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18157

DP/ID/SER.A/1327
23 March 1990
ENGLISH

PROCESSING OF VIETNAMESE ESSENTIAL OILS AND RELATED
NATURAL PRODUCTS

DP/VIE/84/010

VIET NAM

Technical report: Findings, work performed and recommendations*

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

Based on the work of Mr. Sudhir Jain,
consultant in compounding and blending of perfumes

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* This document has not been edited.

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INTRODUCTION

In 1987, a project document 'PROCESSING OF VIETNAMESE ESSENTIAL OILS AND RELATED NATURAL PRODUCTS' (VIE/84/010/E/01/37) was signed between the GOVERNMENT OF THE SOCIALIST REPUBLIC OF VIETNAM and UNITED NATIONS DEVELOPMENT PROGRAMME.

The immediate objectives of the project are:-

i) to increase the production of Vietnamese essential oils of internationally acceptable quality. this is to be achieved by use of improved processing techniques derived from means of transfer of technology and the application of appropriate parameters for improvement of both yield and quality and capacity.

ii) to forge an effective link between the CNRS and the Ministry of Foreign Tradeso as to enable the latter to serve requests from foreign markets, particularly in regard to information on essential oils produced, the ability to provide the required quantity and quality of products and forwarding of standard samples.

Enhancement of the research and technological competence of CNRS, as well as the field distillation units will serve to accomplish the objective.

iii) development of an investment policy which will indicate the manner in which future production will be realised and how the transfer of technology from the CNRS to the provincial production centres will be effected.

The programme of activities of the above project included among others 1 m/m (post 11-52), assessment of potential for creating fragrance materials in Vietnam from locally produceable products, assistance in developing local expertise in compounding fragrances materials, assistance in organoleptic evaluation of raw materials and products. The mission of the Consultant covered the aforementioned activities and few other aspects of the project which were added to the Consultants' duties on the request of the project CHIEF TECHNICAL ADVISER Dr. C.K. Atal and ENERCOIL management.

The mission took place between Feb 18th 1990 and March 13th 1990 during which time the Consultant was attached to ENTEROIL (Essential Oil Enterprise) situated at Nghiado Tuliem, Hanoi at the area of the CENTRE NATIONALE DE RECHERCHES SCIENTIFIQUES (CNRS).

As per the terms of reference of the assignment, the Consultant functioned as a member of a team, headed by Dr. C.K. Atal, Chief Technical Adviser and assisted by Dr. W.S. Brud, expert from Poland who was also concurrently in Vietnam during the said period.

The team was located at ENTEROIL a semiautonomous organisation within the CNRS, in Vietnam, dedicated to the development of national resources of botanic origin.

Under the guidance of the UNIDO Chief Technical Adviser for the project — 'PROCESSING OF VIETNAMESE ESSENTIAL OILS AND RELATED NATURAL PRODUCTS' for local use as well as for export — located in Hanoi, the expert carried out the following specific functions:-

- i) Assisted in developing local expertise in compounding fragrance materials
- ii) Assisted in organoleptic evaluation of raw materials and products
- iii) assessed the potential for creating fragrance materials in Vietnam from locally produceable products
- iv) Formulated recommendations in regard to future needs

Additionally the following activities were performed:-

- i) NATIONAL WORKSHOP on the development of local expertise in Odour Evaluation & Compounding of Fragrances was conducted
- ii) Hydro-distillation Still of TOURNAIRE was commissioned

Although no proper facilities were available by way of even an elementary fragrance laboratory, the requisite samples of perfumery raw materials and finished fragrances alongwith the necessary accessories were arranged from India and 61 major perfumery raw materials and 21 fragrance formulations were explained in detail and demonstrations were made by means of practical examples to representatives of three major National Institutions of Vietnam in the National Workshop on the Development of Local Expertise in Odour Evaluation and Compounding of Fragrances.

Three specialists of ENTEROIL, HANOI, two of DETERGENTS COMPANY OF SOUTH VIETNAM, HO CHI MINH CITY and one of the INSTITUTE OF MATERIA MEDICA, HANOI were put through the National Workshop on the Development of Local Expertise in Odour Evaluation and Compounding of Fragrances, and were comprehensively introduced to the techniques involved.

The National Workshop on the Development of Local Expertise in Odour Evaluation and Compounding of Perfumes was conducted for a period of 10 days and 60 hours of intensive tutorials with practical demonstrations and active participation by the Vietnamese specialists, were taken and the participants taken to the stage where they could do olfactory assessment independently and also begin to compound primary perfumery compounds themselves.

FOR DETAILS:- SEE ANNEXURE 1 & 2

Modern trade and technical terminology used in the Perfumery Raw Materials field was explained to the participants of the workshop.

FOR DETAILS:- SEE ANNEXURE 3

Four specialists out of the seven attending the workshop were recommended for advanced training, in fragrance compounding.

FOR DETAILS SEE ANNEXURE 4

Assessment was made of the potential for creating fragrance materials from locally produceable materials.

FOR DETAILS : SEE ANNEXURE 5

Equipment required for setting up an aromatic chemicals synthesis plant and fragrance manufacturing unit was determined.

FOR DETAILS SEE ANNEXURE 6

Fragrance formulations were finalised for use in the Soap Industry using entirely indigenous Vietnamese perfumery raw materials.

for details see annexure 7

An ACTION PLAN was formulated for the integrated development of the ESSENTIAL OILS, AROMA CHEMICALS AND FRAGRANCE INDUSTRIES in Vietnam.

FOR DETAILS : SEE ANNEXURE 8

ENTEROIL — ORGANISATION AND ACTIVITIES : SEE ANNEXURE 9

LIST OF CANDIDATES RECOMMENDED INITIALLY FOR OLFACTORY TRAINING BY ENTEROIL

FOR DETAILS : SEE ANNEXURE 10

LIST OF CANDIDATES FINALLY TAKEN FOR TRAINING IN OLFACTORY TECHNIQUES
IN THE NATIONAL WORKSHOP FOR DETAILS: SEE ANNEXURE 11

FINDINGS, OBSERVATIONS AND WORK PERFORMED

1. GENERAL COMMENTS ON PROJECT OBJECTIVES

Project objectives as specified in the Project Document (see above in INTRODUCTION) are more limited than given in Preparatory Assistance Document (VIE/010/A/01/37) which specified objective as under:-

" to establish an essential oils industry utilising the country's natural resources of essential oil bearing species in order to substitute imported products, thus saving foreign currency, now spent for import of essential oils, aromas and flavours, and to contribute to the country's export earnings.

Present objectives limit the activities and aims of the project to development of production and export of essential oils without considering possible (and usually higher) currency savings on local use of essential oils, isolates, and their derivatives as the substituents for imported fragrance compounds.

It shall be mentioned here that the second approach to use of Vietnamese essential oils is included in the other project 'PROCESSING OF AROMA CHEMICALS AND FRAGRANCE MATERIALS' DP/VIE/86/033 being executed in Mekong Chemical Union Enterprise in Ho Chi Minh City.

It is the opinion of the Consultant that same or similar programme should be covered by both projects considering as final result both export of essential oils and their derivatives and manufacture of fragrance compounds based on locally available and produced raw materials. There are facilities and educated staff in ENTEROIL and in co-operation with CNRS, such a programme should be developed and introduced. Proper training of perfumers will be necessary along with one or two chemists in fragrance chemistry.

Equipment required for the production of aromatic chemicals and fragrance compounds can in part be imported, but given the excellent fabrication facilities available, the same can be fabricated locally also,

Several actions already taken by the Chief Technical Adviser are already leading to the aforementioned direction:-

- i) Specialists from ENTEROIL, HANOI and DETERGENTS COMPANY OF SOUTH VIETNAM, HO CHI MINH CITY, and the INSTITUTE OF MATERIA MEDICA, HANOI have been trained in the correct method of OLFACTORY EVALUATION and OLFACTORY ASSESSMENT.
 - ii) The same specialists from the aforementioned organisations have been taken through a detailed course of Fragrance Blending and Compounding Techniques and introduced in depth to the intricacies of the Fragrance Industry.
 - iii) Alongwith the aforementioned programme, they have also been made familiar with QUALITY CONTROL TECHNIQUES, in terms of ORGANOLEPTIC EVALUATION.
 - iv) Production scale fractionation unit has been installed and commissioned in ENTEROIL. The personnel required to operate the said unit have been trained.
- However since technology to process the fractions obtained by fractionation of various oils is not yet available, the full utilisation of the fractionation facility will be made only when the fractions recieved are processed further to produce Aromatic Chemicals and also the same are the utilised in the fragrance blending unit to produce fragrances on an IMPORT SUBSTITUTION BASIS.

2. CONDUCT OF THE NATIONAL WORKSHOP ON THE DEVELOPMENT OF LOCAL EXPERTISE IN ODOUR EVALUATION AND COMPOUNDING OF PERFUMES.

On arrival the Consultant was introduced to Dr. W.S. Brud, who had conducted an initial screening of candidates for the said workshop. Of the 10 people initially proposed (see annexure 10), were finally selected (see annexure 11) and the National Workshop was started in the premises of ENTEROIL.

It is necessary to emphasise that not even elementary fragrance laboratory facilities were available on the premises of ENTEROIL. However, with the help of and on the basis of FRAGRANCE RAW MATERIAL SAMPLES and FRAGRANCE SAMPLES arranged by the Consultant all the way from India entirely at his own expense, the workshop was initiated.

