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ASSISTANCE TO THE LAUREL OIL FACTORY IN SILIFKE, ICEL

SI/TUR/88/803

TURKEY

Technical report: Rehabilitation of the Semi-installed Laurel
Oil Factory Silifke - I Phase*

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

Based on the work of Mr. M.B. Narasimha
UNIDO expert

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United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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CONTENTS

	<u>Page No.</u>
1. INTRODUCTION TO THE MISSION ..	1
1.1 BACK GROUND ..	1
1.2 ROLE OF ANADOLU UNIVERSITY'S MEDICINAL PLANTS RESEARCH CENTRE ..	2
1.3 MISSION PRELIMINARIES ..	3
1.4 SITE VISIT ..	4
1.5 NATURE AND SCOPE OF WORK ..	4
2. SUMMARY ..	5
3. 3.1 POSITION AT COMMENCEMENT (ASSESS- MENT) ..	7
3.2 PROGRAMME OF WORK OUTLINED ..	14
3.3 WORKDONE AT MEDICINAL PLANTS RESEARCH CENTRE OF ANADOLU UNIVERSITY ESKISEHIR. ..	18
3.4 TOTAL WORK ACCOMPLISHED ..	19
4. CONCLUSION AND RECOMMENDATION ..	26
5. ACKNOWLEDGEMENTS ..	28
6. ANNEX I ..	29
7. ANNEX II ..	33
8. ANNEX III ..	34
9. ANNEX IV ..	36
10. ANNEX V ..	37

1. INTRODUCTION TO THE MISSION

1.1 BACK GROUND

Laurus nobilis (bay tree) is an evergreen tree which grows abundantly in the coastal countries of the mediterranean sea. The coastal tracts of Turkey have abundant growth of this tree. In ancient Greece, its heroes were honoured with garlands of bay leaves and branchlets. The dried leaves are valued for their flavouring property in culinary preparations. The essential oil obtained by steam distillation of the leaves possesses aromatic, spicy odour and is a valuable adjunct in the flavouring of food products and is also used for medicinal purposes.

Since 1968 Turkey has been exporting more than 1,500 tons per annum of dried laurel leaves. ORKOY an abbreviation for Orman Koylerini Kalkindirma Kooperative which is in English version called Forest Villages Development Cooperative (KOOP/FVDC) an organisation of the Ministry of Agriculture Forestry and Rural Affairs was established in 1969 is the owner of the Laurel oil factory, situated at Silifke Icel. The Koop has 1,050 members from several villages in the vicinity of the factory, who constitute the main collectors of the raw material viz., laurel leaves and laurel berries to be processed by the factory to produce essential oil and fixed oil respectively.

Setting up the factory has been accomplished by way of sub-contract to a firm who, favouring Italian Technology and French equipment began to establish the desired factory in 1975 with the aim to complete it in 1978. However due to the timely death of the contractor in 1983, construction work could not be completed as scheduled and all the activities came to stand still. Since then the partly installed plant and equipment was left incomplete inside the factory building.

The plant site is situated in an area of 10,000 M² and comprises factory building, warehouse, administration buildings and roads.

A loan of TL 140 million and a grant of TL45 million was drawn in 1975 to setup the factory and has steadily grown to TL 600 million. The grant was subsequently withdrawn and formed part of debt, since it was linked with the commissioning of the factory before 1985.

It was brought to the notice of the expert that several local technical teams after a visit to the site expressed their inability to rehabilitate the factory. It is learnt that an Italian company had quoted a fee of US\$ 5,000 return air fare and accomodation for their representative in a first class hotel for a mere prefeasibility assesment with appropriate recommendations (annex.-I.) and in addition US\$ 585-per day as charges for the services of an Engineer to supervise the rehabilitation of these plants to which Koop agreed.

The factory had been designed to operate 2,000 tpa of leaves for disillation of essential oil and 5,000 tpa of berriesfer the extraction of fixed oil. No shortage of raw material is foreseen as Laurel tree grows wild and abundantly along the coastal line of Turkey. It is learnt that Silifke region alone can produce about 300 tpa Laural leaves which constitute a major export commodity and are not processed for essential oils in Turkey.

1.2 ROLE OF ANADOLU UNIVERSITY'S MEDICINAL PLANTS RESEARCH CENTRE

The Anadolu University's Medicinal plants research centre has been able to establish from scratch during the first phase of the UNIDO project DP/TUR/83/003 "production of pharmace-utical materials from medicinal and aromatic plants" and the current project DP/TUR/88/001, with the active assistance and cooperation of UNIDO and its experts, basic infrastructure facilities to conduct R&D studies and scale-up activities to pilot plants to produce crude extracts and essential oils based on some of the plants indigenour to Turkey.

One of the plant material subjected to extensive studies from bench scale to pilot plant level to semi-commercial level is the Laurus nobilis, with the active assistance of the UNIDO expert during the implementation of these projects. MPRC was already in possession of Technology package covering the entire range of operations namely pretreatment, distillations, recovery and enriching of essential oils.

After several local technical teams held out no hope of rehabilitation of the factory, and due to certain financial and legal disputes between the cooperative (Koop) and ORKOY, it was thought of selling the factory as scrap at this stage the newly elected executive board of Koop (a few years ago ORKOY was abolished) approached MPRC for rehabilitation of the factory.

With the intension of extending the benefits of R&D to industry, Professor Dr. Baser, the dynamic director of Anadolu University's Medicinal plants Research centre accompanied by a team of MPRC experts visited the factory at Silifke at the invitation of Koop during the early 1988, sent a project proposal to UNIDO Vienna for SIS funding routing it through the Ministry of Foreign Affairs and MR.M. Kamal Hussein UNIDO, SIDFA at ANKARA.

1.3 MISSION PRELIMINARIES

At the initiative of Anadolu University's MPRC Eskisehir, with concurrence of SIDFA Ahkash and UNIDO Vienna, the writer, who began his mission DP/TUR/88/001 in early August 1988, was advised to proceed to Silifke, study and assess the condition of the plant and equipment and report his findings.

The "Assessment report" dated 15th August 1988, details elsewhere in the report, the outcome of the expert's visit to the plant site between 6-11 August 88.

An important outcome of the Expert's visit and on-this-spot study and assessment was the non-acceptance of the Italian firm's offer resulting in a substantial saving to Koop.

The expert found that the factory in fact comprised two units one for essential oil and the other for fixed oil with common services Viz., water, watercoolers, step-down transformer, two boilers; all the plants and service units were found to be thoroughly incomplete, mostly wrongly connected; everything was in total disarray and the equipment was at various stages of rusting and decay, due to complete neglect.

It was also noticed by him that some vital parts were missing (particularly more so with fixed oil unit) and installation drawings were non-existent. However, he assured that the essential oil units along with all the services could be taken up for successful rehabilitation under phase I with the assistance of UNIDO and its expert.

At the request of SIDFA in Ankara, the expert drew up detailed work plan for the rehabilitation of Factory and general services under phase I.

1.4 SITE VISIT

Upon the submission of the assessment report and detailed work plan, Dr. Rob. Wijesekera UNIDO Special Technical Adviser personally visited Eskisehir, where the writer was assisting UNIDO project DP/TUR/88/001 and after detailed discussions with the writer and the National project Director who is also Director of Anadolu University MPRC, travelled to silifke and site-visited the factory accompanied by the expert the Director MPRC and UNIDO SIDFA. He went through the factory inspecting each and every piece of equipment, including general services,. With his expertise and wide experience he made some very useful and practical suggestions which the expert noted.

SIDFA Ankara, NPD have also made some very useful suggestions at the site of the factory.

1.5 NATURE AND SCOPE OF WORK

It was proposed to take up the work of the rehabilitation of phase I consisting of Essential oil distillation units and General services.

The essential oil unit consists of (1) semi-mechanical feeding arrangements in the form of elevator and conveyer system and three hopper bins, partly installed, with certain vital components missing material of construction is mildsteel.

(2) Three steam distillation stills of $2M^3$ capacity each with individual shell and tube condensers of $10m^2$ cooling surface area.

(3) A set of oil water separators common to all the three stills. These were lying loose and not connected through piping.

(4) A tank of about 200 l capacity with submersible pump. Material of construction of these units is of stainless steel type 304 (Pump is of C.1.)

