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Executive Committee of
the Multilateral Fund for the
Implementation of the Montreal Protocol

Seventeenth Meeting
Montreal, 26-28 July 1995

PROJECT PROPOSALS: LEBANON

This document includes the following project proposals:

- Investment Project for Phasing out CFCs at Cosmaline Industries s.a.l. UNIDO
- Investment Project for phasing out CFCs at Zeenni's Trading Agency UNIDO

PROJECT COVER

Country/Region:	The Republic of Lebanon
Project Title:	Investment Project for Phasing out CFCs at COSMALINE INDUSTRIES s.a.l.
Sector covered	Aerosols
ODS Consumption in this sector:	In 1993 ODS consumption in this sector was 372 MT of CFC composed of 82.6 MT of CFC-11; 254.0 MT of CFC-12 and 35.4 MT of CFC-114.
Project impact:	Phase out of annual consumption of 32 MT of CFC 11; 72.6 Mt of CFC 12 and 35.4 MT of CFC 114.
Project duration:	18 months
Project economic lifetime:	10 years
Total proposed project cost:	US $679,921
Project investment cost:	US $601,700
Implementing Agency's overheads:	US $78,221
Incremental Operating Cost: (6 months operational cost)	US$ 0.00
Proposed MP financing:	US $679,921
Cost effectiveness:	See Annex C: Unit Abatement Cost
Counterpart enterprise:	COSMALINE INDUSTRIES s.a.l.
Implementing Agency:	UNIDO
Coordinating Ministry:	Ministry of Environment

PROJECT SUMMARY

Through the implementation of the present project 100% of the CFC used as aerosol propellants (32 TM OF CFC 11; 72.6 TM of CFC 12 and 35.4 TM of CFC 114) at COSMALINE INDUSTRIES s.a.l., will be phased-out in the main producer of aerosols for cosmetics use in Lebanon.

The project objective is to phase-out chloro-fluorocarbons (CFC) as aerosol propellants in COSMALINE INDUSTRIES s. a. l. The above will be achieved by transferring the filling line presently existing near Byblos in Lebanon to a newly built facility in the same factory premises, where a building of 15 m x 7.5 m specially constructed for the reinstallation of the filling line is ready to receive the plant equipment. Also separate areas for warehouses and location of LPG tanks are ready. The existing infrastructure will permit the manufacture of aerosols using LPG following the established international safety requirements. The completion of such a facility will enable COSMALINE to phase-out about 140 metric tons of ODS by 1997 when the plant will be under operation.

The chosen alternative propellant is hydrocarbon (butane/propane mixture). The project will include the conversion of the two CFCs filling lines presently operating in COSMALINE to hydrocarbon propellants; the installation of hydrocarbon gas storage and treatment, as well as the necessary water bath and can drying system for quality control, and the requirements for fire and explosion protection for the operation of the plant.

The consumption of CFCs in COSMALINE INDUSTRIES s.a.l. for the production of aerosols amounts to 140 MT per year. The figures mentioned correspond to a yearly production of 660 000 cans of aerosols. The estimated consumption of CFCs for the next 5 years for the production of aerosols is approximately 200 MT per year, which will be utilized as a propellant if no conversion were to take place in the near future.

BACKGROUND

SECTOR BACKGROUND

The use of aerosols as one of industry's most modern packing systems for easy delivery of diverse products needed in modern life, has introduced a new era in the development of the industry oriented to the satisfaction of daily needs. Aerosols are used for the application of different products such as insecticides, paints, air fresheners, hair sprays, deodorants, hair mousses, shaving lather, medicinal products, products necessary for the automotive industry and other industrial sectors. The major producer of aerosols in the world is the United States of America; in Europe the main producer is the

United Kingdom, followed by Germany. Developing countries do not produce significant quantities of aerosols compared with the level of aerosols production in industrialized countries; nevertheless, they are able to cover the local needs for some products at competitive margins. Table N.1 shows the share of manufacture of aerosols during 1992 and 1993 in the main industrialized countries, as well as in some developing countries.

Table N.1: Aerosol production 1992-1993 (millions units)*

COUNTRY	1992	1993	+/_ %
UK	880	935	6
Germany	698	729	4
Belgium	175	172	(2)
Denmark	26	26	1
Finland	14	16	16
Austria	36	37	3
Spain	196	181	(8)
Sweden	14	16	11
France	590	595	1
Greece	20	23	17
Italy	280	285	3
Netherlands	218	260	19
Portugal	26	27	6
Switzerland	35	37	5
Turkey	26	26	1
Europe Total	3,233	3,369	4.2
USA	2,989	2,940	(2)
Australia	142	152	7
Japan	672	635	2
World Total	6,986	7,096	1

*Manufacturing Chemist, January 1995

Lebanon ratified the Vienna Convention on March 30, 1993; the Montreal Protocol on March 31, 1993 and the London Ammendments on the same date. The ratification of the Copenhagen Amendments is still in progress. The aerosols sector comprises an important part of the Lebanese industrial infrastructure. It is important to consider that light industry represents the major industrial activity in the country. The industrial production of aerosols is well stablished with the necessary distribution network. The demand for CFCs in Lebanon has rapidly increased since the war and, consequently, is expected to grow from 830.6 tons in 1992 and 1154 in 1993 to 1600 tons by the year 2000 and 3057 tons by the year 2010.

Aerosols are mainly produced in the country as insecticide formulations, air fresheners, cosmetic products, hair sprays, etc. The Lebanese Government has recently created the Ministry of Environment which has the responsibility to establish and follow the implementation of national regulations related to the protection of the environment. The Ministry of Environment is also responsible for the implementation of the National Programm for the elimination of CFCs from industrial practice, for which the National Committee on Ozone Depleting Substances was created. The Committee has been working on the preparation of the Country Programm for phasing out ozone depleting substances. The programm is almost ready and will soon be officially submitted.

Among the activities carried out by the National Committee the following can be mentioned:

- Identification of consumers and suppliers of CFCs.
- Collection of statistical information for determining the present and future level of consumption.
- Assistance to UNEP and the Government on the elaboration of the Country Programm.
- Outlining project concepts and proposals for phasing-out ODS from the industrial practice in the country.

Lebanon is considered a middle-income country with an estimated population of 3.85 million, including the repatriates after the war and the refugees who have already established themselves in the country. 65% of the population is concentrated in eight principal cities and is dedicated to industrial production, services and commerce.

The Lebanese Republic does not produce any CFC; all CFCs utilized for industrial production are imported.

COSMALINE INDUSTRIES s.a.l. BACKGROUND.

In the framework of the National Country Program for the phase-out of ozone depleting substances in various sectors of industrial production in Lebanon, the government has requested UNIDO to offer the necessary assistance services to COSMALINE INDUSTRIES s.a.l., which is considered the pioneer national enterprise dedicated to the production of aerosols for the satisfaction of local market needs. The plant has manufactured insecticides, deodorants, toiletries and body perfumes using CFC 11; 12 and 114. The program of the company is to maintain and slightly increase the level of production of aerosols by introducing new products and formulations, and to eliminate the CFCs from the industrial practice.

The company started in 1963 producing mainly cosmetics and toiletries. Despite the difficult years of the war the company was able to diversify the production programme, as well as to modernize the production installations. Presently the company has a newly established premises with well organized warehouses and quality control laboratories. The company is producing only for the domestic market. Now COSMALINE manufactures mainly hair sprays, deodorants, and air fresheners. The formulation of aerosols started in 1967 working with a small capacity manual machine from DALLEMBACH, Switzerland, which is still in operating condition in the factory. In 1983 a 6.AVG machine from COSTER, Italy was purchased in order to increase the formulation capacity of the factory.

COSMALINE's share on the consumption of CFC is estimated as follows:

YEAR	TONS OF CFC
2000	178
2005	207
2010	228

A list of most important aerosol formulations manufactured during the last years is shown in Table No.2.

Table No.2: Main manufactured aerosol products in Lebanon

TRADE NAME	TYPE OF PRODUCT
WELLA	hair spray
SATINET	hair spray
TEAM	deodorant
NEW WAVE	styling foam
SMASH	insecticide
COSMAL	air freshener

As mentioned above, CFCs in Lebanon have to be imported - mainly from Europe (France and Italy). During the last years the price of the CFCs has increased considerably, affecting the capabilities of the company to become competitive in the market. After the conversion, the necessary propellant for the manufacture of aerosols - propane-butane, will also be imported as the country does not produce any. For the above special isotainers have to be purchased in order to dedicate them only for odourless propane-butane; the rest of the components for the different formulations will also be purchased from international market as it is done today.

The company has already invested in the preparation of the civil construction works for the location of the converted aerosol line, out of the existing facilities but on the same premises as the plant. The new production room (15 x 7.5 x 3.5 m) was built to locate the aerosol filling machines and also an adjacent room (3 x 3 m) for the location of the gas house. The area was provided with explosion-proof electric installations and lamps. Good natural ventilation is achieved thanks to the location of windows down and up in the filling area; taking advantage of the location of the plant on a hill about 300 m above sea level without any other building or facility around. The plant area has good access to paved roads. A 5000-litre water supply tank for fire extinction was also recently built by the company, as well as a special platform for the location of LPG tanks. In general, the company has taken the necessary measures to prepare the facilities for the conversion. As soon as the present project is approved and the required financial resources are allocated, it will be possible to start the pending activities and perhaps have the project finalized in less than 12 months.