The NATIONAL WORKSHOP covered the following aspects:-

- i) Correct Method of Organoleptic Evaluation of raw materials and fragrance materials.
- ii) Definitions of Fragrances and Flavours (Industrial).
- iii) Uses (Industrial) of Fragrances.
- iv) Classifications of Fragrance Raw Materials and Terminology used in the fragrance raw materials trade.
- v) Odour Description of commonly used fragrance raw materials were discussed and each raw material discussed was physically shown to each participant.
- vi) Workable and Useable fragrances utilising only the raw materials presented in the workshop were exhaustively discussed, analysed and finalised, each representing a well known class of Fragrances.
- vii) A selection of four candidates from the seven was made, for being recommended for higher training in Perfumery Technology at an appropriate place.

3. ASSESSMENT OF THE POTENTIAL FOR UTILISING LOCALLY PRODUCEABLE RAW MATERIALS FOR THE PRODUCTION OF FRAGRANCES

- a) The Potential for Optimum Utilisation of the existing variety of essential oils produced in the country currently was examined.
- b) The potential for Diversifying the range of the essential oils produced in Vietnam was examined.
- c) Workable and useable Fragrance Formulations based on locally produceable raw materials were finalised.
- d) Action Plan for the Integrated Development of the Essential Oils, Aromatic Chemicals and the Fragrance Industries was finalised.

4. NATIONAL WORKSHOP ON ODOUR EVALUATION AND BLENDING OF PERFUMES

4.1. CORRECT METHOD OF ORGANOLEPTIC EVALUATION OF RAW MATERIALS AND FRAGRANCE MATERIALS

The participants of the workshop were shown by practical example, the correct technique involved in odour evaluation, taking within its ambit, the terminology used, avoidance of olfactory fatigue, avoidance of bias, necessity to maintain freedom from contaminating odours, need to maintain a library of standard samples, preservation of smelling strips, importance of a clean environment, the separate procedures involved for liquid, semi-solid and solid samples and the general method for conducting the evaluation or evaluation.

Instead of lecturing, the consultant adopted an attitude of talking to the participants and engaging them in a meaningful discussion, thus drawing them out and breaking down their inhibitions and ridding them to any phobia that they might have had about the subject. By directly encouraging each participant to freely comment and take part in the discussion, it was assured that each person had actually understood the topic being discussed. Further, by adopting this method the self confidence of the participants was built up and interest in the subject awakened.

Since this approach was followed right through the workshop for all the topics, this description of the consultants approach and method will not be repeated again and again.

4.2. DEFINITIONS OF FRAGRANCES AND FLAVOURS

Since the workshop only concerned with fragrances destined for industrial use, the definition thereof was given in detail by the consultant.

4.3. USES (INDUSTRIAL) OF FRAGRANCES

The extent and scope of the Industrial Fragrances Industry was explained to the participants by the Consultant and they were made to realise the very great extent to which modern mankind has become dependent on items of daily use in which industrial fragrances play acritical part.

4.4. CLASSIFICATION OF FRAGRANCE RAW MATERIALS AND TERMINOLOGY USED IN THE FRAGRANCE RAW MATERIALS TRADE.

The categories into which the 2000 fragrance raw materials currently in use in the industry, can be classified on the basis of being either natural or synthetic or their source or their method of production were explained in detail, with practical examples by the Consultant.

4.5. ODOUR DESCRIPTIONS OF COMMONLY USED FRAGRANCE RAW MATERIALS

Sixty individual commonly used raw materials were physically shown

to each participant and the odour descriptions and olfactory characteristics of each one of them were explained in detail and discussed at length with each participant.

4.6. FRAGRANCE FORMULATIONS

Twenty one formulations based on the sixty raw materials presented were given to the participants of the workshop and discussed threadbare with them. The twenty one formulations represented all the major classes of modern fragrances and thus covered the entire spectrum of the perfumery field.

The participants were encouraged to understand, discuss, analyse and discover for themselves the intricacies of the complex trade.

The techniques used by the consultant enabled the participants to imbibe within the duration of the workshop, sufficient expertise to independently formulate elementary fragrances and clearly distinguish between different fragrance raw materials.

4.7. SELECTION OF CANDIDATES FOR HIGHER TRAINING

Four participants out of the seven attending the course were selected for higher training in perfumery technology on the strength of their superior ability to distinguish between different odours, superior odour memory and recall and greater imagination in creating new fragrance styles.

5. ASSESSMENT OF THE POTENTIAL FOR UTILISING LOCALLY PRODUCEABLE RAW MATERIALS FOR THE PRODUCTION OF FRAGRANCE MATERIALS

5.1 POTENTIAL FOR OPTIMUM UTILISATION OF EXISTING VARIETY OF RAW MATERIALS AND ESSENTIAL OILS:-

The current variety of essential oils was considered — available in Vietnam — and apart from those oils which are naturally destined for fragrance or flavour use, the others were found to be such that they could be profitably fractionated for the isolation and derivation of important fragrance raw materials.

5.2. POTENTIAL FOR DIVERSIFYING THE RANGE OF ESSENTIAL OILS PRODUCED

The agro-climatic conditions of Vietnam were considered and on the basis of that and the need to eventually create a fragrance production facility, the list of new essential oil bearing plants/trees to be cultivated was finalised.

5.3. FRAGRANCE FORMULATIONS BASED ON LOCALLY PRODUCEABLE RAW MATERIALS

A series of fragrance formulations based on locally produceable raw materials were finalised such that they are capable of being used in the soap and DETERGENTS INDUSTRY which is currently the major consumer of fragrance materials in Vietnam.

5.4. ACTION PLAN FOR THE DEVELOPMENT OF THE PERFUMERY INDUSTRY

Given the fact that all the three sectors of perfumery industry ie natural essential oils, aromatic chemicals and fragrances are currently under development in Vietnam, an Action Plan alongwith a list of Equipment required for setting up an integrated facility to manufacture the entire range of products was prepared, keeping in mind the current and future needs of the country.

NOTE: ALL OPERATIONAL AND FRACTIONAL DETAILS OF THE OUTPUT OF THE CONSULTANT AS LISTED ABOVE ARE GIVEN IN THE ANNEXURES ATTACHED TO AND FORMING PART OF THE REPORT.

6. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

1. The correct method of organoleptic evaluation of raw materials and fragrance chemicals as taught and explained to the participants in the National workshop will now enable the following people to undertake odour evaluation and olfactory quality control independently, on the basis of the superior olfactory sensitivity shown by them :-

- | | | |
|----|-----------------------|--|
| a. | Ms. TRAN KHANH NGOC | ENTEROIL, HANOI |
| b. | Ms. VO BAO DUNG | DETERGENTS CO. OF S. VIETNAM, HCM CITY |
| c. | Mr. NGUYEN QUANG HIEN | DETERGENTS CO. OF S. VIETNAM, HCM CITY |
| d. | Ms. DCAN THI HOA BINH | ENTEROIL, HANOI |

The trainees are listed in the order of their performance.

2. The project as in progress during the work of the Consultant will create in Enteroil, a basis for Research & Development in the creation and production of fragrances. The nucleus of a Fragrance R & D laboratory has been created on the basis of the standard samples (25 gm. each) of all the basic raw materials required to initiate R&D work, supplied by the Consultant .

3. There is at the time of the mission, no unit anywhere in Vietnam to produce Fragrances required by the domestic industries such as soap and detergents. The problem resulting from this lacuna is that there is no domestic market for the locally produced essential oils and also large sums of foreign exchange are being spent to import the requisite fragrances from foreign sources. The problem can be solved easily by initiating the simultaneous establishment of an AROMA CHEMICALS MANUFACTURING FACILITY BASED ON LOCALLY PRODUCED ESSENTIAL OILS as also a FRAGRANCE BLENDING FACILITY IN TURN BASED ON THE AROMATIC CHEMICALS THUS PRODUCED AND THE EXISTING LOCALLY PRODUCED ESSENTIAL OILS.

The Project as currently conceived is technically and economically incomplete without further steps in the direction of manufacturing aromatic chemicals and compounding of fragrances. Quick development and the new approach to the economy in Vietnam, seen everywhere as intensive activity amongst the people will result in growing demand

for detergents, soaps, cosmetics, toiletteries, perfumes etc. This will encourage production of these goods which will immediately create a market for fragrance compounds. Both ENTEROIL and CNRS have sufficient well qualified personnel who can be picked up for appropriate training and eventually the ENTEROIL AND CNRS can become the TECHNOLOGY BANKS for the entire range of fragrance related industries.

Therefore, the scope of the project should be extended or a second stage started which will include :-

- a) setting up of pilot plant facilities for production of isolates and derivatives obtained directly from locally produced essential oils.
- b) setting up of fragrance blending facility based on the local production of essential oils, isolates and derivatives, inclusive of the training of appropriate technical personnel.
- c) Technology Transfer for the aforementioned objectives should be initially arranged from appropriate consultants so as to avoid unnecessary waste of monetary resources.

4. The project as existing on the date of the mission, can be taken to its logical and fruitful conclusion if the need to have technical personnel trained fully in olfactory techniques is realised and the requisite number of such personnel are properly trained and then appointed to fulfill the following roles :-

- i) QUALITY CONTROL PERFUMER
- ii) MANUFACTURING PERFUMER
- iii) CREATIVE PERFUMER

The sequential order for the achievement of this target should be as under:-

- i) Establishment of the Odour Evaluation Laboratory
- ii) Selection and Training of the Odour Evaluation Panel
- iii) Introduction of rigid quality control based on odour coupled with the usual wet chemical and GLC methods.
- iv) Selection from amongst the odour evaluation panel of the person with an aptitude for fragrance technology in all its aspects and the training

of such an individual so as to enable him/her to eventually start an integrated fragrance facility capable of quality control, routine manufacturing and creative blending.

