**UNITED NATIONS**

**EP**

**United Nations Environment Programme**

Distr.
Limited

UNEP/OzL.Pro/ExCom/32/30/India
10 November 2000

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Thirty-second Meeting
Ouagadougou, 6-8 December 2000

## PROJECT PROPOSALS: INDIA

This document consist of the comments and recommendations of the Fund Secretariat on the following project proposals:

Foam:

| | |
|---|---|
| • Conversion from CFC-11 to water-blown technology in the manufacture of flexible molded polyurethane foam at Netplast Ltd. | UNDP |
| • Conversion from CFC-11 to water-blown technology in the manufacture of flexible molded polyurethane foam and from CFC-11 to HCFC-141b technology in the manufacture of integral skin polyurethane foam at Sawhney Seating Systems | UNDP |
| • Conversion from CFC-11 to HCFC-141b technology in the manufacture of integral skin polyurethane foam at Sun Steering Wheels Ltd. | UNDP |

Process agent:

| | |
|---|---|
| • Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Doctors Organic Chemicals Ltd., Tanuku | UNIDO |
| • Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Svis Labs Ltd., Ranipet | UNIDO |

| | |
|---|---|
| • Conversion of carbon tetrachloride (CTC) as process solvent to trichloromethane at M/S Alpha Drugs India Ltd., Patiala | UNIDO |
| • Conversion of chlorinated rubber manufacture from carbon tetra chloride to non-ODS process at Rishiroop Organics Pvt. Ltd. And Rishiroop Polymers Pvt. Ltd. | World Bank |
| • Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Satya Deeptha Pharmaceuticals Ltd., Hummabad | UNIDO |

Refrigeration:

| | |
|---|---|
| • Conversion from CFC-11 to HCFC-141b and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Nine Enterprises | UNDP |
| • Conversion from CFC-11 to HCFC-141b and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Sandlas Air-Con Systems P. Ltd. | UNDP |
| • Umbrella project for the conversion of three commercial refrigeration enterprises in New Delhi | UNIDO |

# PROJECT EVALUATION SHEET
# INDIA

SECTOR: Foam ODS use in sector (1998): 6,400 ODP tonnes

Sub-sector cost-effectiveness thresholds: Integral Skin US $16.86/kg

***Project Titles***:

(a) Conversion from CFC-11 to water-blown technology in the manufacture of flexible molded polyurethane foam at Netplast Ltd.
(b) Conversion from CFC-11 to water-blown technology in the manufacture of flexible molded polyurethane foam and from CFC-11 to HCFC-141b technology in the manufacture of integral skin polyurethane foam at Sawhney Seating Systems
(c) Conversion from CFC-11 to HCFC-141b technology in the manufacture of integral skin polyurethane foam at Sun Steering Wheels Ltd.

| **Project Data** | **Flexible moulded** | **Flexible moulded** | **Integral skin** |
|---|---|---|---|
| | **Netplast** | **Sawhney** | **Sun Steering** |
| Enterprise consumption (ODP tonnes) | 18.00 | 28.90 | 17.00 |
| Project impact (ODP tonnes) | 18.00 | 27.99 | 15.65 |
| Project duration (months) | 36 | 36 | 36 |
| Initial amount requested (US $) | 177,224 | 241,619 | 144,379 |
| Final project cost (US $): | | | |
| Incremental capital cost (a) | 70,000 | 100,000 | 85,000 |
| Contingency cost (b) | 7,000 | 10,000 | 8,500 |
| Incremental operating cost (c) | 100,224 | 131,619 | 50,879 |
| Total project cost (a+b+c) | 177,224 | 241,619 | 144,379 |
| Local ownership (%) | 100% | 100% | 100% |
| Export component (%) | 0% | 0% | 0% |
| **Amount requested (US $)** | 177,224 | 241,619 | 144,379 |
| Cost effectiveness (US $/kg.) | 9.85 | 8.63 | 9.23 |
| Counterpart funding confirmed? | | | |
| National coordinating agency | Ministry of Environment & Forests | | |
| Implementing agency | UNDP | UNDP | UNDP |

| ***Secretariat's Recommendations*** | | | |
|---|---|---|---|
| Amount recommended (US $) | 177,224 | 241,619 | 144,379 |
| Project impact (ODP tonnes) | 18.00 | 27.99 | 15.65 |
| Cost effectiveness (US $/kg) | 9.85 | 8.63 | 9.23 |
| Implementing agency support cost (US $) | 23,039 | 31,410 | 18,769 |
| Total cost to Multilateral Fund (US $) | 200,263 | 273,029 | 163,148 |

## PROJECT DESCRIPTION

Sector Background

| | | |
|---|---|---|
| - Latest available total ODS consumption (1998) | 11,736.70 | ODP tonnes |
| - Baseline consumption (average 1995-1997) of Annex A Group I substances (CFCs) | 6,681.00 | ODP tonnes |
| - Consumption of Annex A Group I substances for the year 1998 | 5,264.60 | ODP tonnes |
| - Baseline consumption of CFCs in foam sector | 2,391.00 | ODP tonnes |
| - Consumption of CFCs in foam sector in 1998 | 2,403.00 | ODP tonnes |
| - Funds approved for investment projects in foam sector as of end of 1999 | US $23,389,349.00 | |
| - Quantity of CFC to be phased out in investment project in the foam sector as of end of 1999 | 2,753.60 | ODP tonnes |
| - Quantity of CFCs phase out from investment projects in the foam sector as of end of 1999 | 2,459.40 | ODP tonnes |
| - Funds approved for investment projects in the foam sector in the year 2000 | US $3,105,884 | |
| - Quantity of CFC to be phased out in foam projects approved in the year 2000 | 443.60 | ODP tonnes |

As at the time of preparation of this evaluation India had not reported its ODS consumption for 1999 to the Ozone Secretariat.

**(a) Conversion from CFC-11 to water-blown technology in the manufacture of flexible molded polyurethane foam at Netplast Ltd.**

**(b) Conversion from CFC-11 to water-blown technology in the manufacture of flexible molded polyurethane foam and from CFC-11 to HCFC-141b technology in the manufacture of integral skin polyurethane foam at Sawhney Seating Systems**

**(c) Conversion from CFC-11 to HCFC-141b technology in the manufacture of integral skin polyurethane foam at Sun Steering Wheels Ltd.**

### Flexible Molded and Integral Skin Polyurethane Foams

1. Three companies (listed below) manufacture flexible molded and integral skin polyurethane foam. Netplast manufactures flexible molded polyurethane foam for the automotive industry while Sawhney manufactures flexible molded and integral skin foams for the automotive and furniture industries and Sun Steering Wheels manufactures integral skin foam steering wheels, head rests and others also for the automotive industry. The equipment used by the enterprises are indicated in table 1 below. The density of the molded foam is stated to be 42 kg/$m^3$.

