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STRENGTHENING OF THE ESSENTIAL OILS AND PERFUMERY INDUSTRY

SI/DRK/86/925

DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

Terminal report*

Prepared for the Government of
the Democratic People's Republic of Korea
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Mr. P. J. Hylands, UNIDO consultant

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Chemical Industries Branch

United Nations Industrial Development Organization
Vienna

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Contents

I. INTRODUCTION

The Government of the Democratic People's Republic of Korea (D.P.R.K.) has recently recognised the need to strengthen its essential oil and perfumery industry by requesting the United Nations Industrial Development Organisation (UNIDO) for assistance (Annexe 1). The Resident Representative of the United Nations Development Programme (UNDP) in Pyongyang supported the request and suggested that a preliminary assessment be made under UNIDO's SIS programme (Annexe 2). The project description of the 1 m/m mission is given in Annexe 3.

The immediate objective was to render technical advice on the most appropriate technology options and, in collaboration with local counterparts, to develop a plan for enhancing the present capability of the Pyongyang Natural Perfumery Laboratory (P.N.P.L).

II. SUMMARY

The mission took place in July and August 1987. After briefing in Vienna, the Consultant travelled to Pyongyang. The first meeting, after initial discussions with local UNDP representatives, took place at the offices of the Fifth Department, Ministry of Foreign Trade. At this meeting, the Government outlined its plans for the development of the P.N.P.L. and a detailed itinerary was established.

The Consultant visited the premises of the P.N.P.L. on a number of occasions and held detailed discussions with the staff. Field visits were made to installations in the extreme north west and eastern coastal regions of the country as well as to those near Pyongyang. The Consultant also visited related institutions concerned with analysis and production from natural materials but was not able to see any traditional medicine factories. During this field work, it soon became clear that the very restricted role which the Government had foreseen for the Laboratory was wholly inappropriate and that it made good sense to centralise all research and development capacity related to natural products in the P.N.P.L. The Government itself recognised this by agreeing to a change of name of the Laboratory to reflect its wider role. This, and other agreed changes and recommendations, are detailed in part IV of this report.

The last few days of the mission were spent in outling a suitable project document for the implementation stage.

III. FINDINGS and OBSERVATIONS

III.A. The Democratic People's Republic of Korea

The D.P.R.K. comprises the northern half of the Korean peninsula extending southwards from the north-east corner of China. To the west lies the Bay of Korea (West Korean Sea) and to the east, the Sea of

Japan (East Korean Sea). The D.P.R.K. shares its southern border with the Republic of Korea and to the north lies China. A small part of the north-eastern border is shared with the USSR. The country lies approximately between latitudes 38° and 43°N and longitudes 124° and 131°E. It is largely mountainous, only about 20% of its land being capable of cultivation, mostly in the (lower) western part of the country. Mountains form a spine along the whole length of the country (with many peaks rising up to about 2000m) leaving only a relatively narrow coastal strip in the east.[1,2] A sketch map is provided in Annexe 4.

The climate is extreme temperate with four well-defined seasons. Winter (November to March) is relatively dry with average daytime temperatures of 0 to -5° (at night it may fall to -20°). For two months in the summer (July and August) it is hot and humid with an average temperature of 25°. The wettest month is August with a rainfall of about 300mm (nearly 30% of the total annual precipitation).[1,2] Because it has a complicated terrain and is in temperate latitudes, as well as being surrounded by seas, the wide range of climates produced supports a diverse flora. This also enables a wide range of plants to be cultivated as well as having harvesting implications.

The capital of D.P.R.K. is Pyongyang, a city of some 2 million.[1]

III.B. General background to the essential oil industry in D.P.R.K.

It is important to realise the very specific nature of the request from the government of D.P.R.K. before proceeding with the terminal report. The Government originally wished only to begin utilisation of some of its resources which it considers to be 'waste' at the moment, i.e. those plants which grow in local abundance and are not used currently.

Despite a flora of some 4000 species in 951 genera and the fact that about 25% of these have been used in traditional medicines or as sources of esssential oils, the people of Korea have only a very limited history of use of naturally-occurring materials as perfumes.[3] General conditions prevailing since 1953 have not allowed any initiatives on production, even though some oils have been produced and some isolated materials prepared and exported (see below) but now the Government of D.P.R.K. has decided to utilise its natural resources to satisfy a growing public demand for scented cosmetics and toiletries.

Three wild and hitherto-unutilised plants have been selected for special development:

1 *rose (Rosa rugosa)*,

2 lilac (*Syringa dilatata*) and

3 lily of the valley (*Convallaria keiskei*).

It must be emphasised that these plants are not presently cultivated.

The essential oil and perfumery industries have been organised on two levels in D.P.R.K. Local distilleries and cosmetic production units (e.g. small scale soap factories) are present throughout the country and these are under the direction of the Ministry of Local Industry. The oils for use in these installations are both of local origin (for example, some *Mentha piperita* and *M.arvensis* are cultivated and it is from these units that some menthol has been isolated and exported to the USSR, though not even approximate figures are available) and imported from China and Japan (some has been imported in the past from Bulgaria). Only organoleptic quality control facilities are available.

As part of the new initiative, the Government decided to create a new unit for the production and quality control of the products from rose, lilac and lily of the valley. This new unit is the PNPL (under the direction of the Pyongyang Administrative and Economic Guidance Committee) and had been given the task of solving production problems related to oils of only these species as well as establishing an effective means of quality control. It is to supply material to the largest cosmetic factory in the country - that at Sinuiju (q.v.) - but no real plans existed for any cultivation of plants, the Government being determined to put to use the wild stands throughout the country of the three plants under consideration.

III.C. Pyongyang Natural Perfumery Laboratory

This laboratory was established in 1983. It is presently housed in a few rooms in the College of Surgery in Pyongyang. A new building, however, has been constructed in the grounds of the College and the shell was completed in the Spring of 1986 but it has not yet been fitted out (photograph 1, Annexe 5). The building is of prefabricated concrete under a flat roof (blue print attached, Annexe 6). Rooms on the upper floor are provided with minimal water and electricity supplies with roughly tiled benches (photograph 2, Annexe 5). Internal walls are plastered and freshly painted. A room suitable for a tall fractionating column is not currently available.

Pilot and development equipment comprises a range of mild steel stills and condensers of various capacities together with vacuum pumps and refrigeration units. Analytical apparatus includes a simple gas/liquid chromatograph (Lab. Pristroje, Prague) with FID detection and capability of temperature programming (but results obtained with it are poor), refractometer, polarimter, pH meter, balances and some laboratory scale fractional distillation equipment. Some glassware is available locally but no glass blowing facilities are available on site.

It has a staff of 39, but the government has approved plans to increase the manpower to more than 100 (including 10 senior scientists and 20 research workers). Currently, the laboratory has 4 senior staff with the qualification of associate doctor and 5 others with bachelor

degrees.

Throughout the country, the Laboratory has 6 production units for the rose products, 7 for lilac and 1 for lily of the valley. With these, the Chief of the Laboratory estimates that it could process annually 100 tonnes of rose flowers, 500 tonnes of lilac and 10 tonnes of lily of the valley. It has plans to increase the number of field production units to a total of 36, with which it hopes to be able to process 500 tonnes of rose, 3000 tonnes of lilac and 100 lily of the valley.

A sample of rose absolute was submitted in 1985 for assessment to the Japanese Clove Company. Their report indicated that the sample was not quite of sufficiently high quality but with better washing with 60% ethanol (to remove residual waxes) it could reach marketable quality. The odour was considered to be good. Since its conception, the work of the PNPL had highlighted a number of specific problems which had prompted its request for assistance to UNDP.

P.N.P.L. is an independent government body under the Ministry of Chemistry of Light Industry of Pyongyang City.

III.D. Other activity concerning essential oils in D.P.R.K.

The industry comprises a haphazard collection of local enterprises, run on local lines with local traditions. These may receive help from provincial universities and botanic gardens and any links which may have been established are tenuous and informal. For example, the Central Botanic Garden, Pyongyang, (q.v.) has been concerned with cultivation and production of a number of essential oil products since its foundation.

III.E. Scale of production

The Government of D.P.R.K. was unable to provide any statistics on production, home consumption, import or export. The Ministry of Foreign Trade believes nonetheless that a large home market exists for lilac and lily of the valley products as well as rose and also wishes to make rose products available for export.

III.F. The world scene

Lily of the valley and lilac oils are very minor items of world trade, not figuring, for example, in the 1986 ITC publication: Essential Oils and Oleoresins.[4] Rose products are in demand, the main importer being the U.S.A., but with this product quality is of the utmost importance. In 1986 it was estimated that annual world production of rose oil was about 15-20 tonnes.[4] Rose oil is a valuable commodity - the 1986 world price for Turkish oil being £1300/kg and £2000/kg for the highly-prized

Bulgarian product.[4]

As described previously (III.B.) there are some anomolies with regard to the production of essential oils in DPRK. The Government wishes the P.N.P.L. to be concerned with the production of only rose, lilac and lily of the valley products. After discussion with the Consultant however, it has agreed that the role of the unit be significantly increased and broadened (see below).

III.6. Interaction with other industries using essential oils

1 Pharmaceutical industry

The Pyongyang Pharmaceutical Factory was visited on 12th August 1987. It is principally concerned with preparation of final-dosage forms and it is said to produce, for example, 3,000 million tablets annually. Other preparations include liquids (200 tonnes p.a.). Examples include isoniazid tablets and aspirin tablets. The consultant was not able to visit production units but did see in operation a line manufacturing tablet bottles from polyethylene using Japanese injection moulding equipment and a line printing packages and labels. The paper for the labels was imported. The quality control laboratory was also visited. It has outdated analtyical equipment (colorimetry, single wavelength spectrophotometry, polarography, gas/liquid chromatography) and was not fully operational. It has some home-designed pharmaceutical equipment such as disintegration apparatus and tablet hardness testers. The laboratory was run by a pharmacy graduate from Pyongyang University.

The factory uses natural Korean menthol and synthetic thymol as flavourings as well as imported and Korean synthetic fruit flavourings but no figures on consumption were available.

2 Traditional medicine industry

Desite repeated requests, the Government was unable to arrange for the consultant to have access to information about the scale of utilisation of essential oils, the extraction technology used by the traditional medicine factories or their quality control facilities.

Traditional Medicine Factories exist at a number of locations in the country (e.g. Pyongyang, Sariwon, Wonsan and Kaesong) and in the view of the Consultant it is of great relevance to the successful reorganisation and upgrading of the processing of plants in D.P.R.K. that a co-ordinated plan be agreed encompassing production and development facilities at all centres.