5. The range of essential oil bearing plants/trees being currently grown in Vietnam needs to be increased so as to include the species/varieties suggested by the Consultant so as to provide a wider and more viable base for the projected essential oils, aromatic chemicals and fragrance industry. Some of these such as grapefruit, vetiver, clove ginger and cananga are already being cultivated as fruit, vegetable or spice crops and it only remains for the distillation of the oil to be arranged. Other crops can easily be introduced by including them in the agricultural programmes.

B.

RECOMMENDATIONS

1. ENTEROIL and UNDP/UNIDO shall consider extension of the scope of the project or its second phase so as to create the following facilities :-
 - a) Odour Evaluation and Olfactory Quality Control methods should be immediately introduced in ENTEROIL to ensure that the goods produced are of an olfactorily acceptable international quality so as to enable the country to face international competition in a situation where the crutches of barter trade have been taken away.
 - b) An Odour Evaluation Laboratory should thus be established immediately with the active involvement of the people trained by the Consultant who at the moment are the only people in Vietnam with any grounding in the scientific methods of odour evaluation. The laboratory should be headed by Ms. Tran Khanh Ngoc who was found to be most competent. This laboratory should be entrusted with the task of Olfactory Quality Control of essential oils being produced in Vietnam.
 - c) This laboratory should in turn be expanded into a creative fragrance laboratory, after the staff has undergone systematic advanced training, preferably in Vietnam itself with the help of the Consultant, as commercial companies abroad generally will not impart useful training to a budding competitor.
 - d) The Creative Fragrance Laboratory should actively co-operate with the essential oil and aromatic chemical manufacturing companies in Vietnam and based on the locally available raw materials, design fragrances for consumption by Vietnamese companies manufacturing consumer goods incorporating fragrances, as per the formulae given by the Consultant.
 - e) The production of Aromatic Chemicals based on locally produced essential oils should be immediately established, as suggested in detail
 - f) The range of essential oil bearing plants/trees should be increased as suggested.

- g) The essential oil bearing plants/trees , flowers, spices etc. already being grown in the country should be taken up for distillation, so as to diversify the existing range of production and the variety of local raw materials required for the fragrance manufacturing facility.
- h) Based on the help provided by the Consultant and the subsequent work done by the Creative Fragrance Laboratory a Fragrance Manufacturing Facility should be established.
- i) The technical personnel required to fullfil the aforementioned tasks should be trained in Vietnam and be only sent abroad for exposure training. It should be borned in mind that no meaningful training can be provided to a potential competitor in any commercial organization.

ANNEXURE 1

NATIONAL WORKSHOP ON THE DEVELOPMENT OF LOCAL EXPERTISE IN THE
COMPOUNDING OF FRAGRANCE MATERIALS AND ORGANOLEPTIC EVALUATION
OF RAW MATERIALS AND RELATED PRODUCTS

In consultation with and under the direct guidance of Dr. C.K. Atal, Chief Technical Adviser, and with the co-operation of Dr. W.S. Brud who was concurrently in Vietnam also, a detailed programme was implemented relating to the titled subject.

The programme of the workshop was initiated by Dr. W.S. Brud who elaborated on some of the theoretical aspects of Olfaction and odour quality evaluation and made an initial selection of candidates so as to ensure that only people with an acceptable degree of olfactory sensitivity attended the programme.

The Salient Points of the Fragrance Blending and Odour Evaluation
Workshop

Theoretical :

1. Human & Animal Senses
2. Structure of Human Sense of Smell
 - a) Anatomy
 - b) Receptors— structure and position
 - c) Olfactory bulb, axons, nerves & grain
3. Odour Perception Mechanisms
 - a) molecular structure of receptors (alpha-helix)
 - b) olfaction theories
4. Sensitivity of Odour Perception, minimum perceptible
 - a) odour thresholds
 - b) just noticeable difference
5. Personal Abilities of Human Olfaction Sense
 - a) sensitivity
 - b) odour memory
 - c) odour association
 - d) odour differentiation

- e) influence of personal condition (health, mood) on above abilities
- 6. Odour Description and Odour Classification
 - a) history of odour description methods
 - b) methods of classification
 - c) primary odours
 - d) odour profiles
- 7. Odour Quality Evaluation
 - a) direct comparison
 - b) triangle method
 - c) duo-trio method
 - d) quality comparative scale

After establishing in short, the theoretical background of the subject on the basis of the topics elaborated above, the practical side of the training was initiated by the consultant on the basis detailed below:-

1. Fragrance—Industrial

- a) Definition :- Any mixture of two or more odouriferous substances, of a type used in industry
 - i) of a type used in food..... Flavour
 - ii) all others..... Fragrance

Thus it was explained that for the purposes of the programme which was mainly concerned with the industrial use of fragrances and/or use of industrial fragrances, it was necessary to abide by the aforementioned definition which is now used internationally as per the Brussels Trade Nomenclature.

- b) Uses : Since the programme was concerned with use of industrial fragrances, the possible uses of such products were explained and are listed below:-

- i) Household Products
 - Soaps and Detergents
 - Cleansers
 - Disinfectants
 - Polishes
 - Paints
 - Adhesives
 - Air Freshners
- ii) Personal Products
 - Cosmetics: Make-up Products

- Toilet and Beauty Preparations
 Perfumes and Toilet Waters
3. Industrial Products
 Dry cleaning
 Leather and rubber articles
 Artificial Leather
 Linoleum
 Plastics
 Printing Inks, Perfumed Board And Paper
 Textiles
4. Agricultural Products
 Insecticides
 Insect and Animal Repellents
 Animal Baits & Attractants
 Veterinary Products
 Cattle Feeds

After detailing the uses of varied fragrances, the major classes/ categories into which fragrances can be divided were described and the same are detailed below:-

1. Green
2. Fruity
3. Floral
4. Aldehydic
5. Leather, Woody & Mossy
6. Floral Bouquets
7. Chypre
8. Oriental
9. Eau de Cologne
10. Fougere

To explain the characteristics of each type of fragrance listed above, a set of commonly used raw materials was prepared and presented in the programme with detailed explanation of the odour picture of each item. The raw materials used are listed below:-

1. benzyl acetate
2. phenyl ethyl alcohol
3. bergamot oil
4. coumarin
5. resinoid labdanum
6. resinoid oakmoss

7. patchouli oil
8. vetivert oil
9. vanillin
10. amyl cinnamic aldehyde
11. citronellol
12. sandalwood oil
13. lavender oil
14. nerol
15. linalol
16. styrallyl acetate
17. ylang ylang oil
18. isoeugenol
19. aldehyde C-12 MMA
20. resinoid iris
21. methyl ionone
22. indole
23. benzyl phenyl acetate
24. hydroxycitronellal
25. terpeneol
26. heliotropin
27. anisic aldehyde
28. cinnamic alcohol
29. para crosyl phenyl acetate
30. phenylacetaldehyde 50%
31. linalyl acetate
32. petit grain oil
33. methyl anthranilate
34. aldehyde C-10
35. gereneol
36. dimethyl octanol
37. guaiacwood oil
38. ionone alpha
39. phenyl acetic acid
40. rose crystals
41. aldehyde C-11
42. methyl heptin carbonate
43. ionone 100%
44. benzyl isoeugenol
45. Aldehyde C-8
46. aldehyde C-9

47. aldehyde C-12 Lauric
48. lemon oil
49. lavender oil
50. rixoline
51. sandalwood oil
52. costus oil
53. birch tar oil
54. resinoid castoreum
55. isobutyl quinoline
56. para tertiary butyl cyclohexyl acetate
57. geranium oil
58. phenyl ethyl acetate
59. phenylacetaldehyde dimethyl acetal
60. phenyl ethyl formate
61. benzyl formate

Using only this basic set of raw materials the aforementioned fragrance categories were demonstrated, using the following typical formulations:-

1. Green

Hydroxycitronellal	100
phenyl ethyl acetate	20
Phenylacetaldehyde 50%	30
Phenylacetaldehyde dimethyl acetal	20
Methyl heptin carbonate	5
Benzyl acetate	20
Phenyl ethyl formate	10
Benzyl Formate	10
Terpeneol	20
Amyl cinnamic aldehyde	10
Citronellol	5
Methyl ionone	15

2. Fruity

Benzyl acetate	15
Bergamot oil	15
Vanillin	15
Ylang oil	30
Letitgrain oil	10
Methyl anthranilate	10