2. Netplast and Sawhney purchase CFC-11 premixed in the polyol at a CFC-11 proportion of 13% by weight in the blend, while Sun uses premixed polyol with 20% CFC in the blend. The companies will convert the production of flexible molded foam to fully water-based systems and integral skin foam to HCFC-141b. The costs of these conversions include the retrofit of low and high pressure dispensers at US $15,000 and US $10,000 per machine respectively, replacement of fiberglass molds at US $1,000 per mold, mold heating at US $10,000, technical assistance at US $10,000 per project, and training at US $5,000 per project. Incremental operating cost for each project consistent with the amount of CFC-11 to be phased out is requested as indicated in the table below.

3. The table below (Table 1) provides a profile of the enterprises.

**Table 1: Profile of the flexible molded/integral skin foam producing enterprises**

| Name of enterprise | Date Established | CFC Phase out | Baseline dispensers* | No. of molds | I.C.C.** (US$) | I.O.C.*** (US$) |
|---|---|---|---|---|---|---|
| Netplast | 1980 | 18.0 | H.P.D. 30 kg/min Elastogran | 30 | 77,000 | 100,224 |
| Sawhney | 1993 | 28.9 | 2 H.P.D. 14 kg/min Polycraft<br>1 L.P.D. 30 kg/min OMS | 40 | 110,000 | 131,619 |
| Sun Steering | 1994 | 17.0 | 2 H.P.D. 30 kg/min Eslastogran | 22 | 93,500 | 50,879 |

*L.P.D.: low-pressure dispenser, H.P.D. high-pressure dispenser
**I.C.C.: Incremental capital cost, including 10% contingency.
***I.O.C.: Incremental operating cost.

**Justification for the use of HCFC-141b**

4. Justification for the use of HCFC-141b by Sawhney and Sun in the conversion of the integral skin foam production has been provided in each project document and as annexes to the document, including projected "techno-economic" impact. It is stated that detailed discussions on issues associated with the use of HCFC in Multilateral Fund projects were held with the enterprises prior to the preparation of the projects, and this informed their choice of the technology. The Government of India has also provided a letter supporting the use of HCFC-141b by the companies consistent with Decision 27/13.

5. A sample of the justification (additional justification) annexed to the projects (from Sawhney project document) and the letter of the Government of India supporting the choice of HCFC-141b are attached to this evaluation.

Impact of the projects

6. A total of 61.64 ODP tonnes will be phased out from the three foam projects. This will eliminate 0.9% of India's baseline consumption of Annex A Group I substances. As India's 1999 ODS consumption data is not available to the Fund Secretariat, the impact of the projects on India's 1999 consumption of Annex A Group I substances could not be assessed. There will be residual ODS consumption of 2.26 ODP tonnes as a result of the use of HCFC-141b conversion technology.

## SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

### COMMENTS

1. The three projects and their associated costs have been agreed between the Secretariat and UNDP.

### RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the Netplast, Sawhney and Sun Steering Wheels projects with the levels of funding and associated support costs as indicated below.

| | Project Title | Project Funding (US$) | Support Cost (US$) | Implementing Agency |
|---|---|---|---|---|
| (a) | Conversion from CFC-11 to water-blown technology in the manufacture of flexible molded polyurethane foam at Netplast Ltd. | 177,224 | 23,039 | UNDP |
| (b) | Conversion from CFC-11 to water-blown technology in the manufacture of flexible molded polyurethane foam and from CFC-11 to HCFC-141b technology in the manufacture of integral skin polyurethane foam at Sawhney Seating Systems | 241,619 | 31,410 | UNDP |
| (c) | Conversion from CFC-11 to HCFC-141b technology in the manufacture of integral skin polyurethane foam at Sun Steering Wheels Ltd. | 144,379 | 18,769 | UNDP |

## Annex

## Additional Justification for Use of HCFC Technology

The implementing agency expert appraised the prospective recipient enterprise, Sawhney Seating Systems, prior to the preparation of this project document, during February 2000 and had detailed discussions with the technical and managerial personnel of the enterprise, regarding the choice of technology for replacing the existing CFC-based technology, under the project. The enterprise was briefed in detail about the following:

1. An overview of the available interim (low ODP) and permanent (zero ODP) replacement technologies.
2. The techno-economic impact of each technology on the products manufactured, and the processes and practices employed by Sawhney Seating Systems
3. The possible implication of each technology, in terms of its known impact on environment, health and safety, such as ozone depleting potential, global warming potential, occupational health, fire and explosion hazards.
4. It was emphasized to Sawhney Seating Systems, that HCFC technologies are interim in nature due to their residual ODP and therefore may continue to adversely affect the environment, though at a lower scale than CFCs.
5. It was further explained that HCFCs may become prohibited under present or future international conventions and will therefore also need to be phased out at a future date, and any investments required for their phase-out and for conversion to safer technologies, may have to be borne by Sawhney Seating Systems

The justifications offered by Sawhney Seating Systems for the selection of HCFC-141b based systems in their manufacture of integral skin polyurethane foam are summarized as below:

1. Hydrocarbon (pentanes) technology involves fire and explosion hazards. The local laws governing the use of hydrocarbons cannot be complied with, in the existing manufacturing premises of Sawhney Seating Systems, as they are located in a crowded industrial area. They may need to relocate, which they do not consider feasible. Furthermore the technology is not considered mature or locally available, for this application.

2. Water based systems are not available locally in India.

3. Sawhney Seating Systems considers that the HCFC-141b technology is proven in India and technically satisfactory systems are locally available.

Sawhney Seating Systems believe that the changeover to HCFC technology is relatively quick, safe and cost-effective. They therefore prefer HCFC technology after considering the pros and cons of various available alternatives for their integral skin foam production.

भारत सरकार
पर्यावरण एवं वन मन्त्रालय
ओज़ोन सैल
Government of India
Ministry of Environment and Forests
Ozone Cell

C. Viswanath
*Director (O)*

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F. No. 5/1/2000-OC
September 29, 2000

Dear Mr Van Engel

We are pleased to convey the recommendation of the Ministry of Environment and Forests for submitting the following foam and commercial refrigeration project for consideration of the XXXII Meeting of the Executive Committee in December 2000.

**Foam Sector:**

| S. No. | Name of the Company | Amount Recommended | ODP MT |
|---|---|---|---|
| 1. | M/s. Sawhney Seating System (Revised Project) | 241,619 | 27.99 |
| 2. | M/s. Sun Steering Wheels Ltd. | 144,379 | 15.65 |

**Commercial Refrigeration Sector**

| | | | |
|---|---|---|---|
| 1.. | M/s. Sandias Aircon System (Revised Project) | 200,531 | 22.37 |
| 2. | Group Project of 9 commercial enterprises comprising the following :-<br><br>a. M/s. Anand Aircon<br>b. M/s. Comments Aircon System<br>c. M/s.Freezeland<br>d. M/s. Kay Ess Industries<br>e. M/s.Kool Pack Industries<br>f. M/s. Mongia and Co.<br>g. M/s.RR Industries<br>h. M/s.sheetal Refrigeration<br>i. M/s.Verma Frost | 797,923 | 53.52 |

*Contd..2..*

जोन आर बी, द्वितीय मंजिल, इंडिया हेबिटाट सेंटर, लोधी रोड, नई दिल्ली - 110 003
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2. Reference Foams Projects of India submitted for consideration of the 32nd Executive Committee Meeting in December 2000. It is stated in accordance with the Decision 27/13 of the Executive Committee that the specific situations involved with Foam projects in Sr. No. 1 to 8 and HCFC commitments under Article-2F, has been reviewed and determined that, at the present time, the following projects need to use HCFCs for an interim period. The companies are aware that no funding would be available for the future conversion for their projects.