III.H. Other facilities visited

1 Kim Il Sung Univrrsity, Pyongyang

Kim Il Sung University, established 35 years ago, is sited in relatively modern buildings on the outskirts of Pyongyang. It has a full range of Faculties and Departments as well as a fine library and computer centre. The library has a number of books and journals but all runs are incomplete and Chemical Abstracts lacks isssues for about the last ten years. Books are both Korean translations and originals but of a limited range. Some patents are also available.

The Department of Chemistry has about 40 staff and produces about 100 graduates p.a. Some analytical equipment is available but is principally for student demonstration. No real research-quality equipment is available.

2 Academy of Science, Pyongsong

The General Analysis Centre was visited on August 10th 1987. It has a staff of 140 of which 70 are trained scientists and has some 15 students preparing dissertations for their Associate Doctorates. The Centre provides an analytical service for all Faculties in the Academy of Science. A large package on state-of-the-art Japanese equipment was made avilable in 1984 (a list of the equipment seen by the Consultant is provided in Annexe 7). Although much equipment was in use during the visit (particularly that associated with metallurgy and inorganic analysis [scanning electron microscopy, high temperature microscopy, X-ray diffractometry]) the main problems observed were those general in developing countries, i.e. shortage of consumables such as gases (e.g. helium) and chart recording paper and photo-sensitive paper for the mass spectrometer. Almost no staff had been abroad for training and they therefore relied strongly on manufacturer's training at installation.

3 Sinuiju Cosmetic Factory

The Sinuiju Cosmetic Factory, established in 1954, was visited on 7th August 1987. It employs about 750 staff mainly on the shop-floor, only 15 having received any scientific or managerial training, though only about 50 workers were seen during the visit. It has the facilities to make soap, cosmetic creams, toilet waters and perfumes and toothpaste. It is situated more or less on the banks of the river Amnok (the border with China) (location 5, Annexe 4) and gave the impression of being well-run and maintained. However only the toothpaste packing line was in operation during the visit and some soaps were being hand wrapped. No other activity was evident. The filling equipment in use was of Chinese and Japanese origin. The plant was working at considerably under capacity (annexe 8), the main limiting factors being

1 shortage of raw materials (notably fixed oil) for initial soap manufacture, and
2 shortage of all types of packaging materials from aluminium slugs for tube manufacture to glass bottles and cardboard for outer

containers.

The consultant formed the distinct impression that even if the technical problems with regard to the supply of essential oils were solved, the supply of fixed oils and packaging materials would be a considerable obstacle.

It is planned to increase soap production to 2000 tonnes p.a. by importing fixed oils from the USSR on the condition that Soviet soap manufacturing equipment be purchased.

4 Central Botanic Garden, Pyongyang

The garden has a staff of about 150 including 70 scientists and is housed in 300 hectares near the city and has another 1600 hectares of agricultural land scattered throughout the country, runs its own small production units which produce a variety of essential oils and derived products. These apparently produce a total of some several hundred tonnes of oil annually (mainly peppermint [which is apparently cultivated on a small scale by nearly every co-operative farm in the country, where it is possible], *Abies* sp. and *Thuja* sp. [mainly *T. koragensis*]). The Central Botanic Garden also has its own rectification facility (which was not seen by the Consultant) and produces, among other purified compounds, menthol from *Mentha piperita* and *M. arvensis*, citral, citronellal and geraniol from *Nepeta tongliraa* and *Pelargonium roseum* and Patchouli alcohol from *Salvia* spp. as well as other plant extracts such as from *Valeriana officinalis* and *V. patina* for use in D.P.R.K. as flavouring local tobacco products.

No detailed statistics were available but apparently significant quantities of mint oil and menthol are exported, principally to Japan.

III.I. Details of existing oil production

Only the processes concerned with the production of rose products could be examined by the Consultant, the season for lilac and lily of the valley having passed.

Rosa rugosa

The consultant examined all aspects of the production of volatile products from *Rosa rugosa*. The important features of the processes are outlined below.

1 <u>Concrete and absolute manufacture</u>

Field trips were undertaken to Chang sin-ri (near Chong Pyong) and Majon-ri (near Hamhung) (locations 1 and 2 in Annexe 4). Wild *R.rugosa* grows on the coastal strip about 30m wide (photograph 1, Annexe 10) from the beach itself to a bordering strip of pine trees. The plant is <u>not cultivated</u> and collection is achieved simply by hand picking the

flowers from the wild. The consultant was informed that this strip extends in a similar manner from south of Wonsan to the extreme north west frontier.

After early morning collection in baskets the flowers are transported by lorry about 4km inland to the Wooden Furniture Factory where a distillery of the P.N.P.L. is situated. (This location was chosen because the Factory had an already operational steam generator). The unmade road surface is of very poor standard (photographs 2 and 3, Annexe 10). Equipment is housed in a bamboo building (about 10 x 6m) under a pitched, tiled roof (internal height about 3m) (photograph 4, Annexe 10) with a partially stone flagged floor. The 3 stills (photograph 7, Annexe 10), each capable of a charge of 50-60kg flowers) and water-cooled condensers have been specially fabricated from stainless steel of Japanese origin to the design of scientists of the P.N.P.L. Hexane (g.v.) is transported by road from Pyongyang. Flow diagrams of the apparatus are given in Annexe 11 and the apparatus in use is shown in a series of photographs (6 - 14, Annexe 10), taken in 1986. During the 1986 season, the Consultant was informed that about 10-15 tonnes of flowers had been processed at this site but the Director estimated that this represented only about 25% of the total flowers available from the existing stands in the region.

No steam distillation was carried out at this facilitity, the product being principally studied being *R.rugosa* concrete. Dates of processing in this region were May 25th to July 31st 1986, the best products having been produced between May 25th to June 30th.

The consultant was informed that this set-up was typical of the 6 other facilities available at Undok, Orang and Hwadae (in N. Hamgyong province), Tanchon, Riwon and Sinpo (S. Hamgyong Province) and Wonsan (Kagwon Province). All had 5 extractors similar to the Chong Pyong installation except that at Undok which had 10. Hexane (g.v.) was provided directly to Undok and Orang from the Sungri Chemical Factory at Chong jin, the others being served by the PNPL. The Director, PNPL, estimated that the present total capacity of the 7 installations was 100-150 tonnes. The flowering season is later in the northern areas (by up to one month) and he considered that it would be possible for skilled technicians to progress north during the late spring/summer periods to supervise extraction.

Problems highlighted

1 Collection

Collection is achieved wholly from the wild. Unskilled workers are recruited to pass through the area with baskets but this is very difficult and arduous because of extremely rough terrain and the haphazard arrangement of the wild plants. This is compounded by the presence of large boulders which have been placed along the length of the coast as an anti-invasion device (photograph 15, Annexe 10). This accounts for the low harvest (g.v.).

2 Transport

to the distillery was along 4-5km of very rough road (photographs 2 and 3, Annexe 10).

3 Technical problems reported by the staff of PNPL included:

1 Difficulties with the solvent used (nominally n-hexane but containing ca. 30% of cyclohexane and n-pentane and having a b.r. 45-70° (cf. 65° for n-hexane)).

2 Evaporation of the solvent. To remove the last traces of solvent needed much heat so causing discoloration and decomposition of the residual extract. They had attempted to remove the first 80% of solvent at normal pressure and the final 20% under reduced pressure but they reported loss of much concrete due to entrainement, distillation of low boiling volatiles coupled with inefficient condensation of the vapour which destroyed the vacuum pump.

Development work in order to overcome these problems identified by the staff of the P.N.P.L. has concerned

1 Purification of the solvents by rectification or use of molecular seives though neither had been attempted,

2 changes in the shape of the distillation vessels to increase the evaporation surface, and

3 the investigation of film evaporation. A laboratory scale climbing film evaporator (of a type reported to be used in China for essential oil production) had been prepared but more success had been achieved with a descending film apparatus. Problems had been encountered on this scale due to condensation of atmospheric water vapour but a design had been made for a stainless steel apparatus with a 100mm x 2m column capable of evaporating solvent at the rate of about 100kg/hour. This is presently under construction.

4 Trials had been made on the use of activated charcoal technology. On a laboratory and pilot scale it had been shown that it was possible to adsorb volatiles from flowers of *Rosa rugosa* by passing air (previously purified by a passage through activated charcoal) through columns of the flowers and allowing this air to pass through a second column of activated characoal to adsorb the volatiles. When no more volatiles were being released from the flowers, fresh air was passed through the charcoal to desorb the volatile oil components, these being trapped in a condenser at -20°, so yielding a high quality volatile oil. Trials had shown that it was feasible to carry out this process but had highlighted a number of problems:

1 incomplete removal of volatiles from flowers
2 incomplete condensation of volatiles after desorption.

Solutions proposed included:
1 stirring the flower bed during passage of air,

2 ultrasonication,
3 solvent extraction or steam distillation of the partially-spent flowers after adsorption on activated charcoal, so effectively reserving the the latter process to process a very high quality product but in very limited quantity.

No quantitative work had been attempted.

2 Steam distillation

A field trip was undertaken to a community farm at Yaksu-ri, Kangso county, about 40km west of Pyongyang (location 3 on map, Annexe 4). Here, 4-5 hectares of south-facing hillside of Rosa centifolia (imported from Bulgaria in 1973) (not the wild Rosa rugosa of other areas) is under cultivation (photographs 1 and 2, Annexe 12). The Consultant visited this installation on 8th August 1987. The yield of flowers in 1987 was 20 tonnes. The production unit comprised simple steam distillation apparatus (charge, 60kg), with water-cooled Florentine receivers in a brick building under a tiled roof and with a concrete floor (photograph 3, Annexe 12), located in a hamlet immediately at the side of the field. Access to the growing area was poor (photograph 9, Annexe 12).

Plants were grafted onto local stock (photograph 7, Annexe 12) and rooted in rows in maize fields (photograph 8, Annexe 12) before being planted out. It was envisaged to extend the growing area indefinitely by planting the lower south-facing slopes of hillsides (photograph 11, Annexe 12) which cannot be used for food crops.

During the visit, peppermint was being harvested and oil steam-distilled before being sent for purification and rectification to the Factory of Traditional Medicine at Sariwon in N.Hwanghae province (about 100km to the south). The consultant was surprised to learn that even when the P.N.P.L. is fully established this will continue and only rose products will be dealt with by the P.N.P.L., other oils being processed at other locations, and under other administrations.

IV CONCLUSIONS AND RECOMMENDATIONS

From the foregoing it is obvious that the essential oil industry in the Democratic People's Republic of Korea is very variable. Some units produce oils and isolates which are exported to other countries while others have failed to achieve acceptable quality. This can be explained to some extent by the variations in local facilities and expertise for cultivation, harvesting methods and production as well as an almost complete lack of effective quality control. Nonetheless, it cannot be denied that oils are produced and utilised in the home market in a number of industries using equipment that has been largely designed and fabricated without external input or advice. This is a tribute as much to the dedication of the personnel involved as the available technological expertise.

