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

Ninth Meeting
Montreal, 8-10 March 1993

REVISED PROJECT PROPOSAL: CHINA

This document represents a request for additional funding for the following projects approved by the Executive Committee at its Seventh Meeting:

- | | | |
|----|--|--|
| 1. | Aerosols: | Shanghai CFC Conversion to LPG |
| 2. | Aerosols: | Tianjin CFC Conversion to LPG |
| 3. | Fire Protection: | Beijing ABC Powder Production |
| 4. | Fire Protection: | Zhejiang Halon Extinguisher Conversion |
| 5. | Polystyrene and Polyethylene
Extruded Foam: | Zhejiang Conversion to Butane |
| 6. | Rigid Foam: | Fifty Percent Reduced CFC Foam |

**The Montreal Protocol on
Substances that Deplete the Ozone Layer**

CHINA - FIRST ODS PHASEOUT INVESTMENT PROJECT

REVISED INCREMENTAL COST ESTIMATES AND FUNDING REQUEST

1. Background. At its Seventh Meeting in June 1992, the EC approved \$ 9 million for the first ODS Investment Project in China comprised of six individually approved subprojects (two aerosol, two halon substitute and two foam). A component of one of the foam subprojects was subsequently transferred to UNDP leaving a total of \$8.52 million. In August 1992, the Bank and China signed a Project Preparation Advance (PPA) agreement for \$1.5 million. These funds are being used to initiate activities for the six subprojects and are expected to be depleted by May 1993.

2. In early 1992, guidelines for MPMF projects were under preparation and considerable effort was spent during the year reaching a consistent, satisfactory set of guidelines for calculating incremental costs and processing MP projects. A consensus was reached in late 1992. The revised incremental costs for the six subprojects, which we are now presenting for final EC approval, reflect those guidelines.

3. Funding Request. Based on detailed examination of subproject costs and careful calculation of incremental costs using consistent methodology the aggregate incremental cost for five of the six subprojects (excluding the sixth subproject: 50% Reduced CFC Foam) increased 16%, or \$1.09 million, as explained below and detailed in attached table. The incremental costs increased for three subprojects (two aerosol and one halon substitute) and decreased for two (one halon substitute and one foam). All incremental cost increases are under \$500,000 per subproject. The 50% Reduced CFC Foam subproject is being resubmitted for a revised incremental cost of \$7,678,000 (\$5.8 million over previous submission). The analysis on which the original version was based including the grant request, were based on incomplete information and several assumptions that proved to be ill founded. The current submission is based on substantiated capital and operating cost figures. The former submission should be disregarded and this subproject should be considered based on the new documentation which includes a review by OORG reviewer Dr. Michael Jeffs. Finally, the Bank requests \$185,000 to pay the financial agent fee for appraisal, procurement, disbursement and auditing of this Project (based on 1.2% of total grant amount).

4. Justification for Subproject Additional Funding Request <\$500,000. On behalf of the Chinese government, the Bank requests \$270,000 in additional funds to cover the incremental costs of the Tianjin Aerosol Subproject which will eliminate about 6300 MT of CFC-12 annually and \$470,000 for the Shanghai Aerosol Subproject which will also eliminate about 6300 MT of CFC-12 annually. The cost effectiveness of these two subprojects considering revised incremental cost estimates is still under \$0.10/kg ODP/year using the unit abatement cost calculation formula. The increase is due to increased total capital costs for one subproject and adjustment in the revenue savings from the filling operations. As the calculation of incremental costs are very sensitive to revenue and capital cost assumptions, all cost estimates were reviewed in detail by the OORG aerosol expert Mr. Geno Nardini. Mr. Nardini concurs that the revised incremental cost figures, and the supporting assumptions for revenue and capital costs are reasonable. A copy of Mr. Nardini's report is available from the Bank.