With regards,

Yours sincerely,

(C.Viswanath)

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# PROJECT EVALUATION SHEET
# INDIA

SECTOR: Process agent ODS use in sector (1998): 3,689 ODP tonnes

Sub-sector cost-effectiveness thresholds:

***Project Titles***:

(a) Conversion of chlorinated rubber manufacture from carbon tetra chloride to non-ODS process at Rishiroop Organics Pvt. Ltd. And Rishiroop Polymers Pvt. Ltd.
(b) Conversion of carbon tetrachloride (CTC) as process solvent to trichloromethane at M/S Alpha Drugs India Ltd., Patiala
(c) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Doctors Organic Chemicals Ltd., Tanuku
(d) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Satya Deeptha Pharmaceuticals Ltd., Hummabad
(e) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Svis Labs Ltd., Ranipet

| **Project Data** | **Process conversion** | **Process conversion** | **Process conversion** | **Process conversion** | **Process conversion** |
|---|---|---|---|---|---|
| | **Rishiroop** | **Alpha Drugs** | **Doctors Organic** | **Satya Deeptha** | **Svis Labs** |
| Enterprise consumption (ODP tonnes) | | 69.70 | 94.60 | 27.92 | 54.17 |
| Project impact (ODP tonnes) | 452.00 | 69.70 | 94.60 | 27.92 | 54.17 |
| Project duration (months) | 36 | 18 | 18 | 18 | 12 |
| Initial amount requested (US $) | 4,957,246 | 197,194 | 451,469 | 342,337 | 317,971 |
| Final project cost (US $): | | | | | |
| Incremental capital cost (a) | 4,066,100 | 236,043 | 387,648 | 202,046 | 207,402 |
| Contingency cost (b) | 406,610 | 13,372 | 38,765 | 20,205 | 10,613 |
| Incremental operating cost (c) | 484,536 | 153,022 | 75,219 | 120,086 | 99,956 |
| Total project cost (a+b+c) | 4,957,246 | 402,437 | 501,632 | 342,337 | 317,971 |
| Local ownership (%) | 100% | 100% | 100% | 100% | 100% |
| Export component (%) | 0% | 0% | 0% | 0% | 0% |
| **Amount requested (US $)** | 3,319,990 | 163,370 | 325,768 | 288,166 | 272,881 |
| Cost effectiveness (US $/kg.) | | 2.34 | 3.10 | 10.32 | 5.04 |
| Counterpart funding confirmed? | | Yes | | Yes | Yes |
| National coordinating agency | Ministry of Environment and Forest | Ministry of Environment and Forest | Ministry of Environment and Forest | Ministry of Environment and Forest | Ministry of Environment and Forest |
| Implementing agency | IBRD | UNIDO | UNIDO | UNIDO | UNIDO |

| ***Secretariat's Recommendations*** | | | | | |
|---|---|---|---|---|---|
| Amount recommended (US $)<br>Project impact (ODP tonnes)<br>Cost effectiveness (US $/kg)<br>Implementing agency support cost (US $) | | | | | |
| Total cost to Multilateral Fund (US $) | | | | | |

## PROJECT DESCRIPTION

(a) Conversion of chlorinated rubber manufacture from carbon tetra chloride to non-ODS process at Rishiroop Organics Pvt. Ltd. And Rishiroop Polymers Pvt. Ltd.
(b) Conversion of carbon tetrachloride (CTC) as process solvent to trichloromethane at M/S Alpha Drugs India Ltd., Patiala
(c) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Doctors Organic Chemicals Ltd., Tanuku
(d) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Satya Deeptha Pharmaceuticals Ltd., Hummabad
(e) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Svis Labs Ltd., Ranipet

Sub-Sector Backgrounds

The sub sector background for each process for which projects have been submitted is included with the description of the relevant projects.

## PRODUCTION OF CHLORINATED RUBBER

(a) Conversion of carbon tetrachloride as process solvent to a non-ODS process at Rishiroop Organics, Rishiroop Polymers Pvt. Ltd., India

1. The objective of this project is to eliminate the use of carbon tetra-chloride (CTC) as a process agent in the production of chlorinated rubber (CR) by Rishiroop Organics Pvt. Ltd. (ROL) at its plant in Vapi, India and by Rishiroop Polymers Pvt. Ltd. (RPL) at its plant at Nasik, India. As part of an industrial restructuring the two units are proposed to be amalgamated into a single production unit at ROL, Vapi. The production capacity of the converted non ODS CR production facility proposed for funding is equal to the combined production capacity of ROL and RPL, that is, 1100 tonnes per annum

2. Rishiroop Organics and Rishiroop Polymers are wholly Indian-owned companies which manufacture chlorinated rubber as part of the Rishiroop Group. In the last three years of operation, Rishiroop Organics consumed an average of 226.2 ODP tonnes of CTC as a process agent in the production of 344.3 tonnes of chlorinated rubber annually. In the period from 1992-1995, Rishiroop Polymers consumed an average of 225.6 ODP tonnes of CTC as a process agent in the production of 371.5 tonnes of chlorinated rubber. Production at Rishiroop Polymers was suspended in September 1995 due to a labour dispute, which was finally resolved in October 1999. The enterprise has yet to restart production of chlorinated rubber and so the consumption of CTC for the last three years has been zero.

3. There are five CR manufacturers in India, including three in the Rishiroop Group, who use CTC as a process solvent. Details of these enterprises are as follows :

CR Manufacturers in India

| Serial No. | Enterprise | Start of commercial production | Installed capacity (MT/yr.) | Process agent (CTC, Metric Tons) inventory in plant equipment when inspected (Dec. 1999) |
|---|---|---|---|---|
| 1. | Rishiroop Polymers Pvt. Ltd. (RPL) | 1973 | 550 | 65.0 |
| 2. | Pauraj Chemicals Pvt. Ltd. | 1980 | 150 | 26.0 |
| 3. | Rishiroop Organics Pvt. Ltd. (ROL) | 1991 | 550 | 65.0 |
| 4. | Rishiroop Rubber International Ltd. (RRIL) | 1993 | 4500 | 400.0 |
| 5. | Tarak Chemicals Ltd. | 1998 | 300 | Not visited. |

4. The cumulative consumption and emission of CTC by these enterprises is estimated to be 1,800 MT (or 1,980 ODP tons) in the year 2000, at levels slightly above the estimates in the country programme.