The climate of the country is suitable for the production of a number of plant products in addition to those already used (see Annexe 9) and with appropriate development of the areas to be mentioned below there is no doubt that research and development into natural oils and related products would be of great benefit to the economy of D.P.R.K.

The shortcomings of the existing industry can be summarised in two main areas:

1 lack of expertise in all aspects specifically related to the production of oils and

2 lack of equipment, both production and analytical.

The key to overcoming both problems is largely in appropriate training, together with the provision of basic equipment. Almost no scientific personnel have received any exposure to training and methods abroad.

The following specific recommendations are put forward:

1 That the name of the P.N.P.L. be changed to the Pyongyang Essential Oil Research Centre (P.E.O.R.C.) to reflect the broader role of its activity outlined below. This change was agreed by the Director of the Laboratory and the Deputy Director, Fifth Department, Ministry of Foreign trade at the wrap-up meeting of the mission on August 13th.

2 That the original decision to collect only wild plant materials be re-examined in light of the dramatic improvements which could be achieved by appropriate cultivation.

3 That where cultivation is carried out, methods be improved according to current agronomic techniques to increase yield and quality. This will require specific training.

4 That consideration of agronomic methods be upgraded within P.E.O.R.C. by the creation of a specific department.

5 That improved post-harvest treatment of flowers be investigated and implemented. This may require closer attention to transport and scale of production.

6 That yields and quality of oils be improved by attention to processing technology and pilot plants. The Consultant is of the opinion that the highest priority areas here concern the improvement of steam distillation and solvent extraction technologies rather than extensive investigation into the use of novel methods (i.e. activated charcoal technology) and the development of the latter be reserved for a future date. Thus emphasis should be placed on reduced-temperature solvent removal training and technology.

7 That an effective means of analysis and quality control be established at the P.E.O.R.C. Appropriate training in this area is particularly important.

8 That research and development be undertaken into alternative commercially-used essential oils, both established and new.

9 That research and development be undertaken into alternative enterprises relating to the essential oil industry (e.g. the production of pure isolates by fractionation, the use of natural oils as sources of starting materials for semi-synthetic products, etc).

10 That stronger links be formed between the personnel of P.E.O.R.C. and all those concerned with utilisation of plants. This will allow rapid and effective exchange of information and so avoid much duplication of effort which exists at the moment.

The Government of D.P.R.K. has recognosed the importance of the new centre by requesting an increase in the budget for the project to strengthen the essential oil industry from US $200,000 to US $300,000. A copy of this request is given in Annexe 15.

An outline project document was prepared at the end of the mission and is presented as Annexe 16.

It is the view of the Consultant that, if the above recommendations are implemented and the P.E.O.R.C. is so upgraded along these lines, it should assume an increased role by acting as CHIEF TECHNICAL and, in particular, SOLE QUALITY CONTROL ADVISER to all those concerned in essential oil production and utilisation (and similar technologies such as those employed in the flavourings, spices and traditional medicine industries) in D.P.R.K. Eventually it could act as a training centre in D.P.R.K.

X2

Annexe 1

Initial request to UNDP from Government

Dear Sirs 6 October 1986

Subject; Strengthening laboratory of natural perfumery

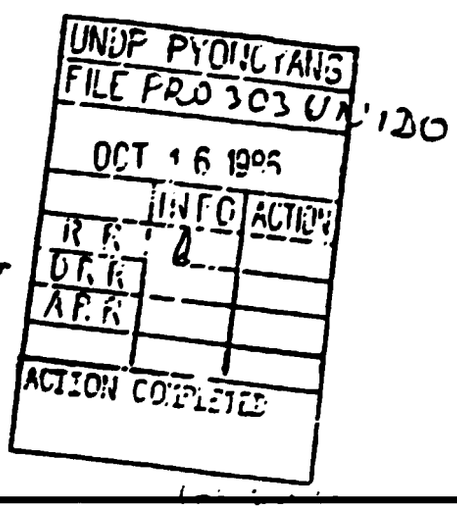
Mr. Yong Tu Rong had visited the laboratory of natural perfumery on 20th August 1986 concerning the above mentioned project, and asked the enclosed data on the laboratory of natural perfumery.

I would appreciate it if you kindly ask UNIDO to include the project as one of programmes under UNIDO SIS Programme.

Yours sincerely,

Kim Ha Dong
Director General
Fifth Department
Ministry of Foreign Trade

Mr. Evan V. Melder
Resident Representative a.i.



UNITED NATIONS
DEVELOPMENT PROGRAMME

OFFICE OF THE
RESIDENT REPRESENTATIVE

유엔개발계획 /주재 대표부

PYONGYANG, DPR KOREA

Annexe 2

Request from UNDP to UNIDO

3 NOV 1986
Mr. Tandon

PRO 303 UNIDO

23 OCTOBER1986

Dear Mr.Vassiliev,

Ctr. No. 8601149
File: DRK

Subject: Strengthening of Natural Perfumery Laboratory

I have received the annexed proposal from the 5th Department, Ministry of Foreign Trade of DPR Korea for consideration and inclusion in UNIDO's SIS programme. In discussion with Mr. Han Tae Hyek the Deputy Director General it was agreed as follows.

We would propose to UNIDO that instead of initiating this project with a study tour and training programme an expert would be sent to DPRK by UNIDO to make an assessment of DPRK's perfumery industry, its needs and expansion possibilities.

The proposed approach would be in line with the objective of seeking export possibilities for essential oil extracts.

I shall be grateful if consideration is given to the inclsion of this project in UNIDO's SIS programme bearing in mind the proposed approach.

I look forward to your early response.

Yours sincerely,

Carl-Erik Wiberg
Resident Represent aive

Mr.A.A.Vassiliev
Deputy Director General
Department of Industrial Operations
UNIDO,Vienna, Austria.

RECEIVED
4 NOV 1986
AREA PROGRAMMES

cc: 5th Department
Ministry of Foreign Trade
Pyongyang

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REGISTF

Mail P O Box 27 Telephone Cable address: UNDEVPRO PYONGYANG

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT PROPOSAL

PART A - BASIC DATA

COUNTRY	: Democratic People's Republic of Korea
PROJECT NUMBER	: SI/DRK/86/805
PROJECT TITLE	: Strengthening of the Essential Oils and Perfumery Industry
SCHEDULED START	: As soon as Possible
SCHEDULED COMPLETION	: 2 Months after commencement
ORIGIN AND DATE OF OFFICIAL REQUEST	: Letter of Resident Representative dated 23 October 1986
UNIDO CONTRIBUTION	: US$ 11,500
GOVERNMENT CONTRIBUTION	:
CURRENCY REQUIRED:	
FOR UNIDO INPUTS	: US$ 11,500
CONVERTIBLE	: US$ 11,500
OTHER	:
UNIDO SUBSTANTIVE BACKSTOPPING SECTION	: CHEMICAL INDUSTRIES BRANCH PHARMACEUTICAL INDUSTRIES UNIT
PROGRAMME COMPONENT CODE	: ZZ-J-13422

1. **OBJECTIVES:**

(a) **Development Objectives:**

To develop an export-oriented manufacturing industry by processing essential oils and related natural perfumery products from flowers and aromatic plant raw materials available in DPR Korea.

(b) **Immediate Objective:**

To render technical advice on the most appropriate technology options, and in collaboration with local counterparts develop a plan for enhancing the present capability of the PYONGYANG Natural Perfumery Laboratory.

2. **Special Considerations:**

N.A.

3. **Background and Justification:**

In the Democratic Peoples' Republic of Korea, flowers such as Rugosa rose, Lilac, and Lily-of the Valley are grown spontaneously on a substantial scale. Harvesting of flowers is concentrated to one season and available in quantities of the order of 1000 tonnes per season. Their distribution is concentrated in geographical regions depending on the kind of flowers.

It is felt that by systematic cultivation of Rogosa rose and Lily-of the Valley, two harvests per season would be possible. Under the aegis of the Pyongyang Natural Perfumery Laboratory (PNPL) an area which can yield 1000 tonnes harvests is being cultivated. This laboratory - the P.N.L.P. - was established in 1983 for the purpose of carrying out research on the scientific and technological aspects of manufacturing essential oils and the perfumery products from flowers and other raw materials. One of its main objectives is to develop export-oriented products.

At present the laboratory is engaged in the extraction of the essential oil from Rogosa roses, Lilac, and Lily-of-the-valley gathered from various geographical regions, the improvement of extraction methodology, studying the compositional variations and methods to improve the quality of the oils - the laboratory is also attempting to establish contacts with perfumery companies likely to be interested in their products. The laboratory has a staff of 30 with a 600 m^2 building presently being completed. The laboratory possesses over 60 pieces of equipment including facilities for solvent extraction and steam-distillation of the flowers. Samples of essential oils sent from the laboratory have attracted the interest of Japanese Perfumery companies, However, they have drawn attention to the need for quality guarantees.

The government having realized the export potential of the oil produced by the Pyongyang National Perfumery Laboratory (PNPL) based on locally available raw materials endeavoured to improve the extraction and quality of oil. However, they have failed to achieve a breakthrough in this regard due to the following reasons:

i) Apparently, technologies for extraction of natural heat-sensitive perfumery materials from flowers in the factory is out of date.

ii) The factory does not have solvent extraction facilities and purification of extracts at a low temperature.

iii) No Quality Control facilities exists in the factory.

iv) The type of equipment used and the design and construction methodology needs to be reassessed to ensure quality products.

In view of the above, the government have requested UNIDO to field an expert on an urgent basis to make an assessment of the perfumery factory and recommend expeditiously ways and means to improve the extraction method and quality control of the factory based on acceptable technology.

The UNDP Resident Representative in Pyongyang has supported the request and transmitted the formal government request for SIS assistance vide letter dated 23 October 1986.

4. Project Outputs:

The output of the project will be a technical report including, inter alia, recommendations to achieve:

i) Upgraded technical expertise for extraction of natural heat-sensitive perfumery materials from locally available flowers.

ii) Solvent extraction facilities and purification of extracts at a low temperature.

iii) Quality Control facilities acceptable to international importers.

iv) Assessed additional equipments necessary to meet outputs (i) to (iii).

5. Project Activities and Modalities of Implementation:

The following activities are envisaged for the project:

A. Consultations on site between UNIDO specialists/consultants and officials of the P.N.L.P together with site visits to flower growing areas.

