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MULTILATERAL FUND
FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

MEMORANDUM AND RECOMMENDATION
OF THE
CHIEF OF COUNTRY OPERATIONS, INDUSTRY AND FINANCE DIVISION,
COUNTRY DEPARTMENT II, SOUTH ASIA
TO THE
DIRECTOR OF THE COUNTRY DEPARTMENT II, SOUTH ASIA
ON A
PROPOSED OZONE PROJECTS TRUST FUND GRANT
IN THE AMOUNT EQUIVALENT OF US\$1.252 MILLION
TO
INDUSTRIAL DEVELOPMENT BANK OF INDIA
FOR THE
" TECHNICAL SUPPORT AND INVESTMENT FOR THE REDUCTION OF
CONSUMPTION OF OZONE DEPLETING SUBSTANCES PROJECT "

JULY 26, 1994

Country Operations, Industry & Finance Division

India Department

MICROGRAPHICS

South Asia Region

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12446 IN

CURRENCY EQUIVALENTS

Currency Unit = Indian Rupee (Rs.)
US\$1.00=Rs. 31.37 (Exchange rate as of May 1994)

UNITS AND MEASURES

metric ton = Ton (T) = 1000 kg

ACRONYMS

CFC	:	Chlorofluorocarbons
CTC	:	Carbon Tetrachloride
GOI	:	Government of India
IDBI	:	Industrial Development Bank of India
MF	:	Multilateral Fund
MFEC	:	Executive Committee of the Multilateral Fund for the Implementation of the MP
MFMP	:	Multilateral Fund for the Implementation of the Montreal Protocol
MOEF	:	Ministry of Environment and Forests
MP	:	Montreal Protocol on Substances that Deplete the Ozone Layer
ODS	:	Ozone depleting substance
OTF	:	Ozone Projects Trust Fund
UNDP	:	United Nations Development Program
UNEP	:	United Nations Environment Program
UNIDO	:	United Nations Industrial Development Organization

FISCAL YEAR

Government of India	=	April 1 - March 31
IDBI	=	April 1 - March 31

INDIATECHNICAL SUPPORT AND INVESTMENT FOR THE REDUCTION
OF CONSUMPTION OF OZONE DEPLETING SUBSTANCES PROJECTProject and Grant Summary

Financial Agent : IDBI

Executing Agencies : Ministry of Environment and Forests

Beneficiaries : Shriram Refrigeration Industries Ltd. and Blue Star Ltd.

Amount : US\$1.252 million

Terms : Trustee to IDBI: Grant

Re-lending Terms : IDBI to Beneficiaries: Grants

<u>Project Cost Summary</u>	<u>Component</u>	<u>US\$ Thousand</u>
	Shriram Ref. Ltd.	584
	Blue Star Ltd.	483
	Contingency	160
	Financial Agent Fee	25
	<u>TOTAL</u>	<u>1,252</u>

Economic Rate of Return : Not applicable

Staff Appraisal Report : Not applicable. A Technical Annex has been prepared.

MEMORANDUM AND RECOMMENDATION
OF THE CHIEF OF THE COUNTRY OPERATIONS, INDUSTRY & FINANCE DIVISION,
TO THE DIRECTOR OF COUNTRY DEPARTMENT II, SOUTH ASIA
ON A PROPOSED OZONE PROJECTS TRUST FUND GRANT
IN THE AMOUNT EQUIVALENT TO US\$1.252 MILLION
TO INDUSTRIAL DEVELOPMENT BANK OF INDIA FOR THE
TECHNICAL SUPPORT AND INVESTMENT FOR THE
REDUCTION OF CONSUMPTION OF OZONE DEPLETING SUBSTANCES PROJECT