The company also has its own maintenance workshop, the storehouses having been built according to international standards requirements.

The company has built a special warehouse only for aerosols in the same building dedicated to the future production of products by means of the LPG process.

The main filling line under operation at COSMALINE INDUSTRIES s.a.l. is working with a semi-automatic filling machine from COSTER, the following unitary operations are manually performed: can loading and valve placing, product filling and crimping are performed by the machine. Water bath testing, drying, cap placing and case packing are all manually performed activities. Specifically water bath testing is done only for batch samples in a very primitive way that needs to be modified when the plant starts the production utilizing LPG.

The industrial facility operates in one shift of 8 hours during 300 days per year. On occasions of urgent requests, a second shift is organized only for a short period of time.

The difference between the actual production and the capacity installed could be explained as due to the causes indicated below:

- Necessary time for production recovery after the war.
- Difficulties in obtaining financing facilities (hard currency) for import of raw materials, specifically CFCs due to price increases.
- Since 1991 the purchase of CFC propellants became difficult.

PROJECT OBJECTIVE

The objective of the project is to completely phase-out the use of 140 MT of CFC; (32 TM of CFC-11; 72.6 TM of CFC-12 and 35.4 TM of CFC-114 as aerosol propellants per year in Lebanon by converting the production facility at COSMALINE INDUSTRIES s.a.l. from a CFC utilizing installation to a hydrocarbon-based production process in the field of aerosols.

The phasing-out of CFCs could reach 200 TM per year in the next 7 - 10 years. The total project impact, therefore, will be the phasing-out of a minimum 1400 MT of ODS in the next 7 to 10 years.

PROJECT DESCRIPTION

COSMALINE INDUSTRIES s.a.l. is prepared to phase-out the ODS in the aerosol sector as soon as they obtain the requested technical and financial assistance; the necessary machinery and equipment are installed and the plant staff has been trained.

Based on the technical characteristics of the machinery, the products manufactured by the company, and the possibilities to import the LPG, it is suggested to replace CFCs with hydrocarbon aerosol propellants. The substances mentioned are used as the main replacement products for CFCs in the production of aerosols. Among the advantages of hydrocarbon aerosol propellants, the following could be mentioned:

- They have similar spray patterns to CFCs.
- They are very stable in the formulations and in time.
- They do not affect the ozone layer.

One of the main disadvantages of the hydrocarbons is their extreme flammability; this implies the need for special care in handling and storage practices.

Because of the above, and taking into consideration that the company intends to expand the production of aerosols for the satisfaction of the growing local demand, it was decided to transfer the existing production lines to the newly built area where it would be possible to utilize the hydrocarbon more safely, and to install a necessary gas house for filling the cans. Utilizing the available filling machine, the company will be able to do the product filling, valve insertion and crimping, and then do the gas filling with LPG in a small room (3 x 3 m) in which the gas house will be located. The gassed cans will come back for water bath testing, capping and packaging.

The assistance required through the project is sought for:

A.- Procurement of a necessary gas filling system with external gas house and safety control system.

B.- Gas transfer and purification of LPG.

C.- Assistance for the preparation of engineering design, performance of construction works, installation of the equipment, commissioning of the plant and training of the personnel.

The major components of the project are the conversion of the filling line and the supply of LPG from a bulk storage tank.

A detailed description of the project requirements is as follows:

A. New gas filling system:

A.1.- A new separate rotary indexing gassing system is needed for the filling line to be placed in the area already built in the aerosol plant; the required system should include:
*-Stainless steel cabin complete with armoured entry door with porthole and ejectable rear door. A 2-way suction system. A barrier ventilation system on a conveyor. A 6-position device for cans being handled under the filling heads, complete with a size set for two cans' diameters. A checking devise for cans inlet/outlet to and from the cabin.
*- 2 gas filling stations from 0-330 ml, each consisting of: gas cylinder up to 330 ml and approaching cylinders; gas filling heads with adaptor for two types of valves; head holding valve.
*- A rapid pneumatic adjustment system for gas supply.
*- An explosion-proof electric panel.
*- Conveyors and a motorization system for the cans built of antistatic material.
*- A detecting system for propane-butane propellant gas with the required valves.
Estimated cost: US $150,000.

A.2.- Universal test bath with can holders of synthetic material to avoid scratching of cans, adaptable to two different dimensions of cans as a minimum with:
*- a mechanical group for sorting, holding and releasing the cans
*- a chain conveyor system
*- an insulated tank made of stainless steel
*- an electric water heating system equipped with control and adjustment for the temperature.
*- an air-blowing device to dry the cans in the exit of the tank
*- connecting conveyor lines to the filling and packaging line.
Estimated cost: US $130,000.

B. LPG storage, purification and transfer system to the filling machine. The system includes:

B.1.- Two LPG isotainers of 8 Tons capacity each (20 cubic meters each).
Estimated cost: US $100,000.

B.2.- One off loading pump 200 l/min (for propane/butane); including skid, pipes and valves. Flameproof motor.

Estimated price: US $11,000.

B.3.- One transfer pump (30 L/min), complete with flameproof motor, including skid with valves and fittings.

Estimated price: US $8,000.

B.4.- One multi-stage centrifugal process pump (30 L/min). Differential pressure of 125 psi. Including skid, valve and fittings.

Estimated cost: US $15,000.

B.5.- One set of pipework fittings within tank farm and flow return lines comprised of:

*- A set of valves and special fittings within tank farm for butane & propane to include off-loading vapour flow and return and destenching pipework. With back pressure regulating valves and two automatic safety shut-off valves.

Estimated cost: US $34,000.

B.6.- Tank farm control panel comprised of all controls and circuits for off loading, transfer and recirculation pumps; five channels gas detectors, interface relays for connection with filling rooms controls and factory fire protection systems.

Estimated cost: US $35,000.

B.7.- Pipework support gantry to bridge between the tank farm and filling room. Approximately 15 meters.

Estimated cost: US $9,000.

C. ASSISTANCE FOR DESIGNING, INSTALLATION, COMMISSIONING AND TRAINING

The services for the implementation of the project will include assistance for the performance and supervision of the engineering designs of the new facility for a period of one month.

Assistance in the installation and commissioning of the plant, including the gassing house and the gas tank farm, for 30 days.

Assistance for training the personnel in production, quality control and safety procedures for 30 days.

OTHER REQUIREMENTS

In addition to the above-mentioned equipment and services, the project requires other services, equipment and materials. COSMALINE INDUSTRIES s.a.l. already invested in the land, construction of the new building for the filling line and gas house, and construction of the special area for the storehouse, as mentioned above.

The additional needs listed bellow will be also covered by COSMALINE INDUSTRIES:

- elaboration of all technological and engineering designs for the completion of plant facilities and LPG storage and purification according to international requirements.
- performance of additionally required civil construction and installation works for the aerosol plant, indispensable to allow the plant to work with flammable solvents, including LPG storage, gas house and warehouses.
- supply of all components for the deluge system and performance of installation works for protection of the LPG storage and distribution area.

The equipment supply for the deluge system will include:

- one electrically driven main deluge pump. Head 30 m. Capacity 50 L/sec.
- one diesel driven stand by deluge pump of the same output.
- one jockey pump to maintain the water pressure in the system. Capacity and head to be decided when the engineering designs of the plant are completed.
- one main deluge valve.
- one compressor for air detection system pressurization. Capacity has to be decided when the engineering designs of the plant are ready
- one flow providing system.
- one main feed pipe length about 50 m length; diameter 5 inches.

- pipe work over LPG tanks and off loading zone as required based on the designs.
- two sets of spare heads plus six spares.
- two sets of detecting nozzles plus six spares.
- one set of control and isolating valves.
- two solenoids dump valves.
- two manual dump valves.
- one control panel for electric and diesel pump sets.
- one distribution board for pump house power users.
- one set of cables for pump house excluding main supplies to pump controllers and control panel.
- local consulting engineers to manage the project in the different stages.
- relocation of the existing equipment in the new facility.
- performance of installation works and commissioning of the new plant.

JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGIES

There are different possibilities to replace the CFCs as propellants for the industrial production of aerosols. Among the existing technological alternatives the following can be mentioned:

- utilization of compressed air or gas.
- utilization of pressure capsules.
- utilization of hydrocarbon propellants.

The first two alternatives are not commercially feasible, as these alternatives do not produce good spray systems, and the cost of phasing-out the CFC utilizing those alternatives would be very high. In principle, those alternatives are based on the introduction of constructive modifications and additions to the cans, valves and formulations of the products.

Hydrocarbon aerosol propellants are used more than any other propellant as the main replacement for CFCs. They are readily available, give good spray patterns, and do not affect the ozone layer. Hydrocarbons are the only propellants which give a good performance on the formulation elaborated by COSMALINE INDUSTRIES s.a.l.

Based on the above given facts and taking into consideration that the required hydrocarbon mixture could be made available in the country, it was recommended to perform the phasing-out utilizing hydrocarbon propellants.

PROJECT IMPLEMENTATION

The project will include the supply of some equipment, installation materials, services for design, installation and commissioning and on-the-job training services of COSMALINE INDUSTRIES s.a.l. staff as indicated above. In order to guarantee a proper transfer in particular of the new aerosol

technology using the highly flammable hydrocarbon propellants, the selected contractor is requested to issue an "Operational Safety Statement"for the recommended technological solution.