(5) Overhead monorail without electric hoist for mechanical discharge of marc-spent plant-material.

The designed capacity was to handle 2,000 tpa of leaves. The stills and condensers were partly installed and misaligned with no interconnecting process and service piping.

(6) The elevator conveyer system made of M.S. was just hanging loose.

(7) A fractionation assembly to fractionally distill and rectify essential oils consisting of:

- Steam jacketed reboiler of 240 litre capacity.
- Fractionation column 7M high with accessories.

Revival of general services/infrastructural installations to provide steady supply of the following to the plants:

- Power
- Steam
- Water

It was originally planned that the installations would be the responsibility of Koop with the supervision and assistance of the UNIDO expert, but due to various reasons the entire responsibility of procurement of equipment, tools engagement of labour, planning and execution of all the activities fell on his shoulders, who bore it well, withstanding freezing sub-zero winds-with non-existing room-heating.

2. SUMMARY

The expert assisted by a young chemical Engineer from Anadolu University's MPRC took up the mission "Assistance to Laurel oil factory in silifke Icel" under project Sl.TUR. 88.803, during the first week of Nov.1988 and worked out a detailed plan of action to rehabilitate the sick factory and provide general services/infrastructural installations to ensure steady supply of :

- water
- power
- steam
- Cooling water
- Recycle cooled water.

A very serious problem faced was due to non-availability of skilled and semi-skilled technicians at Silifke. Since there are no industries between Mersin and Antalya except government owned craft paper (SEKA) mill at Tasucu about 15km from Silifke.

SIDFA Ankara in his note for the file dated 15.2.1989 after visiting the project from 2-4 Feb.1989 noted that :

"Under severely difficult climatic and working conditions and with much of indigenous efforts UNIDO consultant Mr. Narasimha was able to complete all arrangements, readjustments, piping of distillation and fractionation plants.

Mr. Narasimha arrived in Silifke early November. He worked in a plant which is not heated during sever winter time. It is very windy and most of the window glass is broken with splinters falling most of the time. Though the understanding was that the Cooperative will look after all infrastructures, these were not done till Mr. Narasimha arrived in Silifke. No staff was available from Silifke to help, labourers and technicians are simply not available.

Mr. Narasimha managed to establish his own workshop and complete all piping, fittings using this workshop and partime labourers he used to pick-up from distant places".

An overhead tank (35m high) of $100M^3$, which had never been filled with water since its construction, was connected through 80m.m. G.I, pipe to a newly bored tube well at a distance of about 1,250 M and filled for the first time.

An extensive net work of pipes and fittings were laid connecting the overhead tank to essential distillation plant, fractionation unit, and fixed oil extraction unit (main header only) and also return live to the water cooling plant, recirculation and water treatment unit of twin boilers of 50 K.Calories/hr Capacity (each).

Installed feed elevator, realigned conneyor, distillation unit, discharging assemblies, condensing and separating units.

Dismantled fractionation assembly, correctly, reassembled filling it with internal packing was accomplished. Installation of vaccum pump, centrilegal pumps and established a pump house for recircuation purposes.

The complete plant (I phase) including the entire infrastructure consisting of :

- 500 KVA step down transformer
- $100 M^3$ Overhead tank
- Twin water coolers
- Pump house
- Two boiler
- Water treatment unit
- Three essential oil distiln units
- Water circulation and recycling system.
- Fractional distillation unit with vaccum pump.

Was successfully tested and commissioned on 7th March 89, by Governor of Merdin. A total of about 7,000kg of dried laurel leaves were processed in the plant, producing 135 litres of essential oil.

3.1 POSITION AT COMMENCEMENT (ASSESSMENT)

The plant at Silifke consists of two units viz., 1. Essential oil unit and 2. fixed oil extraction unit. Additionally, common services like, water overhead tank, water cooling unit, step-down transformer and two boilers with water softening plant.

1. Essential oil unit: This unit consists of
 - (a) Herb (steam) distillation and
 - (b) essential oil fractionation sections.

(a) The steam distillation section consists of three stills of 2m³ capacity each fitted with individual shell and tube condensers of 10 m² cooling surface area.

- A set of oil-water separators common to all the three distillation stills.
- A tank of about 200 l capacity with submersible pump. Material of construction of these units is stainless steel type 304.
- Common elevator and conveyor set-up with individual hoppers connected to the three distillation stills, to facilitate semi-mechanical charging of plant materials into the stills.

Overhead monorail, presumably to facilitate discharge of spent plant material (marc).

This is not fitted with an electric hoist.

Additional Work

The three distillation stills and condensers have been installed but require some changes and modification to facilitate operational flexibilities.

- Interconnecting process and service piping.
 - Insulation of units.
- Elevator/conveyor system partly installed-to be completed and tested.

Missing Parts

1. An electric hoist to lift maximum load of 1.5MT, vertical lift of 5 m with flexibility of up and down and to and fro horizontal movement with suitable steel chains and hooks.

Additional Requirements

1. Stainless steel pipes and fittings for process piping.
2. Galvanized iron pipes and fittings for water piping.
3. Mild steel pipes and fittings for steam piping.
4. Glass wool mats 75 mm thick for insulation.
5. Essential oil filtration - basket centrifuge 450 mm dia. S.S. vapour tight.

On enquiry at nearby city of Adana all these items are available in adequate quantities of DIN standard.

(b) Fractional distillation of essential oils:

This section consists of

- steam jacketed reboiler of capacity 240.l
 - fractionation column dia.320 mm, 7 m in height (in two sections of 3.5 m each).
 - condensers
 - product receivers - 3 nos.
 - reflux distributor
- Contact parts of all these units are made of stainless steel type 304.
- vacuum gauges
 - thermometers with thermocouples
 - internal packagings - pall rings in S.S.

Additional Works

These parts have been fitted incomplete without proper alignments and pall ring fillings in the column.

This section needs to be dismantled completely and reinstalled properly.

The unit stands 10.5 m between the floor and top of the condensers. A vertical steel ladder has been fitted to the wall without any protective rings.

- proper protective rings in steel to be welded.
- some S.S. pipes and hanging loose, to be properly aligned and welded.
- insulation of the reboiler, column sections, etc

There appears in the supply a water-ring vacuum pump. These pumps generally create vacuum of not more than 28" to 29" of Hg which is not sufficient for fractionation of essential oils. It is therefore recommended to procure an oil displacement vacuum pump with the displacement capacity of 2m³/min. (for creating an operating vacuum of 5 mm Hg) and to be fitted with a suitable cold-trap, freon gas compressor with motors, starters, I.C. switches, to make a complete unit.

Additional requirements

- steam pipe and fittings
- water pipes and fittings

2. Fixed oil extraction unit

The extraction unit consists of :

- A triple roller crusher of whole dried berries.
- Crushed berries elevator/conveyor.
- Crushed berries storage bin with motorized bottom outlet regulator into the rotocell extractor.
- Rotocell extractor.
- Marc elevator/conveyor.
- Marc desolventiser.
- Desolventised marc discharge conveyor.
- Miscella filtration tank.
- Miscella distillation unit.
- Heat exchangers.
- Miscella circulation pumps.

The entire closed circuit system designed to extract about 25 to 30 TPD (24 hr), is made of mild steel and delivered at site some time during 1976/77.

The extractor as seen from its windows shows signs of rusting, but not seriously.

It seems to be a good case for its rehabilitation.

Missing parts

Extractor's main drive motor.

a. Horizontal rotation of the extractor synchronised with feed charging bin's outlet mechanism, heavy duty motor flame proof type along with flame proof starter have to be procured from the suppliers of the plant namely M/S de Vita Italy.

b. Crushed berries elevator drive assembly, its flame proof motor, flame proof starters.

For reasons as in (a) above these two should have to be procured from the suppliers.

c. There are 15 port holes for light and sight glasses, two circular man holes and two rectangular view holes fitted on the body of the extractor. Baring two rectangular port holes all the others are deprived of tough glasses. Since these are specially made accessories of solvent extractor, handling highly volatile solvents, it is strongly recommended to procure these plus one additional set as spares from the plant's suppliers.

d. Interconnecting solvent, miscella pipe and fittings.

e. Water and steam pipe and fittings.

Items under (d) and (e) can be procured locally.

f. Intermediate tank. This can be got fabricated locally.

