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PROCESS AND PRODUCT DEVELOPMENT CENTRE FOR ESSENTIAL OILS,
KANNAUJ, UTTAR PRADESH

DP/IND/89/133/11-51

INDIA

Technical report: First mission*

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 N. V. Shrimpton, perfume blending consultant

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United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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ABSTRACT

One month mission performed between 15th August, 1993 and 13th September, 1993. Study of the perfumery industry in the Kannauj area with a view to improving the products and their presentation. Advice on the setting-up of a new product development facility and laboratory for sensory evaluation and fragrance formulation within the process and product development centre for essential oils, Kannauj, Uttar Pradesh, India.

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LIST OF ABBREVIATIONS USED

UP	UTTAR PRADESH
PPDC	PROCESS AND PRODUCT DEVELOPMENT CENTRE
SISI	SMALL INDUSTRIES SERVICE INSTITUTE
DCSSI	DEPARTMENT OF THE COMMISSIONER FOR SMALL SCALE INDUSTRIES
CIMAP	CENTRAL INSTITUTE FOR MEDICINAL AND AROMATIC PLANTS
UPT	UTTAR PRADESH TOURISM
UPSIC	UTTAR PRADESH SMALL INDUSTRIES CORPORATION
CSIR	COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
NBRI	NATIONAL BOTANICAL RESEARCH INSTITUTE
HBTI	HARCOURT BUTLER TECHNOLOGICAL INSTITUTE
ITRI	INDUSTRIAL TOXICOLOGICAL RESEARCH INSTITUTE
IIT	INDIAN INSTITUTE OF TECHNOLOGY

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INTRODUCTION

The perfumery industry at Kannauj has a long history going back over many generations. The production methods attest to this, a crude Hydro-Distillation called the Bhapka Process and storage in Kuppis (leather bottles). The industry has however adapted over time with the replacement of Hydro-Distillation of sandalwood with the use of steam distillation earlier this century. The Kuppi is itself being replaced by more modern packaging and now only between 5 to 10 families are said to be engaged in the making of the leather bottles.

The production of rose wood boxes for the presentation of perfumes is said to involve only 20 to 25 families and much of the work now being undertaken is on other handicraft items.

The town and its people are totally reliant on the success of the traditional Attar Industry which was given a fillip with the introduction of Pan Masala (a new form of chewing tobacco) which has had substantial success in the market place. However there is a questionable future for this product and if the Kannauj industry does not begin to restructure itself then the long history of decline will continue.

Kannauj has been compared to the French perfumery town of Grasse which also boasts of a tradition going back several generations, yet Grasse has been at the forefront of technological advance. The traditional equipment has been turned into a tourist attraction which brings in additional revenue and maintains (in the tourists mind) a romantic feel to the town. Perhaps such a scheme could be employed at Agra but Kannauj is too far from the tourist routes.

The Process and Product Development Centre (PPDC) at Kannauj has been established to service, sustain and upgrade the essential oils and perfumery industry at Kannauj. PPDC can assist in the restructuring and development of the industry and

ensure it's long term success to the benefit of the local population.

INDUSTRY SURVEY

Contact with local industrialist was undertaken through visits to production units, informal one to one discussions and at a meeting called at PPDC.

The meeting at PPDC gave the consultant an opportunity to introduce himself, UNIDO and to obtain feed back on the needs of the industrialists and how they can support the PPDC (minutes of meeting held on 31.8.93 Annex 12).

Representatives of thirteen companies attended the meeting, six of whom were from the first ten producing companies (Annex 13). The top ten companies produce up to 70% of the output of Kannauj. Outputs (sales) are estimated to be in the region of US\$ 10 million. A confidential questionnaire was distributed to participants at the meeting (Annexe 14). Ten questionnaires were returned. The following estimates are made on these and on informal discussions with individual industrialists:

10% to 15% of production is exported with exports being handled equally by the producer himself or a local agent/exporter. Only two of those present had made an overseas sales/marketing trip in the previous year. In contrast the number of trips undertaken in India by all relevant companies (see industry structure below) was between 12 to 30 per annum.

The main activities of the industry in Kannauj would appear to be by value in percentage terms:

- a) Production of Attars for the flavouring of Chewing Tobacco, Zarda, Pan Masala etc.

b) Production of attars to flavour other products; Confectionery, Gulkand, Sherbets etc. (including floral waters).	10%
c) Production of attars for fragranced (perfumery) products.	10%
d) Production for external sales of pure oils of natural origin (Note 1).	15%.
e) Production of compounded (blended) fragrances and flavours of synthetic and natural origin (Notes 2&3).	5%
	<hr/>
	100%
	<hr/>

Notes

- 1) Sandalwood is distilled primarily for internal use in the production of Attars.
- 2) A blended product is defined as a mixture of two or more starting materials one of which is a complex mixture or compound.
- 3) Extenders (compounds) and individual synthetics are often added (blended) with 'Natural' Attars. Many of the Attars produced would fall into this category.

The consensus was divided equally amongst those who felt that there was a poor outlook and those who felt that there was a good outlook for the industry. The majority are not looking for foreign investment in their company. This is to be expected as they are family based units.

A clear majority were willing to pay for technology transfer.

The following comments were noted in the questionnaire:

- a) Fear that the industrialists will loose their trade secrets.
- b) PPDC can help most in providing modern techniques and assist in diversification.
- c) Good quality Aroma Chemicals have to be imported and it was suggested that PPDC open a section for stocking and selling of these imported materials.
- d) The PPDC library be made available to industrialists.

Essential Oils

Sandalwood Pure Sandalwood is the traditional base for Attars. There are 16 units with steam distillation facilities with about 80% of the work load being carried out on a contract basis where the owner of the wood remains separate.

Between 20 and 30 metric tonnes of sandalwood oil were made available in the Kannauj area in one year as follows:

- a) The purchase of already distilled South Indian sandal wood oil 10-15 metric tonnes.
- b) Oil distilled from wood bought at government auction 1-2 metric tonnes.
- c) Oil, distilled from wood obtained from 'Private' sources 10-12 metric tonnes.

The Government controls the sale and therefore price of sandal wood. The export of wood is no longer permitted although much is still exported through 'Private' channels. The majority is used in the production of Joss Sticks in South East Asia.