B. On-site study of present technology used at P.N.L.P for quality control and for extraction/distillation of flowers.

C. Formulation of proposals by consultation with a view to assisting the government to achieve, among others, the following:

- acceptable technologies for extraction of natural heat-sensitive perfumery materials;
- identification of improved solvent stripping facilities and purification of extracts at a low temperature;
- establishment of quality control methods in keeping with the requirements of international importers; and
- assessment of additional equipment necessary to modernize the plant.

D. Consultations with the concerned government authorities with the findings and recommendations.

E. Finalization of report and proposals with UNIDO Special Technical Adviser at UNIDO Headquarters.

F. Submission of report to the Government.

6. Project Inputs:

(a) Government Inputs

These will include the following:-

Government P.N.L.P technical counterpart personnel to assist consultant with his work and necessary institutional facilities.

(b) **UNIDO Inputs:**

A highly qualified consultant on the chemistry and technology of essential oils will be fielded by UNIDO for 1 w/m. The total cost of inputs is estimated at US$ 11,500 as under:

B/L 11-51 Short term consultants	US$ 10,500.-
B/L 15-00 Project travel	US$ 500.-
B/L 51-00 Miscellaneous	US$ 500.-
B/L 99-00 Total	US$ 11,500.-

7. **Evaluation Plans:**

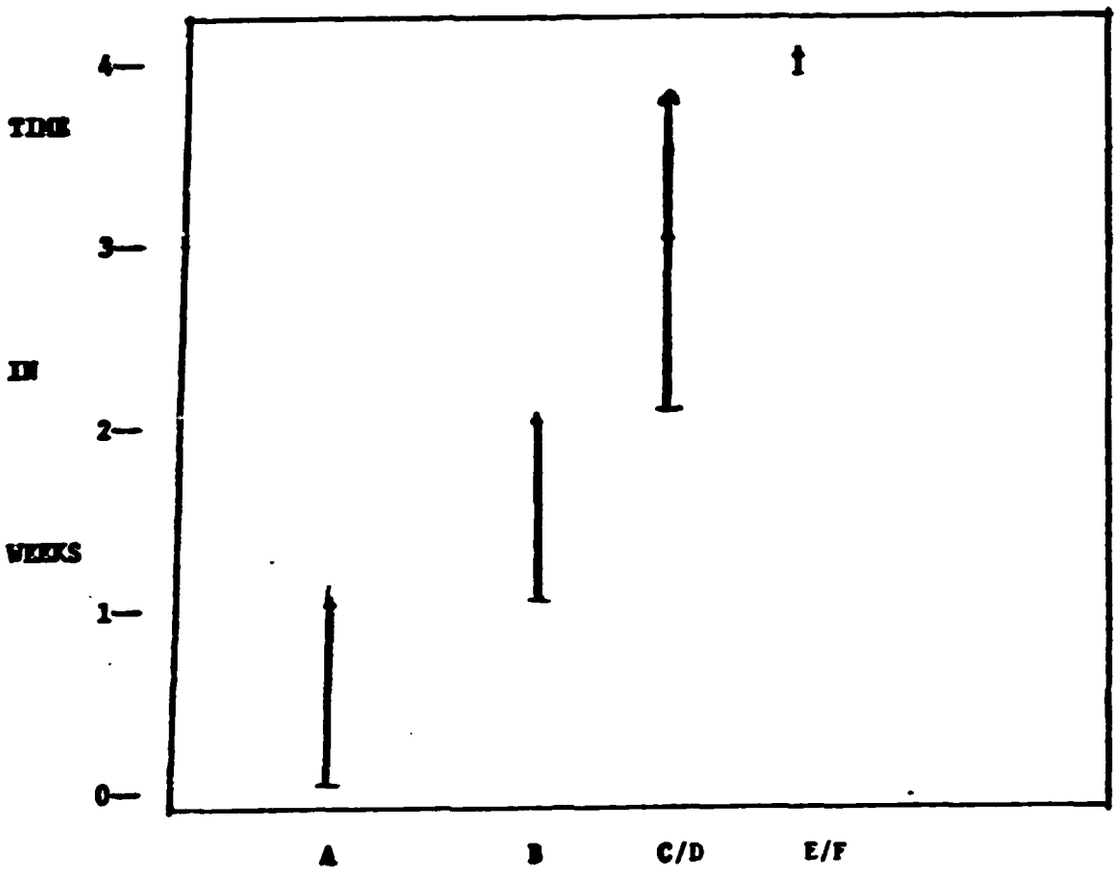
N.A

8. **Envisaged Follow-up:**

It is expected that the final report of the mission will propose measures for following action. The report will serve as a basis for initiations by the government to develop export-oriented products from essential oils. It must however be mentioned that UNIDO in no way commits itself to support any follow-up assistance.

9. **Work Plan:**

The work plan is envisaged as follows:-



ACTIVITY AS IN SECTION 5.

PART C - CLEARANCE AND APPROVAL:

CLEARED BY: R.O.B. [illegible] DATE: 23.11.86.

BACKSTOPPING OFFICER

IO/T/CHEM

IN CO-OPERATION WITH: M.A. MANSUR, PPD/AREA/AP DATE: 17 December 1986

CLEARED BY: R. JAMIL[illegible], ACTING HEAD, AREA/AP Date:

A. TCHEKHAVORIAN-ASENBAUER DATE:

HEAD

IO/T/CHEM

L. BIRITZ DATE: 25/11/86

DIRECTOR

IO/T

UNIDO

PROJECT BUDGET/REVISION

COUNTRY	4. PROJECT NUMBER AND AMENDMENT	5. SPECIFIC ACTIVITY
DPR KOREA	SI/DRK/86/	ZZ-J-13422

PROJECT TITLE

Strengthening of the Essential Oils and Perfumery Industry

INTERNATIONAL EXPERTS (Functional titles required except for line 11-50)	16. TOTAL		17. 1987		18.		19.		20.	
	m/m	$	m/m	$	m/m	$	m/m	$	m/m	$
11										
12										
13										
14										
15										
16										
17										
18										
19										
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12										
13										
14										
15										
16										
17										
50 Short term consultants	1	10,500	1	10,500						
59 Sub-total—International experts*	1	10,500	1	10,500						

REMARKS

* If more than 16 experts are required check here ☐ and attach continuation sheet 1A. This sub-total *must* include all experts.

UNIDO

PROJECT BUDGET/REVISION

OJECT NUMBER 1/DRK/86/	16. TOTAL		17. 1987		18.		19.		20.	
	M/M	$	M/M	$	M/M	$	M/M	$	M/M	$
S EXPERTS (functional titles required)										
01										
02										
03										
09 Sub-total-OPAS experts **										
INISTRATIVE SUPPORT PERSONNEL										
00 Clerks, secretaries, drivers										
50 Freelance interpreters (non-UNDP projects)										
99 Sub-total-administrative support personnel										
VOLUNTEERS (functional titles required)										
01										
02										
03										
04										
99 Sub-total-UN VOLUNTEERS **										
00 Project travel		500		500						
00 Other personnel costs (including UNIDO staff mission costs)										
IONAL EXPERTS (functional titles required)										
01										
02										
03										
04										
05										
99 Sub-total-National experts **										
00 Surrender prior years' obligations										
99 TOTAL-PERSONNEL COMPONENT										

additional individual budget lines are required, check here ☐ and attach continuation sheet 1A. These sub-totals must include budget lines listed on page 1A.

UNIDO

PROJECT BUDGET/REVISION

OJECT NUMBER S1/DRK?86	16. TOTAL		17. 1987		18.		19.		20.	
	m/m	$	m/m	$	m/m	$	m/m	$	m/m	$
CONTRACTS										
0 Subcontracts										
INING										
0 Individual fellowships										
0 Study tours; UNDP group training										
0 In-service training										
0 Non-UNDP group training										
0 Non-UNDP meetings										
0 TOTAL – TRAINING COMPONENT										
IPMENT										
0 Expendable equipment										
0 Non-expendable equipment										
0 Premises										
0 TOTAL – EQUIPMENT COMPONENT										
CELLANEOUS										
0 Sundries		500		500						
0 Hospitality (non-UNDP projects)										
0 Support costs (CC and DC projects only)										
0 TOTAL – MISCELLANEOUS COMPONENT		500		500						
PLUS/DEFICIT										
0 Surplus/Deficit (ADM/FS use only)										
0 PROJECT TOTAL	1	11,500	1	11,500						
* COST SHARING (UNDP/IPF projects only)										
* NET UNDP CONTRIBUTION										

For information only – not for PAD input

UNITED NATIONS DEVELOPMENT PROGRAMME

OFFICE OF THE RESIDENT REPRESENTATIVE

PYONGYANG, DPR KOREA

3 NOV 1986

Mr. Tandon

PRO 303 UNIDO

23 OCTOBER 1986

Dear Mr.Vassiliev,

Ref. No. 8601149

File: DRK

Subject: Strengthening of Natural Perfumery Laboratory

I have received the annexed proposal from the 5th Department, Ministry of Foreign Trade of DPR Korea for consideration and inclusion in UNIDO's SIS programme. In discussion with Mr. Han Tae Hyek the Deputy Director General it was agreed as follows.

We would propose to UNIDO that instead of initiating this project with a study tour and training programme an expert would be sent to DPRK by UNIDO to make an assessment of DPRK's perfumery industry, its needs and expansion possibilities.

The proposed approach would be in line with the objective of seeking export possibilities for essential oil extracts.

I shall be grateful if consideration is given to the inclusion of this project in UNIDO's SIS programme bearing in mind the proposed approach.

I look forward to your early response.

Yours sincerely,

Carl-Erik Wiberg
Resident Representaive

Mr.A.A.Vassiliev
Deputy Director General
Department of Industrial Operations
UNIDO,Vienna, Austria.

cc: 5th Department
Ministry of Foreign Trade
Pyongyang

RECEIVED
4 NOV 1986
AREA PROGRAMMES

86 NOV 3 10:12

REGISTRY

Dear Sirs

6 October 1986

Subject; Strengthening laboratory of natural perfumery

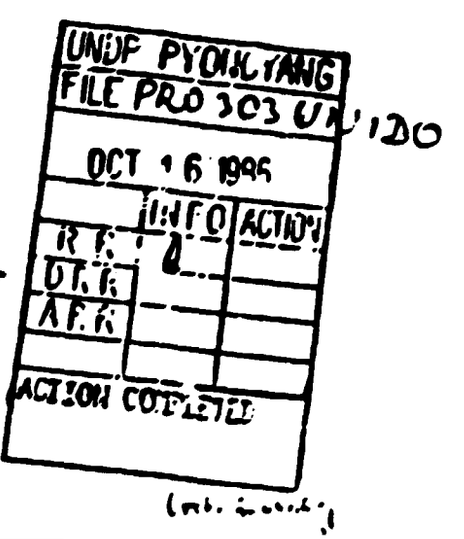
Mr. Yong Tu Rong had visited the laboratory of natural perfumery on 20th August 1986 concerning the above mentioned project, and asked the enclosed data on the laboratory of natural perfumery.

