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PROJECT COVER

Country/Region:	REPUBLIC OF SUDAN
Project title:	Phasing out CFCs at SUDANESE COSMETICS & HOUSEHOLD PRODUCTS Ltd.
Sector Covered:	AEROSOLS
ODS Consumption in this Sector:	In 1993 ODS consumption in the sector was 281.5 MT of CFC composed of 72 MT of CFC-11, 204 MT of CFC-12 and 5.5 MT of CFC-114.
Project impact:	Phase-out of 281.5 MT of CFC used for production of 3 million cans of aerosols in 1997.
Project duration:	18 months
Project economic lifetime:	10 years
Total proposed project cost:	US $1,014,288
Project investment cost:	US $897,600
Incremental Operating Cost: (6 months operational cost)	US $0.00
Implementing Agency's overheads:	US $116,688
Proposed MF financing:	US $1,014,288
Cost effectiveness:	See Annex C: Unit Abatement cost
Counterpart enterprise:	SUDANESE COSMETICS & HOUSEHOLDS PRODUCTS ,KHARTOUM, SUDAN
Implementing Agency:	UNIDO
National Coordinating Agency:	Higher Council for Environment and National Resources.

PROJECT SUMMARY

Through the implementation of the project 100% of the CFC used as aerosol propellants (72 MT of CFC-11; 204 MT of CFC-12 and 5.5 MT of CFC-114) at SUDANESE COSMETICS & HOUSEHOLDS PRODUCT Ltd., will be phased out; i.e., 100% of CFCs used in aerosol production in Sudan will be phased out as the enterprise is the only producer of aerosols in Sudan.

The project objective is to phase out chlorofluorocarbons (CFC) as aerosol propellants. This will be achieved by installing a completely new filling line in a newly selected industrial area following the established requirements for hydrocarbon aerosol propellants. The installation of such a facility will make it possible to phase out about 281.5 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 CFC filling lines to hydrocarbon propellants; the installation of hydrocarbon gas storage and treatment, as well as the necessary system for quality control and the requirements for fire and explosion protection for the operation of the plant.

The consumption of CFCs in SUDANESE COSMETICS & HOUSEHOLD PRODUCTS Ltd. for the production of aerosols amounts to 281.5 MT per year. The mentioned figures correspond to an average production of aerosols amounting to 3 million units. If no conversion were to take place, the estimated consumption of CFCs in production of aerosols in Sudan is estimated at 400 MT per year for the next 5 years.

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 the industry oriented to the satisfaction of daily needs. Aerosols are used for application of different products such as insecticides, paints, air fresheners, hair sprays, deodorants, hair mousses, shaving lather, medicinal products and products used in 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 aerosol production in industrialized countries; nevertheless, they are able to cover the local needs for some products at

competitive margins. Table No.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 No.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

Due to climatic and hygienic conditions, special attention has been given to the production of aerosols in Sudan. The aerosol sector comprises an important part of Sudan's industrial infrastructure. It is connected to the local markets and consumers through a well established distribution network. The sector demand for CFCs is increasing rapidly resulting in the unconstrained forecast consumption of ODS for 2000-2010 as shown

below.

YEAR	TONS OF CFC
2000	378.0
2005	445.0
2010	540.0

Aerosols are produced in the country mainly as insecticide formulations such as PIF PAF, etc.

In 1992 Sudan established the Higher Council for Environment and Natural Resources, which is responsible for:

- The coordination of environmental and natural resources and related activities, carried out at national, regional and international levels in which the country is represented.
- The preparation of a long-term and environmentally sound development plan.
- The establishment of technical committees or councils to assist the Higher Council for Environment and Natural Resources in managing environmental problems.
- Obtaining funds from the government and from local and international organizations to support the effective running of the Council.

In 1993, the Higher Council established the National Committee for the Implementation of the Montreal Protocol. The Committee is chaired by the first under-secretary of the Ministry of Industry. The Ministries of Labour and Social Affairs, Health, Finance and Interior, as well as the Sudan University of Science and Technology, and the National Council for Research are active members of the Committee. Also some non-governmental organizations such as the Sudanese Industries Association, the Association of Refrigeration Manufacturers, one major ODS importer and one major ODS user are members of the Committee.

The role of the National Committee is to be the main consultative body in all ODS and Montreal Protocol related issues.

