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PROJECT MP / ALG / 95 / 026

Preparation of investment project for the phase out of CFC 11 in the manufacture of sandwich panels at PROSIDER Berrahal.

PROJECT REPORT

September 95.

PROJECT COVER SHEET

Country	: ALGERIA
Project title	: phasing out of CFC 11 in the manufacture of sandwich panels at PROSIDER Berrahal.
Sectors Covered	: Rigid foam
ODS use in sector (1991)	: 650 mt. of CFC 11
Projec impact	: phase out of annual consumption of 58 mt. CFC1
Project Duration	: 18 mounths
Project Economic Life	: 10 years
Total project Cost	: USD 994,170 (Total of capital cost and incremental operating cost for two years of operation)
Capital cost	: USD 902,000.
Incremental Operating Cost	: USD 92,170 (two years of operation)
Overheads (13 %)	: USD 129,240.
Proposed MF Financing	: USD 1,123,410.
Cost Effectiveness	: USD / Kg 3.45
Counterpart Entreprise	: PROSIDER.
Implementing Agency	: UNIDO
National Coordinating Ministry	: Direction Générale de l'Environnement,Ministère de l'Intérieur des Collectivités Locales, de l'Environnement et de la Réforme Administrative.

PROJECT SUMMARY

This project will phase out 100 percent of the use of CFC 11 (i.e 58 tons based on 1994 consumption) for the production of sandwich panels at PROSIDER Berrahal. The project will include the conversion of the foaming line through the introduction of formulations and procedures for foam injection based upon the use of pentane as blowing agent. The project includes equipement modification, plant conversion, consulting, production trials, testing, training and incremental operating costs for two years.

I. BACKGROUND :

A. Sector Background :

The Algerian industry used in 1991, 650 tons of CFC wich correspond to 650Tons of ODP.
The foam sector represents 9 % of the total consumption of CFC (2, 144 Tons in 1991).
The rigid foam field uses the CFC and is mainly represented by the following national public entreprises:

- ENIEM, for the manufacturing of domestic refrigerators and freezers.
- BATIMETAL Beni Mansour, for the manufacturing of insulating panels which are used in industrial buildings, leisure and industrial refrigeration.
- PROSIDER Berrahal.

Many private factories manufacture flexible foam from the CFC processes. This foam is mainly used for furniture manufacturing.

B. PROSIDER's background :

PROSIDER is 100% state owned company, promoting the metallurgic products. Its sandwish panel plant, located in Berrahal, employs 75 people.
The main activities of this plant are :

- Galvanising under heat.
- Steel pipes.
- Isotherm panels.

The production of panels started in 1987, producing sandwich panels that are used for the barding and covering of cold storage warehouses, sports halls, metallic camping tents and industrial and agro-industrial buildings.
The plant has a manufacturing line with a nominal capacity of 120,000 m2, following a non-continious production process, whereas the 1994 production was 90,667 m2. A target capacity of 120,000 m2 is expected in 1995.
The P.U.R sandwich panels are steel faced.

PROSIDER operates 2 foaming machines :

- **injection machine HK 500:**
  - Manufacturer: HENNECKE Germany.
  - Year of purchase : 1985.
  - Capacity : 150 liters / minute.

- **Injection machine HK 1250.**
  - Manufacturer : HENNECKE Germany.
  - Year of purchase: 1978.
  - Capacity: 1,6 liters / seconde

The manufacturing process of sandwich panels is a non-continious type. Once the shaping of the sheet- irons completed, the filling is done laterally, using the two streams of chemicals as follows:

- stearm A : made of a mixture of CFC 11 and polyol (also including the activator)
- stream B : made of isocyanate (MDI.).

The polyurethane is made with the reaction produced by these two streams.

The chemicals are imported from BAYER, BASF, ICI and DOW.

In 1994, PROSIDER consumed 58 tons of CFC 11 blowing agent.

Main characteristics of the panels :

Dimensions : maximum length: 8 meters,

width: 930 mm for PP40 products,

730 mm for TN 40 products,

thickness : 40 mm.

Foam density : 25 kg/M3.

II - PROJECT OBJECTIVE :

The objective of this project is to eliminate the use of CFC- 11 in the production of rigid polyrethane foam sandwich panels through conversion to the use of pentane as blowing agent for the polyrethane insulation foam.

III - PROJECT DESCRIPTION :

PROSIDER Berrahal is prepared to phase out ODS as soon as the new technologies have been acquired, the necessary machinery, equipement installed and the technical staff trained.