Aldehyde C-10	5
Lemon oil	10
3. <u>Floral</u>	
i) <u>Gardenia</u>	
nerol	30
linalol	20
bergamot oil	40
styrallyl acetate	20
ylang oil	50
isoeugenol	30
• ald C 12 MEA	1
benzyl acetate	40
amyl cinnamic aldehyde	20
ii) <u>Jasmine</u>	
benzyl acetate	30
phenyl ethyl alcohol	10
resinoid iris	5
methyl ionone	5
indole	5
ylang oil	5
hedione	3
benzyl phenyl acetate	10
hydroxycitronellal	30
amyl cinnamic aldehyde	10
isoeugenol	6
iii) <u>Lilac</u>	
jasmine	35
rose	150
terpeneol	50
heliotropin	100
anisic aldehyde	5
cinnamic alcohol	50
hydroxycitronellal	300

iv) <u>Narcissus</u>	
jasmine	100
neroli	15
para cresyl phenyl acetate	10
phenylacetaldehyde 50%	5
v) <u>Neroli</u>	
linalol	250
terpeneol	80
nerol	150
linalyl acetate	70
petitgrain oil	300
methyl anthranilate	50
hydroxycitronellal	50
amyl cinnamic aldehyde	40
aldehyde C 10 10%	5
vi) <u>Rose</u>	
citronellol	300
phenyl ethyl alcohol	100
gereneol	200
dimethyl octanol	100
guaiacwood oil	50
isoeugenol	10
ionone alpha	10
cinnamic alcohol	50
phenyl acetic acid	40
rose crystals	30
aldehyde C 11 10%	5
vii) <u>Violet</u>	
benzyl acetate	100
bergamot oil	100
methyl heptin carbonate 10%	10
resinoid iris	40
methyl ionone	300
ionone alpha	150
ionone 100%	200
benzyl isoeugenol	40
ylang oil	20
jasmine	40

4. Aldehydic

aldehyde C 8	1
aldehyde C 9	2
aldehyde C 10	3
aldehyde C 11	2
aldehyde C 12 lauric	3
aldehyde C 12 NMA	2
bergamot oil	50
lemon oil	5
lavandin oil	30
fixolide	20
sandalwood oil	20

5. Leather

bergamot oil	10
patchouli oil	10
costus oil	2
birch tar oil	5
resinoid labdanum	10
resinoid castoreum	30
methyl ionone	5
isobutyl quinoline	1

Woody

aldehyde C 11 10%	5
vetivert oil	20
sandalwood oil	30
p-tert. butyl cyclohexyl acetate	30
ionone 100%	20
ionone alpha	10
patchouli oil	15
geranium oil	10

<u>Nosy</u>	
resinoid oakmoss	100
coumarin	50
vetivert oil	5
lavender oil	15
nerol	15
linalol	15
phenylacetaldehyde 50%	5
petitgrain oil	30
linalyl acetate	15
lavender oil	30
6. <u>Floral Bouquets</u>	
i) jasmine	50
rose	50
green	5
aldehyde	15
ii) rose	100
jasmine	50
violet	50
aldehyde	20
iii) lilac	100
violet	50
neroli	50
iv) jasmine	100
lilac	50
neroli	50
7. <u>Chypre</u>	
benzyl acetate	20
phenyl ethyl alcohol	20
bergamot oil	30
amyl cinnamic alcohol	10
citronellol	10
coumarin	5
resinoid labdanum	5
resinoid oakmoss	10
patchouli oil	10

vetivert oil	5
vanillin	5

8. Oriental

jasmine	50
rose	30
bergamot oil	30
lavender oil	15
resinoid labdanum	15
resinoid oakmoss	15
patchouli oil	5
vetivert oil	5
sandalwood oil	20
vanillin	30
resinoid iris	5
ylang oil	30
methyl ionone	15
hydroxycitronellal	40
heliotropin	10
costus oil	5
aldehyde	20

9. Eau de Cologne

bergamot oil	100
petitgrain oil	100
lemon oil	30
lavender oil	30
lavandin oil	30
neroli	50
ylang oil	50

10. Fougere

benzyl acetate	20
phenyl ethyl alcohol	20
amyl cinnamic aldehyde	10
citronellol	10
coumarin	5
resinoid oakmoss	15
patchouli oil	10
sandalwood oil	5
vanillin	5
lavender oil	40

ANNEX I

METHOD FOR OLFACTORY ASSESSMENT OF NATURAL AND SYNTHETIC PERFUMERY MATERIALS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 10 March 1988, after the draft finalized by the Natural and Synthetic Perfumery Materials Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 This standard was first published in 1963. The Committee responsible for the preparation of this standard felt that it should be revised in view of the trade practices prevailing in perfumery industry and also to make it more comprehensive.

0.3 Natural and synthetic perfumery materials, such as essential oils, aromatic chemicals, etc. are used primarily for their odour appeal. Although the analytical characteristics which are commonly determined may provide some assurance regarding the chemical purity of an odouriferous substance, they do not necessarily indicate the 'purity' of odour. Hence, olfactory evaluation has been practised for centuries and, in the perfumery trade, it has been formed the basis of acceptance or rejection of odouriferous materials. In spite of the importance attached to this subject, there is no uniform method for odour evaluation nor has a standard procedure yet been formulated in any country. This standard was formulated with a view to introduce

a uniform method of test for olfactory assessment of natural and synthetic perfumery materials.

0.4 Olfactory assessment has been the target of some criticism as it is a subjective test. Numerous attempts on basic odour research and, more particularly, on objective measurement techniques have been made from time to time but none of these has so far found wide acceptance. Whereas objective methods are the goal of all odour research, there is at present no technique which may replace sensory detection and evaluation of odours.

0.4.1 So far 23 Indian Standards have been published on sensory evaluation (see Appendix A).

0.5 In the preparation of this standard, substantial assistance has been derived from the accumulated testing experience of the Indian perfumery soap and cosmetic industries. Assistance has also been derived from various international publications on this subject.

0.6 This standard is a necessary adjunct to all Indian Standard specifications relating to natural and synthetic perfumery materials, such as essential oils, aromatic chemicals, etc. Unless otherwise agreed between the purchaser and the supplier, the purchaser shall have the option to conduct olfactory assessment of the material in accordance with this standard.

1. SCOPE

1.1 This standard prescribes method for olfactory assessment of natural and synthetic perfumery materials based on comparison of a given material with its corresponding standard sample.

2. TERMINOLOGY

2.0 General — For the purpose of this standard, the following definitions shall apply.

2.1 Top Note — The initial and primary odour effect perceived by the olfactory nerves on smelling a strip freshly impregnated with the material being tested. The top note(s) is (are) usually

of a short duration and may or may not be co-perceived along with the middle note.

2.2 Middle Note — The secondary overall odour effect experienced by the olfactory nerves on smelling a strip impregnated with the material after the initial top note has evaporated. It lasts for a longer time on the strip than the top note.

2.3 Residual Note (Dry-Out Note) — The tertiary odour effect experienced by olfactory nerves on smelling a strip impregnated with a material after the top and the middle notes have disappeared. Besides indicating the lasting character and strength of the material, it may also reveal the nature of the lesser volatile materials.

2.4 By-Note — An odour effect, additional to the normal pattern of odours associated with the material, experienced by olfactory nerves on smelling an impregnated strip during any stage of evaporation. It is generally regarded as an index of foreign odour and/or undesirable adulterant and alien.

2.5 Odour Description — Due to the absence of precise terms, descriptive words which are subjective in nature are commonly used to express the odour sensations perceived in the top, middle, residual and by-notes. Some of these terms are given below but the list is not intended to be exhaustive:

acid
acrid
aldehydic
amber
animal

Balsamic
bitter
burnt

camphoraceous
choking
citrus
cloying
cool

dry
dull

earthy
exalting

faecal
fatty
fishy
floral
fungal
fresh
fruity

goaty
grassy
green

heavy
herbal
honey

intense

leafy
leathery

minty
mossy
mushroomy
musky
musty

nauseating
nutty

oriental
peppery
persistent
phenolic
piny
powdery
pungent
refreshing

sappy
sharp
sickly
smoky
sour
spicy
stem like
still odour
sulphuraceous
sultry
sweet

tarry
tart

woody

3. REQUIREMENTS

3.1 General Requirements — The following general precautions are required to be noted.

3.1.1 Selection and Training — Better results are obtained if individuals with a keen sense of smell and ability to distinguish between different odours are selected for training in olfactory assessment.

3.1.2 Fatigue — Continuous smelling causes olfactory fatigue and decreases critical odour perception. To avoid this, the number of samples assessed during a session should be limited as far as is practical. Further, during smelling, the body should be relaxed. Resting for an interval between smelling different samples is also advantageous. If the number of samples to be tested is fairly large, it is advisable to examine last those materials which are known to be pungent or strong in odour.

It should be borne in mind that inability to correctly identify certain odours may arise from natural deficiencies such as specific anosmia. For instance, some people are unable to perceive musky odour.

3.1.3 Bias — The necessity of minimizing all differences between samples other than that of odour in order to prevent the prejudicing of results is stressed. 'Blind' tests should be conducted by ensuring that the markings on the smelling strip do not dislodge the origin of the samples.

3.1.4 Time of Olfactory Assessment — The evidence relating to the most favourable time for conducting olfactory assessment is somewhat conflicting. However, the morning appears to be

generally favoured. In general olfactory assessment should be done after a reasonable interval of time has elapsed after a meal or a beverage has been taken.

3.1.5 Freedom from Contaminating Odours — It is necessary to ensure that the hands, nose and smelling strips are free from contaminating odours as these are likely to vitiate the results. It is recommended that the individual responsible for assessing odour should wash his/her hands several times during a smelling session as well as clear his/her nose.

3.2 Material Requirements — The following materials, apparatus and environmental conditions are required.

3.2.1 Library of Standard Samples — For each essential oil, aromatic chemical or other perfumery material, there shall be a standard sample of approved odour value as agreed upon by the purchaser and the supplier. The standard samples shall be kept in well-stoppered, air-tight, neutral amber-coloured glass bottles and when not in use, they shall be stored in a refrigerator at about 5°C.