1. I submit for approval the following memorandum and recommendation on a proposed Ozone Projects Trust Fund (OTF) grant to Industrial Development Bank of India (IDBI) for the equivalent of US\$1.252 million to finance the Technical Support and Investment Project for the Reduction of Consumption of Ozone Depleting Substances (ODS) (hereafter the "Project"). This Project would be the first grant to India under the Multilateral Fund for the implementation of the Montreal Protocol (MFMP).
2. Background on Ozone Depleting Substances. In 1991 India produced and consumed approximately 10,400 metric tons of ODS. ODS per capita consumption is currently estimated to be 10 grams against 300 grams allowed under the Protocol. Most ODS consumption is in foams, refrigeration, air conditioning, aerosols and solvents in electronics and machine tools. India is self sufficient in production of chlorofluorocarbons (CFCs) and is expected to be self sufficient in the production of halons. Large quantities of ODS are used as solvents in processing and manufacturing sectors. In addition to being used as solvents, carbon tetrachloride (CTC) is also used as a feedstock for CFC preparation, as well as process chemical for manufacturing.
3. India ratified the MP on Substances that Deplete the Ozone Layer in June 1992, and is eligible for grants from the Multilateral Fund (MF), which was established to provide support to eligible developing countries to meet their MP obligations. The Fund is managed by an Executive Committee of the MF for the Implementation of the Montreal Protocol (MFEC). The Bank is an implementing agency, jointly with the United Nations Development Program (UNDP), United Nations Environment Program (UNEP) and the United Nations Industrial Development Organization (UNIDO). Projects are channelled through the Bank's Ozone projects Trust Fund agreement with the MFEC. India has played an active role in MP affairs even prior to ratification, and undertook a National Study on ODS in 1990. India's Country Program on ODS Phase out, supported by UNDP, was approved at the 11th meeting of the MFEC held in Bangkok on November 10-12, 1993 as a first step in the development of a comprehensive phase out strategy subject to India preparing a revised document that would incorporate: (i) the substantive information that was included in the presentation made by India at the Eleventh Meeting of the MFEC; (ii) adjustments based on MF Secretariat's comments on the country program; and (iii) the results of a survey of the small and informal sector. In parallel, the Bank, at the request of Ministry of Environment and Forests (MOEF) undertook project preparation of operations for ODS phase-out. That work which is in line with ODS phase-out strategy outlined in the Country Program includes the first project containing two sub-projects (Shriram and Blue Star), which were approved by MFEC on June 28, 1993, and a larger second project which is currently under preparation.
4. India has a mature and growing industrial sector. Environmental issues are receiving increased attention in India, with the MOEF taking the lead. The Bank has in the past supported industrial development, providing financial and technical assistance to small and medium-scale enterprises and supporting policy changes aimed at increased competitiveness of industrial enterprises. The Bank is also supporting environmental program through the first Industrial Pollution Control Project that was approved by the Bank in May 1991, and a second Pollution Prevention project which was approved in July 1994.
5. Project Objectives. The objective of the proposed project is to support India's program to phase out ODS consumption by providing technical assistance, engineering and product development support to the Shriram and Blue Star sub-projects as detailed in Annex 1.

6. Project Description. The Project has two components: (a) Shriram Refrigeration Industries Ltd., to provide assistance for conversion of compressor manufacture from CFC-12 to HFC-134a designs; and (b) Blue Star Ltd. to support funding for substitution of CFC-11 refrigerant by HCFC-123 in Centrifugal Chillers. Both components are designed to assist the participating enterprises in switching from use of ODS to non-ODS materials and technology (Annex 1). The sub-projects represent measures that must be taken early to enable India to develop a cost-effective program to phase out ODS consumption, and they require no policy actions to be taken. Project Summaries and appraisal reports for the two components are available in the Project File. Each sub-project includes technology (from established technology supply relationships), design, training, equipment and implementation of product and engineering development activities to enable each enterprise subsequently to convert to non-ODS technology.