For the operation of such technology using highly flammable and explosive materials, the authorization for the operation must be received from the related national authority; and the production lines have to be regularly controlled by the responsible local authority, which should already be involved at the stage of engineering of the plant modifications to avoid further difficulties during the construction and commissioning of the plant.

The final equipment specifications, the work plan and consequently the "Operational Safety Statement" can only be elaborated after approval of the basic approach for project implementation by the relevant local authorities.

Any construction work needed to accommodate the equipment for the new aerosol technology using hydrocarbons will have to be carried out by COSMALINE INDUSTRIES s.a.l.; the details are not reflected in the project budget. The specifications for construction work will be elaborated by the local construction company after project approval and as an outcome of the necessary inspection of the site.

It is estimated that, after 18 months, the complete conversion of the factory will have been carried out.

The proposed tentative work plan for the project's implementation is indicated below.

TIME SCHEDULE.

ACTIVITIES	MONTHS 0	2	4	6	8	10	12	14	16	18
General:										
01. Project approval, reception of funds.	X									
02. Preparation of detailed work plan.		X								
03. Elaboration of engineering designs and consultation with local authority.		XXX								
Civil Construction works:										
04. Approval certificate from local authority to start the completion and installation works.			X							
05. Installation of plant equipment.						XXX				
06. Installation of water system for purification.				XXXX						
07. Deluge storage area and tank ready and tested.					XX					
LPG storage:										
08. Negotiations and purchase of LPG tank and materials.			X							
09. Purchase of local materials for the system.				XX						
Gas filling equipment:										
10. Selection of equipment.		X								
11. Purchase of equipment.		XX								
12. Installation of equipment and commissioning.							XXX			
Training:										
13. Training of the staff in-situ.							XX			
Certification:										
14. Project final report and certification.								X		

PROJECT COSTS

I. INVESTMENT COSTS

The investment costs will cover incremental capital investment costs for modification of manufacturing facilities, new machinery, materials, testing equipment, training, installation and consultancy services for modifications. An incremental capital investment cost breakdown is shown in Annex A.

The cost of CIF transportation and insurance for the provided equipment are included in the budget.

II. INCREMENTAL OPERATING COSTS

In fully converting from CFCs to hydrocarbons, some operating costs will increase while others may decrease. As described bellow, COSMALINE INDUSTRIES s.a.l. will not realize any net incremental operating costs or savings.

The following costs per unit will increase:

- electricity
- ethanol 99.9%
- amortization costs, due to the new investment
- advertising costs: it is necessary to convince the customers that they are receiving the same dosage as with the previous formulations and also that they are receiving environmentally safe products, mainly when the weight of the same size can will drop almost to half of the usual one produced with CFC mixture 11/12.

The following costs will certainly decrease:

- LPG cost will be approximately US $1.70 per kg., compared with the cost of a CFC-11/12 mixture which is US $3.20 per kg; the price for mixture 12/114 is US $5.00/kg.

There will be a slight increase in maintenance costs when the plant phases out production to the use of LPGs.

Details of the cost of materials for the production of aerosols with LPG and similar utilizing CFCs are indicated in the following table.

Comparative cost analysis of aerosols production*

MATERIAL	QUANTITY	PRICE	COST
WITH LPG	G/300 ML filled CAN	IN US$	IN US$
ETHANOL 99.9%	80.0	2.70	0.216
Butanene/Propane	120.0	1.70	0.204
Estimated increase in electricity cost**			0.060
Additional Amortization***			0.100
Estimated total cost with LPG			0.580
WITH CFC 11/12			
CFC 11/ 12 only	175.0	3.20	0.560

* The analysis refers only to propellant consumption due to conversion

** Due to security measures and fire extinction system

*** Due to new investment

III. CONTINGENCY FUND

A contingency fund (10% of the total budget), proposed to cover unforeseen expenses which might incur during the project implementation, is included in the funding requested from the Multilateral Fund of the Montreal Protocol.

IV. TOTAL COSTS

COST COMPONENT	US $
- Incremental investment cost See (Annex A: "Equipment Specification and cost breakdown and Annex B.	601,700
- No incremental operating cost.	
- Executing agency's overhead cost (13% of MP financing costs).	78,221
- For the complete cost breakdown (Annex B: "Project Budget"). - For the calculation of the unit abatement cost (Annex C: "Unit Abatement Cost").	
- Total requested funding by the MFMP	679,921

Contribution of COSMALINE INDUSTRIES s.a.l. is indicated in the Annex D to the present document.

A N N E X A

Investment with equipment specification and cost breakdown.

Description	Qty	Unit cost US$	Total cost US$
A. Filling line			
A.1. Gas filling house	1	150,000	150,000
A.2.Water bath with drying tunnel	1	130,000	130,000
Subtotal filling line		280,000	280,000
B. LPG bulk storage			
B.1.LPG storage tanks	2	50,000	100,000
B.2.Propane/butane pump	1	10,000	10,000
B.3.Transfer pump	1	7,000	7,000
B.4.Centrifugal process pump	1	13,000	13,000
B.5.Pipes and fittings (set)	1	40,000	40,000
B.6.Tank farm control panel	1	30,000	30,000
B.7.Pipework support set	1	7,000	7,000
Subtotal LPG storage			207,000
TOTAL EQUIPMENT			542,000

Tax & customs are not included in the price of machinery and will not be covered by this project.

EQUIPMENT SPECIFICATIONS

A. New gas filling system :

A.1.- A new separate rotary indexing gassing system is needed for the filling line to be placed in the area already built in the aerosol plant; the required system should include:
*Stainless steel cabin complete with armoured entry door with porthole and ejectable rear door. 2-way suction system. Barrier ventilation system on conveyor. 6 position device for cans being handled under the filling heads, complete with size set for two cans diameters. Checking devise for cans inlet/outlet to and from the cabin.

*- 2 gas filling stations from 0-330 ml, each consisting of: gas cylinder up to 330 ml and approaching cylinders; gas filling heads with adaptor for two types of valves; head holding valve.
*- Rapid pneumatic adjustment system for gas supply.
*- Explosion-proof electric panel.
*- Conveyors and motorization system for the cans built with antistatic material.
*- Detecting system for propane-butane propellant gas with the required valves.

Estimated cost: US $150,000.

A.2.- Universal test bath with can holders of synthetic material to avoid scratching of cans, adaptable to different dimensions of cans with:

*- mechanical group for sorting, holding and releasing the cans
*- a chain conveyor system
*- an insulated tank made of stainless steel
*- an electric water heating system equipped with control and adjustment for the temperature.
*- air blowing device to dry the cans in the exit of the tank
*- connecting conveyer lines to the filling and packaging line.

Estimated cost: US $130,000.

B. LPG storage, purification and transfer system to the filling machine. The system includes:

B.1.- Two LPG tanks of 8 Tons capacity each (20 cubic meters each).
Estimated cost: US $100,000.

B.2.- One off loading pump 200 l/min (for propane/butane); including skid, pipes and valves. Flameproof motor.

Estimated price: US $10,000.

B.3.- One transfer pump (30 L/min), complete with flameproof motor, including skid with valves and fittings.

Estimated price: US $7,000.

B.4.- One multi-stage centrifugal process pump (30 L/min). Differential pressure of 125 psi. Including skid, valve and fittings.

Estimated cost: US $13,000.
B.5.-One set of pipework fittings within tank farm and flow return lines comprised of:

*- A set of valves and special fittings within tank farm for butane & propane to include off-loading vapour flow and return and destenching pipework. With back pressure regulating valves and two automatic safety shut off valves.

Estimated cost: US $40,000.

B.6.- Tank farm control panel comprised of all controls and circuits for off loading, transfer and recirculation pumps; five channels gas detectors, interface relays for connection with filling rooms controls and factory fire protection systems.

Estimated cost: US $30,000.

B.7.- Pipework support gantry to bridge between the tank farm and filling room. Approximately 15 meters.

Estimated cost: US $7,000.

ANNEX B

PROJECT BUDGET

Budget line	Description	Duration	Budget w/m	US$
	I-EQUIPMENT			
	Filling line equipment, as indicated in Annex A			280,000
	LPG bulk storage equipment, as per Annex A			207,000
	II-CONSULTANCY SERVICES*			
	-Total consultancy services for: supervision of engineering designs and construction works		3.0	60,000
	(two visits)		1.0	
	- Assistance for installation of machinery and LPG system		1.0	
	- Assistance for commissioning and training		1.0	
	III-MISCELLANEOUS			
	Contingency Fund (10% of the costs of all equipment and services)			54,700
Subtotal (I+II+III).....				601,700
Agency's Overheads (13%).....				78,221
TOTAL.....				679,921

*The above indicated costs include air fare, hotel accommodation costs and subsistence costs during the missions.