I would appreciate it if you kindly ask UNIDO to include the project as one of programmes under UNIDO SIS Programme.

Yours sincerely,

Kim Ha Dong
Director General
Fifth Department
Ministry of Foreign Trade

Mr. Evan V. Melder
Resident Representative a.i.

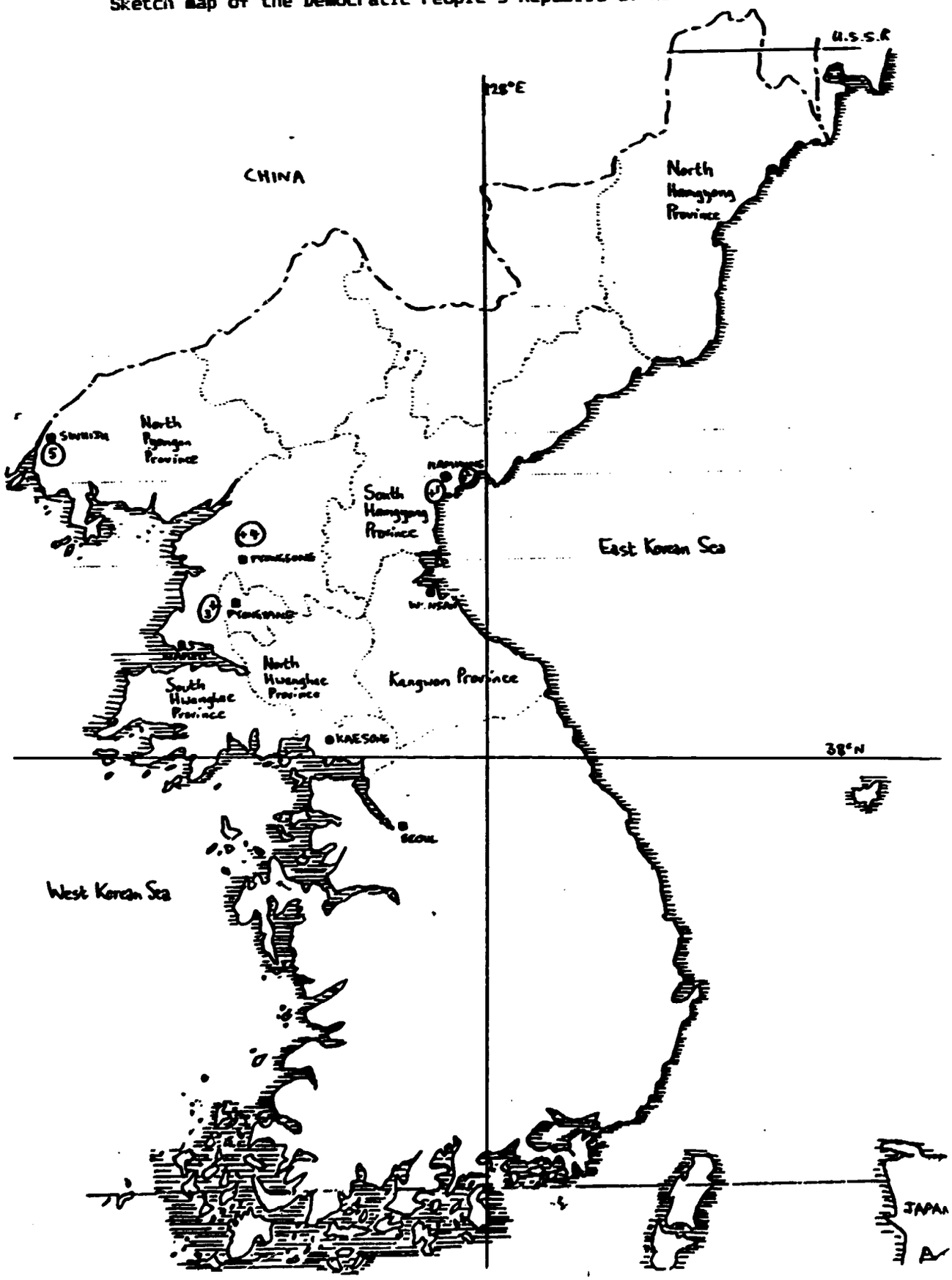


SPECIAL INDUSTRIAL SERVICES (SIS)

No.	Project Proposal Number	Project Title	Project Cost US$	LDC/ Non-LDC	Recommendations/Remarks by the Project Review Committee
(1)	(2)	(3)	(4)	(5)	(6)
3.	SI/[illegible]/86/824	Assessment of Possibilities of Rehabilitation of Ship Repair Yard SUBMITTING SECTION: ENG	25,800	non-LDC	Recommended for approval under SIS subject to the receipt of a revised PDS/budget as follows: (i) Techno-economic feasibility study cannot be financed under SIS therefore budgetline 11-01 to be deleted, only the services of the ship repair yard expert budgetline 11-02 to be included; (ii) budgetline 15.00 "experts travel" to be covered under Government inputs; (iii) budgetline 51.00 $ to be reduced accordingly. The revised PDS to be submitted to the PRC Secretariat. Need not be resubmitted to the PRC.
4.	SI/[illegible]/825	Strengthening of the Essential Oils and Perfumery Industry SUBMITTING SECTION: [illegible]	11,500	non-LDC	Recommended for approval under SIS. Mention to be made in the PDS that UNIDO, in no way commits itself to support follow-up assistance as detailed in the letter of 23 October 1986 from the Resident Representative, PDR Korea. An amended PDS to be submitted to the PRC Secretariat. Need not be resubmitted to the PRC.

Annexe 4

Sketch map of the Democratic People's Republic of Korea



Annexe 5

Photographs taken at P.N.P.L.

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Annexe 6

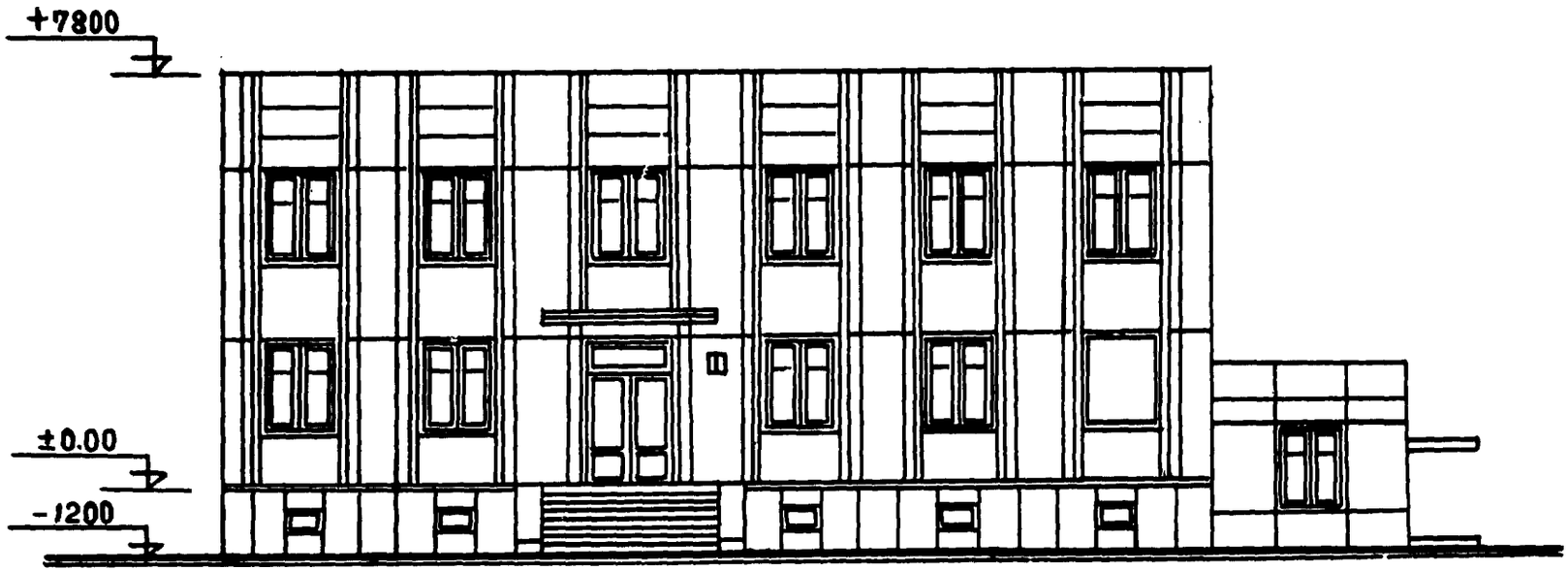
Plans of the Pyongyang Natural Perfumery Laboratory

평양천연향료연구소

(PYONGYANG RESEARCH CENTRE OF NATURAL PERFUMERY)