- (a) Shriram Refrigeration Industries Ltd. Phase one of this component, which has been funded by MF, will lead to conversion of an existing CFC-12 refrigeration compressor manufacturing facility at Shriram near Hyderabad to a facility which manufactures compressors operating with non-ozone depleting refrigerant HFC-134a. In phase one, 1200 compressors will be produced for test purposes. The full project when completed will provide a major indigenous source of HFC-134a compressors for use in the production of non-CFC domestic refrigerators.
- (b) Blue Star Ltd. Phase one of this component will provide technology, engineering assistance, and training to Blue Star, a major CFC-11 centrifugal chiller manufacturer located near Bombay, to manufacture equipment suited for use of HCFC-123 as the refrigerant. Phase two will provide for regular manufacture of HCFC-123 Chillers. Technology will be obtained from York International Corp (US) under terms of a technology transfer agreement signed in December, 1992, to expand the existing agreement to cover the technology for HCFC-123. An in-house test facility will be constructed for prototype testing and quality assurance. Capacity will be developed to support customers with subsequent retrofit of existing CFC-11 chillers installations to HCFC-123 centrifugal chillers. Manufacturing facilities will also be modified for production of new HCFC-123 centrifugal chillers. Over the life of the project, demand for 540 MT of CFC-11 will be eliminated for the charging and servicing chillers in large office buildings and hotels throughout India.

7. Project Costs and Financing Arrangements. Estimated Project costs for the two sub-projects including contingencies and financial agent's fee are US\$1.252 million. Use of IDBI as financial agent has proven to be the most efficient and economical way of managing the implementation of the project including handling fund transfers. IDBI's fee of 2% of grant amount is quite reasonable compared to the alternative, of Bank staff carrying out the same functions. During negotiations it was confirmed that IDBI's fee shall be 2% of actual sub-grant amount disbursed. Moreover, the use of a financial agent is standard practice in other ODS phase-out projects. The financial agent fee has been approved by MFEC. Grants equal to the sub-projects' incremental cost will be channeled from the OTF to the participating enterprises through IDBI. Funds for these projects have been transferred from the MFMP to the Banks's OTF. The two enterprises are receiving 100% of project costs as grants. The proceeds of the Grant will be allocated as follows:

(a)	Shriram Refrigeration Industries Ltd.	\$584,000
(b)	Blue Star Ltd.	\$483,000
(c)	Contingency	\$160,000
(d)	Financial Agent Fee	\$ 25,000
	<u>Total</u>	<u>\$1,252,000</u>

Estimated sub-project costs and financing plan are provided in Schedule A. Procurement methods and disbursement table are provided in Schedule B. Incremental costs eligible for funding from OTF are defined as capital costs (excluding taxes) plus net present value of operating costs less benefits discounted at 10% p.a. in constant economic terms (for four years); and then multiplied by local equity portion.¹

8. Project Implementation. MOEF is responsible for project coordination and consistency of operations with the Country Program, it will determine overall objectives and policies, and promote ODS phase-out activities. IDBI will be responsible for sub-project implementation, including sub-project evaluation, supervision, procurement and disbursements. The Bank has completed the sub-projects technical appraisal, and IDBI, has completed the enterprise and financial/economic portions of sub-project appraisal. The Grant Agreement is between the Bank and the IDBI, and the subgrant agreements between the IDBI and the participating enterprises. Key conditions for the subgrant agreement would include: (i) the beneficiary to carry out and operate the sub-project with due diligence and efficiency and in accordance with sound technical, financial managerial, environment and ecological standards; (ii) procurement of goods, works and consultants' services to be financed out of the proceeds of OTF grant would be in accordance with the Bank procurement guidelines ; (iii) the beneficiaries shall maintain records and accounts of expenditures in accordance with sound accounting practices; and (iv) the beneficiaries shall take out and maintain risk and hazards insurance consistent with sound business practices. During negotiations, assurances were obtained from IDBI that: (i) sub-grant agreements with each participating enterprise will be acceptable to the Bank, (ii) IDBI shall prepare and provide semi-annual sub-project progress reports to the Bank as well as the MOEF, and (iii) IDBI shall prepare and provide annual audit reports. The Bank will supervise the overall implementation of the project. The Project is expected to be completed by September 30, 1996, and the Project closing date shall be March 31, 1997.