5. Conversion of RIL and ROL will make use of an aqueous process developed by the third Rishiroop Group company, Rishiroop Rubber International (RRIL) The conversion of production of CR at RRIL (capacity 4,500 tonnes per annum) is not included in the current proposal. The project document states that "the conversion at RRIL will be taken up at a subsequent stage". It is indicated that RRIL is a publicly owned company and any proposal for amalgamation of a publicly owned company with a privately owned enterprise requires legal clearances from various institutions. It is also stated that apart from these processes, RRIL would also need to take approvals for the merger from its shareholders which would take additional time. It is indicated on the Rishiroop web-site that the RRIL plant is a 100 per cent export-oriented facility.

6. Of the other two remaining companies involved in the manufacture of CR, ***Tarak Chemicals*** is ineligible for MP assistance, as it was established after the funding cut-off date of July 31, 1995. The other, ***Pauraj Chemicals***, has an installed capacity of 150 MT/year, and was established in 1979-80. It has been consuming between 34-38 MT of CTC per year in the last two years. The project document indicates that conversion of technology at Pauraj Chemicals will require a complete overhaul, particularly because of the plant's age and capacity. The company has no plans at present about the next steps for conversion.

7. The non-ODS technology developed by RRIL involves the chlorination of rubber in an aqueous medium using ultra-violet light as a catalyst. RRIL applied for a domestic patent for its process in December 1998, and registered a provisional patent under Indian law on January 8, 1999. Details regarding the Indian patent process are included in Annex 8 of the project document.

8. The technical requirements of the new process require that much of the existing equipment be replaced. The main capital cost items requested are six glass-lined reactors (US$

512,000), a photochemical system (US$ 184,000), glass-lined stirred tanks (US$ 240,000), FRP belt filter (US$ 370,000), two-stage fluidized bed dryer system (US$ 334,000), effluent treatment facility (US$ 55,700), process utility and piping (US$ 310,400). Incremental operating costs arising mainly from increased power consumption and additional quantities of chemicals are requested for four years at a level of US$ 484,536.

9. A technology transfer fee of US$ 238,000 is requested, to be paid to RRIL as the developer of the technology. "Pre-operative" costs are also sought for insurance, travel, training and project team salaries (US $141,000) fixed overheads for a six month changeover period (US $71,500) and costs of amalgamations of ROL and VAPI (US $199,000) as well as start up and commissioning costs (US $71,500)

10. The project document contains an explanation of the rationale for the choice of the aqueous process. It also includes a detailed discussion of emission control options and an analysis which concludes that capital costs for emission control would be similar to the proposed costs for process conversion, but that operating problems provide "strong argument against opting for an emission abatement system in Indian conditions".

11. A technical review of the project has been provided.

Secretariat's Comments

*Sub-sector profile and guidelines for process agent projects (Decision 27/78)*

12. The project document provides details of the entire chlorinated rubber sub-sector in India and thus appears to meet the requirements of Decision 27/78 (a).

13. The project proposal may not conform fully to paragraph (c) of the decision which states "to permit adequate consideration of the industrial rationalisation option, a project proposal should cover all the production facilities in the country for the particular application under consideration." The proposal includes closure of the RPL plant not now in production and a doubling of production capacity at the ROL plant, but does not include a discussion of conversion of RRIL other than to indicate that it will be taken up at a subsequent stage. In this regard it is noted that the World Bank has included a possible project for conversion of RRIL in its draft 2001 business plan. It is also noted that the current total level of CR production of all plants in the Rishiroop Group including RRIL, is less than 1100 tonnes per annum (TPA) which is equal to the capacity requested in the present project proposal. RRIL has a nominal capacity of an additional 4500 TPA.

14. The Secretariat raised with the World Bank the issue of industrial consolidation involving RRIL. The Bank advised that in its view the proposal provides a complete description of the sub-sector and is fully consistent with Decision 27/78. The Bank believed that the guidelines did not require all plants to be converted at the same time.

*Eligibility of the Rishiroop Polymers Limited (RPL) plant*

15. At the sixteenth Meeting the Executive Committee decided that consumption should be calculated on the basis of either the year or an average of three years immediately preceding preparation of a project. The Secretariat advised the World Bank that since the RPL plant has had no consumption since 1995, it appeared that conversion of the RPL plant was not eligible for funding. The Secretariat also noted that in these circumstances the proposal to convert the ROL plant at a capacity of 1100 TPA amounted to a capacity upgrade. The Secretariat therefore has reviewed the project on the basis of conversion of the ROL plant only, and at its current capacity of 550 TPA.

16. The World Bank subsequently responded to the Secretariat's comments on the basis of a 550 TPA plant, but indicated its view that the plant had been closed because of a "legal strike" which was resolved early in 2000, that the plant was able to resume production and therefore should be eligible for compensation. The Bank also advised that the Government of India is requesting that the project should be considered as submitted.

*Technology development and intellectual property*

17. The proposal indicates that the technology has been developed in-house by RRIL and that a patent application has been filed with the Indian authorities. A number of international patents exist for aqueous processes for production of CTC, mainly originating in Japan where one company, Asahi-Denka, is producing CR commercially using an aqueous process. It is understood that this process is patented in a number of countries but not in India. Because the RRIL patent application process has not yet been completed, the patent information relating to the RRIL process has not been published. It is not possible therefore to use published information to compare the RRIL aqueous process with others. The World Bank has advised the Secretariat that the RRIL process is different from other aqueous processes, but the extent of the difference cannot be established from information so far available The Bank also provided advice from the Government of India which stated, inter-alia, that "The process of Rishiroop does not infringe on any Patent rights of any company within the territorial jurisdiction of India.".

18. The RRIL technology has not yet been put into commercial production. The Secretariat notes that MLF funds have been used to date to fund the transfer of mature technology. Production development has not been funded. The World Bank was invited to provide clarification on this issue, in particular by providing information on the laboratory tests, trials and pilot production undertaken by RRIL which might assist in demonstrating that the technology is mature and the level of technical risk is low. At the time of preparation of this evaluation, no additional information on this matter was available.

*Technology transfer fee*

19. The Secretariat queried the request for a technology transfer fee when the companies involved were all in the same group and RRIL, the technology provider, was partly owned (30 percent) by the owners of ROL. The Bank pointed out that technology transfer fees had

previously been funded by the Multilateral Fund in cases where the beneficiary enterprise was a subsidiary company of a multinational technology provider. The Bank also considered that since it was a public company, RRIL was obliged to seek a return on the costs incurred for technology development, which exceeded the fee requested.