정 면 도

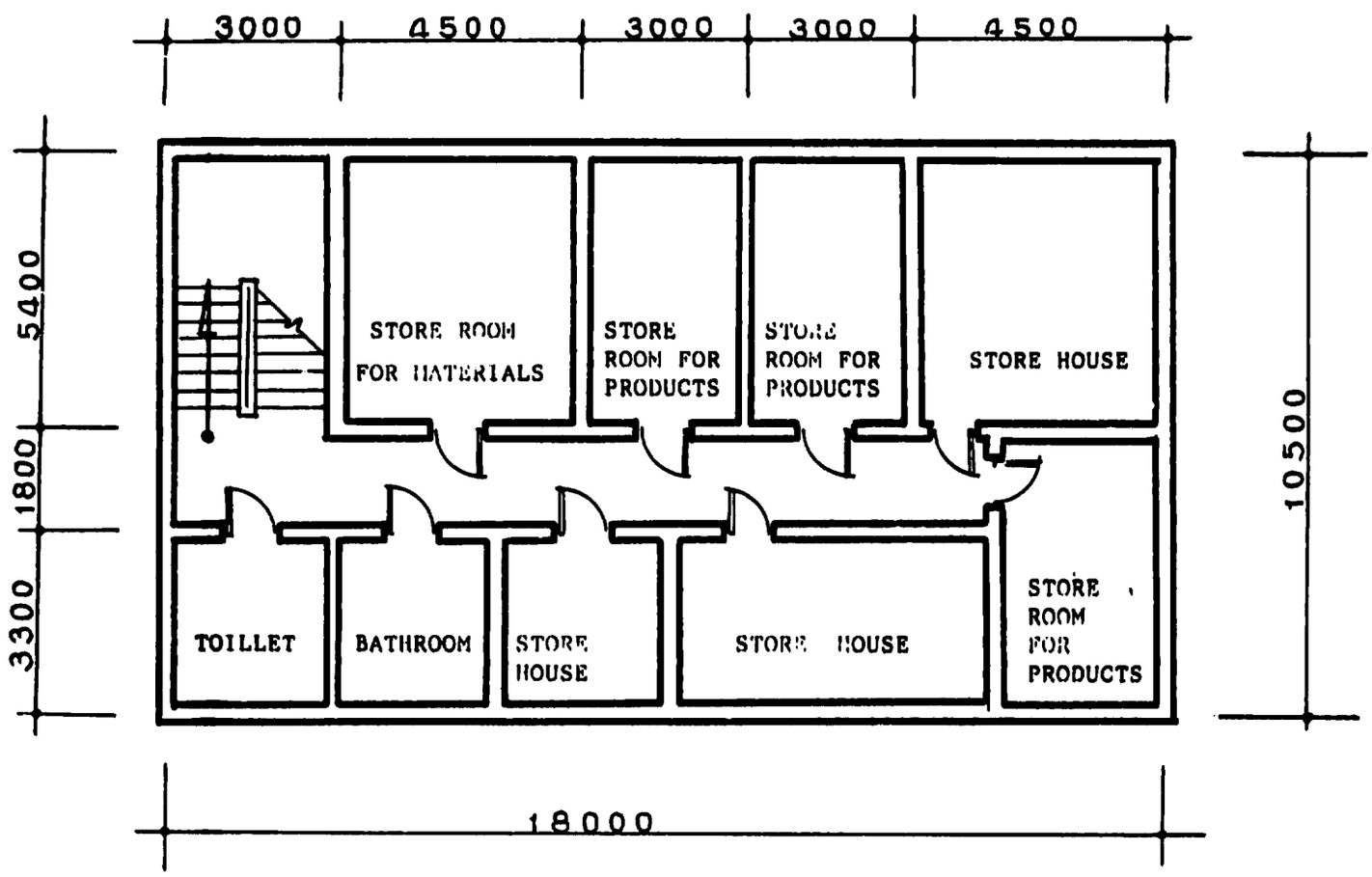
(FRONT)



평양천연향료연구소

지하층평면도

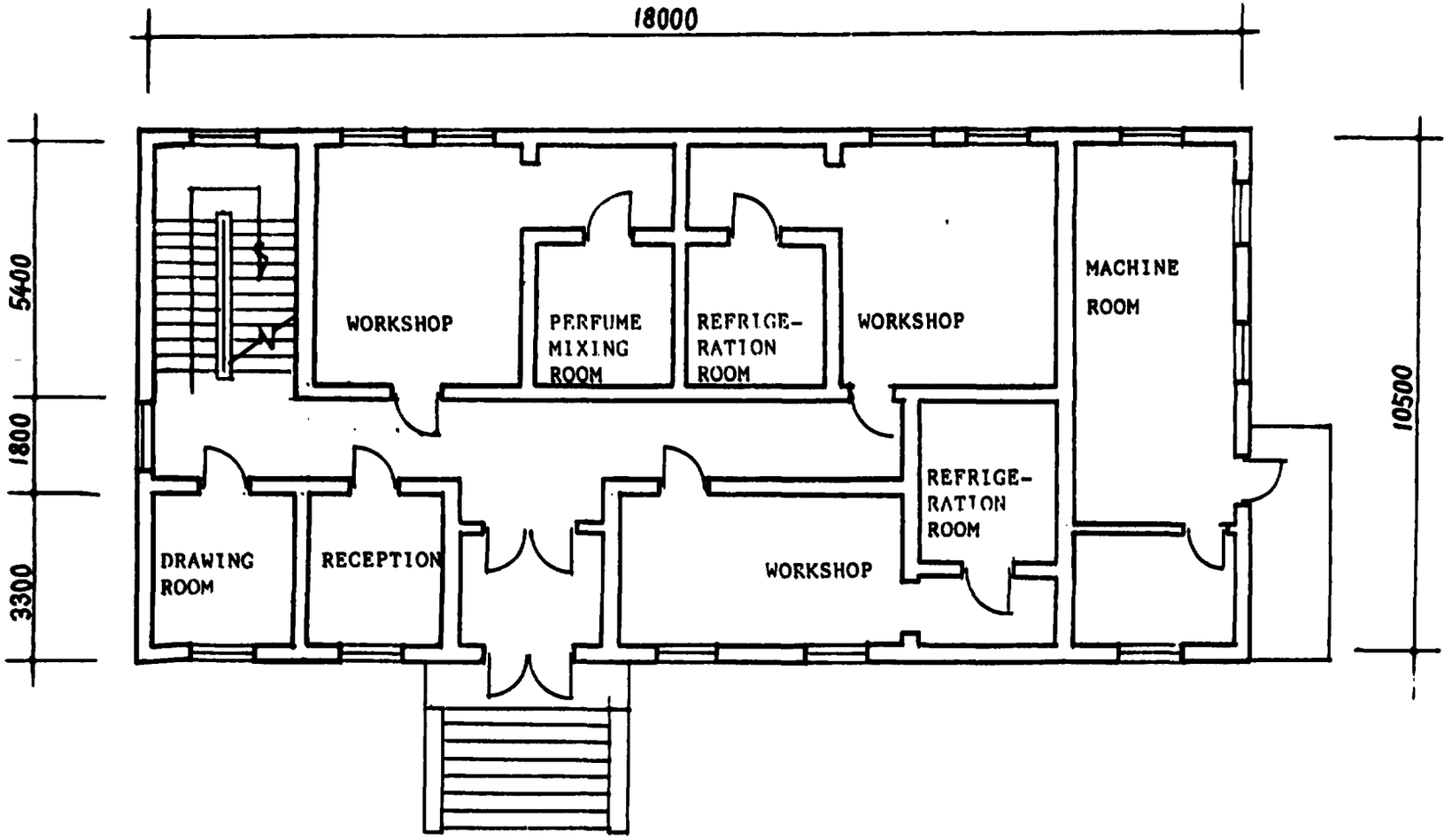
(BASEMENT)



평양천연향료연구소

1층 평면도

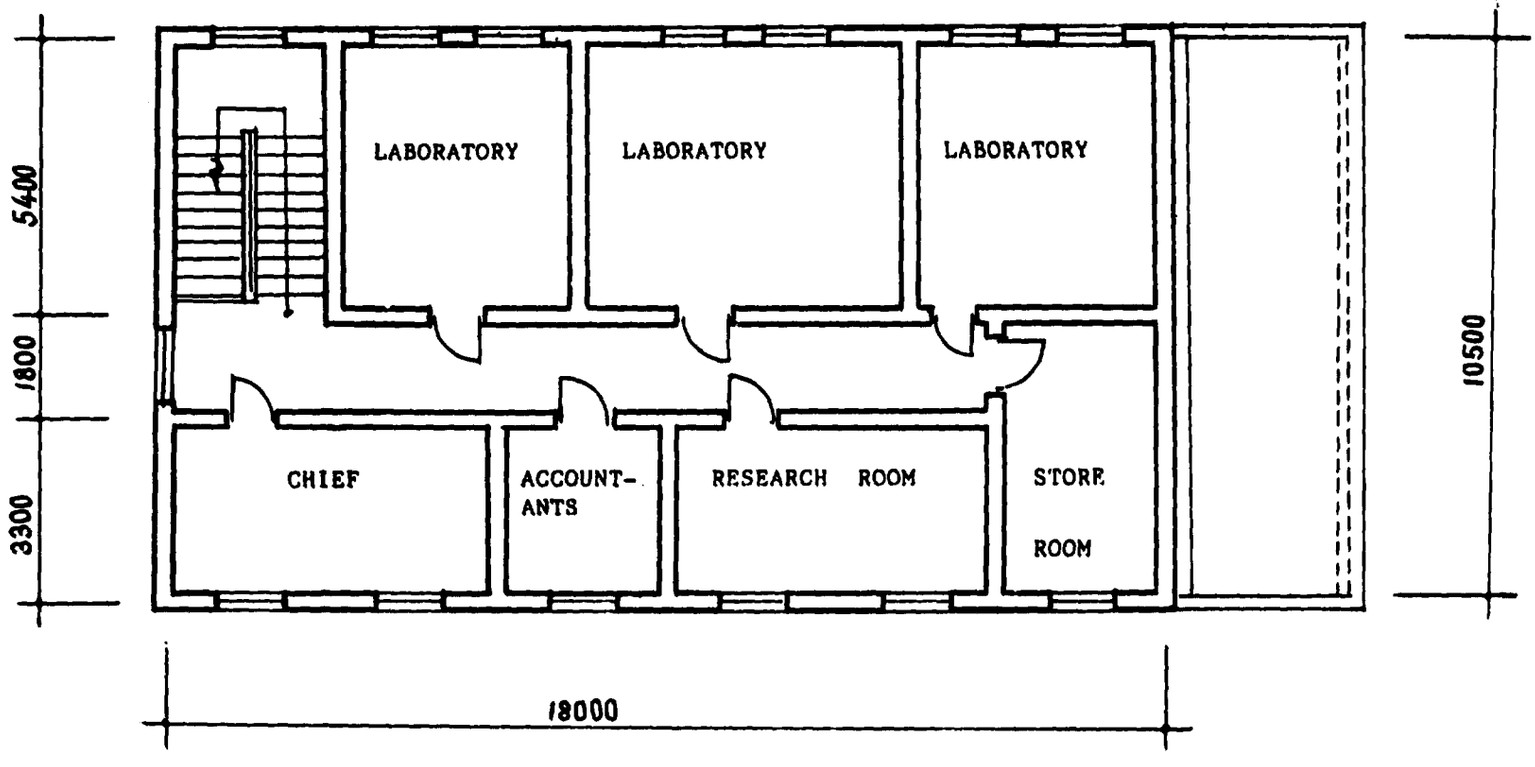
(GROUND FLOOR)



평양천연황토연구소

2 층 평 면 도

(FIRST FLOOR)



Annexe 7

List of equipment seen by the Consultant at the Pyongsong Academy of Science

JEOL JMS-DX300

HITACHI polarized AA spectrophotometer 180-80

CHINON HM-100

JEOL JSM-255II scanning EM

MOP VIDEOPLAN

SHIMAZU X-ray DIFFRACTOMETER XD-3A

RIGAKU X-ray analyzer

HITACHI ultracentifuges 85P-72, 70P-72

HORIBA MESA-1130 X-ray fluoresence analyzer

SHIMAZU GC-9A + integrator

YAMACO G388 GC

SHIMAZU LC-4A LC

A range of other smaller equipment was also operational.