Throughout the project, assistance will be provided in the field of :

- Procurement of equipements ;
- Redesign, reconstruction and testing of sandwich panels;
- Installation, commissionning, trial operation and start up ;
- Technical assistance (safety) ;
- Training.

The following equipments are required to the conversion to pentane technology :

1- Storage tank facility for pentane:

This double-walled steel tank, installed below ground, has a capacity of 25 m3 with 2 feed pumps, pipe line system, all necessary fitings and safety equipement.

2- Pentanat P30:

Special unit for processing the pentane in batch operation.

3- Two conversion sets for existing high pressure machines HK500 and HK 1250 including new mixheads.

4- Safety equipement according to HENNECKE system with differential pressure switches for the exhaust air pipe lines.

5- Metering machines.

6- Safety cabin for the daylight press including extractors.

Justification for selection of alternative technologies.

As a new blowing agent for the polyrethane, the major alternatives are :

Blowing agent	ODP
100 % CO_2	0
HCFC- 141 b	0.11
HCFC- 22	0.065
HCFC- 142b + HCFC- 22	0.06
HCFC- 134 a	0
Cyclopentane	0
HFC- 356	0

The major advantages and disavantages of the various alternatives are as follows :

- **CO2** : though environnementaly attractive, it cannot be selected as an acceptable technology for sandwich panels production due to poorer physical properties and poorer foam adhesion.

HCFC 141b: has many advantages, amongst them, good aging characteristics, cost effective with no plant modification required. However, even though it is the most acceptable from the technical and economical point of view, it is only a transitional substance.

Pentane: excellent solution, widely used in Europe thanks to to its good foam aging characteristics, foam properties and low cost. However. the pentane technology requires plant modification and extensive precautionary measures due to its flammable and explosive character.

Other blowing agents, such as HFC 134a, HCFC 356 and HCFC 142, are transitional substances that are also more disadvantagious than HCFC 141b.

PROSIDER are not interested by a transitional substance. The pentane solution, though its disadvantages, seems to be the most appropriate solution considering its technical characteristics as blowing agent.

IV. INPUTS :

1. Capital Goods Replacement:

The equipment for pentane storage, foaming system and safety as specified below, need to be replaced or added:

- pentamat P30 unit,
- conversion set for HK 500,
- conversion set for HK 1 250,
- safety equipment,
- metering system,
- safety cabin for presses including extractors.

2. Training :

Within the framework of this project, technicians from PROSIDER Berrahal will be trained in the following areas :

- operation and maintenance of the new machinery and equipment,
- quality control in relation with conversion,
- laboratory tests,
- new technologies for foam,
- specifications for pentane,
- safety regulations for flammable chemicals.

V. PROJECT IMPLEMENTATION :

The project implementation will be carried out by UNIDO in close co-operation with PROSIDER. After competitive bidding performed according to UNIDO's rules and procedures, a General Contractor will be appointed by UNIDO and PROSIDER for the implementation of the major project components (foaming system). The General Contractor will be responsible for the supply of equipments, installation, commissioning and training of local staff on the premises. The detailed Terms of Reference for the service to be provided by the General Contractor will be elaborated after project approval.

The final equipment specifications and the work plan could only be elaborated after approval of the basic approach for project implementation by the MFMP.

The permission from the local authorities for the introduction of the new technologies with established national standards is to be obtained by PROSIDER.

Having accepted the conversion of its plant to the use of non- ODS under this Project, PROSIDER will be committed to provide the following inputs :

- All activities and costs related to the construction work needed (including the provision of technical infrastructure) to accomodate the new technologies introduced under this project (the relevant construction work will have to be arranged by PROSIDER under the supervision of the General Contracter and in line with the established milestones for this project. The costs for construction work are, therefore, not reflected in the project budget. The specifications for construction work needed will be elaborated by the General Contractor after project approval and the necessary site inspection),

- Technical staff as required by the General Contractor,
- Provision of tools, transportation and lifting equipement as required .

UNIDO as the implementing Agency has the necessary experience and capabilities for the successful implementation of the project at entreprise level. Upon approval of the project by the MFMP, the project budget will be transferred to UNIDO. The respective project allotment document will then be issued by UNIDO's Finance Section . Any substantive or financial deviation from the approved project is subject to approval by MFMP and UNIDO.
The project implementation, milestones are set in Annex " IMPLEMENTATION SCHEDULE ".

VI - PROJECT COSTS :

1- Incremental operating costs :

The use of pentane blown foam changes the product cost due to :
- the higher foam density using pentane process (about 10% more),
- the use of a lesser amount of blowing agent,
- the new composition from which the price of the foam is calculated, based on the local price level.