NOTES:

ANNEX C

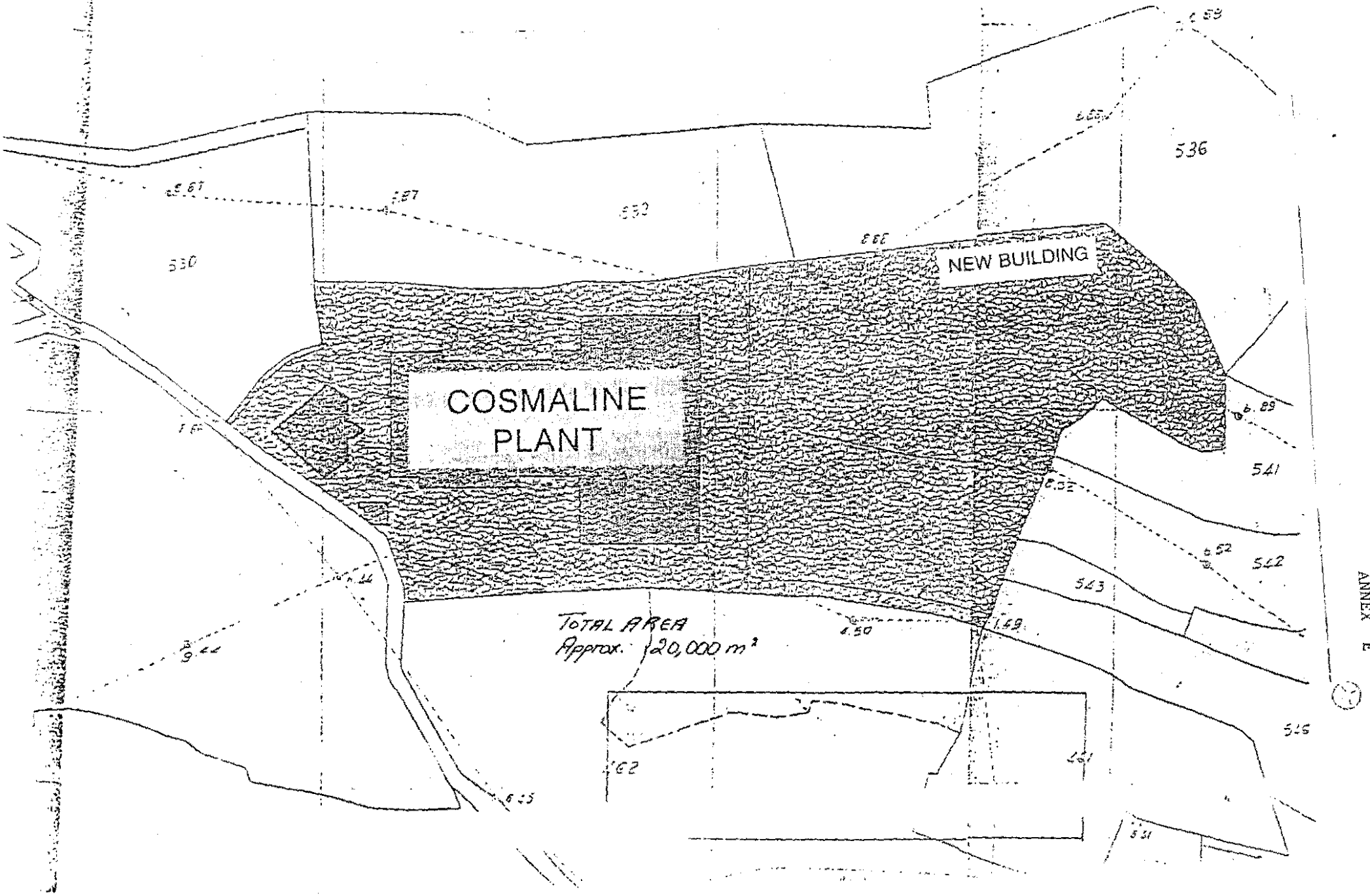
UNIT ABATEMENT COST

A	ODS PHASE-OUT		TOTAL PROJECT
A1	Average use of CFC 11	MT	32
A2	ODP of CFC 11		1
A3	ODP-weighted CFC 11 phased out (A1 x A2)	MT	32
A4	Average of CFC 12 per year	MT	72.6
A5	ODP of CFC 12		1
A6	ODP weighted CFC 12 phased out (A4 x A5)	MT	72.6
A7	Average use of CFC 114 per year	MT	35.4
A8	ODP of CFC 114		1
A9	ODP weighted CFC 114 phased out	MT	35.4
A10	Total ODP weighted phase out	MT	140
B	Annualized capital cost		
B1	Total investment cost (model redefinition + production conversion)	US$	679,921
B2	Equipment life	Year	10
B3	Discount rate	%	10
B4	Annualized capital cost (B1 x 0.1627)	US$	110,623.15
C	Annual incremental recurrent cost	US$	0.00
D	Unit Abatement cost		
D1	Annualized capital cost per kg ODS phased out (B4/(A10x1000)	$/kg	0.790
D2	Annual 1/2 incremental recurrent cost per ODS phased out (C/A7 x 1000)	$/kg	0.00
D3	Unit abatement cost (D1 + D2)	$/kg	0.790

ANNEX D

CONTRIBUTION OF COSMALINE INDUSTRIES s.a.l. TO THE PROJECT

ACTIVITIES	Cost in US$
- Cost of land; (50m x 100m)	250,000
- Construction of new building.	250,389
- Civil construction for tank farm.	60,000
- Construction of deluge tanks and pump house.	40,000
- Supply of equipment and materials for deluge system	130,000
- Transfer of equipment and machinery.	10,000
- Technological and engineering designs.	20,000
- Performance of installation works.	30,000
- Project management cost for local consultant Co.	15,000
TOTAL	805,389


COSMALINE
PLANT
NEW BUILDING
TOTAL AREA
Approx. 20,000 m²
536
541
542
543
515
530
531
532
ANNEX E

1.	**Country of origin:**	**The Republic of Lebanon**
2.	**Project title:**	**Investment Project for phasing out CHFs at COSMALINE INDUSTRIES S.A.L.**
3.	**Sector covered:**	**Aerosols**
4.	**Relationship to country programme:**	**The programme was prepared in line with the ratification of the Montreal Protocol on March 31, 1993.**

5. Technology:

5.1 The chosen alternatives of Propan-Butan (HAPs) as aerosol propellants are the only alternative of this project.

5.2 The technologies in formulating Propan-Butan aerosols have been known since a long time.
Most of the products can be reformulated without problems.

5.3 Regarding safety there is a lot of general knowledge availabe throughout the world.

6. Environmental Impact:

6.1 HAPs have zero ODS.

6.2 The appropriate measure to minimize health and safety impact are dealt within the project.

Cont/...

7. Project costs:

7.1 The existing filling machine is presently placed in the main production room. Also the propellant filling is done on the same machine. This was ok by working with CFCs.
To work with HAPs the propellant filling has to be separated and the layout of the aerosol filling line must be newly arranged.
The existing building has to be adapted to adequate safety.
A ventilation system and gas detectors must be installed.
A new gas storage system must be built which includes storage tanks, purification by molecular sieve and delivery to the filling machine.
The purification system is necessary as a packup if local gas has to be pur chased.

7.2 There is no request for additional equipment. All equipment asked for is justified.

7.3 The modification of the existing equipment and the buildup of the complete line will not increase the basic output. But the new layout will stand for the latest technology and safety recommendations aerosol manufacturing.

7.4 Start up / Commissioning costs
The amount of consulting commissioning and training costs on site seem to be appropriate. Additional training and instruction in safety technics is very important.

7.5 Operating costs
The operating costs of the filling station working with HAPs will be a little higher. This is due to more frequent maintenance work and additional safety-checks.

Cont/...

7.6 Other costs
A contingency of 10 % of all equipment and services is included. This is appropriate and justifiable. Implementing agency overhead costs are reasonable.

7.7 Cost effectiveness
The unit abatement costs of US$ 0.790/kg is on a medium level. The project includes a good level of cost effectiveness over the lifetime of the project. The investment is relatively high per ODP tonne phase out.

7.8 Implementation time
The proposed implementation time is realistic, 18 months is sufficient for planning, manufacturing and installation.

8. Recommendations:

The overall project is realistic. The costs are kept to the necessary level to guarantee a safe and trouble free operation.

J. Walker

June 6, 1995

PROJECT COVER

Country/Region:	The Republic of Lebanon
Project Title:	Investment Project for Phasing out CFCs at ZEENNI'S TRADING AGENCY.
Sector covered	Aerosols
ODS Consumption in this sector:	In 1993 ODS consumption in this sector was 372 MT of CFC composed of 82.6 MT of CFC-11; 254.0 MT of CFC-12 and 35.4 MT of CFC-114.
Project impact:	Phase-out of annual consumption of 212 Mt of CFC-12.
Project duration:	18 months
Project economic lifetime:	10 years
Total proposed project cost:	US $1,049,092
Project investment cost:	US $928,400
Implementing Agency's overheads:	US $120,692
Incremental Operating Cost: (6 months operational cost)	US $0.00
Proposed MP financing:	US $928,400
Cost effectiveness:	See Annex C: Unit Abatement Cost
Counterpart enterprise:	ZEENNI'S TRADING AGENCY
Implementing Agency:	UNIDO
Coordinating Ministry:	Ministry of Environment

PROJECT SUMMARY

Through the implementation of the project 100% of the CFC used as aerosol propellants (212 TM OF CFC-12) at ZEENNI'S TRADING AGENCY will be phased-out. The company is the main producer of insecticide aerosols in Lebanon.

The project objective is to phase-out chlorofluorocarbons (CFC) as aerosol propellants. This will be achieved by remodelling the existing industrial facilities for the production of insecticide aerosols in BSARMA-KOURA, near Tripoli in North Lebanon. The company has recently built a new plant for the production of aerosols. The building was completed with reinforced walls, explosion-proof electrical installations and a fire system, as well as a special area for the location of the LPG tanks and for the distribution of the gas to the filling room. Warehouses and the storage area for LPG tanks are ready. The existing infrastructure is well advanced and will be able to safely produce aerosols using LPG as soon as the plant area, gas filling room and improvements to the security system are ready. The company will phase-out about 212 metric tons of ODS by 1997 when the civil construction works modifications in the plant structure are finished, the installation works for the filling room and storage system are completed, and the aerosol filling line will be able to produce at full capacity.