Local industrialists complain of the high price of the raw material. The current price of a Kilo of oil is Circa Rs.5,000. Traders of oil are resorting to adulteration of the natural raw material. The adulterants are not always suitable for food related products and in some cases may be toxic. Adulterants commonly used are Glycols and Phtalates in particular polyethylene glycol 400/600, Dioctyl Phthalate. These are being identified by the Quality control laboratory at PPEC. The potential purchaser of the raw material is not rejecting the sandalwood because of the adulteration but rather using it as a bargaining point to reduce the cost of his input and is therefore knowingly added to commercial products.

Producers of Attar are using liquid paraffin to make cheaper products and speciality chemicals with a sandalwood characteristic.

Other Essential Oils

There is fairly limited introduction of new varieties of essential oil bearing plants in the Kannauj area. Those grown such as the Edwards rose used for making rose water, is a low yielding variety. In common with sandalwood the raw materials are brought from some distance for processing at Kannauj. A number of the companies maintain distillation units in Orissa for Kewra oil and Aligarh where Bulgarian Rose (*Rosa Damascena*) is grown, others take mobile distillation units to work on-site during the season.

A number of oils that are distilled such as vetiver (KHUS) oil are harvested from the wild, the North Indian oil is more expensive than the Southern variety and is not accepted on the international market. A wide variety of odour and colour was seen resulting from the heterogeneous nature of the feed stock material, distillation variations and adulteration. the resultant oil is however marketed with relative success in the local indian market.

Several oil bearing roots are obtained from remote areas for the purpose of making the famed Attar Hina (see note 1).

Varieties of the mentha species had previously been grown in the Kannauj area. The Uttar Pradesh region has been particularly successful in introducing mentha arvensis providing some 75% of the indian productive capacity. Two reasons were given for the demise of mentha crops in the area. Firstly the problems of irrigation with this summer crop. Secondly the buying policy of the local distillers who had an oligopoly and drove prices to a level where the farmers replaced their crops with more marketable items.

NOTE 1 ATTAR HINA

This is the classic tobacco flavouring based on a range of natural materials such as:

Kapoor Kachri (stem)
Sugandh Mantri (stem)
Jatamashi (root)
Sugandh Bala (root)
Nagar Motha (root)

On evaluation of a number of samples labelled attar hina some contained aroma chemicals and in one case was a straight compound.

The higher grade of this material is called Shamama.

STRUCTURE OF INDUSTRY

There are around 25 medium to large manufacturers. Because of the existing tax regime (or domestic reasons) several of the ten main companies have split their operations into smaller units usually headed by each of the brothers from one family. Tax is

lower on these smaller units. It would be better to say that the kannauj industry is primarily in the hands of a few families.

Around 80-100 smaller units exist who are engaged solely in the crude distillation of attars. These are then sold on to the larger companies for bulking and eventual sale. Additionally there are a number of traders who would also purchase from the smaller units and sell into the market place.

ESTABLISHMENT OF A FRAGRANCE RESEARCH & DEVELOPMENT LABORATORY

An existing structure shed No.F-11 (annexe 1) has been allocated for the setting-up of a laboratory for new product development, fragrance formulation and sensory evaluation.

The area allocated has been sectioned into basic units:

- 1) Compounding Laboratory
- 2) Evaluation Room
- 3) Applications & Training Area

A line drawing (Annexe 2) has been drawn up together with a schedule of works (Annexe 3). Both the compounding laboratory and the evaluation room should be provided with air conditioning and exhaust. The applications area has been designed so that air conditioning can be installed at a later date.

A list of laboratory equipment (Annexe 4) glassware and miscellaneous items (Annexe 5) furniture (Annexe 6) has been compiled.

A list of aroma chemicals for experimental purposes has been drawn up (Annexe 7). During the visit a number of the listed items were procured which allowed for some elemental training to take place. A full range of readily available natural essential oils is to be acquired (Annexe 8).

CONCLUSIONS

The location of the industry at Kannauj is based on tradition. The sources of raw materials are in most cases far from the town itself but the strength of tradition should not be under estimated.

There is a fundamental confusion of the non-mutuality of fragrances and flavours. Whilst the industry was based on natural sandalwood oil, rose oil etc., no problem existed since sandal wood is suitable for both fragrances and flavours likewise rose oil. But price pressure has meant the addition of synthetic materials to attars which are sold for both perfumery and food related products. In principal there is no problem in this practice but that chemicals are being added arbitrarily on the basis of cost alone without due regard to the applicability of the chemical or indeed it's toxicology. This issue raises serious concern. Chemicals suitable for fragrances may not be suitable for flavours and vice versa. There is however an overlap and this third category is chemicals which are suitable in both applications. Since the perception of an attar is a 'Fragrance Flavour' then only materials from this third category should be used.

The traditional export markets for attars are contractors, primarily the middle east. Attars are blended off in the middle east with compounds, many of which are originating from Europe. As the price of attars increases the blender substitutes more of the compound. In turn the exporter 'Cuts' his attars with various materials to maintain his export market. However this speeds up the process of switching to more sophisticated compounds.

Agro policy limits the growing of essential oils on a plantation intensive scale and oligopoly practices dissuade the small producers to return to essential oil production. Plantation scale would allow for investment in integrated growing and

distillation units. At the small scale, co-operative distillation units could be introduced with the guidance of PPDC or PPDC could provide the facility on a toll basis. The sometimes wide price variations of essential oil crops and associated risk for the farmer is another barrier. This risk could be passed on to the trader/industrialist by the use of forward contracts.

Packaging Design would be a useful extension to the applications section in developing new products for the market place and assisting with the export potential of these products. The designer should have a sound technical knowledge of packaging and packaging materials.

RECOMMENDATIONS

The Kannauj industry needs to be educated in the use of safe materials and in new formulation methods. It is recommended that a one day work shop is organised to address these issues with the industry.

The introduction of herbal oil bearing plants is to be encouraged, particularly the re-introduction of the mentha species.

The new product development aspect of the project will be particularly relevant to the Kannauj and the U.P. Industry. It is recommended that packaging design becomes an integral part of the applications section and that the area set aside for packaging technology be used as an assembly area for fragranced handy crafted items for export. Local industrialists should be encouraged to take equity in the unit. Since women would have a high profile in this project it would contribute to the gender sensitisation programme.

The fragrance R&D laboratory can work on a contracted research & development basis. The unit should also become a centre of excellence for perfumery training for India and other developing countries. It is therefore vital that the head of this department is a recognised perfumer of some experience (Annexe II).