Additional Work

Miscella storage/filtration unit, heat exchangers of both miscella distillation unit, and solvent recovery unit, seems to have been fixed misaligned and misplaced needs to be checked, reinstalled and realigned.

Crushed berries elevator shell only without the basket elevator component has been installed. Needs to be totally dismantled and reassembled with accessories.

Solvent storage tanks:

There are two M.S. tanks of 20 m³ capacity without proper nozzles and need some alterations.

Procurement of solvent pumps, their installation and pipe connections.

Provision of water chilling unit with storage tank and circulation pump, necessary to all the heat exchangers of solvent recovery systems has to be made considering min/max temperature in Silifke 26 to 40°C in summer.

Details to be worked out.

Fire protection :

Water connections have been provided at various places in the plant area. Additionally, chemical fire fighting equipment needed.

3. General Services

- Steam
- Water
- Power

Steam :

Two coal-fired boilers of 50 T.cal/hr each, along with water softening unit have been found installed, but not completed and tested.

Additional Work :

- Completion of installation
- Testing of each and every item
- Procurement of - main steam pipe to be connected to essential oil and extraction plants.
 - Insulation material
 - pipes and fittings to individual unit needing steam
 - Procurement of adequate amount of coal
 - Procurement of ion exchange resins to water softening unit
 - Procurement of boiler licences from Government authorities.

Water :

Reinforced cement concrete overhead tank (R.C.C.O.H. tank) exists, which has to share the pumping time of a pump, which is located about a km away from the tank.

- The tank has never been tested after its construction
- Piping not connected from the O.H. tank to the plant building.

A water cooling tower with a water pump below it exists - never been tested and piping not connected.

Two centrifugal pumps size 75 mm x 75 mm (suction and delivery) with motors are found lying loosely in the boiler/water softening rooms. Presumably meant mix for this unit.

NOTE :

1. It is proposed to take up the work of rehabilitation of laurel oil factory situated at Silifke, Turkey approved under the project SI/TUR/88/802 "Assistance to Laurel Oil Factory at Silifke, Icel" in two phases. Under the first phase within the approved period of time rehabilitation of essential oil unit, consisting of essential oil distillation plants and fractionation of essential oil plant; commissioning of all the three essential service units viz., steam, water, power and connecting items to the plant building;

Simultaneously (during the 1st phase period) de-rusting operations of the extraction plant, hydraulic testing of the rest of the plant; procurement of missing parts from the suppliers could be undertaken.

2. For undertaking the 1st phase programme, no erection drawings nor commissioning instructions are needed except the missing and additional accessories. However these, regarding the extraction plant would help speed up rehabilitation work.

The Cooperative chairman and his deputy were verbally informed to procure these and missing accessories of the extraction plant.

3. A heavy duty conveyor was noticed lying loose in the plant area may be meant for conveying the berries to the tripple roller crusher. But the layout of the crusher give no room to accomodate such a conveyor, and in the present form of the crusher it would be a difficult proposition to feed the crusher of about 25-30 TPD of berries manually.

4. Dried laurel berries have outer pericarp rich in essential oil and practically no fixed oil. The inner kernels are rich in fixed oil and a minor percentage of essential oils.

It is very essential to mechanically crack the berries and pneumatically separate pericarp and kernels. The kernels are to be automatically fed to the triple roller crusher. This facility does not exist in the present set up.

Pericarps can be extracted of its essential oil in the essential oil distillation plant.

- This procedure, when implemented, would result in
- the light coloured fixed oil with very low percentage of essential oils that are extracted from the kernels.
 - higher processing capacity of oil-rich kernels
 - additional yields of essential oils from pericarps.

Laboratory investigations will be carried out at Anadolu University Mecinal Plants Research Centre (MPRC), Eskisehir to establish confirmed data. Based on these investigations details of additional equipment needed would be worked out and added to the plant at a later stage.

5. **Quality Control:** A quality control laboratory building without laboratory equipment, control instruments, infrastructure facilities for the supply of water, gas, electricity exists between essential oil and extraction sections. Until it becomes operational MPRC's excellent facilities and services of trained personnel may be drawn for this purpose, under a proper protocol.

6. A large built-in ramp exists within the plant area, presumably for the receipt of raw materials unloaded from trucks. No facilities exist for transporting these materials, from this area to the nearby processing plants.

An effective system has to be worked out to mechanise the operations.

7. A weigh-in balance of loaded truck cap. 40MT is required for keeping accounts of incoming raw materials and outgoing products.

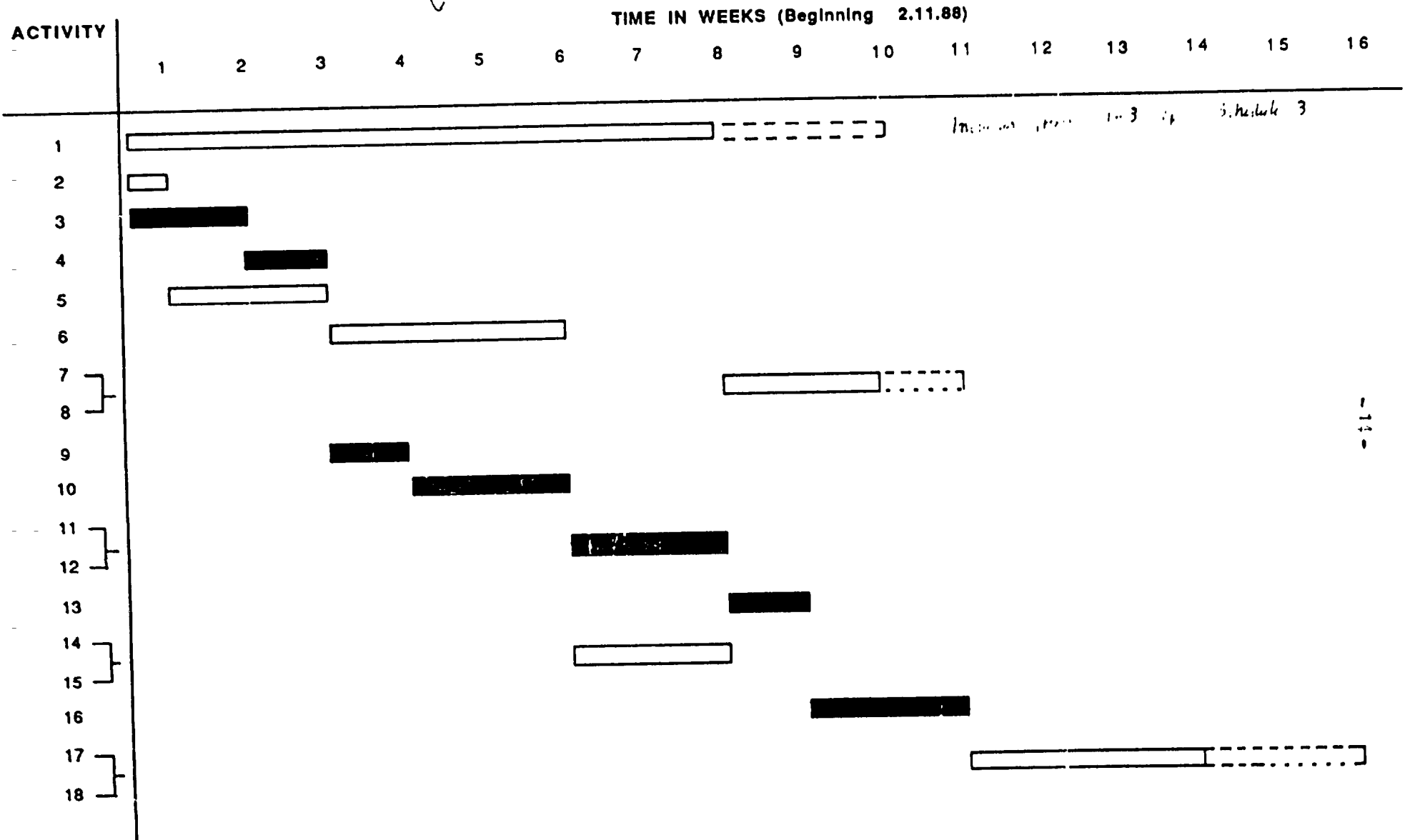
8. There does not exist a product storage tank for storage of fixed oil produced in the plant.

A suitable tank can be designed and got fabricated locally during the implementation stage of the 2nd phase.