The chosen alternative propellant is hydrocarbon (butane/propane mixture). The project will include the full conversion of the CFCs filling line presently operating to hydrocarbon propellants; the complete installation of hydrocarbon gas storage and treatment system, including the transportation of LPG as well as the necessary water bath system for quality control, and the required instruments for gas detection, and fire and explosion protection for the safe operation of the plant.

The consumption of CFCs in ZEENNI'S TRADING AGENCY for the production of aerosols amounts to 212 MT per year. The figures mentioned correspond to a yearly production of 3,829,000 cans of insecticides, deodorants and air fresheners aerosols. The projected consumption of CFCs in the next 5 years for the production of aerosols in the company is estimated at about 250 MT per year, which will be utilized as propellant in case the company cannot speed up the initiated conversion of the facilities in the imminent future.

BACKGROUND

Sector Background

The use of aerosols as one of industry's most modern packaging systems for easy delivery of diverse products needed in modern life has introduced a new era in the development of industry oriented to the satisfaction of daily needs. Aerosols are used for the application of different products, such as insecticides, paints, air fresheners, hair sprays, deodorants, hair mousses,

shaving lather, medicinal products, products necessary for the automotive industry and other industrial sectors. The major producer of aerosols in the world is the United States of America; in Europe the main producer is the United Kingdom, followed by Germany. Developing countries do not produce important quantities of aerosols compared with the level of aerosols production in industrialized countries; nevertheless, they are able to cover the local needs of some products at competitive margins. Table N.1 shows the share of manufacture of aerosols during 1992 and 1993 in the main industrialized countries, as well as in some developing countries.

Table N.1: Aerosol production 1992-1993 (millions units)*

COUNTRY	1992	1993	+/_%
UK	880	935	6
Germany	698	729	4
Belgium	175	172	(2)
Denmark	26	26	1
Finland	14	16	16
Austria	36	37	3
Spain	196	181	(8)
Sweden	14	16	11
France	590	595	1
Greece	20	23	17
Italy	280	285	3
Netherlands	218	260	19
Portugal	26	27	6
Switzerland	35	37	5
Turkey	26	26	1
Europe Total	3,233	3,369	4.2
USA	2,989	2,940	(2)
Australia	142	152	7
Japan	672	635	2
World Total	6,986	7,096	1

*Manufacturing Chemist, January 1995

Lebanon ratified the Vienna Convention on March 30, 1993, the Montreal Protocol on March 31, 1993 and the London Amendments on the same date. The ratification of the Copenhagen Amendments is still in progress. The aerosols sector comprises an important part of the Lebanese industrial infrastructure. It is important to consider that the light industry represents the major industrial activity in the country. The industrial infrastructure for the above is well stablished with the necessary distribution network. The demand for aerosols in Lebanon has rapidly increased, especially since the war finished, and consequently the demand for CFCs. It is expected that the CFCs consumption will grow from 830.6 tons in 1992 and 1154 in 1993, to 1600 tons by the year 2000 and 3057 tons by the year 2010.

Aerosols are mainly produced in the country as insecticides formulations, air fresheners, cosmetic products, hair sprays, etc.
The Lebanese Government has recently created the Ministry of Environment which has the responsibility to establish and follow the implementation of national regulations related to the protection of the environment. The Ministry of Environment is also responsible of the implementation of the National Programm for the elimination of CFCs from industrial practice. For the above the National Committee on Ozone Depleting Substances was created. The Committee has been working on the preparation of the Country Programm for phasing-out ozone depleting substances. The programm is almost ready and will be soon officially submitted.

Among the activities carried out by the National Committee the following could be mentioned:

- Identification of consumers and suppliers of CFCs.
- Collection of statistic information for determining the present and future levels of consumption.
- Assistance to UNEP and the Government on the elaboration of the Country Programm.
- Outlining project concepts and proposals for phasing-out ODS from industrial practice in the country.

Lebanon is considered a middle-income country with an estimated population of 3.85 million, including the repatriates after the war and the refugees living permanently in the country. 65% of the population is concentrated in eight principal cities and is dedicated to industrial production, services and commerce.

The Lebanese Republic does not produce any CFC; all CFCs utilized for industrial production are imported.

ZEENNI'S TRADING AGENCY BACKGROUND

In the framework of the National Country Program for the phase-out of ozone depleting substances in various sectors of industrial production in Lebanon, the government has requested UNIDO to offer the necessary assistance services to ZEENNI'S TRADING AGENT, which is considered the main producer of aerosol insecticides in Lebanon. The programm of the company is to maintain and slightly increase the level of production by introducing new products and formulations, and to completely eliminate the CFCs from industrial practice.

The company was created in 1945; it is a family owned business - 100% Lebanese. Aerosol production was started in 1973 utilizing CFCs. The aerosol factory is operating with a PAMASOL MACROMAT P2045/11 automatic machine, and fills about 60 cans per minute. Despite the difficult years of the war, the company was able to diversify the production programme, as well as to modernize the production installations. The company has constructed the basic building with special concrete reinforced walls , explosion-proof electric installations and an area for LPGs tanks location, but still it is necessary to introduce the required security and safety measures in order to allow the company produce in safe conditions with LPGs and follow the international standards' requirements. Lay-out of the existing facilities is attached. No water bath test is available in the factory, which is extremely important to be introduced when the factory phases-out from CFCs to LPGs.

ZEENNI'S TRADING AGENCY is a good example of a national enterprise capable of maintaining production during the war and even modernize the industrial facilities. The production facilities are located in an area of 8000 square meters, in which 700 are built to locate the aerosol plant and the storehouses. An area of 18 x 12 meters are dedicated to the LPG storage tanks.

The company is doing contract filling for local producers and domestic market.

ZEENNI'S share in the consumption of CFC is estimated as follows:

YEAR	TONS OF CFC
2000	245
2005	270
2010	285

A list of the most important aerosol formulations manufactured during the last years is shown in Table No.2.

Table N.2 Main aerosol products manufactured by ZEENNI'S

TRADE NAME	TYPE OF PRODUCT
MUM 21	deodorant
Body Mist	deodorant
KEMT	hair spray
SPRITEX	insecticides
SMASH	insecticides
SPRIGONE	insecticides

As mentioned above, CFCs in Lebanon have to be imported, mainly from Europe (France and Italy). During the last years the prices for CFCs have considerably increased, and it is expected that the prices will be even higher in the near future. After the conversion, ingredients for the manufacture of aerosols - propane-butane, will also be imported as the country does not produce them; but the prices for LPG are lower than those of CFCs. For the transportation of aerosol grade LPGs special isotainers have to be purchased in order to dedicate them exclusively for odourless propane-butane, as the national supplier of LPG does not have the necessary facilities for storage and transportation of aerosol quality LPG. The rest of the components for the different formulations will also be purchased from the international market as is done today.

The company has already invested in the modification of the buildings reinforcing the civil construction works for the location of the converted aerosol line, as well as in the construction of the storage area and water tank for fire extinction, including the required pumps with an independent electrical supply from the company's own generator. The filling room was prepared to achieve the maximum natural ventilation, but still some additional extraction equipment will be needed. The plant area has good paved access roads. A water supply tank of 150,000 litres capacity for fire extinction was also recently built by the company, as well as a special platform for the location of LPG tanks. In general, the company has taken the necessary measures to prepare the facilities for the conversion. As soon as the present project is approved and the required financial resources are allocated, it will be possible to start the pending activities and perhaps have the project finalized in less than 12 months.

The company also has its own maintenance workshop and the storehouses were built according to international standards.

The production of aerosols at ZEENNI'S TRADING is performed with an automatic filling machine from PAMASOL; all unitary operations are performed automatically except can loading to the feeding round table. Specifically, a water bath testing system will have to be installed in order to assure that no leaking cans will be delivered to the market.

The industrial facility operates in one shift of 8 hours during 300 days per year. On occasions, and for urgent requests, the second shift is organized but only for a short period of time.

PROJECT OBJECTIVE

The objective of the project is to phase-out the use of 212 MT of CFC-12 as aerosol propellants per year in Lebanon by converting the production facility at ZEENNI'S TRADING AGENCY from CFCs utilizing installation, to hydrocarbon based production process.

The phasing out of CFCs could reach 270 TM per year in the next 7-10 years. The total project impact therefore, will be the phasing-out of minimum 2700 MT of ODS in the next 7 to 10 years.

PROJECT DESCRIPTION

ZEENNI'S TRADING AGENCY is prepared to phase-out 100% of the ODS in the aerosol sector as soon as they obtain the requested technical and financial assistance; the necessary machinery and equipment are installed and the plant staff is trained.

Based on the technical characteristics of the machinery, the products manufactured by the company, and the possibilities to import the LPG, the only viable alternative solution is to replace the CFCs by hydrocarbon mixture of propane/butane as aerosol propellants. The mentioned substances are used as the main replacement products for CFCs in the production of aerosols. Among the advantages of hydrocarbon aerosol propellants, the following could be mentioned:

- They have similar spray patterns as CFCs.
- They are very stable in the formulations and in time.
- They do not affect the ozone layer.