R 11 system				Pentane System			
Chemicals	wt %	Price USD/ Kg	Cost USD	**Chemicals**	wt %	Price USD / Kg	Cost USD
Polyol	37	2.5	0.93	**Polyol**	35	2.60	0.91
MDI	50	2.6	1.30	**MDI**	56	2.70	1.51
R 11	13	1.8	0.23	**Pentane**	9	2.40	0.22
PU Cost			**2.46**	**PU Cost**			**2.64**

- The PU foam production (base 1995) is as follows :

120,000 m2 x 40 mm = 4,800 m3

4,800 m3 x 25 kg / m3 = 120,000 kg PU foam.

With pentane system, the required foam density increases of 10 %.

Based on above, the incremental operating costs for PROSIDER are as follows :

Items	CFC 11 System	Pentane system
Price of foam USD /Kg	2.46	2.64
Average foam density (Kg / m3)	25	27.5
Production 1995 (m3)	4,800	4,800
Cost of foam per year (USD)	295,200	348,480
Difference per year	53,280	
Incremental cost (2 years)	92,170	

The net present value of these incremental costs, over aperiod of two years, at 10% discount rate, amounts to USD 92,170.

The cost of transport and insurance of capital goods are included in the budgeted allocation for the respective items.

2 - Contingency fund :

A contingency fund (10 percent of the total investement cost) was calculated. The MFMP is proposed to covrer unforessen expenses wich wight be incoverd during the project implementation, e.g purchase of small testing instruments, wich wight be required during the conversion process, miscellaneous expanses, price escaltion, etc.. .

3 - Total costs:

Investement costs will cover investement costs (at CIF basis) for the modification of exiting manufacturing facilities, purchase of new machenery, training, installation and consulting services for plant and product modifications.

- The incremental operating costs associated with this project are as above.
- Implementing Agency's overhead costs are 13 percent.
- For the complete costs breakdown see Annex « Project budget ».
- For the calculation of the unit abatement costs see Annex « unit abatement cost »
- Requested funding by the MFMP = USD 1,123,410.

PROJECT BUDGET

Budget line	Cost USD
- Capital costs	820,000
- Contingency	82,000
- Incremental operating cost (2 years)	92,170
- Sub - total	994,140
- Implementing Agency overhead (13 %)	129,240
Project total	**1,123,410**

ANNEX Equipment Specifications and capital costs

Items	Total Cost (USD)
1. Pentane storage tank facility	165,000
2. Pentanat P30 Unit. 3 Conversion set for HK500 4. Conversion set for HK1250 5. Metering system 6. Safety cabin for presses including extractors SUB - TOTAL	560,000
6. Electrical modification	25,000
7. Fire protection modification	20,000
8. Production trials	15,000
9. International consultant assistance(Safety)	10,000
10. Thechnology transfer	10,000
11. Training	15,000
SUB - TOTAL	95,000
12. Contingency (10 %)	82,000
INCREMENTAL CAPITAL COST	**902,000**

ANNEX : CALCULATION OF UNIT ABATEMENT COST

A	ODS phase out	Unit	Total project
A1	Average use of CFC 11 per year	mt	58
A2	ODP of CFC 11	-	1
A3	Total ODP weighted CFC 11 phase out	mt	58
B	Annualized capital cost	unit	total project
B1	Total investment cost (model redefinition + production conversion)	USD	902,000
B2	Equipment life	year	10
B3	Discount rate	%	10
B4	Annualized capital cost (B1 * 0.1627)	USD	146,755
C	Annual incremental operating cost	USD	53 ,280
D	Unit abatment cost	-	-
D1	Annualized capital cost per Kg ODS phase out (B4 / A3 / 1000)	USD / Kg	**2.53**
D2	Annual incremental operating cost per Kg ODS phase out (C / A3 / 1000)	USD / Kg	**0.92**
D3	Unit abatment cost (D1 + D2)	USD / Kg	**3.45**

ANNEX - IMPLEMENTATION SCHEDULE

MILESTONES/MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1- Sign the project, receive funding	—																	
2- Appointment of General Contractor site inspection		—	—															
3- Elaboration of detailled project work-plan			—	—														
4- Draft of plant layouts			—	—														
5- Training						—				—	—							
6- Selection of equipment - bidding			—	—	—	—												
7- Modification of existing equipment							—	—	—	—								
8- Purchase, installation, commissionning					—	—	—	—	—	—	—	—						
9- Testing												—	—	—				
10- Start production with pentane												—	—	—	—	—	—	—

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