9. There are two 2 m³ tanks of stainless steel available at site for the storage of essential oils produced in the plant. However, small containers of 11, 51, 101, 201 and 501 may have to be procured for dispatch of these oils and their fractions.

3.2 : PROGRAMME OF WORK OUTLINED

TENTATIVE WORK PLAN - SI/TUR/88/803 - ESSENTIAL OIL UNIT



SERVICESWater

- Over Head Tank
 - Pumping
 - Testing
 - Piping
 - Main
 - Process
- Water Cooling Tower
 - Piping main
 - Process
 - Installation two pumps
 - Testing

Steam Boiler

- Water Softening
 - Ion Exchange, Resin Procurement
 - Testing
 - Repair if necessary
- Steam Piping
 - Main Header
 - Essential Oil Section
 - Fixed Oil Extraction Section
 - Connection to Individual Units
 - Essential Oil Distillation Unit
 - Fractionation Column
 - Testing of all Lines
 - Header & Distribution
 - Repair if necessary
 - Insulation of all Pipes
 - Commissioning of two boilers

Power

- Completion of Power Sub-station
 - Step-down Transformer
 - In-coming H.V. lines completion
 - Bus-Bar Connections
 - Switch gear

Power

- Laying of Main Cable
 - Essential Oil Unit
 - Fixed Oil Extraction Unit
- Distribution & Connections
 - Essential Oil Distillation
 - Elevator
 - Conveyor
 - Electric hoist
 - Submersible pump
 - Essential Oil Fractionation

- Vacuum pump
- Control panel
- Lighting
 - Plant area - complete Explosion Proof
 - Outside - for security

COMPLETE TESTING - UNIT BY UNIT

Estimation of Additional Requirements

Services

- G.I. Pipes and fittings for water
 - Main
 - Distribution
- M.S. Pipes and fittings for steam
 - Main
 - Distribution
- Insulation materials
- Ion Exchange Resins
- Electrical cables, conduits, switches, switch gears, lights, & light fittings.

Processing

Essential oil Section

Essential oil distillation

- Stainles steel pipes and fittings
- Electric hoist

Essential oil fractionation column

- Stainles steel pipes and fittings

Engagement of sub-contractors

- Electrical
- Plumbing
 - Steam
 - Water
- Boiler
- Water cooling tower
- Fitters for s.s. piping

Activities

Essential oil Distillation

1. Completion of works under services
2. Re-alignment of distillation stills
3. Completion of elevator, conveyor system to Essential oil distillation unit
4. Installation of electric hoist.

5. Hydraulic testing and repair if necessary of;
 - Steam pipes & fittings
 - Water pipes
 - Distillation stills
 - Condensers
6. Insulation of
 - Steam piping
 - Three steam distillation units
 - Vapour lines.
7. Test trials
8. Commissioning and training of project personnel

Fractionation

9. Dismantling of fractionation column, condensers, pipes, fittings
10. Reassembly of column, condensers with internals, properly aligned
11. Installation of water-ring vacuum pump
12. Connection to the system
13. Steam and water connections
14. Hydraulic testing of the entire system, unit by unit
15. Insulation
 - Reboiler
 - Column
 - Vapour line
16. Modifications to the vertical ladder
17. Test trials
18. Commissioning and training of project personnel

Fixed oil Extraction Plant

Assistance in the procurement of

- Missing parts
- Additional requirements
- Erection drawings
- Commissioning instructions

Time Schedule

A. Essential oil Distillation

Activity	1	8-10 weeks	
	2	1 week	team (white)
	3	2 weeks	team (green)
	4	1 week	team (green)
	5	2 weeks	team (white)
	6	3 weeks	team (white)
	7&8	2 weeks	team (white)

B. Essential oil Fractionation

Activity	9	1 week	team (green)
	10	2 weeks	team (green)
	11 & 12	2 weeks	team (green)
	13	1 week	team (green)
	14	1 week	team (white)
	15	2 weeks	team (white)
	16	2 weeks	team (green)
	17 & 18	2 weeks	team (white)

Note

1. 16 weeks (6 days a week, 8 working hours aday) beginning 2/11/88.

This period may vary +/-2 weeks, + for unforeseen reasons.

2. Govt./Koop. to procure all the materials and engage electrical, mechanical & plumbing contractors in consultation with the Expert by 30/10/1988.
3. Processing capacity, quantity & quality of products strictly within the design limits of the plants.
4. Procurement of raw materials and disposal of product(s) by (product(s) civil engineering works are beyond the scope of the project.
5. The scope of the project under I Phase covers the rehabilitation of essential oil unit, consisting of herb distillation section and fractionation section, commissioning of these and training project personee.

3.3 Workdone at Medicinal plants research centre of Anadolu University Eskisehir.

As mentioned elsewhere in the report the MPRC which began its R&D activities in the year 1986 with the assistance of UNIDO and its experts through DP/TUR/83/003 and DP/TUR/88/001, has grown to the present stature of international standard with well equiped laboratory, pilot plant and quantity control instruments. It has now on its rolls well qualified and experienced scientific and technical staff headed by a competent director.

With this built in infrastructure the centre has forged ahead to become the nerve centre in the country of Turkey in the development of technologies for the utilisation of medicinal and atomatic plants.

One of the plant materials studied in depth from bench-scale through semi-commercial level is Laurus Nobilis for its essential oil-distillation and rectification by fractional distillation.

In fact it is the unique case of the development of technology and its transfer followed by successful demonstration after rehabilitation of a sick and discarded industry at Silifke, under aegies at MPRC with the assistance of UNIDO and its expert. The expert is confident that MPRC, if entrusted to run the newly revived factory, could successfully run it, diversify and produce tailor-made products that is demanded by the user industry.

3.4. Total work accomplished

The UNIDO expert with the help of a staff member of the Anadolu University Medicinal plants Research centre carried out an official run on 7th March 89, in the presence of the Governor of Mersin, the Governor of Silifke, member of parliament representing Mersin, UNIDO SIDFA in Ankara, National project Director, Koop Chairman, two hundred senior officials and members of the Koop.

The Prime Minister of Turkey and his Minister of Agriculture sent cables, congratulating the successful rehabilitation of Laurel oil factory I phase. The local newspapers and Antalya Radio gave wide coverage to the function.

The protocol for assignment completion was prepared and signed by the president of Koop National, project Director, UNIDO SIDFA in Ankara and UNIDO expert (annex II).

After the successful trial runs on 7th March 89, a long meeting was held with the governor of Mersin, the Governor of Silifke the member of parliament, the Chairman of Koop, National project Director, UNIDO SIDFA in Ankara and the UNIDO expert, to discuss the future of the plant. It was impressed upon the members that the Anadolu University Medicinal plants Research centre with its trained personnel and with excellent infrastructure is best suited to run the factory and diversify the production and train personnel for running it at a future date. This fact was also brought to the notice of the Under Secretary of Agriculture on 14th March at a meeting held in his office chambers in Ankara attended by National project Director UNIDO SIDFA in Ankara and UNIDO expert.

A total of nine trial runs was performed from 26th Feb to 9th March 1989 using about 7 tons of dry laurel leaves with an average yield of a little over 1.9%, producing 135 litres of essential oil.

Table I

Trial Run S.No.	Date	Charge Kg.	Time Hrs.	Yield of Oil ltrs	%	Steam rate L/Kg/hr
1.	28-2-89	180		2.0	<u>First</u>	<u>Trial run</u>
2.	2.3.89	863	4.0	15.3	1.77	0.8-1.0
3.	3.3.89	934	3.0	16.0		0.8-0.9
4.	3.3.89	624	3.0	12.8		0.8-0.9
5.	6.3.89	871	3.0	16.0	1.97	0.8-1.0
6.	6.3.89	650	3.0	14.0	1.97	0.8-0.9
7.	7.3.89	957	3.0	19.0	1.98	0.8-1.0
8.	8.3.89	982	3.0	21.0	2.14	0.8-0.9
9.	8.3.89	930	3.0	18.0	1.94	0.7-0.9

Table II

Break up of time taken for each batch was:

Charging each still (manually) (300-350Kg)	25-30 Mts
Distillation	3.00 Hrs
Discharging	15 Mts
Cleaning	15 Mts
Total time per batch	4.0 Hrs
Total Charge in 3 Stills	900-1,00 Kg.