Publications It is recommended that the centre has an affiliation with IFRA/RIFM-International Fragrance Association/Research Institute for Fragrance Materials. All major producing companies subscribe to the association and it acts as a self-regulating body on the industry. It regularly publishes toxicological data on raw materials. I suggest that this is done in conjunction with ITRI at Lucknow Industrial toxicological research institute.

The following data base should be procured

Perfumery materials and performance (1993) contains:

- 1) Chemical identities. Odour descriptions and CAS numbers of more than 2,500 aroma chemicals.
- 2) Stability records of all chemicals in 21 end products and in water pH 1-12.
- 3) More than 2,500 commercial names and synonyms with suppliers.

Suitable for MS/PC-DOS computer with hard disk. Cost is US\$1750 obtainable from boelens aroma chemical information service, Groen Van Prinsterelaan 21, 1272 GB Huizen, the Netherlands. Telephone/fax + 31 2152 53558.

The library facility should be made available to outsiders within the administrative block under the supervision of the document officer and I suggest that PPDC circulate on a regular

basis a newsletter, a simple black and white two sided A 4 format will suffice, to create a closer relationship with local industrialists and community.

Training

The Q.C. laboratory staff should be trained in the art of Sensory Analysis. Mr.S.V.Shukla has been given a project to initiate this (Annexe 9). Completion of this task will be undertaken during my second mission. This mission is planned to take place in early January, 1994. I suggest a start date of 3 January 1994, briefing in Vienna 0900 Monday 4 January 1994. In addition to the industry workshop afore mentioned to be held on my second mission, a daily surgery will be held with individual industrialists between 1600 and 1700 hours at PPDC during this visit.

Mr.S.V. Shukla is recommended for training as a perfumer (annexe II). In the course of my visit we were able to obtain a limited range of materials from my recommended lists (Annexe 7 & 8) and initial training was started and tasks set (Annexe 9). On my second mission this training will be developed and it is recommended that a training manual be written up during the course of this visit.

It is recommended that a survey of production techniques for floral waters is undertaken. These are used in various applications - skin toner, food, eye washes and for religious purposes. Because of these applications the purity of the process must be strictly controlled. Apart from their local use there is also significant export potential if a quality product can be produced.

NEW PRODUCT DEVELOPMENT

The following areas are recommended for work to be undertaken:

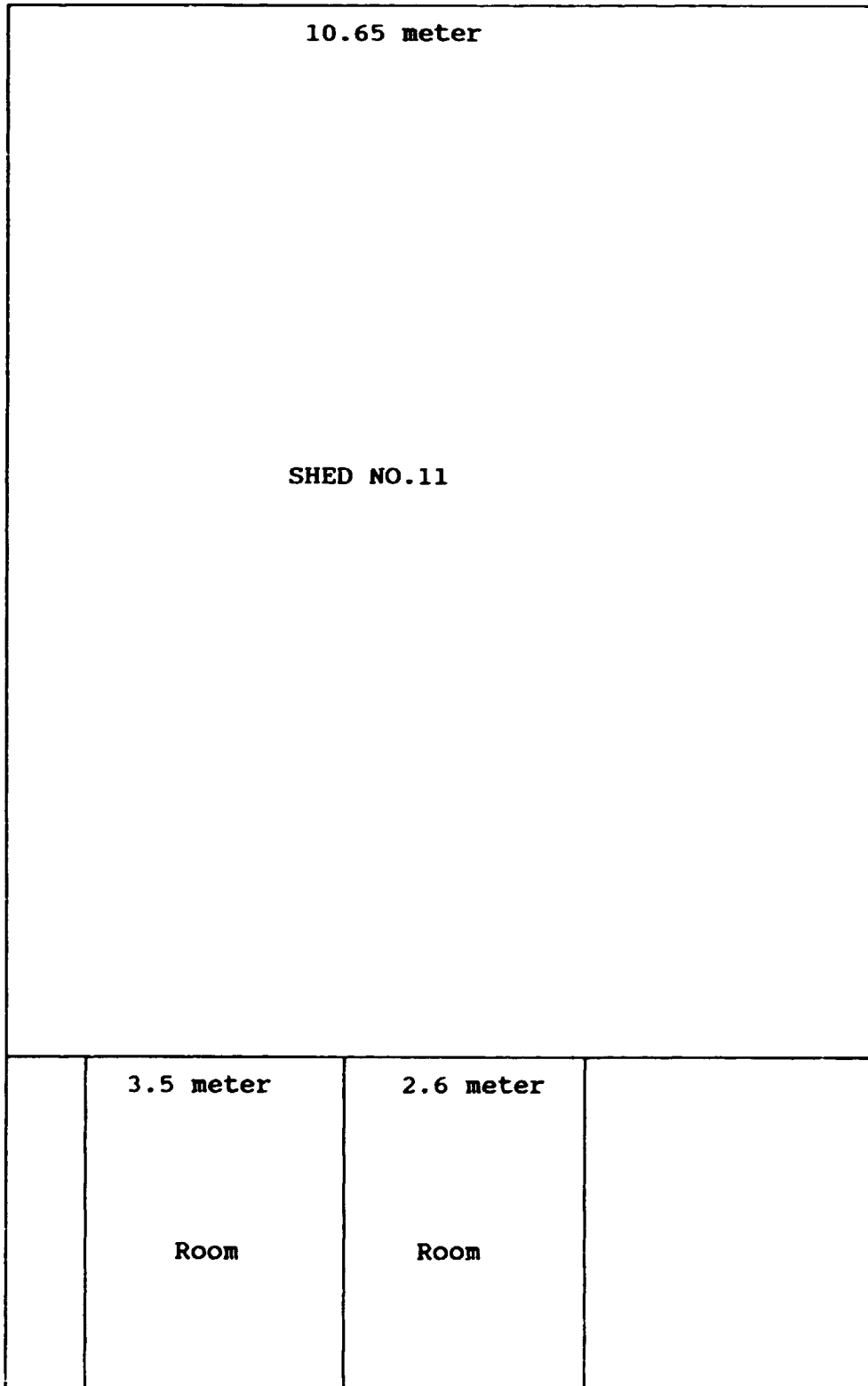
1. **AGARBATTIS** Up until 1974 attars (Sandalwood Based Fragrances) were widely consumed in Agarbattis. Today attars no longer find a place in the production of these products due to price constraints. A few local companies are engaged in the formulation of fragrance compounds based on synthetics to supply to the dipping companies. These producers have limited knowledge of developing acceptable compounds. In response to this real need I have initiated the first R&D project, NPDI to be under taken by Mr.S.V. Shukla in my absence. On completion a paper may be submitted for publication.
2. **NEW CONCEPT-'TAJ'** A women's natural spray cologne primarily aimed at the tourist sector based on the Taj Mahal at Agra. The fragrance to be developed at the PPDC Kannauj using the packaging skills to be introduced at the centre. This will also involve the design of a glass bottle at the PPDC in Firozabad. The fragrance would be developed using locally available materials. The product could be produced and packaged at PPDC and distributed with the help of (UPT) Uttar Pradesh Tourism and UPSIC and handicraft board, out lets would be at Agra, Tourist Hotels in India, duty free at Airports and in-flight on Air India. In addition to providing an additional income source for PPDC, it will bring wide publicity for Kannauj. An appropriately worded leaflet inside the product would give an historical background to the ancient practice of perfumery at Kannauj
3. **PLASTICS** Internationally much work has already been undertaken in this area. Typical applications have been in Air-freshener units, manufacture of dustbins and dustbin