*Emissions*

20. The April 1997 TEAP Process Agent Task Force report indicated that "the aqueous process for the manufacture of chlorinated rubber produces inadvertent, trace quantities of CTC." The Secretariat also understands that the Japanese aqueous process produces chlorinated rubber with a CTC content of between 250 and 500 parts per million. These CTC emissions occur even though no CTC is used, because it is generated inadvertently by the chemicals in the process. Consistent with the Parties' decision on process agents (Decision X/14), the Secretariat asked the World Bank to provide advice on the emissions of CTC from the RRIL process as these appeared not to be zero. The Bank reiterated that the RRIL process is different from the Japanese aqueous technology and the enterprise considers that in its aqueous process there will be "no emission of CTC".

*Technical issues*

21. The project is based on replacement of most of the production equipment because of differing technical requirements in the new process. The project document provides only a broad technical overview. The Secretariat therefore raised with the Bank a wide range of issues related to the design of the new process and the ensuing equipment requirements for a plant equal to the current capacity at ROL, that is 550 TPA. The Secretariat wished to be able to advise the Executive Committee about the technical risk associated with the new process, the extent to which the equipment design was the most cost-effective in the circumstances, the maximisation of opportunities to make use of existing equipment and infrastructure, and the eligibility of incremental operating costs, claimed for four years.

22. In response to the Secretariat's initial comments, the World Bank provided a detailed reply in which substantial additional technical information was included. The Secretariat examined this information and raised further technical comments and enquiries. The Bank's response to these enquiries, and the outcome of the likely further technical discussions on equipment eligibility and cost will be advised to the Sub-Committee on Project Review.

## PRODUCTION OF PHENYL GLYCINE

(b) Conversion of carbon tetrachloride (CTC) as process solvent to trichloromethane at M/S Alpha Drugs India Ltd., Patiala

23. Alpha Drugs consumed an average of 69.74 ODP tonnes of carbon tetrachloride annually during the period from 1997 to 1999 in the manufacture of D(-) phenyl glycine chloride hydrochloride. Phenyl glycine is included in the list of applications in Table A of Decision X/14. Approximately 0.366 tonnes of CTC is used in the manufacture of 1 tonne of phenyl glycine.

24. The project proposes the replacement of carbon tetrachloride with trichloromethane. The reaction rate with trichloromethane is 25% slower than the rate achieved with a combination of CTC and EDC used in the current process (30 hours versus 24 hours). In addition, a larger amount of the new solvent is required. Therefore, some process equipment needs to be enlarged accordingly.

25. The major cost item is US$ 201,043 (for one new glass-lined reactor, one dryer with solvent recovery system (retroactively), reactor modifications and one glass-lined tank). Annual incremental operating costs are US $48,272.

Secretariat's Comments

26. Noting the sharp decrease in the level of production in 1999, the Secretariat inquired about the economic circumstances of the enterprise. UNIDO said that the drop in production was due to lower demand and competitive pricing and that the financial viability of the enterprise was not in question.

27. The Secretariat obtained expert advice that costs for major equipment items were consistent with norms for the industry.

28. Proposed incremental operating costs for additional maintenance arising from new or additional equipment were withdrawn.

29. The Secretariat discussed with the implementing agency, UNIDO, the proposed retroactive payment for the drying system installed in late 1998. UNIDO advised that the dryer was used to reduce emissions of CTC, in which case it could be eligible for funding (taking offsetting incremental operating savings into account). However consumption figures indicate that the major decrease in consumption of around 50 percent was realised in 1997/98 before the dryer was installed.

30. In further discussions it was found that the process agent losses before and after conversion used in IOC calculations has not taken into account the installation of the new dryer in 1998. IOCs were recalculated accordingly. Equipment eligibility and the levels of incremental capital costs and annual incremental operating costs have been agreed between the Secretariat and UNIDO as follows:

| | |
|---|---|
| Incremental capital costs: | |
| (plus 10% contingency, 49% local ownership) | US $122,213 |
| Annual IOC (at 49% local ownership) | US $ 23,653 |

**PRODUCTION OF IBUPRUFEN**

31. In response to decision 31/40 of the Executive Committee, the Government of India submitted a report on India's ibuprofen and bromohexine sub-sectors to the Secretariat on 4 October 2000. The section of the report on the ibuprofen sub-sector is reproduced below:

"Ibuprofen Sub-Sector Profile

(a) In the course of a 1999 project to review knowledge on the Ibuprofen sub sector and to prepare project documents for the sub-sector phase out the existing database has been expanded and revised.

(b) It was stated that there are at least 15 producers of Ibuprofen in India. Majority of these producers have phased out CTC and have converted to EDC, a non-ODS solvent. Five of these producers have stopped production of Ibuprofen and are no longer using CTC in their works (Table-2). A comprehensive list with production data is given below in Table 1.

Table 1
Companies still producing Ibuprofen with CTC or EDC

| S. No | Name of the company | Ibuprofen Production Mt | CTC used currently Mt | Year of conversion to EDC | CTC consumption at the time of Phase out Mt |
|---|---|---|---|---|---|
| 1 | Shasun chemicals & Drugs Ltd. | 1015 | NIL | 93-94 | 210 |
| 2 | Cheminor Drugs Ltd | 500 | ---- | 93-94 | 150 |
| 3 | Sekhsari Chemicals Ltd. | 75 | ---- | 96-97 | 25 |
| 4 | Global Bulk Drug Ltd. (Nicolas Piramal Ltd) | 60 | ---- | 96-97 | 20 |
| 5 | Satwik Drug Ltd. | 300 | NIL | 97-98 | 100 |
| 6 | Global Drugs Ltd. | 260 | NIL | 97-98 | 100 |
| 7 | Svis Labs Ltd. | 290 | ---- | 99-2000 | 51 |
| 8 | Satya Deeptha Pharmaceuticals Ltd. | 170 | 42 | ---- | ---- |
| 9 | Doctors Organic Chemicals Ltd. | 110 | 86 | ---- | ---- |
| 10 | Chiplun Fine Chemicals Ltd. | Production being restarted in the old plant | | | |
| **Total** | | **2780** | **128** | | **656** |

(c) It will be seen from Table 1 that most of the companies (Ser. No. 1 to 7) have phased out CTC (≈ 656 Mt) before of ExCom. decision on submission of 'Process Agent' projects for funding by MPMF. The major part of CTC used in Ibuprofen production will have been phased out by 2000. Only 128 Mt projected to be phased by Satya Deeptha, (Ser.No. 8) and Doctors Organic Chemicals (Ser.No. 9) needs to be phased out by the end of year 2000. Svis Laboratory (Ser.No. 7) changed over from CTC to EDC in 1999 and could be considered for retroactive funding. Chiplun fine chemicals have just restarted production of Ibuprofen with CTC and will come up later on with a phase out project. The total budget required for phasing out CTC for these four companies would be

approximately US$ 1,500,000.

(d) Five other companies listed earlier (Table 2) have stopped production of Ibuprofen for business reasons.