Variation in batch charge was due to manual charging.

Table III

Time taken for generating Steam 7-8 Kg/cm² pressure from cold start and consumption of coal.

S.No.	Date	No. of Boilers	Consumption of Coal (Kg)		For Distillation	
			Kg	Time Hrs	Coal Kg	Time Hrs
1.	2.3.89	One	200	3.5	400	4
2.	3.3.89	Two	150	2.5	350	3
			200	3.5		
3.	3.3.89	Two	Nil	Nil	400	3
			Nil	Nil		
4.	6.3.89	Two	200	3	300	3
			200	3		
5.	6.3.89	Two	Nil	Nil	200	3
			Nil	Nil		
6.	7.3.89	Two	150	2	200	3
			150	2		
7.	8.3.89	Two	150	1.5	200	3
			150	1.5		
8.	8.3.89	Two	Nil	Nil	200	3
			Nil	Nil		

It may be noticed from Table III that the time taken to generate steam from cold start was 3 Hrs, consuming 300 Kg of coal per boiler, to operate two boilers, coal consumption was 600-Kg and time was 3 Hrs, since two boilers were fired almost together.

If the boilers were operated everyday for distillation of one batch, coal consumption was noticed to drop to 150 kg per boiler and time was reduced to 1.5 Hrs since boiler remained hot, due to additional insulation with good quality glass wool mats.

It can easily be deduced that if the plant is operated for one shift per day, one batch of about 900-1,00 Kg of dried leaves can be distilled in 1.5-7 Hrs and consumption of coal goes up by 300-600 Kg (depending upon number of days gap between two consecutive operations).

However, if the plant is put to 3 shifts per day number of batches that can be easily handled would be six and the amount of dried - laurel leaves that can be distilled would be 5,400-6,000 Kg, with considerable saving in coal consumption.

It is therefore strongly recommended that the plant should be run 3 shifts a day without any break.

The expert foresees the problem of finding trained boiler operators and other technicians to man the boilers and distillation units. This can be handled by careful planning in-plant training programme since the boilers are simple manually operated coal fired type and essential oil distillation is equally simple operation.

Feed Charing :

Elevator and conveyor made of mild steel and neoprene coated belt system has been provided adjacent to the distillation stills. Three hopper bins were also provided above the distillation stills.

Conveyor was properly installed but the belt was found totally worn out. The same has been replaced with folded canvas, as neoprene coated belts were not available in Silifke, Mersin or Adana.

The elevator which was just placed loosely was properly grouted and aligned.

The outlet chute of hopper bins were not provided with suitable clamps, in the original state; the laurel leaves when fed from the hoppers would fall clearly out of the distillation stills. All the three chutes have been suitably modified.

The expert would like to point out that the laurel leaves which were stored about 20 metres from the plant area were conveyed to the plant site manually and then fed into the stills by elevator, conveyor and hopper bin system, only a couple of metres away involving considerable wastage of time (about 1 1/2 hours) power, labour and about 5-10% spillage of valuable leaves. To avoid this and effect economy and the leaves were charged directly into the stills circumventing elevator conveyor system.

anover head tank of 100 m³ capacity at a height of about 35m constructed some time in mid-seventies has not been tested nor has even been filled with water save rainwater.

During the implementation of the project, this has been connected through 80 mm G.I. pipe to a newly installed government borewell located at a distance of about 1.25 K.m. The overhead tank when filled first time during mid Feb 1989, showed leakages at several places, which can be repaired. Since civil Engineering works were not covered and the time at the disposal of the expert was limited and just sufficient to commission the plant, the repair work of the overhead tank and also the surface tank of 50 m³ was entrusted to the chairman of the KCOF.

To facilitate laying of 80 mm G.I pipe trenches of 1m depth were dug-up to the length of about 700 metres. Blasting of rocks with dynamite which came in the path of pipe was resorted to. All necessary precautions were observed before blasting of rocks.

Heat exchangers of distillation stills, fractionating column, watering vacuum pump, laboratory, main header to the solvent extraction plant and water treatment plant of the boilers were connected to the overhead tank through 100 mm^{d.i.} pipe.

A return line of 100 mm diameter from the plant area including extraction plant were connected to the twin water cooling units, which in turn were connected to 50 m³ surface tank through 150 mm dia. pipe.

Two centrifugal pumps of 80 m.m. & 80 m.m. were installed in the pump house and connected to the plants in both wings to circulate cooled water thus providing an alternate source of cooled water to the plants. In this case water from overhead tank was used only for "making up" of water lost due to evaporation in the cooling tower. This system worked very well during repeated trial runs.

However, it may be mentioned that the two 5Kw 3 phase 50C/s 440V motors fitted to the coolers were found to be not of the required capacity and had to be replaced by 7.5 Kw 30th 50C/s 440v motors. With these modifications, the coolers performance was very satisfactory.

A total of above 3 km of 150 m.m, 100m.m, 50 m.m., 25 m.m. dia G.I pipe and quite a number (just necessary) valves and fittings were used for pumping, distribution, return circulation of cooled water.

The entire system was perfectly functional except leakages of 1000.3 overhead tank and 50 m³ surface tanks. These could be easily required.

STEAM

Two boilers of 50K. Calories/hr each, manufactured in Adana, Turkey were found installed, without internal refractory linings, pressure reducing assembly, inadequate insulation and no steam piping. Feed water treatment units were partly installed with no inter-connecting piping.

Completed the installation work including two centrifical pumps for pumping deionised water to degasser, and all internal pipes and fittings and commissioned all the units including adequate filling of deionising resins.

It may however be mentioned that a strange fact that came to light, was that both the boilers when tested hydraulically at 8-10 Kg/Cm² pressure, leaked propusely from almost all the tube ends. (These boilers are smoke tube type). This was really a case of manufacturing fault, which should have been tested at the manufacturer's premises, before despatch.

The repair of these boilers needed the services of a specialised welder and locating such a welder at a place like Sillfke was really quite a task. After considerable time and pains the boilers were repaired, hydraulically tested and successfully test fired.

Also fabricated at the factory site was a steam pressure reducing assembly of 80 m.m. size with locally procured pressure reducer, valves and strainers and through this assembly the two boilers were connected to the processing plants with appropriate valves, fittings and expansion joints.

These pipes and fittings, distillation plant, fractionation column and its reboiler were all insulated with 60 mm thick glass wool and covered with 28 G., G.I. sheet.

POWER HOUSE

Reassembled 500 KVA step-down transformer, repaired the power distribution bus-bar, installed suitable switch gear, and connected the busbar to the transformer through switch gear. The transform in turn was connected to the HT lines.

Power Distribution

3/2 core armoured cables were laid from bus-bar to the plant site, boiler room and internal pump house. Through distribution boards, power was connected to the boiler house, distillation plant, internal pump house, water coolers and lighting.

Details of installed power was as follows :

<u>Distillation Section</u>	Total
- Elevator, conveyor, (two motors-1Kw each)	- 2Kw
- Submerged pump (one motor) - 1Kw	- 1Kw
- Four way Electric Host(2 motors) - 1Kw each	- 2Kw
- Watering vaccum pump - 3 Kw	- 3Kw
<u>Pump House</u>	
- Centrifugal pumps - 2 Nos - 7.5Kw	- 15Kw
- Two induced draft - 2 Nos - 7.5 Kw	- 15 Kw
<u>BOILER HOUSE</u>	
- Pressure pump One - 5.5Kw	- 5.5Kw
- Centrifugal Pump - two 1.5Kw	- 3.0Kw
- High pressure feed pumps Four 5.5H H	-16.5Kw
General lighting	2.0Kw

Total 65.0Kw	

Note: Electrical works were done through a local Electrical Engg. Contractor.

Process piping :

The condensate outlets were connected to a system of separators through glass observation connections using Adana procured 304 type stainless steel pipe and the non-condensable gasses were vented outside the plant building thus preventing air pollut.on in the plant area.

Separated oil or water collected in a 200 litre stainless steel tank with cast iron summerisble pump was connected to the 2m³ stainless steel over head tank through 304 type stainless steel pipes and fittings.

Marc Discharge

Only ourhead monorail was available, worked out specification of four way electric hoist of 1 ton capacity personally selected a suitable hoist from Istanbul, installed and commissioned.