sacks. The market for these products remains small. I met with Professor G.N. Mathur, Head of the department of plastic Engineering at HBTI in Kanpur. One idea discussed during our meeting was the development of a product suitable for religious worship moulded into an ornamental shape with a suitable fragrance. The advantage of these products is the slow release of fragrance from the plastic.

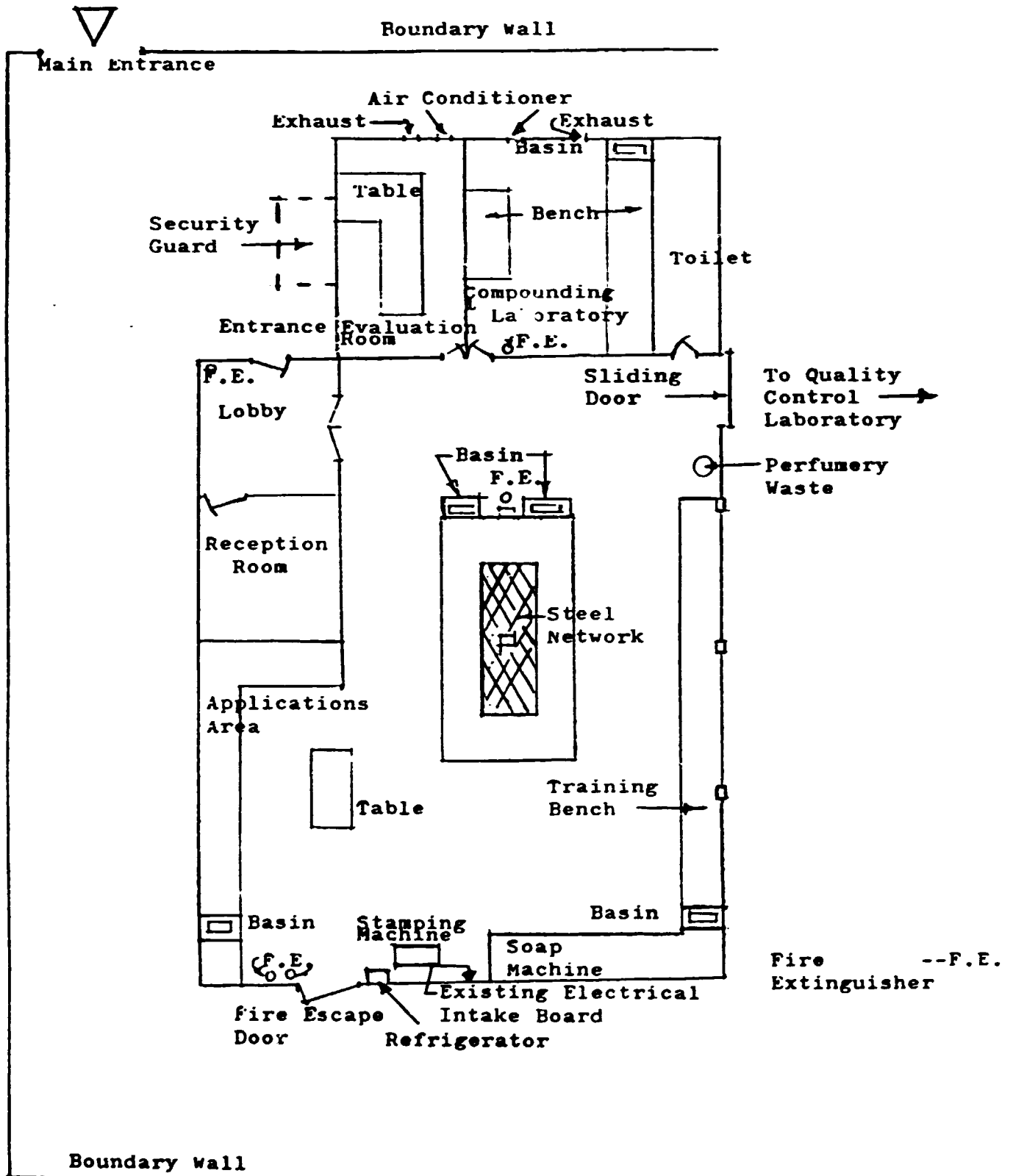
4. CANDLES- Perfumed candles have been available for many years in western countries and have been popular as a form of room freshener.
5. TEXTILES- Perfumed products based on textiles have been introduced into western markets in recent years, examples are clothes hangers, airfresheners, pillows, toys, shirts etc.
6. SOAPS- The world market for soaps is dominated by major producer companies. Specialized markets can however be developed using various novel approaches e.g. herbal soaps.
7. POT POURRI- This has gained great popularity in the U.K. over the last five years. A mixture of natural dried flowers, spices and woods which are placed in a bowl for decorative effect to which a Fragrance has been added to provide freshness to the room.
8. FOOD GRADE BASES - Development of bases for use in food related products sandalwood, Kewra, Rose, Jasmin etc.
9. TISSUES - Perfumed tissues are popular in many forms. In Indonesia individually wrapped good quality cologne tissues have been particularly successful.
10. COSMETICS AND TOILETRIES - Development of a range of modern products and fragrances.