One of the main disadvantages of the hydrocarbons is their extreme flammability; this implies the need for special care in handling and storage practices.

Because of the above and taking into consideration that the company intends to expand the production of aerosols for the satisfaction of the growing local demand, (in the post war period many Lebanese are returning to the country) it is important to give special attention to complete the conversion of the production lines and to install the necessary gas house as well as safety facilities. Utilizing the available filling machine, the company will be able to do product filling, valve insertion and crimping, and then do the gas filling with LPG in a separate gas house. The gassed cans will come back for water bath testing, capping and packing.

The assistance required through the project is sought for:

A.- Procurement of a necessary gas filling system with external gas house and safety control system.

B.- Gas transfer and purification of LPG.

C.- Assistance for the preparation of engineering design, performance of construction works, installation of the equipment, commissioning of the plant and training of the personnel.

The major components of the project are the complete conversion of the filling line and the safe supply, storage and distribution of LPG to the factory.

Detailed description of project requirements are as follow:

A. New gas filling system :

A.1.-New separate rotary indexing gassing system is needed for the filling line to be placed in a special room which have to be prepared for the above in the adjacent area to the aerosol plant; the required system should include:
*-Stainless steel cabin complete with armoured entry door with porthole and ejectable rear door. 2 ways suction system. Barrier ventilation system on conveyor. 6 position device for cans handling under the filling heads, complete with size set for two cans diameters.Checking devise for cans inlet/outlet to and from the cabin
*-2 gas filling stations from 0-330 ml each, each consisting of: gas cylinder up to 330 ml and approaching cylinders; gas filling heads with adaptor for two types of valves; head holding valve.
*-Rapid pneumatic adjustment system for gas supply.
*-Explosion proof electric panel
*-Conveyors and motorization system for the cans built in antistatic material.

*-Detecting system for propane-butane propellant gas with the required valves,
*-Spare parts for two years operation.
Estimated cost US$150,000

A.2.- Universal test bath with can holders of synthetic material to avoid scratching of cans, adaptable to two different dimensions of cans as minimum with:
*- mechanical group for sorting, holding and releasing the cans
*-a chain conveyor system
*-an insulated tank made of stainless steel
*- electric water heating system equipped with control and adjustment for the temperature.
*-air blowing device to dry the cans in the exit of the tank
*-connecting conveyor lines to the filling and packaging line.
*-spare parts for two years operation.
Estimated Cost US$130,000

A.3.-Conveyor line and motorization system: About 20 m length with two drive ends with pignons for conveyor movement, with two drive motors and supporting feet and bracket for conveyor support; plus two round tables to connect from the filling machine to the gas house and from the gas house to the water bath.
Estimated price: US $40,000

A.4.-Codding unit for cans, completed with motor, set of tools and codes.
Estimated cost: US$ 15,000

A.5.-Semi-automatic gas detector with the following characteristics: capable to detect any micro-leak by means of an electronic system which measures the volume of the escaping vapour. The defective cans will be automatically rejected. The equipment specifications are as follows:
*-50 units/min capacity
*-sensitivity: 0.003 CC gas vapour loss per minute
*-supply pressure: 8-10 bar
*-To locate micro leaks form micro pressure packs filled with compressed gasses which are not detectable in a conventional water bath testing system.
Estimated cost: US $40,000

A.6.-Explosion proof ventilation system for the filling room.Details will be completed with the engineering designs.
Estimated cost US $6,000

A.7.-Explosion proof lighting system as per the requirements of the engineering designs.
Estimated cost US $8,000

B. LPG storage, purification and transfer system to the filling machine.The system includes:

B.1.-Two LPG isotainers of 15 Tons capacity each (40 cubic meters each); fully equipped with all necessary valves and gauges; and two LPG containers of 50 cubic meters capacity each.
Estimated total cost: US $180,000.

B.2.-One off-loading pump 200 l/min (for propane/butane/isobutane); including skid, pipes and valves. Flameproof motor.
Estimated cost: US $10,000

B.3.- One transfer pump (30 L/min), complete with flameproof motor, including skid with valves and fittings.
Estimated cost: US $8,000

B.4.- One multi-stage centrifugal process pump (30 L/min). Differential pressure of 125 psi. Including skid, valve and fittings.
Estimated cost US $13,000

B.5.-One set of pipework fittings within tank farm and flow return lines comprising:
*-Set of valves and special fittings within tank farm for butane & propane to include off-loading vapour flow and return and destenching pipework. With back pressure regulating valves and two automatic safety shut off valves.
Estimated cost US $30,000

B.6.-Tank farm control panel including all controls and circuits for off loading, transfer and recirculation pumps; five channels gas detectors, interface relays for connection with filling rooms controls and factory fire protection systems.
Estimated cost US $35,000

B.7.-One destenching column set for propane/butane and associated equipment including:
*- Three absorber columns 18" diameter having bottom support grid, comprising 250 micron stainless steel mesh, sandwiched between 6 mm thick perforated late grids. Manufactured with BS5500 Category II requirements for a throughput of 30 L/min and columns 18" diameter x 3 meters long designed to meet the sieve velocity limits and holding 14 cubic feet of sieve.
Estimated price US $60,000

B.8.- Pipework support gantry to bridge between the tank farm and filling room. Approximately 15 meters. Estimated cost US $9,000

B.9.-Supply of all components for the deluge system and performance of installation works for protection of the LPG storage and distribution area

The equipment supply will include:
- one jockey pump to maintain the water pressure in the system. Capacity and head to be decided when the engineering designs of the plant are complete.
- one main deluge valve.
- one compressor for air detection system pressurization. Capacity has to be decided when the engineering designs of the plant are ready
- one flow providing system
- one set of control and isolating valves
- two solenoids dump valves.
- two manual dump valves.
- one control panel for electric and diesel pump sets
- one distribution board for pump house power users
- one set of cables for pump house excluding main supplies to pump controllers and control panel

Estimated cost US $50,000

C. ASSISTANCE IN DESIGNING, INSTALLATION, COMMISSIONING AND TRAINING

The services required for the implementation of the project will include:

-Assistance in the performance and supervision of the engineering designs for the new modification of the plant facilities for a period of one month.

-Assistance in installation and commissioning of the plant, including the gassing house and the gas tank farm, for 30 days.

-Assistance in training of the personnel in production, quality control and safety procedures for 30 days.

OTHER REQUIREMENTS

In addition to the above- mentioned equipment and services, the project requires other services, equipment and materials. ZEENNI'S TRADING AGENCY has already invested in the land, construction of the new building for the filling line, construction of a special area for the storehouse, as mentioned above, and supply of equipment as indicated in Annex D.

The additional needs listed below will also be covered by ZEENNI'S TRADE AGENCY.

- elaboration of all technological and engineering designs for the completion of plant facilities and LPG storage and purification according to the international requirements.

- performance of additionally required civil construction and installation works for the aerosol plant which are indispensable in order to allow the plant to work with flammable solvents, including LPG storage, gas house and warehouses.

- local consulting engineers to manage the project in the different stages.
-relocation of the existing equipment in the new facility.
-performance of installation works and commissioning of the new plant.

JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGIES

There are different possibilities to replace the CFCs as propellants for the industrial production of aerosols. Among the existing technological alternatives the following can also be mentioned:

- Utilization of compressed air or gas.
- Utilization of pressure capsules.
- Utilization of hydrocarbon propellants.

The first two alternatives are not commercially feasible, as these alternatives do not produce good spray systems and the cost of phasing-out the CFC utilizing those alternatives would be very high. In principle, those alternatives are based on the introduction of constructive modifications and additions to the cans, valves and formulations of the products.

Hydrocarbon aerosol propellants are used more than any other propellant as the main replacement for CFCs. They are readily available, give good spray patterns, and do not affect the ozone layer. Hydrocarbons are the only propellants which give a good performance on the formulation elaborated by ZEENNI'S TRADING AGENCY. Based on the facts given above, and taking into consideration that the required hydrocarbon mixture could be made available in the country, it was recommended to perform the phase-out utilizing hydrocarbon propellants.

PROJECT IMPLEMENTATION

The project will include the supply of some equipment, installation materials, services for design, installation and commissioning, and on-the-job training services of ZEENNI'S TRADING AGENCY staff, as indicated above. In order to guarantee a proper transfer, in particular of the new aerosol technology using the highly flammable hydrocarbon propellants, the selected contractor is requested to issue an "Operational Safety Statement" for the recommended technological solution.

For the operation of such technology using highly flammable and explosive materials, the authorization for the operation must be received from the related national authority; and the production lines have to be regularly controlled by the responsible local authority, which should be already involved at the stage of engineering of the plant modifications to avoid further difficulties during the construction and commissioning of the plant.

Any construction work needed to accommodate the equipment for the new aerosol technology using hydrocarbons will have to be carried out by ZEENNI'S TRADING AGENCY. The details are not reflected in the project budget. The specification for construction work will be elaborated by the local construction company after project approval and as an outcome of the necessary site inspection and discussions with plant staff.

It is estimated that after 12 months the complete conversion of the factory will be carried out.

The proposed tentative work plan for the project implementation is indicated below.

TIME SCHEDULE.