9. Procurement and Disbursements. Procurement of goods, works, and services will be in accordance with Bank Guidelines for lending through financial institutions. IDBI will satisfy itself that goods and services to be purchased are for the sub-projects and are reasonably priced, by ensuring that the grant recipient has canvassed main sources of supply and purchased from the most advantageous source. Consultants will be selected in accordance with Bank Guidelines for the "Use of Consultants by World Bank Borrowers and by the Bank as Executing Agency". A Special Account of US\$200,000 equivalent (about four months of estimated expenditures) would be established for IDBI after the Grant Agreement becomes effective to facilitate disbursements. Withdrawals from the Special Account would be against full documentation except for expenditures under contracts valued below \$200,000 for which the Bank will accept Statement of Expenditures (SOE). The expected disbursement schedule is: 50% in FY95, 40% in FY96 and 10% in FY97. Retroactive financing of up to 10% of grant amount is proposed for expenditures incurred after June 1992, when India ratified the MP.² Blue Star would be reimbursed for US\$100,000 for the transfer of technology an eligible expenditure which is part of Blue Star's project cost of US\$483,000 that was approved by MFEC, and has been procured according to the Bank procurement guidelines.

10. Project Sustainability. The funds for this project are being provided on a grant basis to introduce new non-ODS technologies. The project will establish an efficient mechanism for developing and implementing sub-projects to complete the ODS phase-out program. The Country Program will focus on strategies, policies, costs and actions to ensure compliance with ODS phase-out

¹ The eligible incremental costs are multiplied by the percentage of local ownership to determine the amount of OTF grant.

² Under MP guidelines the determinant eligibility factor for retroactive financing is the date of ratification of the protocol.

targets in the medium and long term. The project will provide incentives to enterprises to start phase-out projects quickly. Grant funding will compensate for commercial and technical risks.

11. Rationale for Montreal Protocol Financing. The project is consistent with MFEC's and the Bank implementation guidelines and criteria for the use of OTF funds.

12. Actions Agreed. Agreement was reached with IDBI on issues including:

- (a) A fee of 2% of actual sub-grants amount disbursed, to be paid to IDBI from the proceeds of the grant (para. 7);
- (b) IDBI shall prepare and provide semi-annual progress report on Project Implementation to the Bank as well as the MOEF (para. 8);
- (c) IDBI shall prepare and provide annual audit reports (para. 8); and
- (d) IDBI shall enter into a Subgrant Agreement with beneficiaries, the terms and conditions of subgrant shall be satisfactory to the Bank (para. 8).

13. Environmental Aspects. The project is designed to protect the environment by reducing ODS emissions. However, substitution of ODS with other chemicals or technology may involve other environmental concerns. IDBI will ensure that the enterprises have complied with all governmental environmental regulations.

14. Project Benefits. The Project will support India's commitment to an accelerated ODS phase out program and provide a practical demonstration to all industries that the phase out program is underway. Enterprises will benefit from timely adjustment to non-ODS technologies.

15. Project Risks. The Project will minimize technical and commercial risks by providing technical assistance to participating enterprises and by providing grant funding for incremental costs of sub-projects. The risk of proceeding with this project prior to completion of the revision of the Country Program is minimal. Both sub-projects represent high priority actions that are being endorsed by the Country Program.

16. Recommendation. I am satisfied that the proposed grant would comply with the relevant provisions of the Ozone Projects Trust Fund in Resolution 91-5 of the Executive Directors, establishing Global Environment Facility, and I recommend that the Director, Country Department II, South Asia Region, approve the proposed grant.

Robert Anderson
Acting Chief
Country Operations, Industry & Finance Division
Country Department II
South Asia Region

Attachments
Washington, D.C.
July 26, 1994

Schedule A

INDIA

TECHNICAL SUPPORT AND INVESTMENT FOR THE REDUCTION
OF CONSUMPTION OF OZONE-DEPLETING SUBSTANCES PROJECT

Estimated Project Cost and Allocation of Grant Proceeds

	Local	Foreign	Total	Financing
	--- (US\$ thousands) ---			(%)
(a) Component 1: Shriram				
(i) Materials & Equipment	344	98	442	100
(ii) Consultancy	55	-	55	100
(iii) Salary & Travel	87	-	87	100
Subtotal	486	98	584	100
(b) Component 2: Blue Star				
(i) Technology	-	100	100	100
(ii) Materials & Equipment	195	125	320	100
(iii) Civil Works	56	-	56	100
(iv) Training	7	-	7	100
Subtotal	258	225	483	100
Total	744	323	1,067	
Contingency (15%)			160	
IDBI Financial Agent Fee (2%)			25	
Grant Total			1,252	