3.2.1.1 The odour characteristics of standard samples are likely to change over a period of time however well they may be stored. Some materials improve in odour as a result of maturing while others deteriorate because of minute oxidative changes. An alteration in the odour characteristics of standard samples is not desirable and, in such cases, fresh standards should be adopted. Generally, all perfumery materials have recommended shelf life and the sample should be changed thereafter.

3.2.2 Ethyl Alcohol — Perfumery grade (conforming to IS : 1049-1962*).

3.2.3 Diethyl Phthalate — Perfumery grade.

3.2.4 Smelling Strips — These shall preferably be 1 cm wide and 15 cm long. They shall be made from odourless, thin, absorbent paper and shall be sufficiently stiff so that the strips do not bend under their own weight when held in a horizontal position.

NOTE — Although it is not within the purview of this standard to prescribe specifications for paper used for making smelling strips, it may be noted that absorbent paper of substance ranging from 100 to 280 g/m² is commonly used. The paper is made entirely from the best cotton material, and is usually in the form of cotton or linen fibre or a mixture of both. It should be free from any trace of chemicals. Also the water used in making such paper should be pure and completely free from odours, chemicals or salts. The paper should be neutral and should have been kept away from odorous materials and environment all the time. These considerations should be useful in evaluating the quality of the paper used for preparing smelling strips.

*Specification for alcohol, perfumery grade (revised).

3.2.4.1 Smelling strips shall be packed in air-tight, odour-free containers and stored in a clean odour-free room. Those intended for daily use shall preferably be kept in a wide-mouthed glass bottle covered by a beaker.

3.2.5 Strip Stand — A cruciform patterned 3-clip stand, approximately 21 cm high, or any other suitable device, to hold impregnated smelling strips as shown in Fig. 1.

3.2.6 Environment — A well-ventilated room, as free as possible from all outside disturbances. Ideally, the temperature and humidity suited are about 20°C and 80 percent RH, respectively. The colouring of the room shall be sober and the furnishing restricted. The general environment shall have a restful rather than a distracting effect.

4. PROCEDURE

4.1 One end of each smelling strip shall be clearly marked before use. Dip the unmarked end of one strip (about 0.5 to 1.0 cm) in the material under examination and of another strip to the same depth in the standard sample after it has attained [±] room temperature. For certain perfumery materials, such as fatty aldehydes, absolutes and solids, use 1 to 10 percent solutions in ethyl alcohol or diethyl phthalate for olfactory assessment.

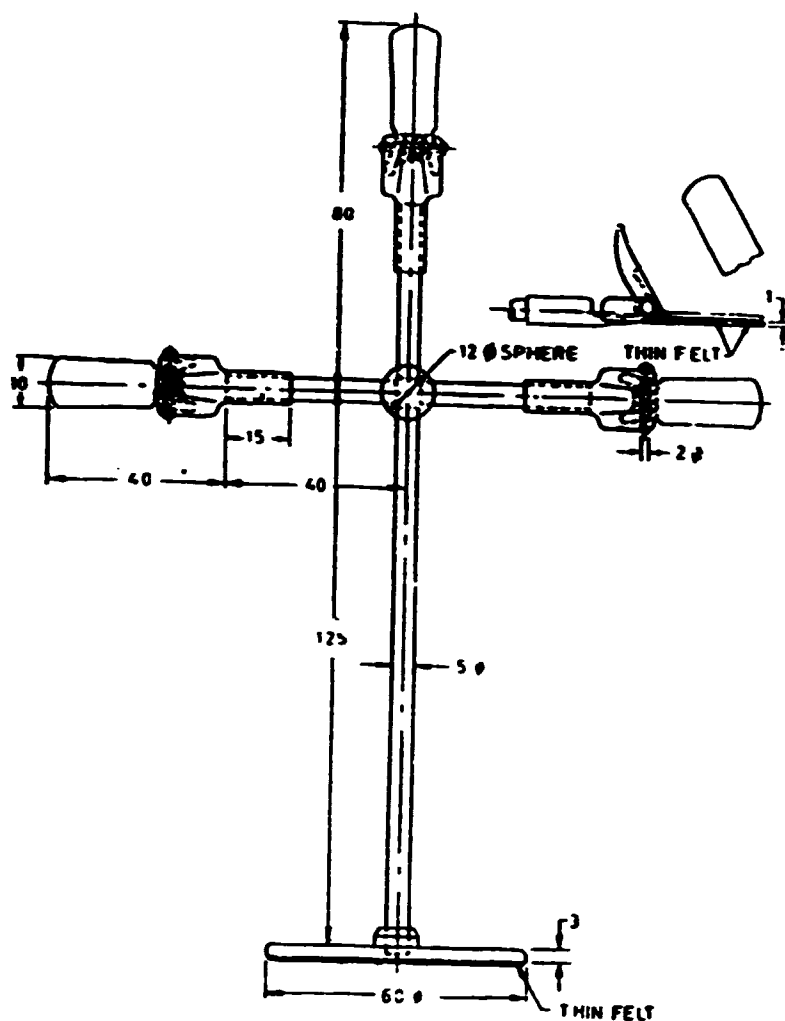
4.1.1 For semi-solids, solids and strong-smelling substances, use the procedure as given below.

4.1.1.1 For semi-solid materials — The odour of semi-solid materials such as guaiacwood oil, oakmoss resinoid and absolute, latdenum resinoid and absolute, etc, should be taken on smelling strips but only after melting the contents completely under controlled temperature below 100°C preferably on water-bath.

4.1.1.2 For solid materials — The odour of solid materials, such as coumarin, musk ambrette, etc, should be examined after pouring out some quantity (about 5g) on odour-free non-absorbent paper (such as glassine). Solids should be smelt both as such, as well as after crushing to enable the occluded impurities to be perceived more easily.

4.1.1.3 For strong-smelling materials — In order to have a better perception, strong smelling substances irrespective of their physical appearance may also be smelt after dilution to about 1 to 10 percent such as indole, fatty aldehydes, etc, using ethanol or diethylphthalate as a diluent.

4.2 Hold the strip impregnated with the standard sample at such a distance from the nose that there is incipient yet distinct perception of odour. While smelling, concentrate wholly on the sensations received and make mental observations. Repeat the procedure with the strip impregnated



All dimensions in millimetres.

FIG. 1 STRIP STAND

with the test sample. After about a minute's rest, repeat the comparison reversing the order of smelling the two strips. Finally, compare the two strips for their odour in a 'blind' test. If a difference in odour is observed, repeat the 'blind' test on the two strips five times. Record the observations of each 'blind' test.

4.2.1 It is important to note that although the room shall be well-ventilated, the strips kept under examination should not be exposed to a direct draught.

4.3 After this initial assessment for top notes, fix the two strips on a stand keeping them sufficiently apart to avoid inter-contamination. Examine the strips periodically by the 'blind' test and note the changes in quality and intensity of odour. Continue in this manner as long as the odour on each strip remains perceptible.

5. REPORT

5.1 Report the top, middle and residual odour

assessment of the test sample as compared with the odour of the standard at corresponding stages of assessment.

5.2 Criterion for Judgement of Quality — The odour of the material under examination shall correspond to that of the standard at all stages of assessment. If it does not and the pattern of odour is considered to be inferior to that of the standard, the quality of the material shall be regarded as not satisfactory.

5.3 Reference Test — In case of dispute, present the individual assessing odour with three suitably coded smelling strips, two of which have been dipped in the material under examination and the remaining one in the standard sample (or *vice-versa*). If the 'odd' sample is consistently picked five times in a 'blind' test, the material shall be deemed to have a pattern of odour different from that of the standard sample.

LIST OF INDIAN STANDARDS ON SENSORY EVALUATION

- IS : 5126 (Part 1) - 1969
Glossary of general terms for sensory evaluation of foods: Part 1 Methodology
- IS : 5126 (Part 2) - 1969
Glossary of general terms for sensory evaluation of foods: Part 2 Quality characteristics
- IS : 6273 (Part 1) - 1971
Guide for sensory evaluation of foods: Part 1 Optimum requirements
- IS : 6273 (Part 2) - 1971
Guide for sensory evaluation of foods: Part 2 Methods and evaluation cards
- IS : 7675 - 1975
Method for sensory evaluation of beer
- IS : 7768 - 1975
Method for sensory evaluation of milk
- IS : 7769 - 1975
Method for sensory evaluation of table butter
- IS : 7770 - 1975
Method for sensory evaluation of *GHEE* (Clarified butterfat)
- IS : 7997 - 1976
Guide for tasting of products of intense flavour
- IS : 7999 - 1976
Tasting glass for liquid samples
- IS : 8104 - 1976
Method for test for pungency of chillies by scoville heat units
- IS : 8105 - 1976
Method for sensory evaluation of pungency of black pepper by scoville heat units
- IS : 8140 - 1976
Guide for selection of panel for sensory evaluation of foods and beverages
- IS : 8153 - 1986
Method for sensory evaluation of fresh fruits (first revision)
- IS : 8639 - 1977
Code for evaluation of the effect of packaging and storage on the sensory qualities of foods and beverages
- IS : 10029 - 1981
Methods for sensory evaluation of sweetened condensed milk
- IS : 10030 - 1981
Methods for sensory evaluation of milk powders
- IS : 10281 - 1982
Method for sensory evaluation of processed cheese
- IS : 10641 - 1983
Recommended methods for determination of aroma and taste thresholds
- IS : 10642 - 1983
General guidelines for consumer sensory evaluation of foods and beverages
- IS : 10643 - 1983
Sensory evaluation procedure to establish guidelines for open dating processed food products
- IS : 11582 - 1986
Method for sensory evaluation of pungency of ginger by scoville units
- IS : 11583 - 1986
Method for sensory evaluation of Indian made foreign liquors (IMFL)

GLOSSARY OF TERMS RELATING TO NATURAL AND SYNTHETIC PERFUMERY MATERIALS (*First Revision*)

0. FOREWORD

0.1 This Indian Standard (*First Revision*) was adopted by the Bureau of Indian Standards on 25 January 1988, after the draft finalized by the Natural and Synthetic Perfumery Materials Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 This standard was first published in 1972. Keeping in view the latest development and advancement in perfumery trade and manufacture, it was decided to revise this standard. It is intended chiefly to cover the technical definition

of terms, and it may not necessarily include all the legal meaning of the terms.