ANNEXES

Annexe 1



FRAGRANCE RESEARCH AND DEVELOPMENT LABORATORY



OUTLINE PLAN

Approximate Scale 1CM -M

SCHEDULE OF WORKS FOR FRAGRANCE R&D LAB**Compounding Lab-**

- 1) Two more tube lights are required in addition to the two existing.
- 2) One basin is required at the corner as shown in plan.
- 3) Existing point for air conditioner to be moved to higher level.
- 4) Air conditioner is to be placed at top shelf area.
- 5) An exhaust fan is to be installed.
- 6) Swing arm door closure on existing door.
- 7) Electric points should be provided to benches
- 8) Existing location of air conditioner should be closed and made good.
- 9) Fan should be taken out to avoid damping on balance.
- 10) Dust proof paint is necessary.
- 11) Door of bathroom to be closed with solid continuous wall, opening into lab for applications/training area (as shown in plan).
- 12) One carbon dioxide fire extinguisher near door is necessary.

EVALUATION ROOM

- 1) One more tube light is required in addition to that existing
- 2) Dust proof paint is necessary.
- 3) Air conditioner is to be placed at top shelf area
- 4) An exhaust fan is to be installed
- 5) Point for air conditioner is to be made.
- 6) Swing arm door closure on existing door.
- 7) L-shaped table with six chairs.
- 8) External door should be taken out and made good

APPLICATION AND TRAINING AREA

- 1) All the civil work including roofing should be carried out so that air conditioning of Lab can be installed later without the need for modification.
- 2) All doors should be outward swinging to avoid dust and facilitate escape.
- 3) L-shaped work benches are to be made for left and right side of Lab and a rectangular bench in centre with dimensions as shown in the plan.
- 4) Cupboard space should be provided beneath the benches for storage of chemicals, glassware and equipment etc.
- 5) The training area benches should be constructed so that two perfumers 'Organs' can be installed with under bench leg room.
- 6) Both the existing shutters should be bricked in and made good.
- 7) A fire escape door and window should added in place of the end shutter.
- 8) Four basins are required with drainage as shown in plan.
- 9) One carbon dioxide type fire extinguisher should be placed at front pillar and one at fire escape door together with a foam type. A foam type extinguisher should be near front door of lab.
- 10) Lab should be painted with dust proof paint.
- 11) Spaced electrical points should be provided to all benches.
- 12) Installation of a new reinforced ceiling with fans.

LABORATORY EQUIPMENT

- 1) Three mettler top loading Digital Electronic Balances with touch tare and acrylic cover.
 - A) Two for Fragrance compounding with a single range of 0.01 g. to 500 gms.
 - B) One for applications with a Dual range of 0.01 g to 400 g/0.10 to 4000 g.
- 2)A) One Bench top Laboratory Scale (Sunlab) Soap Machine with a capacity of approximately 2 Kilos.
 - B) One floor mounted single Die stamping machine with appropriately designed mould.
- 3) One Direct Drive stainless steel Blade Stirrer with Variable speed suitable for batches of 1 to 2 Kilos/L.
- 4) One free standing upright fridge of 165 L capacity.
- 5) One Oven for accelerated stability tests, up to 120 degrees Centigrade.
- 6) One Water Distillation Unit.
- 7) Hotplates/Stirrers as follows:
 - a) Two Hotplate Stirrers (Magnetic) 2 Kilo capacity
 - b) One Stirrer (Magnetic) 2 Kilo.
 - c) One Large Hotplate 2 K.W. capacity.
 - d) Supply of 10 Magnetic Bullets P+FE coated.
- 8) Ten Aluminium lipped trays of dimension 60 cm. x 30 cm.
- 9) Smelling strip Holders to Hold 50 strips.
- 10) Fire Extinguisher:
 - a) 3X Carbon Dioxide Co2
 - b) 2X Foam type.
- 11) One small bath.

GLASS WARE AND MISCELLANEOUS

- 1) Amber (WINCHESTER) Glass Bottles with black screw cap with wadding for storage of developed compounds/samples.
 - A) 100 ml. times 100
 - B) 30ml. times 100
- 2) Reagent Bottles Amber/clear.
 - A) 250ml. X 30
 - B) 100ml X 50
 - C) 50ml X 100
 - D) 30ml X 100
- 3) Disposable Pipettes Glass/plastic 1000 units.
- 4) Glass Rods 50 cms. X 50
- 5) Beakers
 - A) 5 L X 2
 - B) 2 L X 3
 - C) 1 L x 5
 - D) 500ml x 5
 - E) 250ml x 5
 - F) 100ml x 20
 - G) 50ml x 20
- 6) Funnels
 - A) 150mm x 5
 - B) 75mm x 5
- 7) Two stands with clamp for filtration.
- 8) Filter paper (whitman) circular of suitable size, 100 of each.
- 9) Two drain systems for beakers.

- 10) Beaker Brushes of various sizes time 6.
- 11) Spatulas with spoon/flat end X 50.
- 12) Glass jars with screwcap (bakalite). Amber/white.
 - a) 1 kilo x 30
 - 500g. x 25
 - 250g x 25
 - 100g x 50
 - 50g. x 100
- 13) Perfumes/cologne bottles of 100ml. capacity with thread and screw on pump actuator x 50.
- 14) Target Sample bottles borosil 10ml. X 100
- 15) Disposable sample bottles (as seen locally) 3ml. X 20 dozen.
- 16) Wrapping paper for soap (Butter paper).
- 17) Cling film (waxed) for sealing beakers, sufficient quantity.
- 18) Oriandi Smelling strips (odourless material bleached)sufficient quantity.
- 19) 6 covered bins, metal.
- 20) One 25 Kilo red oxide lacquer lined drum for storage of waste oils.
- 21) Two large tissue dispensers (Torque roll) with sufficient supply of rolls.