INDIA

TECHNICAL SUPPORT AND INVESTMENT FOR THE REDUCTION
OF CONSUMPTION OF OZONE-DEPLETING SUBSTANCES PROJECT

Procurement Methods and Disbursement Schedules

Procurement. IDBI will be responsible for procurement under the Project. It will arrange procurement (international and local) for the packages in each sub-project to be handled between the respective participating enterprises and qualified procurement agencies authorized by the Government and acceptable to the Bank. Bidding documents will be prepared based on model bidding documents acceptable to the Bank (e.g. sample Bank bidding documents).

The following contracts and bid packages will be subject to prior review:

- (i) over \$1 million³;
- (ii) over \$200,000 but less than agreed number of bids being sought;
- (iii) for proprietary technology and equipment; and
- (iv) for selection of consultants, where the Bank will review the short list and terms of reference, generic letter of invitation, and award decisions.

For procurement of Equipment the following procedures would apply:

- (i) contracts over \$1 million (excluding proprietary packages) would be procured under international competitive bidding (ICB);
- (ii) contracts between \$200,000 and \$1 million would be procured on the basis of comparison of price quotation solicited from at least three qualified suppliers from at least two countries;
- (iii) contracts above \$50,000 and below \$200,000 would be allocated on the basis of comparison of price quotation solicited from at least three qualified suppliers; and
- (iv) contracts below \$50,000 would be according to IDBI's normal procedures for small contracts.

Consultants (including those from local institutions) retained under the project would be recruited in accordance with the "Guidelines for the use of consultants by the World Bank", published by the World Bank in August 1981.

All contracts financed through this grant will be subject to ex-post review by the Bank in order to verify compliance with Bank procurement guidelines.

³ In other ODS phase out projects the threshold for ICB has been set at \$2 million.

Procurement Methods

<u>Category</u>	<u>ICB</u>	<u>LCB</u>	<u>Other</u>	<u>Total</u>
	----- (US\$ thousand) -----			
Goods	-	-	894	894
Services	-	-	358	358
Total	-	-	1,252	1,252

Note: Goods worth more than \$200,000 would be procured through international shopping by requesting price quotations from at least three qualified suppliers from at least two countries. These arrangements are judged adequate given the small size of the procurement packages and the specialized technologies and equipment required. Although provisions for ICB and LCB have been included in the procurement methods, no such procurement is expected given the proprietary nature of most non-ODS equipments.

Allocation of OTF Grant Proceeds

<u>Category</u>	<u>Amount Allocated</u> (US\$ thousand)	<u>Financing</u> (%)
Civil Works	56	100
Technology	100	100
Materials and Equipment	762	100 ^{1/}
Consultant Services	55	100
Training & Travel	94	100
Unallocated (contingency)	160	-
IDBI Fee	25	100
Total	1,252	-

^{1/} 100% of Foreign Expenditure, 100% of Local Expenditures (ex-factory), and 80% of Local Expenditures for other items procured locally.

Disbursements. The Project is expected to be disbursed within a period of two calendar years. The Bank will disburse against 100% of eligible foreign expenditure and 100% of eligible local expenditures for eligible incremental costs, net of direct import, sales and value added taxes, for grant-financed goods and works contracts. Disbursement procedures have been established as follows:

- (i) Between the World Bank and IDBI: The World Bank will transfer an initial amount up to \$200,000 to a Special Account which the IDBI will open. The minimum amount for replenishment of the Special Account will be US\$200,000. Requests for reimbursement will be based on Statement of Expenditures (SOEs) for contracts with a value of up to US\$100,000. The Bank will accept requests for direct payment to supplier of goods or services (not through special account) only above a minimum of US\$50,000. Terms, conditions and schedule for disbursement must be included in the sub-grant agreement between the IDBI and the enterprise.