Conducted systematic testing of plant unit by unit, suitably rectified and or repaired defects showed-up during the testing.

When all the services viz, supply of water, steam and power became functional, test trials on distillation were successfully conducted

in nine batches using about 7 tonnes of laurel *hobilis* leaves. Producing about 135 litres of oil, which according to the current international price of us \$ 50 per litre valued at US \$ 6,750.

Fractionation unit

The entire assembly was dismantled piece by piece. It was noticed that :

- The reboiler was partly filled with pebbles and concrete pieces.
- Fractionation column sections were installed upside down.
- Column was not filled with packings.
- Stainless steel interconnecting pipes were not welded and were hanging precariously.
- Water ring vacuum pump was not installed.
- Control instruments were not fitted.
- Valves, fittings and glass level indicators were not fitted.
- Sampling cocks were not provided.

Almost all the fittings of distillation units, fractionation assembly and solvent extraction plants were dumped together. It was quite a job to correctly identify and fit them at appropriate places.

The entire assembly was cleaned, assembled and aligned properly. Located water ring, vacuum pump from among 30-35 pumps, installed, fitted vacuum pipe connections, water and steam connections, control instruments, and tested. It was noticed that all the temperature and vacuum indicators were not functioning and needed replacement from the original suppliers the following specifications may be kept in view:

Vacuum Manometers

1. 0-760 m.m. Hg } GVG14
0-30" Hg }
2. 0-14 } GtG12
0-15 }

Thermometers

1. 1" dia Thermo sensor with 8.5m Capillary tube dial 0-150°C.

. . . . 2 Nos'

10 803

GM

MERCURIUS

Mini Work Shop

Worked out specifications of each and every item required for establishing a mini work along with the requirements of G.1 and M.S. pipes and fittings and missing items for the plants. Collected quotations and procured from Mersin and Adana the following items:-

1. A steel work bench fabricated locally in M.S. fitted with a bench vice size: 0.9 m x 2 m x 1 m
2. One steel Almirah measuring 0.4x0.9x1.95 m with three shelves
3. One number 4" pipe wrench
4. One number 4" pipe vice
5. One portable drilling machine (German make)

6.	Drill Bits HSS	
	2 Nos..... 3 mm	
	2 Nos..... 6 mm	
	2 Nos..... 9 mm	
	2 Nos.....12 mm	
	2 Nos.....15 mm	
	2 Nos.....18 mm	
	2 Nos.....20 mm	
7.	Stand for drilling machine	1 No.
8.	300 amps welding set (Machine)	
9.	1 Kg size hammer	1 No.
10.	2 Kg size hammer	1 No.
11.	welder shield	1 No.
12.	Chapper	1 No.
13.	S.S.Electrodes	1 Packets
14.	Helmets	1 Nos
15.	Measuring tapes 5 m	2 Nos
16.	Ciling can 250 gr.	
17.	Metal cutting Scissors.	1 No
18.	Hack saw frames	3 Nos.
19.	190 mm plier	1 No.
20.	Standard plier	1 No.
21.	Telephone Plier (70 mm)	1 No.
22.	Adjustable plier	1 No.
23.	24" Gedore pipe wrench	1 No.
24.	Electric cable cutter	1 No.
25.	Universal plier	1 No.
26.	1 ton capacity Fulley Block complete with all accessories	1 No. 1 No.
27.	12" Screw spanner	1 No.
28.	20 m steel rope 10 mm	
29.	3/8 clamps	2 Nos.
30.	5/8 clamps	2 Nos.
31.	C.clamps 24 mm	1 Nos.
32.	4" pipe chain wrenches	2 Nos.
33.	Greasing pump	1 No.
34.	Tool box	1 No.
35.	WIRAX 1/2"-2" pipe die	1 No.
36.	Gedore Spanner Set	1 Set
37.	Box Spanner Gedore 10-32	1 Set
38.	Allen key set	1 Set(12 Nos)
39.	Screw driver	1 Set
40.	Erkush Electric Host	

4. CONCLUSION AND RECOMMENDATIONS :

- 4.1 Essential oil distillation plant including fractionation unit was made functional.
- 4.2 All the services Viz., water, circulation of water, steam, power have been commissioned and were adequate.
- 4.3 The plant should be operated 3 shifts of 8 hrs each per day and work atleast for 250 days in a year.
- 4.4. The factory is expected to produce about 10-12 tonnes of wet spent leaves which is known as marc per day. This if not utilised and or not disposed of properly will create a serious environmental problem, littering large areas surrounding the factory. The problem will be more serious with the strong winds blowing in Silifke and surrounding villages for 4-6 months a year. A method suggested by UNIDO SIDA in Ankara, was to briquette these spent leaves and use the dried briquets as suplliment fuel in the boilers. This is commendable and it should be pursued.
- 4.5 Skilled and semi-skilled personnel should be recruited as soon as possible and trained by Anadolu University Medicinal plant centre at its premises at Eskisehir and in plant at silifke.
- 4.6 Recommended man power per shift
- | | | | |
|---|----------------------|------|----|
| - | Chemical Engineer | | 1. |
| - | Boiler Operator | | 1. |
| - | Boiler assistant | | 1. |
| - | Semi-skilled workers | | 4. |
- In case Solvant Extraction plant is commissioned the same chemical Engineer can supervise both the plants.
- 4.7 The management of the factory for at least 5 years should be entrusted to Anadolu University Medicinal plants Research centre.
- 4.8 MIRC with its excellent R & D infrastructure and trained technical personnel, should be able to manage the factory and produce essential oils of quality demanded by some users of essential oils is very specific and demanding.
- 4.9 It is not proper for any commercial factory to depend on one plant material. It is strongly recommended to diversify the production based on multiple plant materials. MIRC is the only centre existing in Turkey which is equiped to undertake survey, quality assessment, R & D activities, and technology development.

4.10 The elevator conveyor system as provided in the plant when used involves:

- Additional labour
- Additional power consumption
- 5-10% spillage of valuable raw material
- More time per batch
- Consequently less economical.

Hence the elevator, conveyor system as supplied by the Italian suppliers is redundant and unnecessary; the expert has conveniently discarded the use of this system.

4.11 The expert recommends to experimentally distill:

- Fresh leaves
- Fresh leaves with brachlets and assess the quality and quantity of the resulting oils and the to work out overall economics of the operations. The underlying idea in suggesting this innovation is that if it works out economically - fairly good chance of it so the working the labour intensive operation of separating leaves from small brachlets and drying would become unnecessary. At the initiation of the expert the studies have been undertaken at MPRC.

4.12 The expert strongly recommends that the Ministry of Agriculture Forestry and Rural Affairs Government of Turkey writes off the accumulated interest on the loan advanced to set-up the factory and recover the loan on the soft terms in 10-15 years, to avoid crippling effect on the survival of the rehabilitated factory which remained on the sick list right from the inception.

4.13 It is also recommended to explore the possibility of rehabilitating the fixed oil unit of the factory. This when done, will produce an unique fixed oil which contains 40-60% of lauric ester a very valuable component of good lather producing shampoos and toilet soaps. Presently Turkey has no known source of lauric ester containing fixed oil.

General infrastructural service created for the essential oil unit could be made use of for this unit also Overheads will be considerably reduced.

In the considered opinion of the expert the fixed oil extraction unit when commissioned would have added advantage to the overall economy to the production operations.

5. ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and thanks to Dr. R. O. B. WJESKERA Special Technical Adviser, UNIDO. Vienna, Dr. M. Kamal Hussein SIDFA of UNIDO IN Ankara Prof. Dr. Kamal husnu Çan Başer, National project director and director MPRC of Anadolu University for the encouragement and advice given me during the course of the work.

I should also like to mention the cooperation extended to me by MR. Sedat Hakkı Beis the young bright Chemical Engineer of MPRC and Dr. Ali Su, Chairman Koop Silifke.

Annex - I


de vita
COSTRUZIONI
MECCANICHE
S.R.L.

DATA une 20th, 1988

Vs. Rif.

Ns. Rif.

Messers

ORKOY KOOPERATIFI

Ecz. Tugrul Tol eliyle

• Tol Eczanesi

Silifke / TURKEY

— ADV/FF:

Laurel Oil Extraction Plant

Laurel Oil Distillation Plant

Dear Sirs,

Our Company has taken over the previous activities of Messers F.lli De Vita SpA, which closed down during 1983.