LIST OF FURNITURE

- 1) 6 Stools with adjustable height.
- 2) One 'L' shaped table (1.65mx2.9mx0.9m) in evaluation room.
- 3) 8 chairs for Lab. + 6 chair in reception.
- 4) One table (1.65m x 90 cm) for applications chemist one in reception and one for Security guard.
- 5) 3 Benches for the Compounding Laboratory.
 - a) 2 Perfumers 'ORGANS'
 - b) 1 Work Bench

LIST OF AROMATIC CHEMICALS FOR FRAGRANCE R&D LAB

S.No.	Particulars	Quantity
1.	Anethole	500 gms.
2.S	Alpha-Amyl Cinnamic Aldehyde (ACA)	5Kg.
3.	Aldehyde C ₈	1Kg.
4.	Aldehyde C ₁₀	1Kg.
5.S	Aldehyde C ₁₁	1Kg.
6.	Aldehyde C ₁₂ Lauric	1Kg.
7.S	Aldehyde C ₁₂ (MNA)	1Kg.
8.S	Aldehyde C ₁₄	1Kg.
9.S	Aldehyde C ₁₆	1Kg.
10.	Aldehyde C ₁	1Kg.
11.	Anisyl Aceate	1Kg.
12.S	Alcohol C ₂ Lauric	1Kg.
13.S	Acetophenone	1Kg.
14.S	Benzyl Butyrate	1Kg.
15.S	Benzyl Proprionate	1Kg.
16.S	Benzyl Acetate	5Kg.
17.S	Benzyl Alcohol	5Kg.
18.	Benzyl Salicylate	5Kg.
19.S	Benzyl Salicylate	5Kg.
20.	Benzyl Cinnamate	1Kg.
21.S	Citronellol Pure	5Kg.
22.S	Cinnamic Aldehyde	1Kg.
23.S	Cinnamic Alcohol	1Kg.
24.	Coumarin	5Kg.
25.	Cedryl Acetate	5Kg.
26.	Cinnamyl Acetate	1Kg.
27.S	Cyclamen Aldehyde	1Kg.
28.	Cedrol	1Kg.
29.S	Citral	5Kg.
30.S	Citronellyl Formate	1Kg.
31.	Citronellyl Proprionate	1Kg.
32.	DimethylBenzyl Carbinyl Acetate	5Kg.
33.S	Diphenyl Oxide	5Kg.
34.S	Diethyl Phthalate	5Kg.
35.	Dipropylene Glycol	5Kg.
36.	Ethyl Aceto Acetate	1Kg.
37.	Ethyl Caproate	1Kg.
38.S	Eugenol	
39.S	Geraniol (Synth.98 Ex.Palmerosa)	5Kg.
40.S	Geranyl Acetate	5Kg.
41.S	Hydroxy citronellal	5Kg.
42.	Hexyl Cinnamic Aldehyde	5Kg.
43.	Heliotropin	5Kg.
44.S	Indole	250gm.
45.	Iso propyl Alcohol	5Kg.
46.	Iso-Amyl Salicylate	5Kg.
47.S	Iso-Bornyl Acetate	5Kg.
48.S	Iso-Eugenol	5Kg.

49.	Ionone Alpha	5Kg.
50.	Ionone Beta	1Kg.
51.	Linalool (Synth. Ex. Bois De Rose)	5Kg.
52.S	Linallyl Acetate	5Kg.
53.S	Methol Crystals	1Kg.
54.	Methyl Chavicol	500gms.
55.S	Menthone/Iso menthone	250gms.
56.S	Methyl Anthranilate	1Kg.
57.S	Methyl Cinnamate	1Kg.
58.S	Methyl Salicylate	1Kg.
59.	Methyl Eugenol	1Kg.
60.	Methyl Phenyl Carbinyl Acetate	5Kg.
61.S	Methyl Benzoate	1Kg.
62.S	Methyl Ionone	5Kg.
63.	Methyl Indole (Skatole)	100gms.
64.S	Nerolin Yara	1Kg.
65.S	Nerolin Bromelia	1Kg.
66.S	Nerol	250 gms.
67.	Nerolidol	250 gms.
68.	Para Cresyl Acetate	1 Kg.
69.	Phenyl Ethyl Phenyl Acetate	1Kg.
70.S	Phenyl Acetic Acid	500 gms.
71.S	Phenyl Ethyl Alcohol	5Kg.
72.S	Phenyl Ethyl Acetate	5Kg.
73.S	Phenyl Ethyl Butyrate	1Kg.
74.	Phenyl Ethyl Proprionate	1Kg.
75.S	Phenyl Ethyl Methyl Ether	1Kg.
76.S	Para Cresyl Phenyl Acetate	1Kg.
77.	Phenyl Acetaldehyde Dimethyl Acetal	1Kg.
78.	Phenyl Propyl Acetate	1Kg.
79.	Phenyl Propyl Aldehyde	1Kg.
80.S	Para-Cresyl Methyl Ether	1Kg.
81.S	Trichloro Methyl Phenyl Carbinyl Acetate (Rose Crystals)	1Kg.
82.S	Terpineol	5Kg.
83.S	Terpinyl Acetate	5Kg.
84.	Tetra Hydro Geraniol	5Kg.
85.	Terpinyl Proprionate	1Kg.
86.	Terpinolene	5Kg.
87.S	Vanillin	1Kg.
88.S	Vanillin Ethyl	1Kg.
89.	Vetiveryl Acetate	500gms.
90.	Mono Propylene Glycol	5Kg.
91.S	Musk Ketone	5Kg.
92.S	Musk Xylol	5Kg.
93.S	Musk Ambrette	1Kg.
94.S	Dihydro myrcenol	5Kg.
95.S	Anisaldenyde	5Kg.
96.	Hydratropic Aldehyde Dimethyl Acetal	500 gms.
97.	Iso Propyl Myristate	5Kg.
98.S	d-Limonene	5Kg.
99.S	Iso-Amyl Acetate	1Kg.
100.	Ionone 100%	5Kg.

CHEMICALS LIST (continued)

S.No.	Particulars	Quantity
1.	Aurantine	1Kg.
2.	Acetanisole-Para Methoxy Acetophenone	1Kg.
3.	Acet Iso Eugenol	500 gm.
4.S	Allyl Caproate	1Kg.
5.	Allyl cyclohexane Proprionate	1Kg.
6.	Amyl Benzoate	1Kg.
7.	Anisole	1Kg.
8.	Anisyl Alcohol	1Kg.
9.	Aldehyde C ₆	250 gm.
10.	Benzaldehyde	500 gm.
11.	Benzophenone	1Kg.
12.	Benzyl Cinnamate	500 gms.
13.	Benzyl Formate	1Kg.
14.	Benzyl Phenyl Acetate	1Kg.
15.	Cis-3-Hexenol	100 gms.
16.	Cis-3-Hexenyl Acetate	100 gms.
17.	Cumin Aldehyde	100 gms.
18.	Cis-Jasmone	100 gms.
19.	Di-methyl Hydroquinone	1Kg.
20.	Diacetyl	100 gms.
21.	Dibutyl Sulphide	50 gms.
22.	Dimethyl Benzyl Carbinol	500 gms.
23.	Diphenyl Mentane	1 Kg.
24.	Ethyl benzoate	250 gms.
25.	Ethyl Amyl Ketone	250 gms.
26.	Ethyl Butyrate	1Kg.
27.	Geranyl Nitrile	1Kg.
28.	Geranyl Iso Butyrate	250 gms.
29.	Geranyl Formate	500 gms.
30.	Geranyl Proprionate	500 gms.
31.	Geranyl Iso Valerate	250 gms.
32.	Guaiyl Acetate	1 Kg.
33.	Hexyl Salicylate	1Kg.
34.	Iso Amyl Butyrate	1Kg.
35.	Iso Borneol	1Kg.
36.	Iso Nonyl Acetate	1Kg.
37.	Jasmonyl (Nonane Diol-1:3-Acetate)	500 gms.
38.	Iso-Butyl Quinolene	100 gms.
39.	Linalyl Proprionate	500 GMS.
40.	Methyl Napthyl ketone Crystals	1Kg.
41.	Methyl hexyl Ketone	250 gms.
42.S	Methyl Iso Eugenol	500 gms.
43.	Maltol	250 gms.
44.S	Ortho Tertiary Butyl Cyclohexenol	1Kg.
45.	Phenyl Acetaldehyde 50%	100 gms.
46.	Para Methyl Quinolene	100 gms.