In the framework of the National Country Programme for the phase-out of ozone depleting substances in various sectors of the industrial production in Sudan, the government has selected as a priority enterprise SUDANESE COSMETICS & HOUSEHOLDS PRODUCTS, which is a national enterprise with vast experience in the production of aerosols. The plant has manufactured insecticides, deodorants, toilettes and body perfumes using CFC-11, 12 and 114. The programme is to maintain and even increase the level of production and to eliminate CFCs from the industrial practice. Sudan is considered one of the most needy Least Developed

Countries in the world and requires special attention from international organizations to achieve better living standards through industrialization and better utilization of available resources.

The government plans to promote and motivate the industrial development of natural resources by introducing modern clean technologies and modernizing those already existing.

The Ministry of Industry has expressed interest in having the phase-out implemented as an important step towards the sustainable industrial development of the country.

The population of Sudan reached 25 million inhabitants in 1993; it is growing at a rate of 2.6% per year and is expected to reach 30 million by the year 2000 and 43 million by the year 2010. The population is expected to double in 23 years.

Sudan does not produce any CFCs; all utilized CFCs for industrial production are imported.

SUDANESE COSMETICS & HOUSEHOLDS PRODUCTS BACKGROUND

The company is the only producer of insecticides in Sudan and started their manufacture in the form of aerosols working with two small capacity manual DUAL PACK machines from AEROFILL.

A list of the major aerosol formulations manufactured during the past years is shown in Table No.2.

Table No. 2 Main aerosol products manufactured in Sudan

TRADE NAME	TYPE OF PRODUCT
PIF PAF	Insecticide
Mary Rose	Eau de parfum
Adriano	Deodorant
Gentleman	Deodorant
Monera	Deodorant
Rastell	Eau de parfum

CFCs in Sudan have to be imported - mainly from Europe. After the conversion, ingredients for the manufacture of insecticides such as odourless kerosene and propane-butane will be purchased from local manufacturers.

The company has its own research laboratory for the development of its original formulations and also produces some products under license from European manufacturers.

The company has installed two stand-by electric generators of 300 kw total capacity which guarantee the operation of the plant under present conditions when there is a breakdown in the electricity supply. The company also has its own maintenance workshop and the necessary stock of spare parts for one year's operation of the plant.

The main filling line under operation at SUDANESE COSMETICS & HOUSEHOLD PRODUCTS includes the following unitary operations which are manually performed: can loading; product filling and manual placement of the valve, crimping and gas filling are also manually performed; water bath testing, drying, cap placing and case packing are all manually performed activities.

The industrial facility operates in two shifts of 8 hours during 300 days per year.

The difference between the actual production and the installed capacity is a result of the following:

- Difficulties in obtaining financing (hard currency) for import of raw materials, specifically CFCs due to price increases.
- Since 1991 the purchase of CFC propellants has been difficult.

PROJECT OBJECTIVE

The objective of the project is to completely phase out the use of 281.5 MT of CFC per year (72 MT of CFC-11; 204 MT of CFC-12 and 5.5 MT of CFC-114) as aerosol propellants in Sudan, by converting the production facility at SUDANESE COSMETICS & HOUSEHOLD PRODUCTS from a CFC utilizing installation to a hydrocarbon based production process in the field of aerosols.

The phasing out of CFCs could reach 400 MT per year in the next 7-10 years. The total project impact, therefore, will be the phasing out of a minimum of 2,800 MT of ODS in the next 7 to 10 years.

PROJECT DESCRIPTION

SUDANESE COSMETICS & HOUSEHOLD PRODUCTS is prepared to phase out the use of 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 local availability of raw materials, it is suggested to replace CFCs with hydrocarbon 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 to satisfy the growing local demand, it is suggested to transfer the existing production lines to another area where it could be possible to more safely utilize the hydrocarbons and to install the necessary safety installations.

For the conversion of the production to LPG, SUDANESE COSMETICS & HOUSEHOLDS PRODUCTS can use the same machines for product filling, valve insertion and crimping, and then the cans will be sent outside for gas filling with LPG. The gassed cans will come back for water bath testing, capping and packing.

For safety reasons, the existing filling room at SUDANESE COSMETICS & HOUSEHOLD PRODUCTS is not appropriate for the production of aerosols utilizing hydrocarbons as a propellant.

The company has purchased some land, and is planning to build a new facility for the production of aerosols, where the gas filling process will take place outside the product filling room. For the above a special platform as well as the access for the LPG cars and loading process will be built. A protective fence and special security area for the storage of LPG will also be built by the company.