Table 2
Companies which have stopped production of Ibuprofen

1. C.Well Drugs Ltd.
2. EMGI Pharmaceuticals and Chemicals Ltd.
3. Herren Drugs & Pharmaceuticals Ltd.
4. Karnataka Chemicals Ltd.
5. Kekule Chemicals Ltd.

(e) Thus total production of Ibuprofen in India is now 2780 Mt/year and total CTC emitted/still used annually is 128 Mt. Total CTC phased out in this sector so far is 656 Mt.

Ibuprofen Industry Analysis

(f) Ibuprofen prices fell in 1995, causing the smaller producers to review their production plans. Prices have recovered in 1999. Ibuprofen production seems to have stabilised at about 2800 Mt in 1998-99 and to be set to increase in the year 2000. Shasun has had the leading position with nearly 1500 Mt of production and it has worked hard to achieve quality standards with global acceptance and concentrates on the higher prices export markets (Shasun is at present the only producer with the direct export licence). The smaller producers sell to the indigenous market with some exports possibly going indirectly through traders. Chiplun had suspended Ibuprofen production in Dec. 1995 and has resumed in Sept. 1999 using CTC in the old plant. The projected consumption of CTC for year 2001 is 75 Mt."

(c) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Doctors Organic Chemicals Ltd., Tanuku

32. Doctors Organic Chemicals is a wholly Indian-owned company which manufactures the pharmaceutical drug Ibuprofen. In the period from 1997 to 1999, the enterprise consumed an average of 94.60 ODP tonnes of CTC as a process agent in the production of 238 tonnes of Ibuprofen annually. The enterprise reports an export component of 20% during the last three years.

33. It is proposed that CTC be replaced as process agent by ethylene dichloride (EDC), a non-ODS substance. The chemical process with the new process agent is similar to the baseline process. However, the rate of reaction is slower. In addition, a larger amount of EDC is required

in each batch of chemicals processed. Therefore, to maintain the same level of production capacity, costs are sought to enlarge certain items of the process equipment. Modifications to heating and cooling systems are also required to cater for the different physical and chemical properties of EDC.

34. The main capital cost items requested are two new reactors (US $83,720), single pass condensers (US $41,860), a high vacuum distillation system (US $34,885), effluent treatment plant (US $33,488), trials and training (US $14,802). Annual incremental operating costs are US $6,580.

35. The project document contains an explanation of the rationale for the choice of a new process agent. It also includes a discussion of emission control options to achieve a level of emissions 1-2% or less, and a brief financial analysis which concludes that costs for emission control would be higher than the proposed costs for process conversion.

(d) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Satya Deeptha Pharmaceuticals Ltd., Hummabad

36. Satya Deeptha Pharmaceuticals consumed an average of 27.92 ODP tonnes of carbon tetrachloride annually in the production of ibuprofen in the period 1997 to 1999. Approximately 0.25 MT of CTC is used in the manufacture of 1 tonne of ibuprofen.

37. The project proposes the replacement of carbon tetrachloride with ethylene dichloride (EDC), a non-ODS solvent. With EDC, the solvent requirement is higher and the reaction rate is slower. For these reasons, some additional process equipment is needed. Furthermore, modifications to heating and cooling systems are required to cater for the different characteristics of EDC as opposed to CTC.

38. The main capital cost items requested are four new reactors (US$ 53,203), high vacuum distillation system (US$ 35,700), refrigeration plant (US$ 17,440), civil construction (US$ 20,652), effluent treatment plant (US$ 46,512), training (US$ 10,000) and trials (US$ 6,000). Annual incremental operating costs are US $37,882.

(e) Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Svis Labs Ltd., Ranipet

39. Svis Labs consumed an average of 54.17 ODP tonnes of carbon tetrachloride annually in the manufacture of ibuprofen and IBAP intermediate in the period 1997 to 1999. Approximately 0.245 MT of CTC is used in the manufacture of each 1 tonne batch of Ibuprofen, while 0.219 MT of CTC is used in the manufacture of each 1 tonne batch of IBAP.

40. The project proposes the replacement of carbon tetrachloride with ethylene dichloride (EDC), a non-ODS solvent. The project document indicates that a larger quantity of the new

solvent is required to process each batch. New equipment is needed to permit the conversion to EDC without sacrificing production capacity.

41. The main capital cost items requested are three glass-lined reactors, ranging in size from 2000 to 4000 litres (US$ 47,212), a high vacuum distillation system (US$ 29,605), an EDC storage tank (US$ 3,488), effluent treatment, settling ponds, sludge filtration, solar evaporation (US$ 52,950), piping and flame-proof motors (US$ 21,465). Other costs include civil construction (US$ 22,930), trials (US$ 21,560), training (US$ 10,230) and safety equipment (US$ 3,700). Annual incremental operating costs are US $31,352.

42. The grant of US $ 316,158 is to be provided as retroactive payment except US $ 64,489 (two glass-lined reactors and high vacuum distillation system) and US $ 22,930 covering construction expenditures for housing additional facilities.

**SECRETARIAT'S COMMENTS**

Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Doctors Organic Chemicals Ltd., Tanuku

43. The Secretariat discussed with UNIDO the basis for the size of replacement reactor vessels and the quality of the baseline equipment, both of which led to higher costs for these items that were requested in similar projects. The operating conditions of the chemical processes carried out by the enterprises appear less efficient than those of other comparable enterprises, resulting in a longer processing time and consequently larger baseline equipment relative to the capacity now installed at DOCL. However on the basis of the operating parameters of the baseline process, the major equipment requirements and their costs are justified. UNIDO re-examined certain parts of the proposed production process and agreed that when the process was optimised, a number of auxiliary items initially requested, such as storage tanks, would not be required. Cost for these items were deleted. It was also agreed that proposed new condensers were eligible at 60 percent of the cost initially requested since condensers were already present in the baseline. Adjustment were also made to proposed costs for effluent treatment, site preparation, electrical and other installation work. Incremental costs were agreed between the Secretariat and UNIDO as follows:

| | |
|---|---|
| Incremental capital costs (including 10% contingency) | US $314,319 |
| IOC for one year | US $6,580 |

Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Satya Deeptha Pharmaceuticals Ltd., Humnabad

44. Initial scrutiny of potential costs for emission control indicated that the option might have been similar in cost to process change. At the request of the Secretariat UNIDO presented additional analysis which confirmed that process change is the more cost-effective option.

45. In response to queries on the apparently high quantities of EDC required for make–up after conversion (which are reflected in IOC calculations), UNIDO re-examined and revised the

quantities downwards. The Secretariat also sought and received additional assurances regarding electricity costs and chemicals prices. Proposed incremental operating costs for additional maintenance arising from new or additional equipment were withdrawn. Eligible capital costs for effluent treatment were adjusted downwards by 50 percent as there are no effluent treatment facilitates in the baseline, and incremental costs for civil works were also revised.

