	IMDG Code - A Kuzia
12.15 - 12.30	Discussions
12.30 - 12.50	Water soluble package - S Kumar

AFTERNOON SESSION

14.00 - 15.00	Standards and testing of packages - K B Gupta
15.00 - 15.15	Discussion
15.25 - 16.00	Bulk packages - A Kuzia
16.00 - 16.30	Automatic filling lines for liquids & solids - K B Gupta
16.30 - 17.00	FFS machines and materials - A Kuzia
17.00 - 17.30	General discussion.
17.30	End of the session.

INTRODUCTION TO NEW GENERATION PESTICIDE FORMULATIONS

Second Day (September 26, 1992)

9.30 - 9.45	Inaugural formalities (if any)
9.45 - 10.45	Pesticide Formulations - An Overview Dr. A.R. Woodford
10.45 - 11.00	Discussions
11.10 - 12.00	Suspension Concentrates Dr. P.K. Ramdas
12.00 - 12.10	Discussions
12.10 - 13.00	Concentrated & Micro emulsions Dr. P.K. Patanjali
13.00 - 13.10	Discussions
14.00 - 14.50	Water Dispersible Granules Dr. P.K. Ramdas
14.50 - 15.00	Discussions.
15.10 - 16.10	Controlled Release Formulations Dr. A.R. Woodford
16.10 - 17.30	General Discussion. Felicitor : Mr. A.C. Shroff

INSTITUTE OF PESTICIDE FORMULATION TECHNOLOGY

Registered Under Societies Act XXI, 1860 (Registration No. S-21944/1991)

Institute of Pesticide Formulation Technology

Two days seminar on Packaging and Formulation
Technology of Pesticides.

--- Organised by
Excel Industries
Bombay, _____

Date: Sept. '25-26, 1992.

1. International trends in Packaging

In this lecture main trends prevailing in packaging technology will be discussed. These include:

- packaging waste issue and its influence on future developments also in pesticide sector
- increasing role of barrier packages
- designing of packages for "Value in Use"
- explanation of various types and technologies related to PET containers.

Also short comments on temperproof closures and implementation of ISO 9000 standard in packaging industry will be given.

2. Safety & labelling requirements

In the packaging safety lecture, we shall discuss safety aspects relating to :

- i) General conditions
- ii) Storage
- iii) Loading & unloading
- iv) Waste disposal of containers

The labelling aspects will be covered as per Central Insecticide Act.

3. IMDG Code

Explanations what is the IMDG code is, what does it contain and how to comply with it are given. Requirements concerning packages their testing and marking of the containers are discussed. Proper labeling for shipment.

4. Water soluble films/ packages

Historical development, properties, specifications, water solubility characteristics, water solubility of seams, effect of pH on solubility, sealing nature with respect to humidity.

Two types KA and KB/N based on German Company SYNTAWA will be discussed.

The advantage and disadvantage of Packaging the Pesticide product in water soluble films/ packages will be discussed.

5. Bulk packaging

Three categories of Bulk shipment i.e. transportation packages, intermittent bulk containers (IBC's) and multimodal bulk containers are explained. Special attention is given to construction and design of transport packages from metal and plastics. Examples of IBC's are also presented.

6. FFS machines and materials

Various types of packaging FFS machines are illustrated and their field of application outlined. Single and multilayer materials used commonly on FFS machines are listed. Preferred machine and materials for pesticides are discussed.

LIST OF PARTICIPANTS FOR PACKAGING & PESTICIDE FORMULATION
SEMINAR HELD AT AMBOLI - 25 & 26 SEPT. 1992

- | | | | |
|-----|----------------------------|---|-------------------|
| 1. | Mr. Andrei Kuzia | : | SPEAKER |
| 2. | Dr. A R Woodford | : | —/— |
| 3. | Dr. P K Patanjai | : | Gurgaon |
| 4. | Dr. Ramdas P K | : | I.P.F.T. |
| 5. | Dr. S Kumar | : | I.P.F.T. |
| 6. | Mr. K B Gupta | : | I.I.P (SPEAKER) |
| 7. | Mr. Nandkumar Jagtap | : | Jogeshwari |
| 8. | Mr. Rudrader DasGupte | : | Jogeshwari |
| 9. | Mr. C D Makwana | : | Bhavnagar |
| 10. | Mr. M D Harsoru | : | Bhavnagar |
| 11. | Mr. P S Pandya | : | Bhavnagar |
| 12. | Mr. M P Mistry | : | Jogeshwari |
| 13. | Mr. R D Bhilare | : | Amboli |
| 14. | Mr. Kishor Zare | : | Amboli |
| 15. | Mr. Sangappa C Uppaladinni | : | UPL - Vapi |
| 16. | Dr. R N Patel | : | UPL - Vapi |
| 17. | Mr. L P Gupta | : | UPL - Ankaleshwar |
| 18. | Mr. R Rayarathe | : | UPL - Vapi |
| 19. | Mr. P S Dave | : | Jogeshwari |
| 20. | Mr. N R Mistry | : | Jogeshwari |
| 21. | Mr. J T Rodrigues | : | Jogeshwari |
| 22. | Mr. Prakash S Karkera | : | Jogeshwari |
| 23. | Mr. Ghanshyam M Makwana | : | Amboli |
| 24. | Mr. H S Jagdale | : | Jogeshwari |

25.	Mr.K A Khan	:	Jogeshwari
26.	Dr.Rajan Shirsat	:	Jogeshwari
27.	Mr.P G Butala	:	Roha
28.	Mr.U P Potdar	:	Roha
29.	Mr.Busane	:	Roha
30.	Mr.Dilip Shah	:	Amboli
31.	Mr.Rakesh Saraiya	:	Parul
32.	Mr.P K Amin	:	Parul
33.	Mr.Mahesh Bhatt	:	Jogeshwari
34.	Mr.P M Jadhav	:	Jogeshwari
35.	Mr.Sachin Jadhav	:	Lote Parshuram
36.	Mr.Srikhant Bhagvat	:	Lote Parshuram
37.	Mr.Parvez Kaisar	:	Roha
38.	Mr.K Simhachalam	:	HCS Ltd. Hyderabad

UNIDO COMMENTS

The report gives a clear picture of the potential that exists for IPFT (Institute of Pesticide Formulation Technology) to serve pesticide industry and closely related industries. This would definitely lead to product diversification for providing service to clients. The emphasis of marketing the capabilities to prospective clients is an essential factor for the self sustainability of the Institute.

The next step for the institute is to move towards commercializing and trial marketing of their promising products. According to expert, minor problems in suspension concentrate preparation are affecting customer satisfaction. The management should address to these bottlenecks since customer satisfaction is the utmost priority for success of the project.