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 the bulk storage tank.

A detailed description of 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; the required system should include:

* The gassing machine with two propellant filling heads, which should be guarded with primary enclosure for the ventilation system and also act as a mechanical protection. The machine will be installed in the gas house. Estimated capacity is 50 cans per minute, depending on can size and valve type.

A.2. One rotary table and conveyers to and from the gas house

A.3. New water test bath for the filling line with can drying system. The main characteristics of the system are indicated in Annex A.

A.4. A special hydrocarbon gas filling room complete with ventilation, gas detector system and mounted gas piping system. The gassing machine will be located in the room.

A.5. Two explosion proof fans with ducting system to be located in the filling room.

A.6. A special control system is required for the filling line which also acts as a control for the complete gas house. This control system has to be located in a safe area of the factory and close to the production line and to the access door from the factory to the gas house. Included in the control system is also the gas detection read out. The gas detection system is fully interlocked and operates and controls the ventilation and the LPG shut-off valves.

A.7. Supply of some quality control laboratory equipment will be required to handle flammable propellants. A tentative list of equipment is attached as Annex A.

B. LPG STORAGE, PURIFICATION AND TRANSFER SYSTEM TO THE FILLING MACHINE

The refill of the storage tanks will be done by the gas suppliers by tank truck.

The LPG bulk storage system includes:

B.1. Two LPG tanks of 15 Tons capacity each (40 cubic meters each); off loading system with a 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 molecular sieve. The length of columns will be two meters with a diameter of 4 inches. The throughput will be a maximum of 10 litres per minute, and the flow speed of the LPG will be in the tolerable limit of the molecular sieve.

B.2. Provision of the protection system for the protected areas: two LPG tanks of 40000 litres capacity each, a pump area with molecular sieve filters and the tanker off loading zone.

The equipment supply 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 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 solenoid dump valves;
- two manual dump valves;
- one control panel for electric and diesel pump sets;
- one distribution board for pumphouse power user;
- one set of cables for pumphouse excluding main supplies to pump controllers and control panel.

C. ASSISTANCE FOR DESIGNING, INSTALLATION, COMMISSIONING AND TRAINING

The assistance 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 a month.

Assistance for installation and commissioning of the plant including the gassing house and the gas tank farm, for 60 days.

Assistance for 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. SUDANESE COSMETICS & HOUSEHOLD PRODUCTS agrees to cover the cost of the additional needs as listed below:

- suitable land for the construction of the new aerosol plant, gas storage system and gas house. Circa 3,000 square meters;
- elaboration of all technological and engineering designs for the plant;
- performance of civil construction works for the aerosol plant (including quality control laboratory able to work with flammable solvents), LPG storage, gas house and warehouses;
- supply of water storage tank for the deluge system and installation of the system;
- construction of the pump house for the deluge system;
- supply of electricity to the main production facility and to the pump house;
- 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 CFCs as propellants for industrial production of aerosols. Among the existing technological alternatives it is possible to mention:

- 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 formulations elaborated by SUDANESE COSMETICS & HOUSEHOLD PRODUCTS Ltd.

Based on the above given facts and taking into consideration that the required hydrocarbon mixture for the production of insecticide aerosols (84% of SUDANESE COSMETICS PRODUCTION)is available in the country, it was recommended to perform the phase-out utilizing hydrocarbon propellants. For the production of cosmetics aerosols (about 14 % of the total production), LPG (aerosol grade) has to be imported.

PROJECT IMPLEMENTATION

The project will be implemented by UNIDO in close cooperation with the Ministry of Industry. Local coordination will be carried out by the Higher Council for Environment and National Resources.

The project will include supply of some equipment, installation materials, services for design, installation and commissioning and on-the-job training services of SUDANESE COSMETICS & HOUSEHOLD PRODUCTS Ltd. 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 is needed from the related national authority; and the production lines have to be regularly controlled by the responsible local authority; which should be already involved in the stage of engineering of the plant modifications to avoid further difficulties during the construction and commissioning of the plant.

The final equipment specification, the work plan and consequently the "Operational Safety Statement" can only be elaborated after approval of the basic approach for the 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 SUDANESE COSMETICS & HOUSEHOLD PRODUCTS and 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.