(ii) Between IDBI and Sub-project recipient: up to US\$100,000 per contract, the IDBI will disburse to the sub-project proponent for eligible expenses without prior review by the World Bank. Disbursement will follow the guidelines established in the Disbursement Handbook published by the World Bank in 1992. Details of the disbursement procedures will be included in the initial Disbursement Letter to be issued by the World Bank to the IDBI.

Estimated Disbursements

Bank FY	95	96	97
	----- (US\$ thousand) -----		
Annual	626	500	126
Cumulative	626	1,127	1,252

INDIA

TECHNICAL SUPPORT AND INVESTMENT FOR THE REDUCTION
OF CONSUMPTION OF OZONE-DEPLETING SUBSTANCES PROJECT

Timetable of Key Processing Events

(a)	Time taken to prepare:	Seven months
(b)	Prepared by:	World Bank/GOI
(c)	First Bank Mission:	March 1993
(d)	MFEC Approval:	June 28, 1993
(e)	Appraisal:	July/August 1993
(f)	Negotiations:	May 1994
(g)	Bank Approval:	July 1994
(h)	Planned signing:	August 1994
(i)	Planned effectiveness:	August 1994
(j)	Planned completion:	September 1996

INDIA

TECHNICAL SUPPORT AND INVESTMENT FOR THE REDUCTION
OF CONSUMPTION OF OZONE-DEPLETING SUBSTANCES PROJECT

Sub-Project Descriptions

SHRIRAM

All refrigeration and air conditioning devices manufactured in India use CFCs or HCFC-22 as the refrigerant working fluid. CFC-12 is mainly used for domestic refrigerators and freezers, water coolers, bottle coolers, and to some extent in industrial refrigeration systems employing both open and semi hermetic compressors. Shriram, a 100% Indian owned company, is a major manufacturer of hermetic compressors in India, and in 1992, it produced 48,000 CFC-12 compressors, and 95,000 HCFC-22 compressors. Present capacity for CFC-12 compressors is 75,000 units per year with a planned production increase by 1997/98 to 500,000 HFC-134a units. Under an existing license agreement with Tecumesh, one of the largest compressor manufacturers in the World, technology for HFC-134a compressor manufacture has been transferred to Shriram.

This sub-project, representing essential engineering and manufacturing development, is required to be completed before company can enter the commercial market with non-CFC refrigerators. Commercial production of these non-CFC refrigerators will not be undertaken until subsequent projects are designed and implemented. The commercial production of refrigeration will require India to make a policy decision to mandate industry to convert to non-CFC technology, as is being considered under the ODS Country Program, now under preparation.

SUB-PROJECT OBJECTIVE

The sub-project objective is to convert CFC-12 compressor manufacturing to use HFC-134a as the refrigerant.

SUB-PROJECT DESCRIPTION

The sub-project will be conducted in two phases. Phase I involves the manufacturing of 12 compressor models in the existing manufacturing facilities. Test manufacturing is necessary as the designs transferred to Shriram under their license agreement must be adapted to local conditions. In particular, the compressor motor must be modified by Shriram to tolerate the power surges common in India. Existing laboratory facilities and test equipment will be used to develop and test the necessary design modifications. Shriram has a major development laboratory in which some of the calorimeter and dynamometer instruments can be constructed in lieu of importing similar equipment. Tecumesh, the Indian Institute of Technology, the Central Mechanical Engineering Research Institute, and the National Chemical Laboratory will support Shriram's development activities. Phase II will entail the full conversion for the manufacturing of HFC-134a compressors. OTF grant was requested and approved for the phase I only.

The Phase I sub-project plan is as follows:

- a) Obtain technology package for HFC-134a;
- b) Construct testing facilities for compressor evaluation;

- c) Procure necessary materials and components and produce 1200 HFC-134a units;
- d) Conduct life and reliability tests on 12 compressor models;
- e) Field test HFC-134a compressors in domestic refrigerators, freezers, and coolers; and
- f) Prepare a feasibility study, cost estimate, and schedule for a phase II project to completely convert the plant to HFC-134a compressor manufacture.