Annexe 8

Production of the Sinuiju Cosmetic Factory, tonnes (1986)

		annual production (existing capacity)	essential oils utilised
1	toilet soap	3000 (5000)	45, mainly lilac*
2	cosmetic creams	200 (1000)	2, rose, lilac and jasmin**
3	toothpaste	1200 (4200)	25, mint***
4	toilet waters and perfumes	no figures available	

* mainly imported (some has been provided by the first trials of the PNPL)

** wholly imported

*** all produced in DPRK but outside scope of PNPL

Annexe 9

Some essential oil-containing plants in D.P.R.K.[5]

Syringa dilatata
Syringa amurensis
Rosa rugosa
Convallaria keiskei
Thuja koraiensis
Pinus sp
Abies nephrolepis
Acorus asiaticus
Thymus przewalskii
Agastache rugosa
Ledum palustre
Magnolia sieboldii
Zanthoxylum piperitum
Erigeron canadensis
Mentha arvensis var. piperascens
Rosa damascena
Rosa alba
Rosa centifolia
Pelargonium roseum
Perilla frutescens
Coriandrum sativum
Lavandula vera
Salvia selarea
Ocimum gratissimum
Pogostemon patchouli
Melissa officinalis
Cymbopogon goeringii

Rosa davurica
Robinnia pseudoacacia
Cryptotaenia japonica
Foeniculum vulgare
Benzoin obtusiloubum
Syringa amurensis
Syringa paribiniana
Salvia officinalis
Asperula odorata
Luffa cylindrica
Carthamus tinctorius
Chrysanthemum makinoi
Valeriana fauriei

Annexe 10

Photographs taken in the field at Chang sin-ri and nearby

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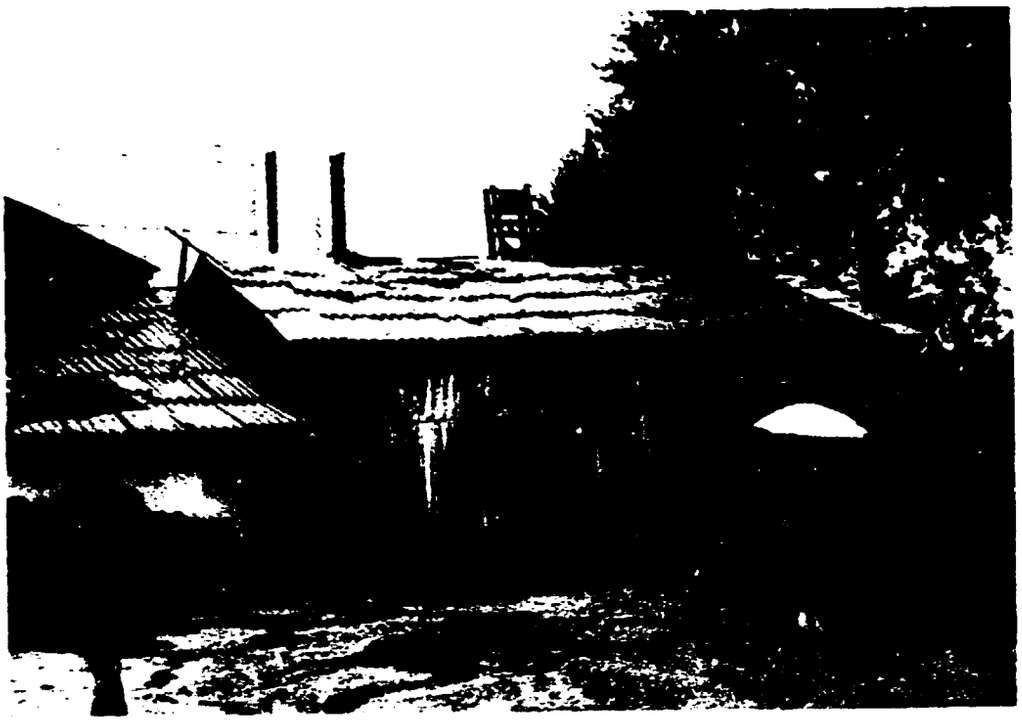

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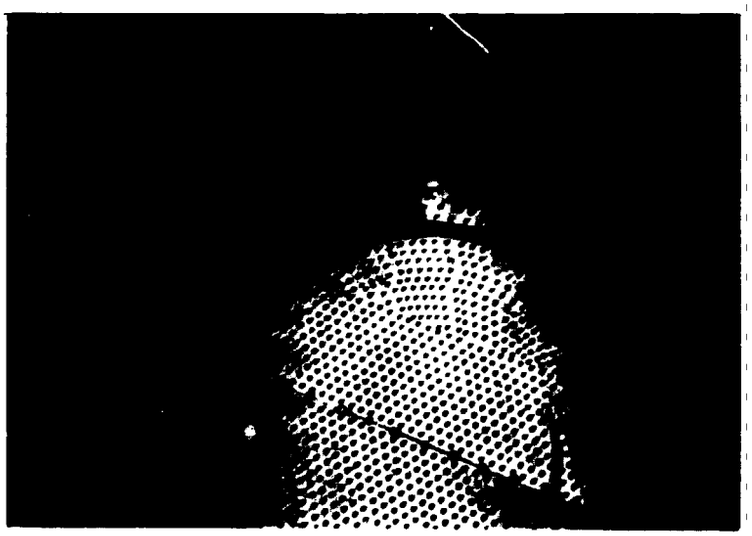

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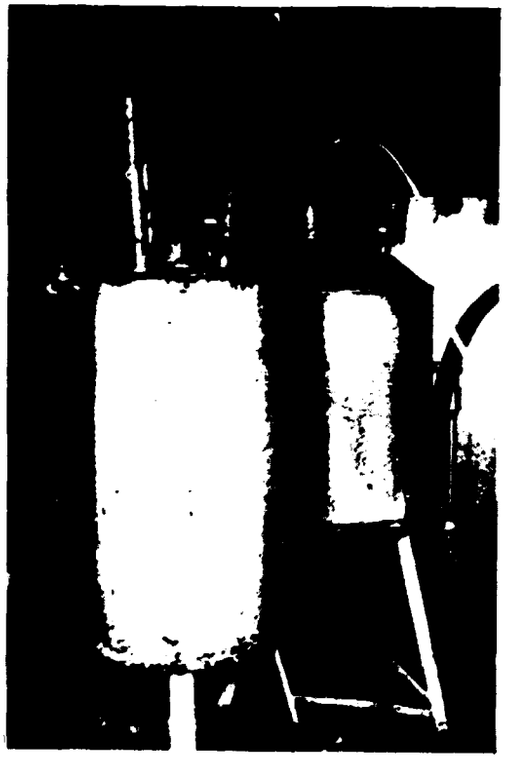

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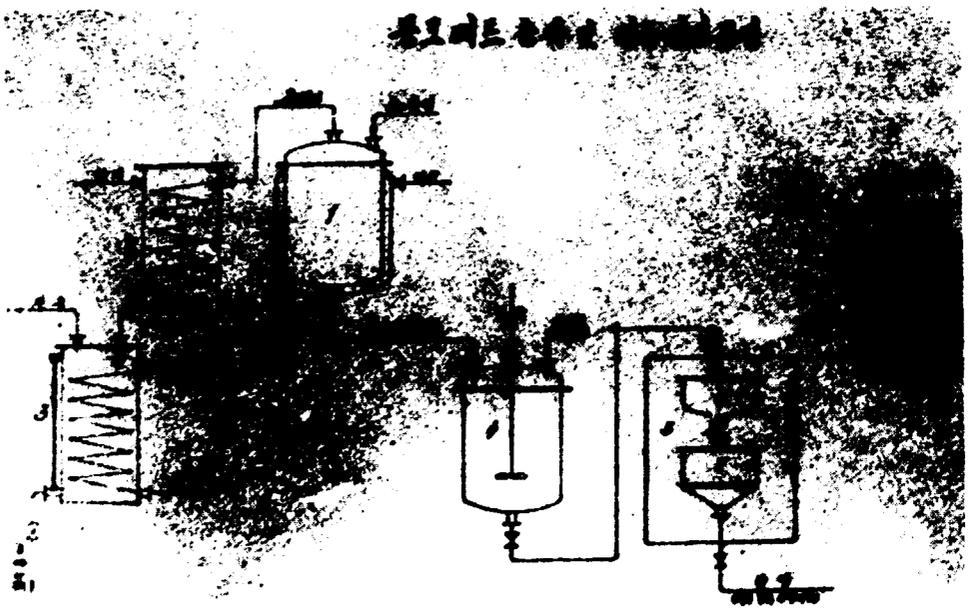
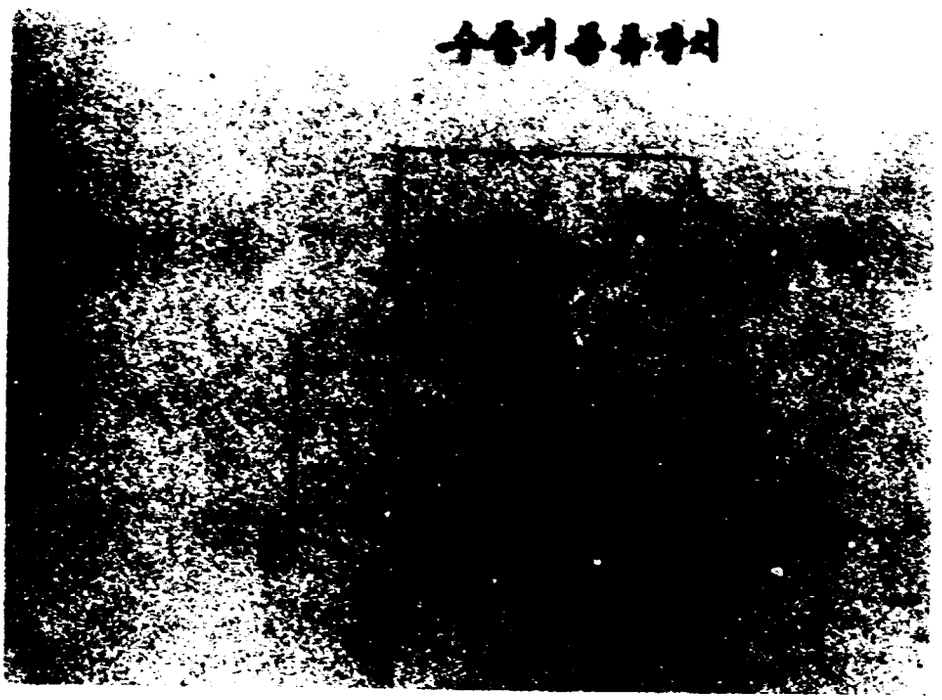
Annexe 11

Flow diagrams of existing and projected processes used at P.N.P.L.