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 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 construction works.	X
05. Building of the plant,concrete platform and roof for LPG and gas house placement.	XXXXXX
06. Acquisition and installation of water storage tank and system.	XXXX
07. Deluge storage area and tank ready and tested	XX
LPG storage	
08. Negotiations and purchase of LPG tank and materials	
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	XXXX
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.

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 below, SUDANESE COSMETICS & HOUSEHOLD PRODUCTS Ltd. would not realize any net incremental operating costs or savings.

The following costs per unit will increase:

- electricity
- kerosene, US$ 2.00/Kg.
- 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 (70% butane, 30% propane) will be approximately US$ 2.00 per kg., compared with the cost of CFC mixture which is US$ 3.00 per kg.

At the present time it is difficult to assure the acceptability of the newly formulated product with LPG by the consumers. The main difference in the finished cans will be that they will be of a lighter weight and the product is flammable. It is obvious that the distributors and the consumers have to be educated about the new type of formulation, otherwise they might not be willing to pay the usual prices because they could believe that the new formulation is a cheap version of the standard product. The light weight of the filled aerosol can is caused by the low density of LPG.

As all ingredients for the formulation are locally available, it should be possible to produce at lower cost. The above will happen only when the technological process is perfectly assimilated and the production volume reaches the usual standard level of production.

There will be a slight increase in maintenance cost when the plant converts production to the use of LPGs.

Details of the cost of materials for the production of aerosols with LPG are indicated in the table below. From the given information it is clear that the production of aerosols utilizing LPG will be less expensive than the same utilizing CFCs.

Comparative cost analysis of aerosols production*

MATERIAL	QUANTITY	PRICE	COST
Woth LPG	G/300 ML filled CAN	IN US$	IN US$
Kerosene	46.0	2.00	0.092
Butane/Propane	128.0	2.00	0.256
Estimated increase in electricity cost**			0.050
Additional Amortization***			0.060
Estimated total cost with LPG			0.458
WITH CFC 11/12			
CFC 11/12 only	210	3.00	0.63

* The analysis refers only to propellant consumption and cost related to conversion.
** Due to security measures and fire extension 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 of the Multilateral Fund for the implementation of the Montreal Protocol.

IV. TOTAL COSTS

COST COMPONENT	US$
- Incremental investment cost See (Annex A: "Equipment Specification and cost breakdown	897,600
No incremental operating cost	
- Executing agency's overhead cost (13% of MP financing costs)	116,688
- For the complete cost breakdown, see (Annex B: "Project Budget")	
- For the calculation of the unit abatement cost, see (Annex C: "Unit Abatement Cost")	
Total requested funding by the MFMP	1,014,288

Contribution of Sudanese Cosmetics & Household Products Ltd., to the project is indicated in Annex D.

ANNEX A

INVESTMENT WITH EQUIPMENT SPECIFICATION AND COST BREAKDOWN

Description	Qty	Unit cost US$	Total cost US$
A. Filling line			
A.1.Gassing indexing unit.	1	40,000	40,000
A.2.Propellant fillers	2	11,500	23,000
A.3.Rotary table	1	13,000	13,000
A.4.Conveyer system	1	40,000	40,000
A.5.Universal test bath	1	102,000	102,000
A.6.Drying tunnel	1	10,000	10,000
A.7.Hydrocarbon filling room	1	102,000	102,000
Sub total: filling line			330,000
B. LPG bulk storage			
B.1.LPG storage tanks	2	60,000	120,000
B.2.Propane/butane pump	1	11,000	11,000
B.3.Transfer pump	1	8,000	8,000
B.4.Centrifugal process pump	1	15,000	15,000
B.5.Pipes and fittings (set)	1	34,000	34,000
B.6.Tank farm control panel	1	35,000	35,000
B.7.Destenching columns set	1	64,000	64,000
B.8.Pipework support set	1	9,000	9,000
B.9.Deluge system	1	130,000	130,000
Sub total: LPG storage			426,000
TOTAL EQUIPMENT			756,000

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

EQUIPMENT SPECIFICATIONS

A. FOR THE FILLING LINE

A.1.-Gassing indexing unit with 16 pocket index mechanism with a stainless steel clad base frame. and tooling set for four can diameters: 35, 45, 52, 65 mm diameter. With silencing manifold and air filter lubricator unit. Base supplied with infeed and outfeed "U" return system. Estimated cost: US $40,000

A.2.-Two propellant fillers with 250 ml stainless steel propellent metering rams fitted with P.T.F.E. seals.
Estimated cost US$ 23,000

A.3.-90 cm. rotary table with single track discharge and variable speed drive with connections to the existing manual filling lines.
Estimated cost: US$ 13,000

A.4.-Conveyer system to and from gas house in straight lines with two 90 degree sections and one straight conveyer along the water test bath length of 9 m.
Estimated cost US$ 40,000

A.5.-One universal test bath for tinplate and aluminum cans with tools for cans of diameter 35, 45, 52, and 65 mm. Drive motor 1.1 KW, EXE flameproof, supplied with steam heating system. Capacity of 50 cans per minute with 3 minutes immersion.
Estimated cost: US$ 102,000.