5. The Bank also requests \$497,000 in additional funds to cover the incremental costs of the Beijing Halon Substitute Subproject which will eliminate 400 MT of Halon 1211 annually (1600 ODP). The cost effectiveness of this subproject considering revised incremental cost estimates is still under \$0.10/kg ODP/year using conservative halon phaseout estimates (400 MT) and the unit abatement cost calculation formula. The increase is due to higher technology transfer costs and lower local prices for the halon substitute than originally estimated. Halon substitute price is currently within the range acceptable to the halon expert who accompanied the Bank's preappraisal missions for this Project, Mr. Erik Pedersen. The

lower price and higher technology transfer cost resulted in a large incremental cost increase for the Beijing subproject, and, because Beijing will supply halon substitute at a lower price to the other subproject at Zhejiang, Zhejiang shows a small decrease (\$87,000) in incremental costs. To provide technical supervision of technology procurement and detailed subproject design, an additional funding request is also made for \$50,000 for technical assistance to both subprojects.

6. Using the accepted MP guidelines, revised incremental costs for the Zhejiang Foam subproject result in a minor decrease of \$69,000. To provide technical supervision of technology procurement and detailed subproject design, an additional request is made for \$20,000 for technical assistance.

7. Justification for Subproject Additional Funding Request >\$500,000. Revised incremental costs resulted in an increase of over \$500,000 for only one subproject (50% Reduced CFC Foam). The Bank requests an additional \$5.8 million for this subproject including \$30,000 for technical assistance to provide technical supervision of project procurement and detailed subproject design. As mentioned above, the previous subproject analysis and grant request were based on preliminary and incomplete information. As such, the Bank requests that the former submission be disregarded and the subproject be considered on the merits of the current submission only. The subproject comprises 13 components including two chemical design institutes, four producers of key raw materials used in foam production and seven rigid foam manufacturers. Incremental costs were carefully reviewed to ensure no double counting. Project Summary and OORC review are attached.

8. The four key foam raw material, polyol and MDI production, components fund technology conversion for the production of foam raw materials that meet the specifications for compatibility with reduced CFC formulations. Although some foam manufacturers still rely on imported raw materials, the trend has been to increasing use of domestic raw materials. The Chinese government estimates that local producers meet 75% of polyol demand and the Yantai MDI plant was constructed to provide local supplies. The transition to local manufacture of foam raw materials is part of China's industrial strategy and it is within this context that the phaseout strategy for this sector was developed. Local foam raw material suppliers have successfully penetrated the market by providing low price product. Lack of a reliable source of local foam raw materials compatible with reduced CFC formulations has been cited by Chinese rigid foam producers as the main obstacle to widespread adoption of the reduced CFC technology. Thus, the major impact of this subproject, will be to set up a transformation of the whole rigid foam producing industry by addressing the supply issues.

9. The Bank reviewed points raised by Dr. Jeffs on costs for components of subprojects and will investigate specific issues during appraisal. The procurement process provides for competitive purchase of all equipment. The amounts requested for these components are reasonable estimates including contingencies. It is likely that the final appraisal may show somewhat lower funding requirements.

CHINA - FIRST ODS PHASEOUT INVESTMENT PROJECT
REVISED INCREMENTAL COST ESTIMATES AND FUNDING REQUEST

(US\$000's)

Component	Incremental Cost as Approved by MPEC	Revised Incremental Cost	Additional Funding Request
<u>Incremental Cost</u>			
<u>Change < \$500</u>			
AEROSOL			
(a) Shanghai	1900	2309	409
(b) Tianjin	2500	2770	270
HALON SUBSTITUTES			
(a) Beijing	403	900	497
(b) Zhejiang	797	710	-87
Technical Assistance	0	50	50
FOAM			
(a) Zhejiang	1042	973	-69
Technical Assistance	0	20	20
SUBTOTAL	6642	7732	1090
 <u>Incremental Cost</u>			
<u>Change > \$500</u>			
FOAM			
(b) 50% CFC Foam	1878 ¹	7648	5770
Technical Assistance	0	30	30
SUBTOTAL	1878	7678	5800
 <u>Financial Agent Fee</u>	 0	 185	 185
GRAND TOTAL	8520	15595	7075

¹ Excluding \$480,000 subproject component transferred to UNDP.