0.3 In the preparation of this glossary, most of the terms currently in use in natural and synthetic perfumery trade and industry together with their synonyms and more common terms in vogue internally and also in other countries have been included.

0.4 In the preparation of this glossary, useful assistance has been derived from various international publications.

1. SCOPE

1.1 This standard defines the terms relating to natural and synthetic perfumery materials.

2. TERMINOLOGY

A

2.1 Absolutes — An ethanolic extract of a concrete or a resinoid which contains the maximum concentration of odoriferous components and is free from natural waxes and/or any solvent used in the processing.

2.2 Acid Value — It is numerically equivalent to the number of milligrams of potassium hydroxide required to neutralize the free acids present in 1 g of the material.

2.3 Alcohol Perfumery Grade, Denatured — Rectified ethyl alcohol, specially denatured for perfumery industry (*see IS : 4117-1973**), and by the addition of denaturants it does not add any undesirable by-odours to it.

2.4 Aldehydic Blend — *See* 2.13.

2.5 Amber Note — A heavy full-bodied warm ambergris like note.

2.6 Animal Note — Odours or notes with a sensuous character.

2.7 Aromatic Chemicals/Aroma Chemicals — Organic chemicals derived by organic synthesis or as isolate from natural essential oils possessing distinct aroma. Used as raw material

*Specification for alcohol denaturants (*first revision*).

for the preparation of perfumery blends or flavours.

2.8 Aromatic Plant — *See* 2.92.

2.9 Aromatic Water — Aqueous odoriferous condensate of hydro-distilled and/or steam-distilled material of vegetable origin containing fully dispersed essential oil.

2.10 Attar (Indian) — A perfume concentrate characteristic of single flower or a mixture of flowers and/or other materials of plant or animal origin with oil of sandalwood as the base.

B

2.11 Balsam — An odoriferous exudate from plants/trees which flows naturally or is artificially induced by incision.

2.12 Blend — Harmonious combination of two or more odoriferous materials.

2.13 Blend Aldehydic — Blend deriving their unique character from the predominance of aldehydic notes.

2.14 Blend, Cologne — Any harmonious combination of fragrances, the main characteristics of which are derived from citrus oils.

2.15 Blend, Oriental — A blend with heavy, full-bodied sweet balsamic and animal note.

2.16 Blend, Spicy — Any fragrance combination having spicy overtone.

2.17 Blend, Woody — Any fragrance dominated by a woody character.

2.18 Body — Main fragrance theme.

2.19 Boiling Range — See 2.40.

2.20 Bouquet — Generally a harmonious combination of two or more floral notes.

2.21 By-Note — A temporary or permanent odour effect additional to the main pattern of odour associated with the material.

C

2.22 Carbonyl Value — It is numerically equivalent to the number of milligrams of potassium hydroxide, that is, equivalent to the amount of hydroxylamine required to oximate the carbonyl compounds present in 1 g of the material.

2.23 Cell — A unit of the plant tissue.

2.24 Cellular — Composed of cells.

2.25 Chypre — A mossy-woody fragrance, complex with a characteristic sweet citrus top note, frequently encompassing some floral tones.

2.26 Citrus — Odours reminiscent of citrus fruits, such as orange, lemon, bergamot, grapefruit, etc.

2.27 Cologne — Name used traditionally for solution of citrus perfume blends in aqueous ethanol (also see 2.113).

2.28 Cologne Blend — See 2.14.

2.29 Concentration — See 2.94.

2.30 Concentrated Perfume — See 2.86.

2.31 Concrete — A material derived from a single source of vegetable or animal origin by extraction with a suitable solvent. It generally contains non-odoriferous constituents, such as waxes, colouring matter, etc, in addition to odoriferous components and is free from any solvent used in the process.

2.32 Condensate — Vapours that have been condensed.

2.33 Condenser — Part of distillation apparatus where the hot vapours are cooled and condensed for recovery.

2.34 Congealing Point — It is the maximum constant temperature at which a liquefied solid resolidifies.

D

2.35 Deterpenized Oil — Natural essential oils which are free from terpenes and/or sesquiterpenes.

2.36 Diffusion — The ability of a fragrance to radiate and permeate the environment.

2.37 Distillation — A process of evaporation and recondensation used for purifying liquids.

2.38 Distillation, Dry — Distillation of semi-solid and solid materials in the absence of steam, water, or any other solvent.

2.39 Distillation, Hydro — Distillation of a substance carried out by indirect contact with boiling water.

2.40 Distillation Range — It is the range of temperature within which a specified percentage of the material distils.

2.41 Distillation Steam — Distillation of a substance by passing steam through it.

2.42 Distillation, Vacuum — Distillation of a substance under reduced pressure.

2.43 Distillation, Water — See 2.39.

2.44 Dry Distillation — See 2.38.

2.45 Dry Out — Final phase of the main fragrance after the main volatile constituents have evaporated.

E

2.46 Enfleurage — Process of extracting fragrance of fresh flowers by intimate contact with mixtures of purified fats preferably at low temperatures.

2.47 Essential Oil — It is a volatile perfumery material derived from a single source of vegetable or animal origin by a process, such as hydrodistillation, steam distillation, dry distillation or expression.

2.48 Essential Oil, Synthetic — It is a composition generally consisting of natural essential oils, aromatic chemicals, resinoids, concretes, absolutes, etc, but excluding animal or vegetable non-essential oils and not having a nonvolatile residue in excess of 10 percent by mass. It is so composed that it bears a close resemblance primarily in odour to a naturally occurring essential oil.

2.49 Ester Value — It is numerically equivalent to the number of milligram of potassium hydroxide required to neutralize the acids liberated by the hydrolysis of the esters present in 1 g of the material. It represents the difference between the saponification value and the acid value of the material.

2.50 Ester Value after Acetylation — It is numerically equivalent to the number of milligrams of potassium hydroxide required to neutralize the acids liberated by the hydrolysis of 1 g of the acetylated material.

2.51 Evaporation Residue — Represents the percentage of perfumery material which is not volatile when heated on a steam-bath under specified conditions.

2.52 Expression — The process of extracting essential oil from the plant cells by application of mechanical pressure.

2.53 Extract — A concentrated product obtained by treating a natural perfumery material with a solvent which is subsequently evaporated.

2.54 Extraction — The process of isolating essential oil with the help of a volatile solvent.

2.55 Extrait, Alcoholic — A French word, now universally used in perfumery, meaning an alcoholic extract of odorous parts of a pomade. It is generally used to mean alcoholic solution of a perfume concentrate.

F

2.56 Fixative — A substance which is compatible with and provides body and substantivity and rounds off a perfume composition by regulating the rate of evaporation of its volatile constituents.

2.57 Flavour — A combined organoleptic sensation of aroma and taste in a flavouring material is also called a flavour.

2.58 Floral — The fragrance characteristic of an existing known flower type.

2.59 Fore Runnings — Initial fractions of the distillate obtained during a distillation process.

2.60 Fougere — Perfume composition having a citrus/lavender top note with sweet powder roseaceous body with mossy/woody background.

2.61 Fractionation — The process of distillation by which an essential oil is separated into various fractions.

2.62 Fruit Flavour/Essence — Suitably blended mixtures of flavouring materials, permitted chemicals and food colours, in a solvent medium of either ethanol or the permitted non-alcoholic solvents.

2.63 Fruity Note — The impression of fruit odours within the fragrance theme.

2.64 Full Bodied — A well-rounded-out fragrance that possess depth and substantivity.

G

2.65 Green Note — Notes that recall fresh-cut grass, leaves and stems or other parts of plants.

2.66 Gum — A natural water soluble anionic material, often of glycoside-like structure and of high molecular mass which collects in or exudes from certain plants. It forms neutral or slightly acidic solution or a sol with water and has a typical mild odour.

2.67 Gum Resin — Natural exudation from plants and trees consisting of gums and resin with very small amounts of essential oils.

H

2.68 Harmonius — Order, accord and symphony in a fragrance.

2.69 Heavy — Oriental balsamic as against floral/green.

2.70 Hydro Distillation — See 2.39.

I

2.71 Infusion — A process of treating a substance with water or organic solvent, with or without heating.

2.72 Isolate — Either a single constituent or a multi-component fraction or a composited fraction, rich in desired odoriferous components and derived from a natural perfumery material.

L

2.73 Lasting Qualities — The ability of a fragrance to retain its character over a given period of time.

2.74 Leathery Note — Any fragrance conveying the dominant characteristic of tanned leather.

M

2.75 Melting Point — The temperature at which the material melts and becomes liquid throughout as shown by the formation of a definite meniscus.