A.6. Drying tunnel with 3 blower nozzles. Air blower driven by a 1.1 Kw explosion proof motor.
Estimated cost: US$10,000.-

A.7.-One transportable hydrocarbon filling room with overall dimensions 3.00m. long x 1.5m. wide x 2.9m. high. The roofs are to be built with explosion relief, with interlocked doors, with ventilation system with primary and secondary ventilation and two speed explosion proof fans. All ductwork to be installed with flameproof ventilation flow switches. Ventilation stack 3.9 m. above ground level. Gas detection system to be five channel system. Stand-by battery system fully interlocked with controls, exhaust fans, propellent valves, air flow sensors, power supply and filling room door. Included with propellant feed pipework system from external termination point of gas house structure to termination point on aerosol filling machine. ASA 300 flanged one-inch pipework to LPGITA code of practice standards complete with hydrostatic pressure relief valves, Worcester type manual LPG shut-off valve, Worcester type automatic LPG shut-off valve position monitoring, cartridge type propellant filter set with 10 micron filter cartridge.
Estimated cost: US$ 102,000

Sub Total.....US $330,000

LPG BULK STORAGE

B.1.-Two LPG storage tanks of 40 cubic meters capacity each, fully equipped with all necessary valves and gauges.

Unit price US$ 60,000.
Estimated cost: US$ 120,000

B.2.- One off-loading pump 200 l/min (for propane/butane); including skid, pipes and valves. Flameproof motor.
Estimated cost: US $11,000

B.3.- One transfer pump (30 l/min), complete with flameproof motor, including skid with valves and fittings.
Estimated cost: US $8000.

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 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$ 34,000

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

A.7.-One destenching column set for propane/butane and associated equipment comprising:

* 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 foot of sieve.
Estimated price US $64,000.

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

A.9.-Deluge system comprising:
One electrical driven main deluge pump capacity 50 litres per sec.;
One diesel driven stand by deluge pump of same output

as main pump;
One jokey pump to maintain the water pressure;
One main deluge valve;
One compressor for air detection;
One flow providing system;
One main feed pipe length up to 50 m. diameter 5 inches;
Pipework over LPG tanks and off-loading zone;
Two sets of spare heads + 6 spares;
Two sets of detecting nozzles + 6 spares;
One set of control and isolating valves;
Two solenoid dump valves;
Two manual dump valves;
One control panel for electric and diesel pump sets;
One distribution board for pump house excluding main supplies;
Two pump controllers and control panel.

Estimated cost US $130,000

ANNEX B

PROJECT BUDGET

Budget line	Description	Duration w/m		Budget US$
	I. EQUIPMENT			
	Filling line equipment,as indicated in Annex A			330,000
	LPG bulk storage equipment, as per Annex A			426,000
	II. CONSULTANCY SERVICES*			
	- Consultancy services for: supervision of engineering designs and construction works (two visits)	1.0		25,000
	- Assistance for installation of machinery and LPG system		1.0	20,000
	Assistance for commissioning and training		0.7	15,000
	III. MISCELLANEOUS			
	Contingency Fund (10% of the costs of all equipment and services)			81,600
	Sub total(I+II+III)			897,000
	Agency's Overheads (13%)			116,688
	TOTAL			1,014 288

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

NOTES:
1. Tax and customs duty are not included in the prices for the machinery and will not be covered by this project.