47.	Para Iso Propyl Quinolene (6,3 Iso Propyl Quinolene)	100 gms.
48.	Raspberry Ketone (Para Hydroxy Phenyl Butanone)	500 gms.
49.	Sandela (Givaudan)	1Kg.
50.	Tetrahydro Linalool	1Kg.
51.S	Tonalid PFW	1Kg.
52.	Vertenex (p.t.B.C.H.A.) (Para tertiary Butyl Cyclohexenyl Acetate)	1Kg.
53.	Veltol Plus	250 gms.
54.S	Fixolide Givaudan	1kg.
55.S	Citronellyl Acetate	1Kg.

S = items purchased during the mission.

ESSENTIAL OILS

Palmarosa
Clary Sage
Cedarwood
Jamrosa
Peppermint (Mentha Arvensis)
Peppermint (Mentha Piperita)
Spearmint
Ajowan
Celery Seed
Sandalwood
Vetiver
Geranium
Lavender
Black Pepper Oil
Citronella Oil
Lemongrass Oil
Davana
kewra
Cinnamon Leaf
Eucalytus (Globulus)
Calamus
Dillseed
Valerian
Chamomile (Blue Matricaria)
Tagette
Artemesia
Basil
Cardamom
Cinnamon
Clove (Bud, Stem & Leaf)
Cumin
Fennel
Ginger
Juniper Berry
Orange
Lemon
Lime
Nutmeg
Patchouli
Ylang
Petitgrain

Resins and Absolutes

Benzoin Resinoid
Labdanum Resinoid
Olibanum Resinoid
Galbanum Resinoid
Styrax Resinoid
Oakmoss Absolute
Treemoss Absolut

Obtain up to 1 Kilo of each material depending on cost E.G.
1Kilo of Citronella oil but 25g of Kewra

WORK TO BE UNDER TAKEN BY MR. S.V. SHUKLA PRIOR TO THE SECOND VISIT OF NEIL V. SHRIMPTON PROPOSED FOR JANUARY 1994

- 1) Obtain a set of target samples of pure essential oils (to be kept in fridge) for quality control purposes. Obtain from CIMAP etc.
- 2) Introduce to the quality control procedures, report on colour and odour using the 'triangle test' (Note 1)
- 3) Raw material familiarisation:
 - a) Daily smell three of the materials available to you and keep a record of your initial evaluation strength of odour, colour, viscosity and describe the odour. Repeat the process after one hour. After seven hours and after 24 hours (only strength and description).
 - b) After completing the above task, work through the materials again individually and make notes on the kind of fragrances you feel they could be used in and at what percentages.
 - c) Make up formulations based on the above (refer to Billot & Wells - chapter 8).
- 4) Prepare 1 kilo each of ethyl and methyl linoleate in the laboratory.
- 5) Carry out new product development on Agarbattis as per NPD 1.
- 6) Carry out exercises using 'selective factory fatigue' in following manner. Ask one of your colleagues to mix together three raw materials in equal proportion $1_q+1_q+1_q=3_q$. Then identify all three materials.
- 7) Obtain complete set of product samples from camphor & allied products Bareilly (UP).

TRIANGLE TEST**NOTE 1**

The triangle test is routinely used by commercial firms engaged in the manufacture and use of flavours, fragrances, essential oils and aroma chemicals.

One strip is dipped in the target sample and the remaining two dipped into the sample undergoing analysis. The strips are then shuffled and smelt blind in an attempt to identify the odd-man out. If on several attempts no difference in odour is detected then the sample is passed. If the odour is clearly and substantially different then the sample is failed on odour. Any sample in doubt should be passed to the senior perfumer for his comments.

NOTE 2 SELECTIVE OLFACTORY FATIGUE

This works on the basis of temporary anosmia (smell blindness). On smelling a compound an experienced perfumer will detect several discrete materials present and make a note of their likely percentage. He will then smell intensely one of these materials or a skeletal formulation of the identified items. The olfactory receptors become blocked for a short period of time and effectively disappear from the formula under investigation revealing to the experienced nose additional materials that were previously not apparent. By repeating this process many times the skeletal formula moves closer and closer to the original. this process could be called nasal chromatography and in conjunction with a conventional gas chromatography a close replica can be achieved.

NEW PRODUCT DEVELOPMENT No. 1

- PRODUCT** Agarbatti by dipping process (Note 1).
- PURPOSE** To develop Agarbatti fragrance compounds which have good burning characteristics.
- PROCEDURE**
- 1) Purchase a full range of market samples for evaluation.
 - 2) Ascertain the most popular brand in the market place (this will be effected by price, packaging, quality and fragrance).
 - 3) Obtain 100 unperfumed Agarbattis.
 - 4) Burn each of the market samples and note their characteristics-strength, volume type. The same volume of air should always be used in testing each sample - A small cupboard will do. Open the cupboard door after one minute in each case.
 - 5) Individually test the raw materials available to you by dipping the unperfumed Agarbattis. A record should be kept as follows based on sensory evaluation, excellent, very good, poor, not suitable (certain fragrance materials have a choking or unpleasant characteristic when heated). All dipping should be undertaken for a uniform amount of time. The Agarbatti should be left to dry for a period of 48 hours. Crystals should be tested diluted at 10% in Benzyl alcohol.