46. Further discussions with UNIDO confirmed equipment eligibility and the levels of costs as previously described and as indicated hereunder:

| | |
|---|---|
| Incremental capital costs (including 10% contingency) | US $222,251 |
| Annual IOC | US $ 37,882 |

Conversion of carbon tetrachloride (CTC) as process solvent to ethylene dichloride at Svis Labs Ltd., Ranipet

47. The enterprise converted its production process in October 1999 to use EDC as a process agent instead of CTC. At the request of the Secretariat, UNIDO is revising its presentation of the project to split up the costs into those incurred by the enterprise before conversion (for which retroactive funding is sought) and those now proposed for funding to restore the baseline capacity and replace equipment which is currently functioning but which is inadequate for the new process (because it cannot withstand the corrosiveness of the new chemicals). The retroactive portion appears eligible for funding. The additional costs now proposed for funding may not be eligible as explained below.

48. In Decisions 19/8 and 20/25 the Executive Committee made it clear that projects similar to those in which an enterprise had already phased out on its own, without the equipment changes usually included in MLF–funded projects, but subsequently sought funding to provide this equipment, would not be considered as eligible in the future. The situation with Svis Labs is not identical because in the projects which gave rise to these decisions the enterprises had converted their production more than three years before the project was prepared, whereas Svis Labs phased out only last October. However the principle is similar and accordingly the additional costs may not be eligible. On this basis the project is being referred for individual consideration.

49. Proposed incremental operating costs for additional maintenance arising from new or additional equipment were withdrawn. Eligible capital costs for effluent treatment were adjusted downwards by 50 percent as there are no effluent treatment facilitates in the baseline, and incremental costs for civil works were also revised.

50. Additional clarifications were obtained on the separation between equipment which was installed prior to phase-out in October 1999, and equipment which is proposed to be installed in the future to replace current equipment of insufficient size to maintain baseline capacity or which is corroding after conversion. Incremental costs were agreed between the Secretariat and UNIDO as follows:

Costs pre-conversion*:*

| | |
|---|---|
| Incremental capital costs (with no contingency) | US $101,273 |
| Annual IOC (which commenced with the conversion) | US $ 31,352 |
| | |
| Costs for proposed new equipment: | |
| Incremental capital costs (including 10% contingency) | US $116,742 |

51. The Executive Committee is invited to consider whether the proposed new equipment is eligible for funding.

Duration of incremental operating costs (all four UNIDO projects)

52. The Secretariat discussed with UNIDO the duration of the "transitional period" for which incremental operating costs should be calculated. UNIDO has proposed a 2-year period based on the time considered to be needed to master the new technology. In this regard, for the single process agent project so far approved in this sector, conversion of production of an agricultural chemical by Excel in India, IOC were requested by the World Bank and subsequently approved for a period of one year. Thje Secretariat noted in these discussions that most enterprises in the pharmaceuticals sub-sector in India have already converted to non-ODS process agents and are thus operating successfully on the cost structure of the converted process. It was also noted that the production process remains largely the same. New equipment is provided to maintain baseline capacity and to cater for different operating parameters (temperature, pressure etc). It appears that the transfer of technology in this sub-sector is well advanced and that the transitional period is short. This being the case the Secretariat is recommending that in these projects IOC should be funded for a transitional period of one year.

**RECOMMENDATION**

1. Each project is recommended for individual consideration.

## PROJECT EVALUATION SHEET
## INDIA

SECTOR: Refrigeration ODS use in sector (1998): 2,202 ODP tonnes

Sub-sector cost-effectiveness thresholds: Commercial US $15.21/kg
Multiple US $14.75/kg* (composite)

***Project Titles***:

(a) Conversion from CFC-11 to HCFC-141b and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Sandlas Air-Con Systems P. Ltd.
(b) Umbrella project for the conversion of three commercial refrigeration enterprises in New Delhi
(c) Conversion from CFC-11 to HCFC-141b and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Nine Enterprises

| **Project Data** | **Commercial** | | **Commercial** | **Multiple-subsectors** |
|---|---|---|---|---|
| | **Sandlas Air-Con** | **3 enterprises** | **Nine Enterprises** | |
| Enterprise consumption (ODP tonnes) | 24.65 | 28.79 | 56.70 | |
| Project impact (ODP tonnes) | 23.31 | 27.32 | 53.52 | |
| Project duration (months) | 36 | 26 | 36 | |
| Initial amount requested (US $) | 233,473 | 379,645 | 797,923 | |
| Final project cost (US $): | | | | |
| Incremental capital cost (a) | 150,500 | 257,124 | 542,250 | |
| Contingency cost (b) | 15,050 | 19,320 | 54,225 | |
| Incremental operating cost (c) | 62,967 | 52,450 | 293,207 | |
| Total project cost (a+b+c) | 228,517 | 328,894 | 889,682 | |
| Local ownership (%) | 100% | 100% | 100% | |
| Export component (%) | 0% | 0% | 0% | |
| **Amount requested (US $)** | 228,517 | 328,894 | 789,425 | |
| Cost effectiveness (US $/kg.) | 9.80 | 12.04 | 14.75 | |
| Counterpart funding confirmed? | Yes | Yes | Yes | |
| National coordinating agency | Ministry of Environment & Forests | | | |
| Implementing agency | UNDP | UNIDO | UNDP | |

| ***Secretariat's Recommendations*** | | | |
|---|---|---|---|
| Amount recommended (US $) | 228,517 | 328,894 | 789,425 |
| Project impact (ODP tonnes) | 23.31 | 27.32 | 53.52 |
| Cost effectiveness (US $/kg) | 9.80 | 12.04 | 14.75 |
| Implementing agency support cost (US $) | 29,707 | 42,756 | 96,837 |
| Total cost to Multilateral Fund (US $) | 258,224 | 371,650 | 886,262 |

## PROJECT DESCRIPTION

Sector Background

| | |
|---|---|
| - Latest available total ODS consumption (1998) | 12,036.00 ODP tonnes |
| - Baseline consumption of Annex A Group I substances (CFCs) | 6,681.00 ODP tonnes |
| - Consumption of Annex A Group I substances for the year 1998 | 5,265.00 ODP tonnes |
| - Baseline consumption of CFCs in refrigeration sector | 2,770.00 ODP tonnes |
| - Consumption of CFCs in refrigeration sector in 1998 | 2,202.00 ODP tonnes |
| - Funds approved for investment projects in refrigeration sector as of July 2000 (31st Meeting) | US$21,838,987.00 |
| - Quantity of CFC to be phased out in investment projects in refrigeration sector as of end of 1999 | 2,121.00 ODP tonnes |

1. The total consumption of CFCs in the refrigeration sector in 1999, according to information from the government of India, was 2,202 ODP tonnes. This figure is sub-divided into consumption in the manufacturing of new refrigeration equipment (662 ODP tonnes) and consumption for servicing (1,540 ODP tonnes).