ANNEX C

CALCULATION OF UNIT ABATEMENT COST

A	ODS PHASE-OUT		TOTAL PROJECT
A1	Average use of CFC 11	MT	72
A2	ODP of CFC !!		1
A3	ODP-weighted CFC 11 phased out (A1xA2)	MT	72
A4	Average of CFC 12 per year	MT	204
A5	ODP of CFC 12		1
A6	ODP weighted CFC 12 phased out (A4xA5)	MT	204
A7	Average use of CFC 114 per year	MT	5.5
A8	ODP of CFC 114		1
A9	ODP weighted CFC 114 phased out	MT	5.5
A10	Total ODP weighted phase out	MT	281.5
B	Annualized capital cost		
B1	Total investment cost (model redefinition+ production conversion)	US$	1,014,288
B2	Equipment life	Year	10
B3	Discount rate	%	10
B4	Annualized capital cost (B1x0.1627)	US$	165,025
C	Annual incremental recurrent cost	US$	- 0 -
D	Unit Abatement cost		
D1	Annualized capital cost per Kg ODS phased out (B4/(A10x1000)	$/kg	0.586
D2	Annual 1/2 incremental recurrent cost per ODS phased out (C/A/x1000)	$/kg	--
D3	Unit abatement cost (D1+D2)	$/kg	0.586

ANNEX D

Contribution of Sudanese Cosmetics & Household Products Ltd., to the project

I. COST OF LAND AND TRANSFER SERVICES

		LS.
1.	Cost of land	20,000,000
2.	Transfer of machines	10,000,000
	Sub Total (A)	30,000,000

II. COST OF SERVICES - CIVIL CONSTRUCTION AND INSTALLATION WORKS

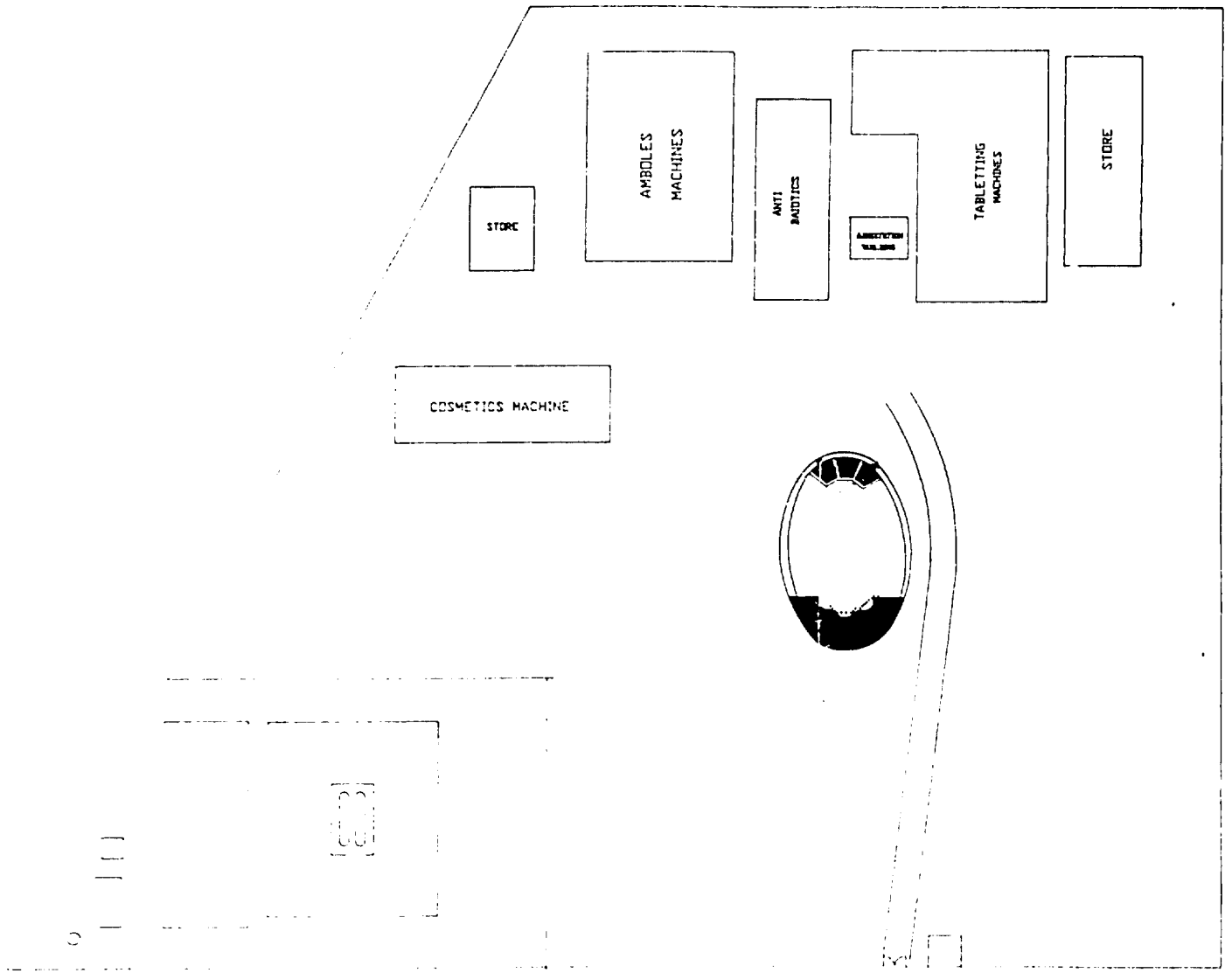
1.	Foundation for two LPG tanks of 15 tonnes capacity each	5,500,000
2.	Pumps foundations and pipes supports	2,000,000
3.	Kuib work for tanks farm	1,000,000
4.	Production area + storage	65,000,000
5.	Petroleum products store	8,500,000
6.	Liquid mixing room	4,000,000
7.	Gas filling room (civil construction)	2,750,000
8.	Boundary fence	3,500,000
9.	Levelling	30,000,000
10.	Electric work	10,000,000
11.	Local installation	15,000,000
12.	Local consultation and commission	8,830,000
	Sub Total	156,080,000
	10% unseen cost	15,608,000
	Sub Total (B)	171,688,000