There is no direct measure of the cost effectiveness of this sub-project, as it focuses on test manufacture of new compressor designs. However, the indirect impact after Phase II is completed, would correspond to 15 MT per year of CFC-12 phaseout, based on present capacity of 60,000 units.

BLUE STAR

All refrigeration and air conditioning devices manufactured in India use CFCs or HCFC-22 as the refrigerant working fluid. CFC-12 is mainly used for domestic refrigerators and freezers, water coolers, bottle coolers, and to some extent in industrial refrigeration systems employing both open and semi hermetic compressors. Water chillers in India provide comfort cooling in hotels, office buildings, hospitals and large structures. Chillers are also found in the industrial sector, particularly in textile manufacturing where climate control is important. Large capacity building chillers are generally of the centrifugal type and use CFC-based refrigerants (mostly CFC-11 and CFC-12, with limited use of CFC-113 and R-500). Technologies for application of the new non-ODS refrigerant, HCFC-123 and HFC-134a to replace CFC-11 and CFC-12 must be imported. This sub-project will be limited to the replacement of CFC-11 with HCFC-123.

Blue Star commenced production of Centrifugal Chillers in 1985, using CFC-11 as the refrigerant, under license from York International Corporation, USA. This agreement will continue until York has fully developed the application of HCFC-123 as a substitute refrigerant for CFC-11 in Centrifugal Chillers. HCFC-123 has already been well proven with a few hundred machines in operation in USA and elsewhere.

The sub-project will provide technology and facility to manufacture equipment suited for use with HCFC-123 as the refrigerant. Technology will be obtained from York International Corp (US) under terms of a technology transfer agreement signed in December, 1992 to expand the existing agreement to cover the technology for HCFC-123. An in-house test facility will be constructed for prototype testing and quality assurance. Capacity will be developed to support customers with subsequent retrofits of existing CFC-11 chiller installations to HCFC-123 refrigerant. Manufacturing facilities will also be modified for production of new HCFC-123 centrifugal chillers. Over the life of the project, demand for 540 MT of CFC-11 will be eliminated for the charging and servicing of chillers in large office buildings and hotels throughout India.

India has made a decision to phase-out the use of CFCs in the refrigerant and foam sectors in compliance with its obligations under the Montreal Protocol. This sub-project, representing essential engineering and manufacturing development, is required to be completed before the enterprise can enter the commercial market with non-CFC refrigerators. Commercial production of these non-CFC refrigerators will not be undertaken until a subsequent project is designed and implemented. The commercial production of refrigeration and foam systems will require India to make a policy decision to mandate industry to convert to non-CFC technology.

SUB-PROJECT OBJECTIVE

The object of this project is to eliminate the use of CFC 11 in manufacturing Centrifugal Chillers through conversion to the use of HCFC-123 refrigerant.

SUB-PROJECT DESCRIPTION

This two-phase sub-project will eliminate Blue Star's use of CFC-11 as a refrigerant in Centrifugal Chillers by converting its product line to HCFC-123. Phase I will provide the know-how and engineering assistance and training needed to build and test/evaluate Centrifugal Chillers using HCFC-123 as refrigerant. Phase II will provide for modifications of production facilities to manufacture of HCFC-123 Centrifugal Chillers. At the conclusion of Phase II, Blue Star will have the capability of converting about 25 Blue Star made chillers per year, operating in the field, from CFC-11 to HCFC-123.

Blue Star has approached York International Corporation for transfer of know-how for producing HCFC-123 Centrifugal Chillers in India and phasing out their current range of CFC-11 Chillers. This would also enable Blue Star to offer retrofitting of the CFC-11 Chillers currently operating in the field to work with HCFC-123. In pursuit of this objective, Blue Star has already made a payment of US\$100,000 (in December 1992) for license fee, Plans, Drawings, Specifications Sheets and Engineering Instructions for the selection, conversion from CFC-11 to HCFC-123 and manufacture of Centrifugal Liquid Chillers using HCFC-123 as refrigerant instead of CFC-11.