2.76 Melting Range — The range between temperatures at which the material begins to form droplets and at which it becomes liquid throughout.

2.77 Middle Note — The main overall odour effect experienced by olfactory nerves on smelling a strip impregnated with a material and exposed to the atmosphere for some time.

2.78 Mossy Note — The notes that recall to mind moist dark forest having moss on the trees.

N

2.79 Natural Perfumery Materials — Perfumery materials of natural origin.

O

2.80 Odour — That property of a substance which stimulates and is perceived by the olfactory sense.

2.81 Oleoresin — Exudations from tree trunks or barks of trees and are characterized by the fact that these consist of entirely or mainly resin accompanied with an essential oil in varying percentages, soluble in organic solvents.

2.82 Oleoresin Gum — An exudation from plants mainly consisting of essential oil, resin and gum.

2.83 Oleoresin, Spice — Extractibles of spice having resin and essential oil obtained by solvent extraction.

2.84 Oriental Blend — See 2.15.

2.85 Perfume — A solution of perfumery compound/compounds in ethanol or other suitable solvents meant for use as a personal adornment.

Here ethanol or other suitable odourless solvents are used as carriers for the fragrances.

2.86 Perfume Concentrate — A non-alcoholic concentrated perfume blend.

2.87 Perfumery Compound — A concentrated base which is further diluted with or without toning and further modifications to suit various end-uses.

2.88 Perfumery Grade Alcohol — *See* 2.3.

2.89 Perfumery Material — A naturally occurring substance, or a derived material, or a preparation obtained by physical and/or chemical means, which diffuses or imparts an odour or a flavour.

2.90 Perfumery Materials, Natural — *See* 2.79.

2.91 Perfumery Materials, Synthetic — *See* 2.107.

2.92 Plant, Aromatic — Plant bearing a characteristic aroma.

2.93 Pomade — Refined and deodorized animal fat(s) saturated with volatile oils present in and exhaled from the flowers especially the rose and the jasmine.

2.94 Rectification — Method of separation of undesirable substance to improve the quality of the materials.

2.95 Relative Density — The ratio of density of material at 27°C to that of distilled water at 27°C or 4°C when all masses are made in air is called relative density at 27°C or 4°C. Originally, it was known as specific gravity.

2.96 Residual Note (Dry Out Note) — An odour effect experienced by olfactory nerves on smelling a strip impregnated with a material and exposed to the atmosphere for a period of time when the top and the middle notes have disappeared.

2.97 Resin — Solid or semi-solid translucent exudation from trees of plants. These are soluble in organic solvents.

2.98 Resinoid — A semi-fluid or a solid material obtained from a single resinous source of vegetable or animal origin by extraction with a suitable solvent and is free from solvent used in the process.

S

2.99 Saponification Value — It is numerically equivalent to the number of milligrams of potassium hydroxide required to neutralize the free acids liberated by hydrolysis of the esters present in 1 g of the material. It represents the sum of acid value and ester value.

2.100 Saponification Value After Acetylation — It is numerically equivalent to the number of milligrams of potassium hydroxide required

to neutralize the free acid and the acids liberated by hydrolysis of the esters present in 1 g of the acetylated product.

2.101 Sesquiterpene — Term denoting a hydrocarbon composed of one-and-a-half terpene units, a single terpene unit being equal to two isoprene units.

2.102 Sesquiterpeneless Oil — An isolate obtained by suitably removing the sesquiterpenes ($C_{15}H_{24}$) from an essential oil.

2.103 Specific Gravity — *See* 2.95.

2.104 Spice Oleoresin — *See* 2.83.

2.105 Spicy Blend — *See* 2.16.

2.106 Steam Distillation — *See* 2.41.

2.107 Synthetic Perfumery Materials — Man-made single perfumery materials, by chemical processes.

T

2.108 Tail Running — The last fraction of distillate obtained in a distillation process.

2.109 Terpeneless Oil — An isolate obtained by removing almost all monoterpenes ($C_{10}H_{16}$) from an essential oil.

2.110 Thin — The lack of body, richness and substantivity.

2.111 Tincture — A cold alcoholic extract of the soluble part of a natural fragrant material of vegetable or animal origin, the solvent being left in the extraction as a diluent.

U

2.112 Tissue — Plant structure composed of cells.

2.113 Toilet Water — *See* 2.27.

2.114 Top Note — The first odour effect experienced by olfactory nerves on smelling a strip freshly impregnated with a perfumery material.

V

2.111 Vacuum Distillation — *See* 2.42.

2.116 Vacuum Distillation Residue — It is the percentage of material left behind undistilled when a known quantity of the material is distilled in vacuum at specified temperature and pressure.

2.117 Volatile — A material is said to be volatile when it has the property of evaporating at room temperature when exposed to atmosphere.

W

2.118 Water Distillation — *See* 2.39.

2.119 Woody Blend — *See* 2.17.

2.120 Woody Note — The impression of wood or woody odours within the fragrance theme.

ANNEX IV

SELECTION OF CANDIDATES FOR HIGHER TRAINING IN FRAGRANCE BLENDING:-

The following candidates were selected to attend the Workshop on Odour evaluation and Fragrance Blending:-

- | | |
|------------------------|--|
| 1. Doan thi Hoa Binh | Enteroil, Hanoi |
| 2. Tran Khanh Ngoc | Enteroil, Hanoi |
| 3. Le Phuong Thao | Enteroil, Hanoi |
| 4. Nguyen Quang Hien | Detergents Co. of S. Vietnam, Ho Chi Minh city |
| 5. Vu Bao Dung | Detergents Co. of S. Vietnam, Ho Chi Minh City |
| 6. Pham Truong Thi Tho | Institute of Materia Medica, Hanoi |
| 7. Mai Thanh Son | Enteroil, Hanoi |

These candidates were put through an intensive training course during the course of the workshop, as described in the previous annexures 1&2. As the course progressed, the candidates were constantly evaluated for sensitivity, odour memory, odour association, odour differentiation, odour description, and ability and imagination and aptitude for fragrance blending.

The candidates were asked to identify and differentiate between various raw materials and finished fragrances, describe in their own words but using perfumery language the odour profile of these materials, describe and illustrate with practical examples the varied uses of these materials, and finally to create illustrative and typical formulations entirely on their own and thus demonstrate their grasp of the subject.

On the basis of the tests described above, the following candidates, in the order of their merit, were selected for higher training in Perfumery Technology:-

1. TRAN KHANH NGOC
2. VU BAO DUNG
3. NGUYEN QUANG HIEN
4. DOAN THI HOA BINH

ANNEXURE V

AN ASSESSMENT OF THE POTENTIAL FOR CREATING FRAGRANCE MATERIALS IN VIETNAM FROM LOCALLY PRODUCEABLE PRODUCTS

Vietnam is currently producing the following Natural Essential Oils:-

1. Citronella oil, Java type
2. Litsea cubeba oil
3. Cajeput oil
4. Mentha Arvensis oil
5. Cassia oil
6. Ocimum gratissimum oil
7. Ocimum basilicum oil
8. Star Aniseed oil

If these, the following are used in certain types of fragrances and flavours :-

<u>Item</u>	<u>End Use</u>
a. Cajeput oil	Flavours
b. Cassia oil	Flavours & Fragrances
c. Ocimum gratissimum oil	Fragrances
d. Ocimum basilicum oil	Fragrances
e. Star aniseed oil	Flavours

The remaining essential oils i.e.

- a. Citronella oil
- b. Litsea cubeba oil
- c. Mentha arvensis oil
- Ocimum gratissimum oil

can and must be produced in even greater quantities and processed to produce important isolates and derivatives such as :-

- a. Citronellal
- b. hydroxycitronellal
- c. Citronellol
- d. Dimethyl octanol
- e. Citronellyl acetate
- f. Citronellyl formate
- g. Citronellyl butyrate
- h. Citronellyl valerate
- i. Gereneol
- j. Geranyl acetate

- k. Geranyl formate
- l. Geranyl butyrate
- m. Geranyl valerate
- n. Citral
- o. Ionone alpha
- p. Ionone beta
- q. Methyl ionone
- r. Menthol
- s. Dementholised oil
- t. Menthone
- u. Thymol
- v. Eugenol
- x. Isoeugenol
- y. Methyl eugenol
- z. Acetyl isoeugenol

The aforementioned raw materials can together constitute a reasonable basis for the production of fragrance materials based on essential oils currently produced in Vietnam.

Further, given the fact that Vietnam has in greater measure an even tropical climate, the following items can be taken up for extensive cultivation and which will in turn yield important raw materials for the production of fragrances and flavours :-

- i. Grape fruit
- ii. Vetiver
- iii. Mentha piperita
- iv. Mentha citrata
- v. Mentha spicata
- vi. Cloves
- vii. Nutmegs
- viii. Ginger
- ix. Black pepper
- x. Cananga

Mentha Citrata oil can be conveniently processed to produce the two very important raw materials which are almost invariably part of any fragrance:-

- 1. Linalol
- 2. Linalyl Acetate

Turpentine oil

Special attention should be given to this very important resource of the Vietnamese nation. Apart from being exported as it is, it can be processed locally to produce the following raw materials which are again basic to the compounding of fragrances :-

1. Terpeneol
2. Terpenyl acetate
3. Pine oil
4. Dipentene
5. Isobornyl acetate
6. Isoborneol
7. Camphor
8. Camphor oil
9. Borneol
10. Camphene (which can be reacted with guaicol/phenol and then hydrogenated to give Synthetic Sandalwood — Sandela)

To sum up we may say that if the existing and proposed resources of Vietnam are utilised in an optimum manner, then a large number of locally produced and produceable raw materials — essential oils and aromatic chemicals — will become available to any future fragrance blending facility.