2. The Executive Committee has approved about US $21,838,987 for 39 projects to phase out 2,121 ODP tonnes of CFC for enterprises manufacturing refrigeration equipment in the

**Commercial refrigeration**

**Three enterprises**

3. The three enterprises (Gaurav Controls, Thermoking and Western Engineering) consumed 18.84 ODP tonnes of CFC-11, 9.95 ODP tonnes of CFC-12 in manufacture of commercial refrigeration equipment (average 1997-1999). The enterprises are manufacturing various models of air-conditioners, walk-in coolers, cold storage units, water coolers, water dispensers and display cabinets. Only one company (Western Engineering) is involved in foam operations, Gaurav and Thermoking are involved in assembly and refrigerant charging operations, using fiberglass or pre-fabricated panels for installation of their refrigeration equipment.

4. The current project will phase-out 18.84 ODP tonnes of CFC-11, 9.95 ODP tonnes of CFC-12 by converting from CFC-11 to HCFC-141b as the foam blowing agent, and from CFC-12 to HFC-134a as the refrigerant. The project includes incremental capital costs covering three low-pressure foam dispensers at Western Engineering (US $120,000) and the necessary provisional evacuation, portable charging and testing equipment for refrigeration operations (US $52,400). Other costs include re-design (US $50,000), testing and trials (US$ 31,000). Incremental operating costs are requested for a period of two years by Western at a level of

(US $37,791), and for one year by Thermoking (US $56,400). Due to the cost-effectiveness threshold figure limitation, incremental operating cost in the Gaurav sub-project is not claimed.

**Nine enterprises**

5. The nine small to medium-sized enterprises (Anand Aircon, Coments Aircon Systems, Freezeland, Kay Ess Industries, Kool Pack Industries, Mongia and Co., RR Industries, Sheetal Refrigeration and Verma Frost) consumed 43.36 ODP tonnes of CFC-11 and 13.34 ODP tonnes of CFC-12 in the manufacture of commercial refrigeration equipment in 1999. The enterprises are involved in the manufacture of various models of commercial bottle coolers, chest freezers and display cabinets. The enterprises employ hand-mixing techniques for foaming operations in the baseline.

6. The current project will phase-out 43.36 ODP tonnes of CFC-11 and 13.34 ODP tonnes of CFC-12 in the manufacture of domestic refrigeration equipment at three medium-sized enterprises in India. This will be achieved by converting from CFC-11 to HCFC-141b as the foam blowing agent and from CFC-12 to HFC-134a as the refrigerant. The project includes incremental capital costs for the nine enterprises, covering the partial cost of high-pressure foam dispensers (US $360,000), refrigerant charging units (US $54,000 each) and vacuum pumps (US $45,000). Other costs include re-design, testing, trials (US$ 90,000), technical assistance (US $135,000) and training (US $45,000). Incremental operating costs are requested by the enterprises for a period of two years for compressors higher than 250 watts, and for six months for compressors of 250 watts and lower. The incremental operating costs reflect the higher cost of chemicals and an increase in foam density.

**Sandlas Air-Con**

7. Sandlas Air-Con consumed 18.2 ODP tonnes of CFC-11 and 6.45 ODP tonnes of CFC-12 in the manufacture of commercial refrigeration equipment (average 1997-1999). The enterprise manufactures polyurethane sandwich panels for walk-in coolers and freezers, cold stores, freezing chambers and refrigerated truck bodies. In addition, the enterprise manufactures custom designed refrigeration units equipped with hermetic and semi-hermetic compressor for various applications. The enterprise operates one low-pressure foam dispenser in the baseline, which will be replaced.

8. The current project will phase-out 18.2 ODP tonnes of CFC-11 and 6.45 ODP tonnes of CFC-12 in the manufacture of commercial refrigeration equipment at Sandlas by converting from CFC-11 to HCFC-141b as the foam blowing agent and from CFC-12 to HFC-134a as the refrigerant. The project includes incremental capital costs covering one high-pressure foam dispenser (US $80,000), refrigerant charging units (US $24,000), vacuum pumps (US $4,000) and leak detectors (US $2,000). Other costs include re-design, testing, trials (US $10,000), technical assistance (US $20,000) and training (US $10,000). Incremental operating costs are requested by the enterprises for a period of two years at a level of (US $67,923). The incremental operating costs reflect the higher cost of chemicals and an increase in foam density.

<u>Justification for the use of HCFC-141b</u>

9. All the three enterprises have selected HCFC-141b technology to replace CFC-11 in their foam blowing operations. It is an interim solution until non-CFC systems (different from hydrocarbons) are commercially available. A letter advising the Government decision to use HCFC technology has been received by the Secretariat in accordance with the Executive Committee Decision 27/13 and is attached to this evaluation together with a justification from the implementing agency.

## SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

### COMMENTS

**Three enterprises**

1. The Secretariat discussed with UNIDO the issue related to the determination of ODS consumption. Additional information has been provided clarifying the specifics of operations in each enterprise. Carbon tetrachloride consumption used by Western Engineering has been taken out from the calculation of ODS consumption with the understanding that a separate solvent project might be developed in the future.

2. Some of equipment is manufactured by Western Engineering Co. on individual contracts according to custom design to be installed outside the premises of the company. In accordance with Decision 31/45 on the new sector for installation assembly and servicing, part of incremental operating costs associated with this project is not eligible.

3. UNIDO has been advised by the Secretariat that the eligible incremental cost for compressors higher than 250 Wt (which are used by the three enterprises) has to be calculated by applying the discounting factor 0.63 which reflects the funding of conversion of compressor manufacturing facilities in India. IOC have been calculated accordingly.

**Nine enterprises**

4. The Secretariat has discussed with UNDP costs requested for technical assistance and training. Umbrella projects are supposed to reduce these categories of cost. The Secretariat advised UNDP to minimize costs by providing training and technical assistance to groups of enterprises at one time. This proposal has been accepted by UNDP and the budget has been adjusted accordingly.

**Sandlas**

5. The Secretariat has discussed with UNDP the incremental operating costs and the requirements of Decision 31/45 on the new sub-sector for assembly, installation and servicing. Part of the production of Sandlas has been identified to be under the new sub-sector. Subsequently, part of the incremental operating costs have been recognized as ineligible. IOC has been adjusted accordingly.

**RECOMMENDATIONS**

1. The Fund Secretariat recommends blanket approval of the commercial refrigeration projects from UNIDO with the level of funding and associated support costs as indicated below.

| | Project Title | Project Funding (US$) | Support Cost (US$) | Implementing Agency |
|---|---|---|---|---|
| (a) | Conversion from CFC-11 to HCFC-141b and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Sandlas Air-Con Systems P. Ltd. | 228,517 | 29,707 | UNDP |
| (b) | Umbrella project for the conversion of three commercial refrigeration enterprises in New Delhi | 328,894 | 42,756 | UNIDO |
| (c) | Conversion from CFC-11 to HCFC-141b and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Nine Enterprises | 789,425 | 96,837 | UNDP |