ACTIVITIES	MONTHS 0	2	4	6	8	10	12	14	16	18
General:										
01. Project approval.Reception of funds.	X									
02. Preparation of detailed work plan.	X									
03. Elaboration of engineering designs and consultations with local authority.	XXX									
Civil Construction works:										
04. Approval certificate from local authority to start the completion and installation works.	X									
05. Installation of plant equipment,				XXX						
06. Completion of deluge systen and location of sensors.				XXXX						
07. Deluge storage area and tank ready and tested.					XX					
LPG storage:										
08. Negotiations and purchase of LPG tanks and materials.			XX							
09. Purchase of local materials for the system.			XX							
Gas filling equipment:										
10. Selection of equipment.			X							
11. Purchase of equipment.			XX							
12. Installation of equipment and commissioning.						XXX				
Training:										
13. Training of the staff in- situ.							XX			
Certification:										
14. Project final report and certification.									X	

PROJECT COSTS

I. INVESTMENT COSTS

The investment costs will cover incremental capital investment costs for modification of manufacturing facilities, new machinery, materials, testing equipment, training, installation and consultancy services for modifications. Incremental capital investment cost break-down is shown in Annex A.

The cost of CIF transportation and insurance of provided equipment is included in the budget.

II. INCREMENTAL OPERATING COSTS

In fully converting from CFCs to hydrocarbons, some operating costs will increase while others may decrease. As described bellow, ZEENNI'S TRADING AGENCY would not realize any net incremental operating costs or savings by converting the production process to LPG.

The following costs per unit will certainly increase:

-electricity
-ethanol 99.9%
-amortization costs, due to the new investment
-advertising costs: it is necessary to convince the customers that they are receiving the same dosage as with the previous formulations, and also that they are receiving environmentally safe products, mainly when the weight of the same size can will drop almost to half of the usual one produced with CFC-12.

The following costs will certainly decrease:

-LPG cost will be approximately US $ 1.70 per kg., compared with the cost of the CFC-11/12 mixture which is US $ 3.20 per kg.

There would be a slight increase in maintenance cost when the plant phases-out the production to the use of LPGs.

Details of the cost of materials for the production of aerosols with LPG are indicated below.

Comparative cost analysis of aerosols production*

MATERIAL	QUANTITY	PRICE	COST
WITH LPG	G/300 ML filled CAN	IN US$	IN US$
Ethanol 99.9%	100.0	2.70	0.270
Butanene/Propane	100.0	1.70	0.170
estimated increase in electricity cost**			0.070
Additional Amortization ***			0.030
Estimated total cost with LPG			0.540
WITH CFC-11/12			
CFC-12 only	200	3.20	0.64

*-The analysis refers only to propellant consumption and costs related to conversion.
**-Due to security measures and fire extinction system.
***-Due to new investment.

III. CONTINGENCY FUND

A contingency fund (10% of the total budget), proposed to cover unforeseen expenses which might incur during the project implementation, is included in the funding requested from the Multilateral Fund of the Montreal Protocol.

D. TOTAL COSTS

COST COMPONENT	US$
- Incremental investment cost (See (Annex A: "Equipment Specification and cost breakdown and Annex B	928,400
- The net incremental operating cost(as above)	NIL
- Executing agency's overhead cost (13% of MP financing costs).	120,692
- For the complete cost breakdown (Annex B: "Project Budget"). - For the calculation of the unit abatement cost (Annex C:"Unit Abatement Cost").	
-Total requested funding from the MFMP	1,049092

ANNEX A:

Investment with equipment specification and cost breakdown.

Description	Qty	Unit cost US$	Total cost US$
A. Filling line:			
A.1.Gas filling house	1	150 000	150 000
A.2.Water bath with drying tunnel	1	130 000	130 000
A.3.Conveyor line & motorization	1	40 000	40 000
A.4.Codding Unit	1	15 000	15 000
A.5.Semi-automatic gas detector	1	40 000	40 000
A.6.Explosion proof ventilation	1	6 000	6 000
A.7.Explosion proof lighting system	1	8 000	8 000
Sub total filling line			389 000
B. LPG bulk storage			
B.1.LPG storage tanks	4	45 000	180 000
B.2.Propane/butane pump	1	10 000	10 000
B.3.Transfer pump	1	8 000	8 000
B.4.Centrifugal process pump	1	13 000	13 000
B.5.Pipes and fittings (set)	1	30 000	30 000
B.6.Tank farm control panel	1	35 000	35 000
B.7.Destenching columns set	1	60 000	60 000
B.8.Pipework support set	1	9 000	9 000
B.9.Components for deluge system	Set	50 000	50 000
Sub total LPG storage			395 000
TOTAL EQUIPMENT			784 000

Tax & customs are not included in the price of machinery and will not be covered by this project.

EQUIPMENT SPECIFICATIONS

A. New gas filling system :

A.1.-A new separate rotary indexing gassing system is needed for the filling line, to be placed in the ares already built in the aerosol plant; the required system should include:
*Stainless steel cabin complete with armoured entry door with porthole and ejectable rear door. 2 ways-suction system. Barrier ventilation system on conveyor. 6 position device for cans handling under the filling heads, complete with size set for two cans diameters. Checking device for cans inlet/outlet to and from the cabin.
*-2 gas filling stations from 0-330 ml each, each consisting of: gas cylinder up to 330 ml and approaching cylinders; gas filling heads with adaptor for two types of valves; head holding valve.
*-Rapid pneumatic adjustment system for gas supply.
*-Explosion-proof electric panel.
*-Conveyors and motorization system for the cans built of in antistatic material.
*-Detecting system for propane-butane propellant gas with the required valves,
Estimated cost: US $150,000.

A.2.- Universal test bath with can holders of synthetic material to avoid scratching of cans, adaptable to different dimensions of cans with:
*- mechanical group for sorting, holding and releasing the cans
*-a chain conveyor system.
*-an insulated tank made of stainless steel.
*- electric water heating system equipped with control and adjustment for the temperature.
*-air blowing device to dry the cans in the exit of the tank.
*-connecting conveyor lines to the filling and packaging line.
Estimated cost: US $130,000.

A.3.-Conveyor line and motorization system: About 20 m length with two drive ends with pinons for conveyor movement, with two drive motors and supporting feet and bracket for conveyor support; plus two round tables to connect from the filling machine to the gas house and from the gas house to the water bath.
Estimated cost: US $40,000.

A.4.-Codding unit for cans, complete with motor, set of tools and codes.
Estimated cost: US $15,000.

A.5.-Semi-automatic gas detector with the following characteristics: Capable to detect any micro-leak by means of an electronic system which measures the volume of the escaping vapour. The defective cans will be automatically rejected. The equipment specifications are as follows:
*-50 units/min capacity.
*-sensitivity: 0.003 CC gas vapour loss per minute.
*-supply pressure: 8-10 bar.
*-To locate micro leaks form micro pressure packs filled with compressed gasses which are not detectable in a conventional water bath testing system.
Estimated cost: US $40,000

A.6.-Explosion-proof ventilation system for the filling room. Details will be completed with the engineering designs.
Estimated cost: US $6,000.

A.7.-Explosion-proof lighting system according to the requirements of the engineering designs.
Estimated cost: US $8,000

B. LPG storage, purification and transfer system to the filling machine. The system includes:

B.1.-Two LPG isotainers of 15 Tons capacity each (40 cubic meters each) off loading system with the pump; one low pressure transfer pump with pipe work to the filling machine and one molecular sieve filter with necessary valves and fittings; one high-pressure transfer pump which will be combined with the LPG purification system that works with the molecular sieve. The length of columns will be two meters with a diameter of 4 inches. The throughput will be as maximum 10 litres per minute, and the flow speed of the LPG will be at the tolerable limit of the molecular sieve; and two LPG storage tanks of 50 cubic meters capacity each.
Estimated cost: US $180,000

B.2.- One off loading pump 200 l/min (for propane/butane); including skid, pipes and valves. Flameproof motor.
Estimated cost: US $10,000

B.3.- One transfer pump (30 L/min), complete with flameproof motor, including skid with valves and fittings.
Estimated cost US $8,000.

B.4.- One multi-stage centrifugal process pump (30 L/min). Differential pressure of 125 psi, including skid, valve and fittings.
Estimated cost: US $13,000.

B.5.-One set of pipework fittings within tank farm and flow return lines comprised of:

*-Set of valves and special fittings within tank farm for butane & propane to include off-loading vapour flow and return and destenching pipework. With back pressure regulating valves and two automatic safety shut off valves.
Estimated cost: US $30,000

B.6.-Tank farm control panel comprised of all controls and circuits for off loading, transfer and recirculation pumps; five channels gas detectors, interface relays for connection with filling rooms controls and factory fire protection systems.
Estimated cost: US $35,000.

B.7.-One destenching column set for propane/butane and associated equipment comprised of:
*- Three absorber columns 18" diameter having bottom support grid, comprising 250 micron stainless steel mesh, sandwiched between 6 mm thick perforated late grids. Manufactured with BS5500 Category II requirements for a throughput of 30 L/min and columns 18"diameter x 3 meters long designed to meet the sieve velocity limits and holding 14 cubic feet of sieve.
Estimated cost: US $60,000.

B.8.- Pipework support gantry to bridge between the tank farm and filling room. Approximately 15 meters.
Estimated cost: US $9,000.

B.9.-Components for deluge system as follows:
- one jockey pump to maintain the water pressure in the system. Capacity and head to be decided when the engineering designs of the plant are completed.
- one main deluge valve.
- one compressor for air detection system pressurization. Capacity has to be decided when the engineering designs of the plant are ready.
- one flow providing system.
- one set of control and isolating valves
- two solenoids dump valves.
- two manual dump valves.
- one control panel for electric and diesel pump sets.
- one distribution board for pump house power users.
- one set of cables for pump house, excluding main supplies to pump controllers and control panel.
Estimated cost: US $50,000.