Total Cost

Sub Total (A)	30,000,000
Sub Total (B)	171,688,000
T o t a l	**201,688,000**

A N N E X E

PROJECT SITE



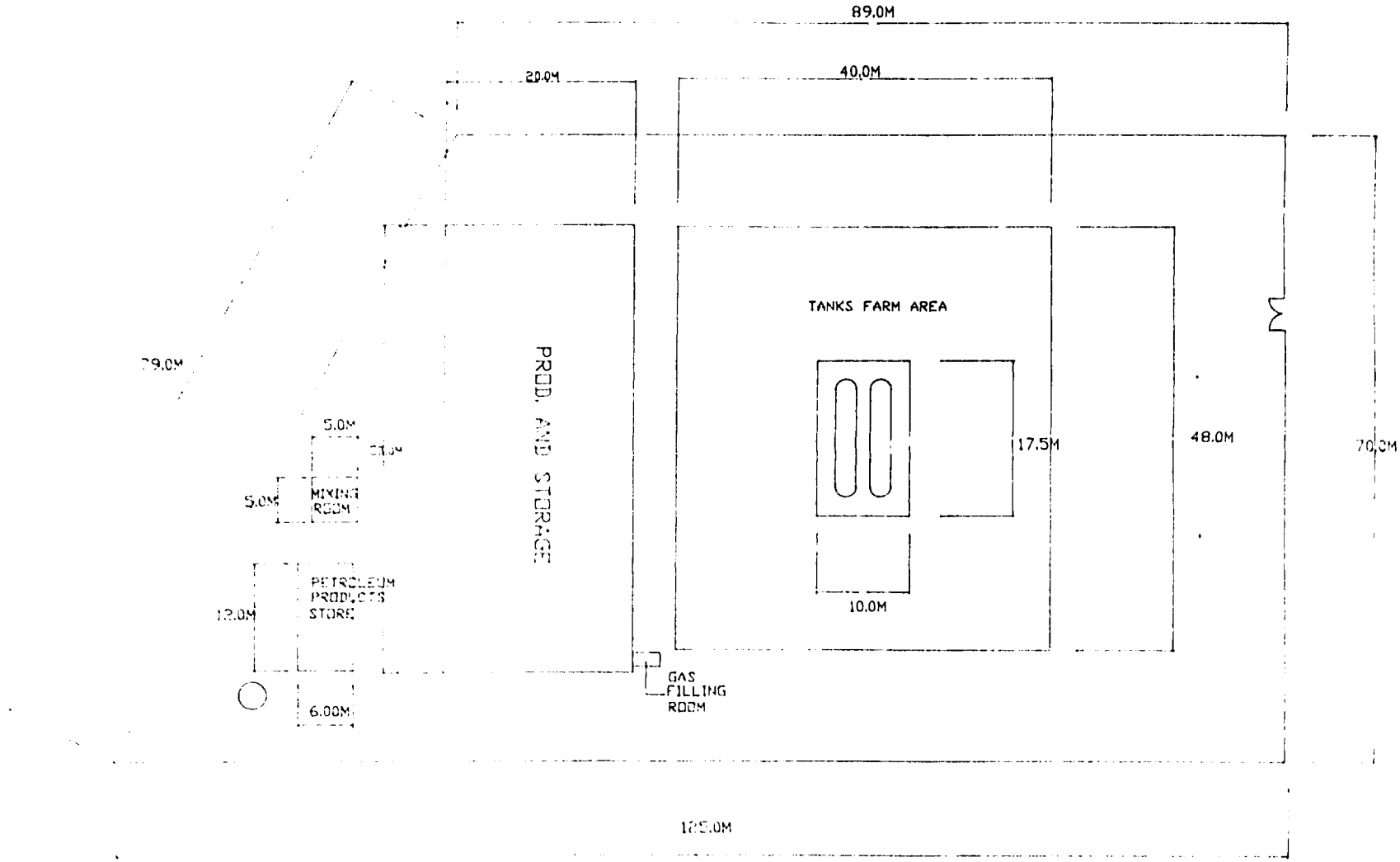
SITE PLAN

SUDANESE COSMETICS & HOUSEHOLD PRODUCT

SCALE 1:10000

A N N E X F

PROJECT LAYOUT



SUDANESE COSMETICS AND HOUSEHOLD PRODUCTS LTD.

Appraisal Notes - Montreal Protocol.

Country/Region : Republic of Sudan

Project Title : Phasing out CFC's at Sudanese Cosmetics and Household Products Limited.

1) Project Aim.

The project would accomplish the positive step of removing 281.5 M.T. of ODS consumption - the entire usage of the Aerosol Industry in the Sudan.

2) Technological Aspect.

The current product range of Sudanese Cosmetics and Household Products Limited ie. insecticides and toiletries can be readily reformulated to utilise LPG aerosol propellants.

There is no practical aerosol propellant alternative for these type of products.

The major advantages of LPG aerosol propellant are :-

- Zero ODS.
- Significantly lower cost than CFC's.
- Local availability for insecticide usage (84% of aerosol production).

The usage of LPG propellants provides the filler with the following problems :-

- The extreme flammability of the propellant requiring special measures for storage pumping and unloading of the bulk propellant.

- the need for a dedicated filling room for the gassing operation with extraction, gas detection and automatic shut-off of the LPG propellant supply.

- The absolute necessity to have 100% Water Bath Testing of the filled aerosols due to the flammable nature of the contents.

- The need for specialised laboratory equipment for re-formulation work and flame extension testing.

- The need to establish positive training and maintenance procedures for the handling, usage and storage of LPG propellants and filled aerosols.

- Cont'd -

3) Equipment Required.

The equipment listed in 'Project Objective' for :-