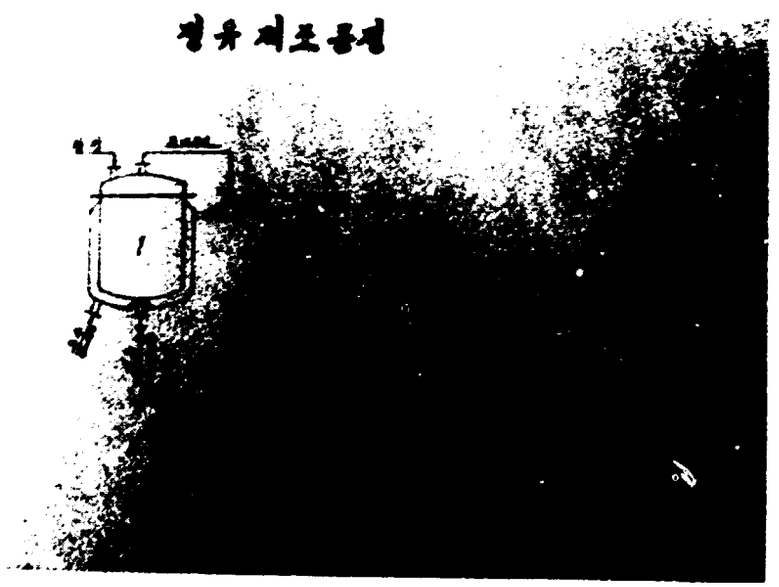
existing solvent extraction



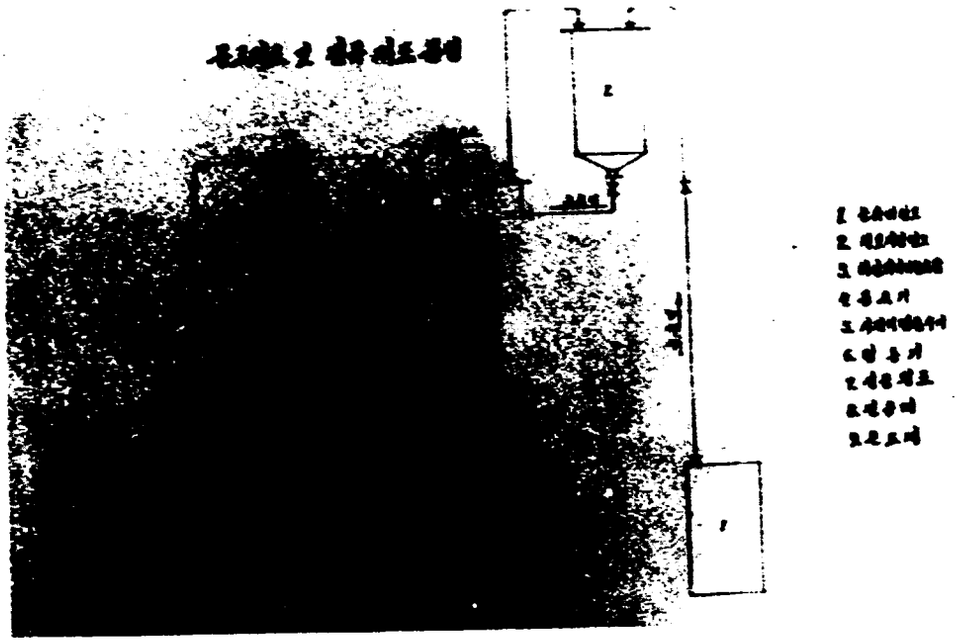
existing concrete production



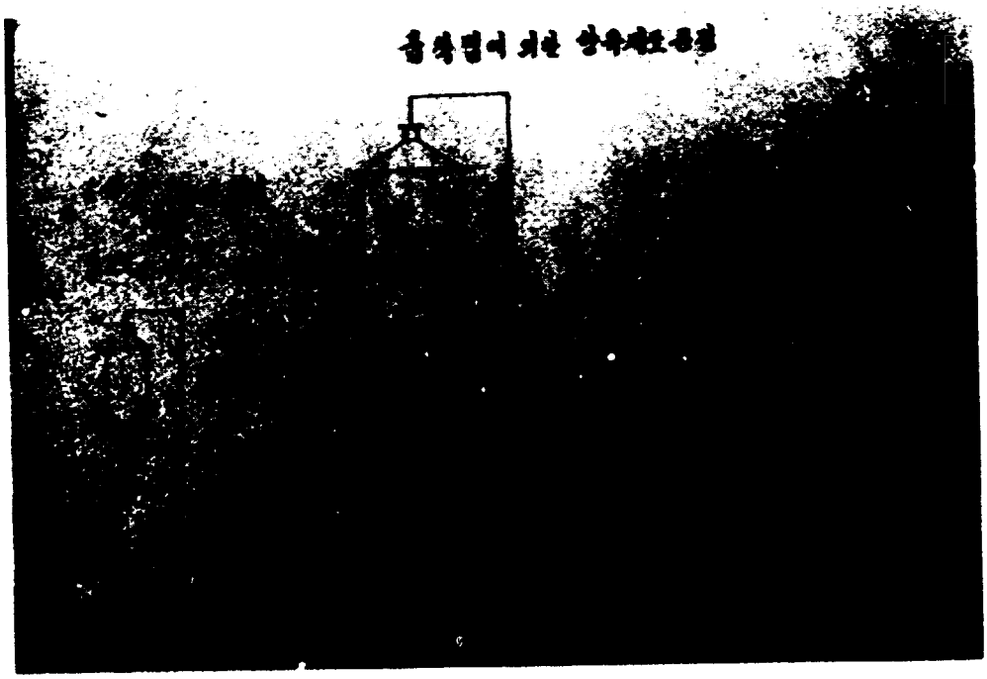
existing steam distillation



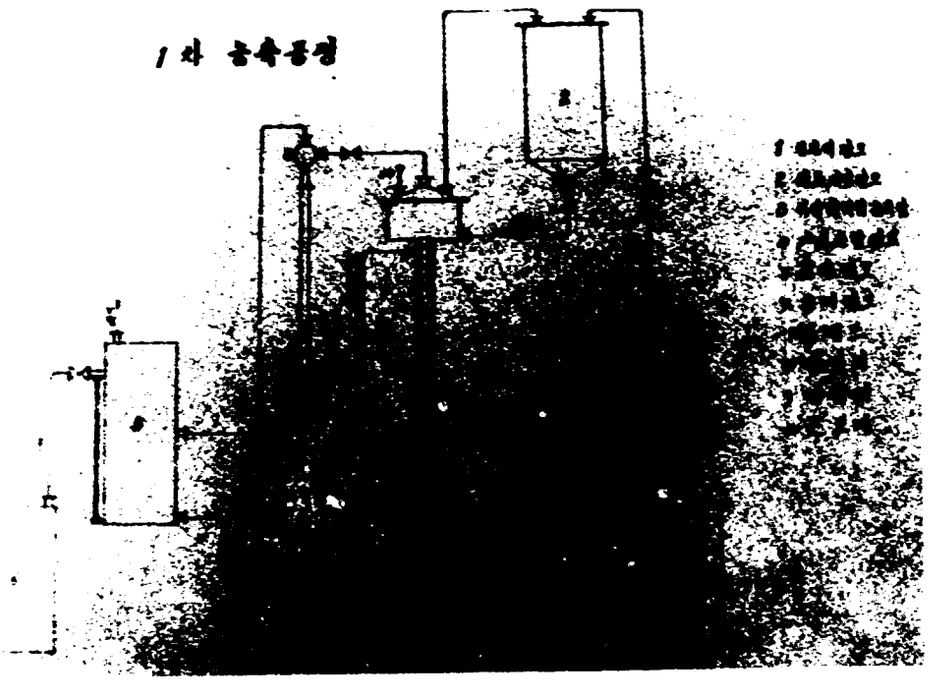
existing concentration



proposed film evaporation



proposed film evaporation



proposed activated charcoal technology

Annexe 12

Photographs taken in the field at Yaksu-ri and nearby

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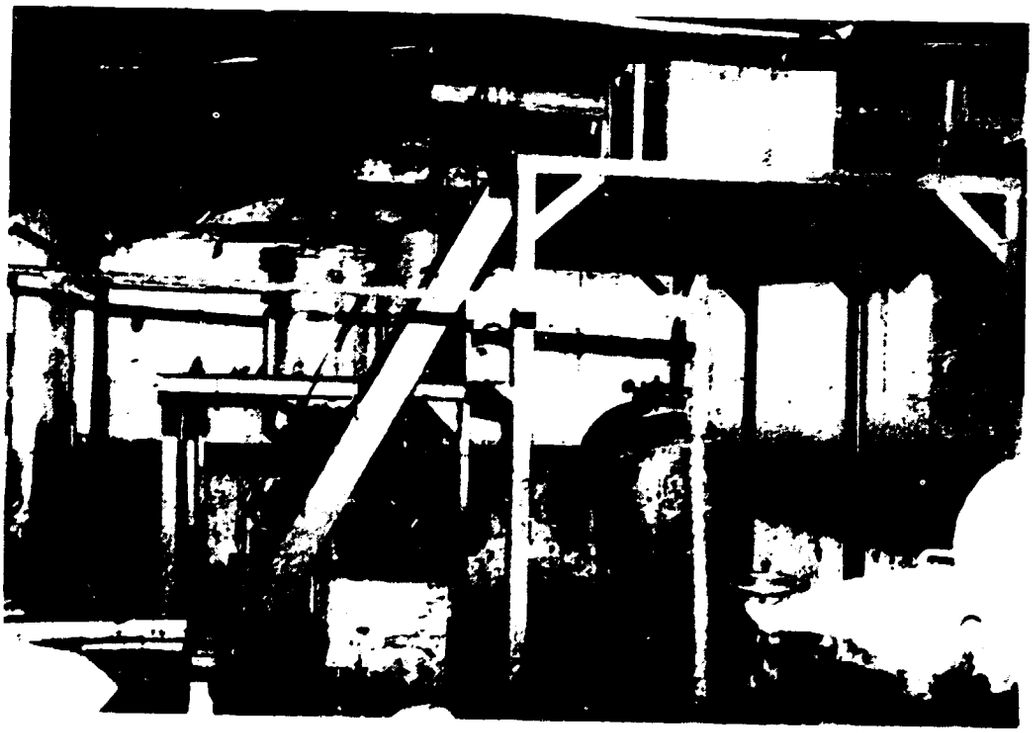

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