ANNEX B

PROJECT BUDGET .

Description	Duration w/m	Budget US$
I-EQUIPMENT		
Filling line equipment,as indicated in Annex A		389 000
LPG bulk storage equipment, as per Annex A		395 000
II-TOTAL CONSULTANCY SERVICES*		
Total Consultancy services for:	3.0	60 000
-Supervision of engineering designs and construction works. (two visits)	1.0	20 000
-Assistance for installation of machinery and LPG system	1.0	20 000
-Assistance for commissioning and training	1.0	20 000
III-MISCELLANEOUS Contingency Fund (10% of the costs of all equipment and services)		84 400
Total(I+II+III).....		928 400

*The above indicated costs include air fare, hotel accommodation costs and subsistence costs during the missions.

-Tax and custom duty are not included in the prices for the machinery and will not be covered by this project.

ANNEX C

UNIT ABATEMENT COST

A	ODS PHASE-OUT		TOTAL PROJECT
A1	Average use of CFC-11	MT	0.0
A2	ODP of CFC-11		1
A3	ODP-weighted CFC-11 phased-out (A1xA2)	MT	0.0
A4	Average of CFC-12 per year	MT	212
A5	ODP of CFC-12		1
A6	ODP weighted CFC-12 phased out (A4xA5)	MT	212
A7	Average use of CFC-114 per year	MT	0.0
A8	ODP of CFC-114		1
A9	ODP weighted CFC-114 phased out	MT	0.0
A10	Total ODP weighted phase-out	MT	212
B	Annualized capital cost		
B1	Total investment cost (model redefinition+ production conversion)	US$	928,400
B2	Equipment life	Year	10
B3	Discount rate	%	10
B4	Annualized capital cost (B1x0.1627)	US$	151,051
C	Annual incremental recurrent cost	US$	0.0
D	Unit Abatement cost		
D1	Annualized capital cost per Kg ODS phased out (B4/(A10x1000)	$/kg	0.712
D2	Annual 1/2 incremental recurrent cost per ODS phased out (C/A7x1000)	$/kg	0.0
D3	Unit abatement cost (D1+D2)	$/kg	0.712

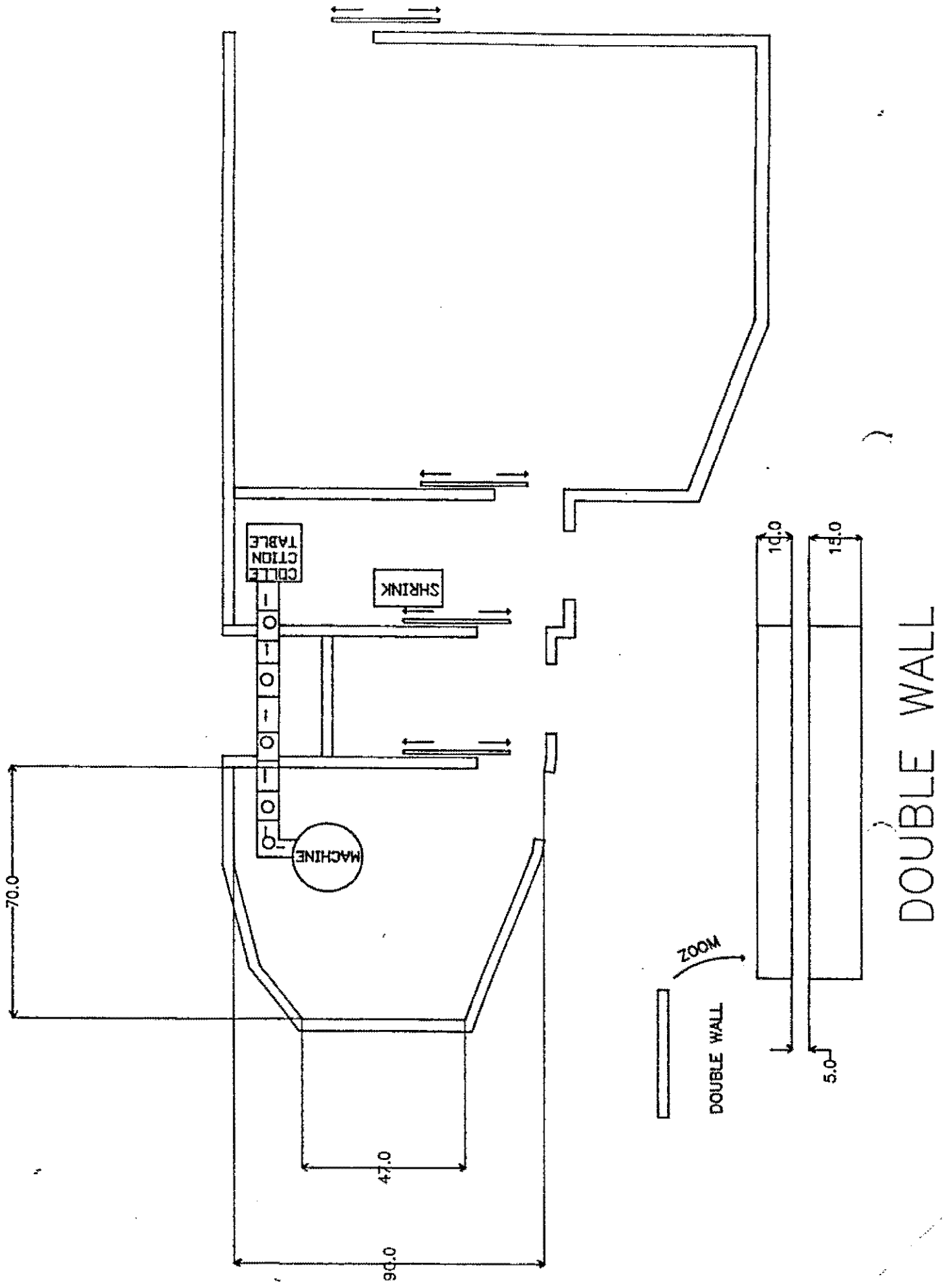
ANNEX D

CONTRIBUTION OF ZEENNI'S TRADING AGENCY TO THE PROJECT.

ACTIVITY	COST IN US $
-Cost of additional land (circa 8000 square meters)	400,000
-Civil construction works and installation	300,000
-Additional utility services (water, electricity, air)	150,000
-Improvement to safety and fire extinction system	80,000
-Quality control instruments and equipment	11,000
-Modernization of the production line (explosion-proof motor mixing tank and measuring appliances)	18,000
-Technological and engineering designs	20,000
-Project management cost for local consultancy company	15,000
Total	994,000

Zenni's Trading Co.

ANNEX E



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1. Country of origin:	**The Republic of Lebanon**
2. Project title:	**Investment Project for phasing out CFCs at ZEENNI'S TRADING AGENCY**
3. Sector covered:	**Aerosols**
4. Relationship to Country programme:	**The programme was prepared in line with with the ratification of the Montreal Protocol on March 31, 1993.**

5. Technology:

5.1. The chosen alternatives of Propan-Butan (HAPs) as Aerosol Propellants are the only alternative of this project.

5.2. The technologies in formulating Propan-Butan Aerosols have been known since a long time. Most of the products can be reformulated without problem.

5.3. Regarding safety there is a lot of general knowledge available throughout the world.

6. Environment Impact:

6.1. HAPs have zero ODS

6.2. The appropriate measures to minimize health and safety impact are dealt within the project.

Cont/....

7. Project costs:

7.1. The existing filling machine is presently placed in the main production room. Also the propellant filling is done on the same machine. This was ok when working with CFCs.

To work with HAPs the propellant filling was to be separated and the layout of the aerosol filling line must be newly arranged. The existing building has to be adapted to adequate safety. A new ventilation system and gas detectors must be installed.

A new gas storage aerea has to be built which includes storage tanks, purification and delivery to filling machine. The purification system by molecular sieve is necessary as a backup if local gas has to be purchased.

7.2. Cost of equipment:
The existing equipment will be integrated into the new layout with certain modifications.

7.3. There is no request for additional equipment. All equipment asked for is justifiable.

7.4. The modification of the existing equipment and the build up of the complete line will not increase the basic output. But the new layout will stand for the latest technology and safety recommendations in Aerosol-Manufacturing.

7.5. Start up commissioning costs.
The amount of consulting commissioning and training costs on site seem to be appropriate. Additional training and instruction in safety procedures is very important.

7.6. Operating costs:
The operating costs of the filling station working with HAPs will be a little higher. This is due to more frequent maintenance work and additional safety checks.

Cont/.....

7.5. Other costs:
A contingency of 10 % of all equipment and services is included. This is justifiable. Implementing agency overhead costs are reasonable.

7.6. Cost effectivness:
The unit abatement cost of US$ 0,805/kg is on a medium level. The project includes a good level of cost effectivness over the lifetime of the project. The investment is relatively high per ODP tonne phase out.

7.7. Implementation time:
The proposed implementation time is realistic. 18 months is sufficient for planning manufacturing and installation.

8. Recommendations

The overall project is realistic. The costs are kept to the necessary level to guarantee a safe and trouble free operation.

Joe Walker

June 6, 1995