We are in possession of all technical information and drawings of the plant supplied You on 1976.

As foreword, we would like, however, to clear that there is no legal connection between Messers F.lli De Vita SpA and our Company.

We shall be glad to cooperate with you for the erection, assembly and starting up of the plant in Your possession and consideration of the time passed from the date of the supply we think that a visit of our Mr. Alberto De Vita to the site

➔

i./..

of the plant is necessary in order to understand which items are available and if any components are eventually missing.

This visit could take place during the next month of August and we propose from the 8th until the 13th.

The fee that we require for this visit is USD. 5,000.= plus all travelling expenses (airplane ticket from Genoa to Instabul - Adana and return and first class hotel accomodation).

During this visit we can discuss also about Your requirements for the erection of the plant, that is if You need to have only the supervision to the erection or also our specialized fitters for interconnecting the various equipments in the correct way.

We can supply these fitters at the conditions of the ANIEMA Association of which we send You copy here enclosed.

We ask You to consider our above said proposal and to let us have Your comments, in the meantime, we remain,

Yours Faithfully


COSTRUZIONI MECCANICHE S.R.L.



Bollettino tariffe per prestazioni di personale all'estero

Bulletin des tarifs pour prestations de personnel à l'étranger

Bulletin of tariffs for staff's services abroad

Boletín tarifas para el personal trasladado al exterior

PAESI EUROPEI	PAYS EUROPEENS	EUROPEAN COUNTRIES	PAISES EUROPEOS
Unioni costruttori:	Groupements de constructeurs:	Manufacturers' group:	Uniones de fabricantes
<p>Apparecchiature ed impianti aerospaziali - «CO.AER»</p> <ul style="list-style-type: none"> ● Caldaeria ● Distributori di carburante ed attrezzature per stazioni di rifornimento ● Impianti di finitura - «UCIF» ● Impianti disinquinamento acque - «UIDA» ● Impianti ed apparecchiatura di insonorizzazione - «CIADI» ● Impianti ed apparecchi di sollevamento e trasporto ● Impianti ed attrezzature per produzioni chimiche ● Impianti frigoriferi industriali ● Impianti industriali di pesatura ● Impianti petroliferi - «UCIP» ● Impianti trattamento acque non reflue - «AQUA ITALIA» ● Macchine alimentari - «UCMA» ● Macchine ed attrezzature per autofficine - «COMAPA» ● Macchine edili, stradali, minerarie ed affini - «U.Co.M.E.S.A.» ● Macchine per concrete - «C.I.M.A.C.O.» ● Materiali antincendi - «UMAN» ● Motori a combustione interna ● Pompe e compressori ● Regolatori e contatori per gas ● Serramenti in alluminio, acciaio, legno - «UNCSAAL» ● Strumenti ed apparecchi di misura e regolazione - «CO.MI.RE.» ● Turbine idrauliche ed a vapore ● Valvolame e rubinetteria 	<ul style="list-style-type: none"> ● Equipements et installations pour le traitement de l'air - «CO.AER» ● Chaudronnerie ● Distributeurs de carburants et équipements pour stations de service ● Equipements pour le traitement de la surface des métaux - «UCIF» ● Equipements de décontamination des eaux - «UIDA» ● Equipements et installations d'insonorisation - «CIADI» ● Equipements de levage et manutention ● Equipements et installations pour productions chimiques ● Installations frigorifiques industriels ● Equipements industriels de pesage ● Equipements pétroliers - «UCIP» ● Equipements de traitement des eaux non refluantes - «AQUA ITALIA» ● Machines alimentaires - «UCMA» ● Equipements de garages et d'ateliers de réparation - «COMAPA» ● Machines pour bâtiment, travaux routiers, mines et similaires - «U.Co.M.E.S.A.» ● Machines pour tanneries - «C.I.M.A.C.O.» ● Matériel anti-incendies - «UMAN» ● Moteurs à combustion interne ● Pompes et compresseurs ● Régulateurs et compteurs à gaz ● Menuiseries en aluminium, acier, alliages - «UNCSAAL» ● Instruments et appareils de mesure et régulation - «CO.MI.RE.» ● Turbines hydrauliques et à vapeur ● Robinetterie et vannes 	<ul style="list-style-type: none"> ● Air treatment equipment - «CO.AER» ● Boilerwork making and allied industries ● Fuel pump and service station equipment ● Metal surface treatment plant and equipment - «UCIF» ● Polluted water treatment plant and equipment - «UIDA» ● Noise-proofing plant and equipment - «CIADI» ● Lifting and handling apparatus and plant ● Chemical plant and equipment ● Industrial refrigerating equipment ● Industrial weighing equipment ● Oil field and refinery equipment - «UCIP» ● Non-effluent water treatment plant - «AQUA ITALIA» ● Food machinery - «UCMA» ● Garage and auto shop equipment - «COMAPA» ● Construction, road making and mining machinery and similar - «U.Co.M.E.S.A.» ● Tanning machinery - «C.I.M.A.C.O.» ● Fire fighting equipment - «UMAN» ● Internal combustion engine ● Pump and compressor ● Gas regulator and gas meter ● Aluminium, steel and alloy window and door - «UNCSAAL» ● Measuring and controlling instrument - «CO.MI.RE.» ● Water and steam turbine ● Valve and fitting 	<ul style="list-style-type: none"> ● Equipos e instalaciones para el tratamiento del aire - «CO.AER» ● Calderería ● Distribuidores de carburantes y equipos para estaciones de servicio ● Instalaciones para el tratamiento superficial de los metales - «UCIF» ● Instalaciones de decantación de las aguas - «UIDA» ● Equipos y aparatos para insonorización - «CIADI» ● Instalaciones y equipos de levantamiento y transporte ● Instalaciones y equipos para producciones químicas ● Instalaciones frigoríficas industriales ● Instalaciones de peso industriales ● Instalaciones petrolíferas - «UCIP» ● Instalaciones para el tratamiento de las aguas no efuentes - «AQUA ITALIA» ● Máquinas para la industria alimenticia - «UCMA» ● Máquinas y equipos para garages y talleres para autos - «COMAPA» ● Maquinaria para la industria de la construcción, carreteras, minas y afines - «U.Co.M.E.S.A.» ● Máquinas para tannerías - «C.I.M.A.C.O.» ● Materiales antincendios - «UMAN» ● Motores de combustión interna ● Bombas y compresores ● Reguladores y contadores de gas ● Puertas y ventanas en aluminio, acero y aleaciones - «UNCSAAL» ● Instrumentos y aparatos de medición y regulación - «CO.MI.RE.» ● Turbinas hidráulicas y de vapor ● Válvulas y grifería

	Qualifica	Tariffa \$	Diaria
3.	Tecnici specialisti Techniciens specialistes Skilled technicians Técnicos especializados		
3.a	Per ogni giornata o frazione di giornata fuori sede per conto del Committente Pour chaque journée ou fraction de journée d'absence du personnel de sa résidence normale pour compte de l'Acheteur For each day or fraction thereof of absence from headquarters for the account of Purchaser Por cada día o fracción de día de ausencia del personal fuera de la residencia por cuenta del Cliente	585	*
3.b	Per ogni ora di viaggio oltre le 8 ore, in ogni giorno Pour chaque heure de voyage en plus des 8 heures, en chaque jour For each hour of journey exceeding 8 hours, in any day Por cada hora de viaje además de las 8 horas, en un día	73	
3.c	Per ogni ora di lavoro oltre le 8 ore in giornata feriale e per ogni ora di lavoro festivo Pour chaque heure de travail en plus des 8 heures les jours ouvrables et pour chaque heure de travail les jours fériés For every hour of work exceeding 8 hours in any working day and for every hour of holiday work Por cada hora además de las 8 horas en días de trabajo y por cada hora de trabajo en días de fiesta	84	

La settimana lavorativa si intende di 40 ore settimanali divise in 8 ore giornaliere di 5 giorni.

La semaine de travail est entendue de 40 heures de travail réparties en 8 heures par jour pour 5 jours.

For working week one intends 40 work hours divided into 8 daily hours for 5 days.

La semana de trabajo se entiende de 40 horas semanales repartidas en 8 horas para 5 días.