These indigenously produced raw materials would be enough to produce standard acceptable perfumery compounds for the entire soaps and detergents industry of the country, which as on today, has to import its entire requirements, leading to the loss of valueable foreign exchange.

ANNEXURE VI

EQUIPMENT REQUIRED FOR SETTING UP AN AROMATIC CHEMICALS SYNTHESIS PLANT
AND FRAGRANCE MANUFACTURING UNIT1. Equipment required for the production of Isolates, their
Derivatives including derivatives of Turpentine oil

Fractionation Columns

vacuum pumps

reaction Vessels

Washing Vessels

Storage tanks

. Cooling Tower

Steam Boiler

Oil Heating System

Chilling Plant

Standby Electric Generator

Quality Control Equipment

2. EQUIPMENT REQUIRED FOR THE PRODUCTION OF FRAGRANCE

Containers for raw material storage

Containers for finished goods storage

Mixing vessels with heating and stirring arrangement

Blending vessels with heating and stirring arrangement

Beakers, jugs, tubs and trays

Weighing balances

Packaging machinery

ANNEXURE VII

Fragrance Formulations based on entirely indigenous Vietnamese
perfumery raw materials1. LILAC SOAP COMPOUND

Hydroxycitronellal	200
Citronellol	50
Citronellyl Formate	20
Geranyl Acetate	20
Citral	5
Ionone Alpha	45
Methyl ionone	20
Isoeugenol	10
Grapefruit oil	30
Linalol	30
Linalyl Acetate	30
Sandela	30

2. ROSE SOAP COMPOUND

Citronellal	2
Hydroxycitronellal	10
Citronellol	75
Dimethyl Octanol	50
Gereneol	75
Geranyl Acetate	20
Citronellyl Formate	20
Ionone Alpha	10
Isoeugenol	10
Terpeneol	48

3. Sandalwood Soap Compound

Sandela	200
Isoborneol	10
Isobornyl Acetate	50
Terpeneol	50
Cananga oil	20
Clove oil	10
Vetivert oil	50
Acetyl Isoeugenol	10
Methyl Ionone	10
Ionone Alpha	10

4. Lavender Soap Compound

Hydroxycitronellal	30
Citronellol	20
Citronellyl Formate	5
Geranyl Acetate	10
Citral	2
Methyl Ionone	8
Isoeugenol	10
Vetivert oil	5
Mentha Citrata oil	60
Ginger oil	5
Cananga oil	10
Terpenyl Acetate	30
Isobornyl Acetate	20

5. Lime/Lemon Soap Compound

Dipentene	10
Terpenyl Acetate	20
Terpeneol	10
Linalyl Acetate	20
Linalol	10
Ginger oil	5
CITRAL	50
Methyl Ionone	10
Hydroxycitronellal	20

ANNEXURE VIII

ACTION PLAN FOR THE INTEGRATED DEVELOPMENT OF THE ESSENTIAL OILS,
AROMATIC CHEMICALS AND FRAGRANCE INDUSTRIES IN VIETNAM

In order to be able to achieve the full potential for the development of the fragrance industry in Vietnam based on locally produceable raw materials, the following steps are required to be taken :-

1. Establishment of a properly equipped facility for the production of Isolates and Derivatives.
2. Establishment of new essential bearing crops.
3. Establishment of a properly equipped facility for production of Turpentine derivatives.
4. Establishment of a fragrance Research & Development Laboratory specialising in both Quality Control as well as Creative Perfumery.
5. Establishment of a properly equipped facility for the production of fragrances from materials derived from locally produceable items.

The essential equipment required for the establishment of these facilities and laboratories is detailed below:-

A. Equipment required for the production of isolates, their derivatives including Turpentine derivatives

Fractionation Columns
Vacuum Pumps
Reaction Vessels
Washing Vessels
Storage Tanks
Cooling Tower
Steam Boiler
Oil Heating System
Chilling Plant
Standby Generator
Quality Control Equipment

B. New essential oil bearing crops

The steps required to be taken to optimise output in this area are as follows :-

- a. Procurement of good planting material
 - b. Propagation of new planting material
 - c. Necessary inputs to the farmers by way of transfer of cultivation technology and other relevant techniques to be provided.
 - d. Standardisation of Steam/Hydro Distillation units both in terms of mechanical design and methodology of operation.
 - e. Regular system of quality control to ensure optimum quality
6. Equipment required for the fragrance R & D Laboratory

Library of Standard Samples of Local as well as Imported Materials
 Samples of all the commonly used samples, aromatic, Natural essential oils, resinoids and solvents.

Properly designed storage racks, work tables and sample bottles
 Analytical Balances

Magnetic stirrer and heater —composite unit and Water Bath

Refrigerators for Storage of Standard samples

Small glass flasks, measuring cylinders, pipettes, beakers etc.

D. Equipment Required for the Fragrance Facility for Production

Containers for raw material storage

Containers for finished goods storage

Mixing vessels with heating and stirring arrangement

Blending vessels with heating and stirring arrangement

Beakers, jugs, tubs and trays

Weighing balances

Packaging equipment

RELATED BENEFITS LIKELY TO ACCRUE TO VIETNAM DUE TO THE ESTABLISHMENT OF THE AFOREMENTIONED FACILITIES

- A. Enhancement of the market for locally produceable raw materials due to local consumption in addition to exports
- B. Relative freedom from the uncertainties caused by the cyclic nature of the international market
- C. Establishment of a new pioneering industry directly leading to the introduction of new technology.

- D. Generation of new employment opportunities in both the industrial as well as the agricultural sector.
- E. Production of import substitution items and consequent saving in foreign exchange
- F. Increase in the variety of production of exportable goods and consequent stabilising and growth of annual exports.
- G. Improvement in the quality of local as well as goods exported from Vietnam.

ANNEXURE IX

"ENTEROIL" ORGANIZATION AND ACTIVITIES

Established in July 1985 ENTEROIL is a company located at premises of Centre Nationale Recherche Scientifiques and operates under CNRS and Ministry of External Economic Relations

The company is engaged in development production and trade of essential oils and related products . According to planning of the Ministry it shall purchase essential oils from farmers , villages or cooperatives , blend and standardise the products , pack and ship to customers (mainly to USSR and East European contries to fulfill government trade agreement) .

The company total employment is 45 people organised in five departments

DIRECTOR	Mr. Le Van Thu
Deputy DIRECTOR	Mr . Le Trong Vong
QUALITY CONTROL & DEVELOPMENT	Manager : Nguyen Quoc Dung 6 engineers with university level
ADMINISTRATION	Manager : Mai Van Toan 7 employees
PRODUCTION	Manager : Mr Le Nhi Hoa 7 engineers with university level 3 technicians
TRADE	Manager : Mr Van Ngoc Danh 6 foreign trade college graduates
WORKSHOP (DISTILLATION ,BLENDING, PACKING, SHIPMENT)	Manager : Mr Nguyen Tan Hung 3 engineers with university level 11 assistance employees

Majority of university graduates were educated or trained in European or Indian University and research centres

ENTEROIL is responsible for execution of UNDP project DP/VIE/84/010

ANNEXURE X

LIST OF PERSONS ORIGINALLY NOMINATED FOR THE NATIONAL
WORKSHOP ON ODOUR EVALUATION AND PERFUME BLENDING

RESULTS OF ODOUR DIFFERENTIATION TEST
CONDUCTED ON THE GROUP INITIALLY NOMINATED

Eight sets of samples (triangle method) were presented. One mistake is considered acceptable, with two mistakes a person can be considered for further training and tested again after training

NAME	NO. OF MISTAKES	RESULT
1. VU BAO DUNG	1	ACCEPTED
2. Mrs. LUC THIS VAN HIEN	2	TEST AGAIN
3. Mr. NGUYEN QUANG HIEN	2	TEST AGAIN
4. Mrs. TRAN KHANH NGOC	1	ACCEPTED
5. Mrs. LE PHUONG THAO	1	ACCEPTED
6. Mr. NGUYEN HUU THAO	5	NEGATIVE
7. Mr. NGUYEN TRONG LUG	3	NEGATIVE
8. Mrs. DOAN THI HOA BINH	1	ACCEPTED
9. Mrs. TRAN THI CUC	4	NEGATIVE
10. Mr. VAN NGOC DANH	4	NEGATIVE

ANNEXURE XI

LIST OF CANDIDATES SELECTED FOR THE NATIONAL WORKSHOP
ON ODOUR EVALUATION AND FRAGRANCE BLENDING

- | | | |
|----|----------------------|--|
| 1. | DOAN THI KOA BINH | ESSENTIAL OILS ENTERPRISE |
| 2. | TRAN KHANH NGOC | ESSENTIAL OILS ENTERPRISE |
| 3. | LE PHUONG THAO | ESSENTIAL OILS ENTERPRISE |
| 4. | MAI THANH SON | ESSENTIAL OILS ENTERPRISE |
| 5. | PHAM TRUONG THAI TAO | INSTITUTE OF MATERIAL MEDICA |
| 6. | NGUYEN QUANG HIEN | DETERGENT CO. OF S. VIETNAM, HCM CITY |
| 7. | VU BAO DUNG | DETERGENT CO. OF S. VIETNAM, HCM CITY. |