The length of time in dipping may effect the concentration of fragrance in the Agarbatti. The formulation of the dough will effect the retention of fragrance and indeed it's odour profile if odoriferous materials are introduced into the dough.

BACKGROUND The Agarbatti industry employs nearly 400,000 people, 60% of this activity is in Karnataka. The industry is dominated by 20 Big Houses accounting for about 50% of the total Indian turnover. Exports in 1989-90 amounted to 147 million rupees (Approx 5 million \$) total production in 1988-89 was 7200 tonnes valued about 900 million rupees (Approx 30 million \$).

Note 1 An alternative process used is to add the fragrance to the dough itself before rolling

PERSONNEL

The establishment required to operate a fully functional fragrance research and development laboratory is as follows:

1. Director/Deputy Director

A science graduate with a minimum of five years experience working as a perfumer in a commercial environment to attract the calibre of candidate required the post could be based at C.I.M.A.P., Lucknow.

2. Trainee/Junior Perfumer

A science graduate with a minimum of one years experience in working with essential oils or other perfumery materials within a quality control environment and a minimum of two years experience working in research and development on gas chromatography of organic compounds. A total of three years experience in related areas.

Part of my mission task was to screen potential candidates for training. Three were put forward for selection all of whom were working within the existing quality control facility at the P.P.D.C.

Mr. S.V. Shukla is recommended as the most suitable candidate available to undergo training. His natural aptitudes and enthusiasm together with his work on gas chromatography will serve him well.

3. Applications Chemist

A science graduate with at least one years experience working in an industry laboratory in the field of soaps/cosmetics. The work is multi-disciplinary with a need for original thought.

4. Compounding Assistant

A science graduate. The main requirements for this job is a methodical and accurate approach.

Minutes of the Industry Meeting held at the PPDC
on 31 August 1993

Present: Mr. Neil V. Shrimpton
Mr. M. Prasad, Deputy Director, Chemicals, SISI,
Kanpur, Acting Director of PPDC.
Dr. Lahri, Q.C. Dept.
Mr. S.V. Shukla, Q.C. Dept.
Mr. B.V. Shukla, Q.C. Dept.
Mr. N. Akbar, Q.C. Dept.

Industry companies: Kumud, G. Nath Tandon, R.N.P.N., Anee,
Lala Pragdutt, Pt. D. Pershad Pragdutt, Gupta Fragrances, M.L.
Ramnarain, Munnalal Sons, KLSC, National Perfumers, Jagat, Anand
Misra.

1. Chair taken by Mr. N.V. Shrimpton
2. Welcome Address
3. Introduction of UNIDO to assist industrial progress in developing countries with due regard to environment, health & safety. Sensitivity to the real needs of the local people. To encourage trade and the exchange of ideas between developing nations.
4. Bio-data of N.V.S.
5. Initial observations of the Industry by N.V.S.
6. N.V.S. on UNIDO brief.
7. Distribution of confidential questionnaire
8. Open session:

Points

- A. Industry wants to diversify away from it's dependence on the pan masala market which is now saturated.
- B. Industry wants to produce good replacement compounds for sandalwood.
- C. Industry wants to be able to develop good quality agarbatti compounds.
- D. Industry is interested to develop soap compounds.
- E. Industry requires suitable preservative for floral waters which can inhibit fungal growth.
- D. Industry is interested in being trained.

Action

1. Implement NPD's new product development brief
2. Find suitable preservative for floral waters (phenoxyethanol should be checked for suitability)
3. Hold one day workshop for Industrialists during second mission.
4. Hold surgeries with individual industrialist during second mission.

TOP TEN COMPANIES IN KANNAUJ

1. S. Md Ayub Md Yacub
2. Debi Prasad Sunderlal Khattri
3. Kumud Products
4. Munnalal Sons & Co.
5. Lala Prayag Dutt
6. Quality Perfumers
7. Misra Brothers
8. Ram Narain Pratap Narain
9. Indian Fragrance & Chemicals Works
10. Jagat Aroma oils Distillery

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION(Confidential Questionnaire)

Dear Sirs,

I would kindly request you to fill in the following confidential Questionnaire. This will help in providing the best possible assistance to the local industry of Kannauj. Please be assured that the information given will only be used by myself to produce total/aggregate figures for the purposes of my report to the United Nations Industrial Development Organisation.

1. Your Name (optional):
2. Your Company Name(optional):
3. Annual Sales in Rs. :
4. What percentage of this is exported: %
5. What percentage of your export sales are handled By:
 - A) Yourself %
 - B) A local Indian Agent/Exporter: %
6. What are the main activities of the Company in percentage terms:

A) Production of Attars for flavouring of tobacco, Pan Masala etc.	%
B) Production of Attars to Flavour other Products	%
C) Production of Attars for Fragranced (perfumed) Products.	%
D) Production of Pure Oils of Natural Origin	%
E) Production of Compounded (Blended) Fragrances and Flavours of Synthetic and Natural Origin	%
F) Others	%
TOTAL	<hr style="width: 50%; margin: 0 auto;"/> 100 % <hr style="width: 50%; margin: 0 auto;"/>

7. What do you see as the future of the Industry based on current conditions (Please tick one):

Poor	Very Good
Fair	Excellent
Good	

8. Are you looking for Foreign Investment in your Company (Please tick one):

Yes	No
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9. Are you willing to pay for technology transfer (Please tick one):

Yes	No
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10. Please give the Numbers of Marketing/Sales trips that you make in a one year period:

- A) Inside India
- B) Outside India

COMMENTS:

Please list here specific requirements that you have of PPDC (Process & Product Development Centre) and any observations that you may like to have

Thank you,

Neil V. Shrimpton
CONSULTANT, UNIDO

**Backstopping Officer's Technical Comments
based on the work of Mr. N. Shrimpton,
DP/IND/89/133/11-51**

The report contains a detailed account of the Consultant's activities and recommendations. The consultant has carried out more work than envisaged in the job description. He has partly trained a counterpart and given him an assignment to be completed during his absence. Furthermore he has interacted with the private entrepreneurs and obtained valuable information to plan activities for the future. PPDC thereby will be able to cater to the immediate needs of the private sector so as to make it financially self-supportive. The plans for the perfumery laboratory have been given so that the project authorities could re-model the present building. The requirements of furniture, glassware equipment and chemicals have been included. Most of the items could be locally purchased and should be made available during his second mission. Plans for new product development have been included which will be the major part of his activities during the return mission.