PROTOCOL FOR THE COMPLETION
OF MISSION SI/TUR/88/801

1. Distillation and fractionation units of the Silifke Laurel oil Factory are fully functional with steam, power and steam utilities. Therefore, SI/TUR/88/803 project has fulfilled its objectives. So far, 4.8 tons of 1988 crop laurel leaves have been processed in 6 trial runs to produce 75 liters of laurel leaf oil with a yield of 1.6%, approximately.
2. Technical staff of the Anadolu University Medicinal Plants Research Centre and particularly Chem. Eng. Sudaş H. Beis have been given proper training to run the Factory and are competent enough. Unqualified workers employed by the Cooperative have been trained on loading and unloading the distillation stills. Until qualified staff are employed, the Factory should be operated by Anadolu University Medicinal Plants Research Centre. For this, a special agreement should be made between the Cooperative and the Anadolu University Medicinal Plants Research Centre.
3. All vacuum and temperature gauges of the fractionation unit are faulty and are to be replaced with proper ones.
4. Overhead water tank is leaking and has to be properly insulated.
5. Steam generators are leaking and so many weldings had to be done. Still, some leakages have been observed and they should be repaired. The steam generators are under capacity.
6. Pumps of the water cooling tower are under capacity.
7. A list of equipment and tools purchased from United Nations funds is attached. They are handed over to Anadolu University by the United Nations. Anadolu University reserves the right to hand them over to the Cooperative.
8. Fully functional Factory together with laurel leaf oil produced, and the equipment and tools handed over to Anadolu University by the United Nations have been given to the custody of Dr. Ali Su, Chairman of the Cooperative.
9. 25 liters of Laurel leaf oil have been handed over to Prof. Dr. K. Husnu Can Baser for fractionation studies to be carried out at Anadolu University Medicinal Plants Research Centre.
10. Briquetting of spent leaves for use as fuel should be considered.

This protocol has been reviewed and confirmed by the undersigned on 7 March 1989.

Annex : A list comprising 46 pieces of equipment and tools in 2 hand-written pages.

On behalf of
United Nations Industrial Development Organization (UNIDO)

-signed-
Mr. K. Hussein

UNIDO expert
-signed-
Mr. M.B. Narasimha

On behalf of
Anadolu University
Medicinal Plants
Research Centre

-signed-
Prof. Dr. H. Husnu
Can Baser

On behalf of
Silifke Forest
Villages Development
Cooperative

-signed-
Dr. Ali Su

Annex III

Handed over to Dr. Ali Su Chairman Koop a running plant rehabilitated under Phase I of Project SI, TUR. 80.803 consisting of the following units :

1. Feed Charging section.
 - Elevator and conveyor with motors 2
 - Charging Bins .. 3 Nos.contact parts in M.S.

2. Essential oil distillation plant
 - 3 units of 2M³ volume
 - 3 condensers
 - A set of two separators
 - 200 L tank fitted with submerged pump (M.S.)
 - 2 storage tanks of above 2M³ Cap
 - Inter connecting pipes and fittings of S.S., G.I. and M.S.

3. Mechanized spent leaves discharging system consisting of 3 Nos perforated heavy duty bottom plate heavy chains of S.S. M.S. mono rail four-way electric hoist of 1 ton lap fitted with two electric motors.

4. Fractionation section consisting of
 - Reboiler 240 L capacity
 - Column 304mm diameter 7M Ht filled with pall rings.
 - Condensers,
 - Reflux distributors
 - 3 Nos storage tanks
 - Interconnecting pipes and fittings.All contact parts in S.S.
 - Water ring vacuum pump will 3 KW 3Ø 50 C/S motor.
 - Control panel with two vacuum guages (Out of order), three thermometers (One on reboiler) (one of order)

5. Utilities
 - Pump house consisting of two centrifugal pumps of 80 x 80mm with 7.5 KW motors each for recirculation of water from 50M³ surface tank.

- Two induced draft cooling towers with two fans and two motors of 7.5kw 3Ø 50 c/s
- Two coal-fired steam boilers of 50 M² surface each fitted with pressure reducing assemblies, and water softening section :

Two-in-one de-ioniser, tanks pumps inter connecting pipes and fittings.

- Pressure pumps with motor 5.5 kw 1Ø
- two centrifugal pumps 1.5 kw 3Ø
- Four high pressure feed pumps 5.5 HP 3Ø

Handed over

Sd/-x
M.B. Narasimha
UNIDO Expert
Proj: SI TUR 66.803
I Phase.

Taken Over

Sd/- x
Dr. Ali Su
Chairman Koop

C.C.

1. Dr. Kamal Hussein
SIDFA, Ankara
2. Prof Dr. K.H.C. Baser
NPC.

Annex IV

Silifke
9th March 1989

Handed over 109 litres of Laurus nobilis leaf oil obtained during test trials of rehabilitated plant under 1st Phase of Project SI. TUR 88.803 Assistance to Laurel oil Factory in Silifke Icel" and 1473 Kg of undistilled leaves packed in Polythene bags.

Sd/-xxx
M.B. NARASIMHA

Proj : SI.TUR 88.803
Silifke
9.3.89

Taken over

Sd/-xxx
Dr. Ali Su
Chairman
Koop
Silifke
9-3-89

C.C.

1. Dr. Kamal Hussein
SIDFA, Ankara,
Ankara.

2. Prof. Dr. K.H.C. Baser
NPC.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project in the Republic of
Turkey

JOB DESCRIPTION
11-51

Post title Chemical Technologist

Duration 1.5m/m (split mission)

Date required ASAP

Duty station Silifke (Icel) and Eskisehir

Purpose of project To assess requirements and conditions for installation and operation of a semi-installed laurel oil factory

Duties The expert is expected to work in close collaboration with the other experts and with the director and staff of the University of Anatolia Medicinal Plants Research Centre (MPRC) in the assessment of requirements and later installation and operation of the semi-installed laurel oil factory situated in Silifke (Icel). The factory is designed to produce fixed oil from Laurel Berries and essential oil from Laurel leaves.

The expert team is specifically required to :

1. make an assessment of requirements of the factory for operation in the first part of his mission
2. Take necessary steps to complete installation of the equipment and operation of the plant.
3. The expert is expected to produce a final report.

Applications and communications regarding this Job Description should be sent to:

Project Personnel Recruitment Section, Industrial Operations Division

Qualifications Chemist/Pharmacist or chemical engineer with experience in the processing of essential and fixed oils from plant materials at pilot and industrial levels.

Language English

Background information

Since 1968 Turkey has been exporting dried laurel leaves from the Laurus nobilis tree (common name bay tree) of quantities more than 1500 t/a. The Coastal States of Turkey which have an altitude of 700 meters have significant quantities of laurel trees.

The Laurel Oil Factory situated in Silifke, Icel is owned by the Forest Villages Development Cooperative which has 1050 members from several villages in the vicinity of the Factory. These members also constitute the main collectors of raw materials to be processed by the factory.

The cooperative was established in 1969 through an initiative of ORKOY, an organization of the Ministry of Agriculture, Forestry and Rural Affairs and is the owner of the plant.

The cooperative planned to set up a factory to process Laurel Berries for fixed oil and Laurel Leaves for essential oil using raw materials collected from the Laurus nobilis tree growing wild in the region.

Setting up the factory was subcontracted to a firm who, favoring Italian technology began to establish the desired factory in 1975 with the aim to complete it in 1978. However, construction work could not be completed as scheduled and untimely death of the constructor in 1983 halted all activities at the factory site. Since then, half-installed machinery and equipment were left as such inside the factory building which was 90% completed. The plant site is situated in an area of 10,000m² which comprises factory building, warehouse, administration and social buildings and canals.

Due to several financial and legal disputes between the cooperative and ORKOY (loaner to this project) nothing could be done so far to complete and operate the factory. A few years ago ORKOY was abolished. Recently, the newly elected executive board of the Cooperative has approached the MPRC for assistance directed towards UNIDO, in the form of international expertise.

The factory was designed to process 2000 tons/year leaves for distillation of essential oil and 5000 tons/year fruits for extraction of fixed oil. There is no shortage of raw materials for processing. The tree grows wild abundantly along the coastal line of Turkey stretching from Sinop in Black Sea to Antakya in Eastern Mediterranean. The leaves constitute a major export commodity and they are not, at present, processed for essential oils in Turkey. MPRC has carried out several pilot plant experiments for the distillation of essential oil and established quality control methods.