A. New gas filling system.

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

C. Assistance for designing, installation, commissioning and training.

plus other requirements.

would I Believe enable Sudanese Cosmetics and Household Products Limited to safely utilise LPG propellants for aerosols.

The essential requirement is for sound basic training on all safety procedures and an in-built company structure for continuation and up-dating of safety training.

4) Project Duration.

The project duration of 18 months and the time schedule shown on page 13 are realistic for a conversion from CFC to LPG aerosol propellants.

5) Project Costs.

The equipment specified in annex is all essential for the conversion from CFC to LPG aerosol propellant. The listing appears to be complete with no apparent omissions.

The cost of US $ 330,000 for equipment and US $ 426,000 for LPG bulk storage are realistic.

The total costs for consultancy services, installation, commissioning and training are very reasonable for the nature of the project.

The contingency fund of 10% is justified by the complexity and duration of the project.

Agency overhead of 13% are presumed to be a standard percentage of project costs.

Cont'd -

6) Unit Abatement Cost.

The unit abatement cost of 0.586 $/kg. is appropriate to the annual tonnage 281.5 M.T.

7) Local Contribution.

The items listed for land, transfer services, civil construction and installation are appropriate.

8) Conclusion.

The project to phase out CFC's at Sudanese Cosmetics and Household Products Limited would remove all aerosol usage of CFC's from the Republic of Sudan. Although the quantity is relatively small compared to CFC's eliminated from major aerosol producing countries I believe that the elimination of 281.5 M.T. of ODS to be environmentally beneficial.

The costs are appropriate to the scope of the project.

John F.

J.D. Ferguson. 08-06-95