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PROJECT COVER SHEET

COUNTRY: CHINA

PROJECT TITLE: 50% Reduced CFC Foam

SECTOR COVERED: Rigid Polyurethane Foam

**ODS CONSUMPTION
IN SECTOR (1991):** 13,000 MT CFC-11 (13,000 MT ODP)

PROJECT DURATION: 2 years

PROJECT IMPACT: Phase out 660 MT CFC-11 (660 MT ODP)

TOTAL PROJECT COST: \$12,100,000

PROPOSED OTF GRANT: \$7,648,000

COST EFFECTIVENESS: \$7.50/kg ODP/year¹ (\$6.50/kg ODP/year if only consider
requested investment amount and not full investment
costs)

LOCAL AGENCIES:

Design Institutions: Liming Research Institute
510 Research Institute of MAA

Chemical Producers: Shen Yang Petrochemical Plant
Shanghai No.6 Plastics Factory
Wuxi Foam Material Factory
Yantai Synthetic Plastic

Four Refrigerator Factories (Users):
Shangling
Qindao Liebeherr
Xin Fei
Shaung Yan

Three Panel Manufacturers (Users):
Tianjin PU
Chengde Commercial Machinery
Da Lian

**NATIONAL COORDINATING
AGENCIES:** Ministry of Light Industry (MLI) and the
National Environmental Protection Agency (NEPA)

IMPLEMENTING AGENCY: World Bank

¹/Investment costs annualized over 10 years using 10% discount rate.

PROJECT SUMMARY

This project will demonstrate the commercial applicability of 50% reduced foam technology in polyurethane (PU) insulation foam applications by converting four refrigerator and three panel manufacturers. In addition the project will adapt three domestic polyol suppliers and China's only MDI producer to the production of material compatible with the reduced CFC formulation. The reduced CFC foam formulation will be phased in at the seven manufacturers resulting in a phase out of 660 tons of CFC-11 per year at full production. Reduced CFC foam formulations have been applied commercially in Europe and other areas as short term CFC reduction measures.

SECTOR BACKGROUND

Consumption of CFC-11 in rigid PU insulation applications in China was about 13,000 tons in 1991. 50% of consumption went to rigid PU panel production, 30% to household refrigerators, 10% to other refrigeration equipment, 6% for in-situ spraying and 4% to making pipe sleeves. MLI predicts the consumption of CFC-11 in household refrigerators will grow at 12% annually to reach 8,500 tons in 1996; consumption of CFC-11 in 1996 for panels, in-situ spraying and pipes will be 11,200, 1,400, and 1,000 tons respectively; for a total of 22,100 tons in 1996 for the sector.

PROJECT OBJECTIVES

The objectives are to:

(i) Adopt a CFC foam formulation at three panel manufacturers and four household refrigerator factories to demonstrate the commercial applicability of low CFC formulations as an interim measure for China's rigid PU insulation applications; and

(ii) Convert three domestic polyol manufactures to produce polyol compatible with the reduced CFC formulation and upgrade China's MDI manufacturer to produce material suitable for use with the reduced CFC formulation.

PROJECT DESCRIPTION

The use of reduced CFC foam formulations is impeded by a lack of domestic raw material suppliers, concerns about long-term foam stability and by higher price. The subproject will overcome these barriers by demonstrating the new technology at several manufacturers and by converting domestic materials producers to the production of compatible materials.

The Liming Research Institute and the 510 Research Institute of the Ministry of Aviation and Aerospace (MAA) have developed polyols compatible with reduced CFC foam formulations. These institutes will transfer their new polyol

technology to Wuxi Foam Material Factory and the Shen Yang Petrochemical Plant. Shanghai #6 Plastics Factory will acquire technology locally if quality meets specifications, or it will import new polyol technology. About 75% of the polyether polyols used in China are produced locally. However no local producers can yet produce a polyol compatible with a 50% reduced CFC formula.

The Yantai Synthetic Plastics Factory will upgrade its MDI production facilities to manufacture materials compatible with reduced CFC foam formulation. The MDI produced at China's sole producer has a high acid and hydrolysis chlorine content that may create special problems when the MDI is used in conjunction with reduced CFC foam formulations.

Four refrigerator plants and three panel manufacturers will adopt the reduced foam formulation. Conversion will include trial runs to optimize formula and blowing technique, batch production and full scale conversion. Factories will use domestic raw materials to demonstrate their performance. The new foam formulation will be used with existing foam blowing equipment.

The Beijing Household Electrical Appliances Research Center (BHEARI), will serve as a testing, evaluation and promotion center for reduced CFC technology. ICI has equipped the center with foam testing equipment. A UNDP supported project will provide further technical training to BHEARI. The center will conduct performance tests to ensure product quality, set appropriate standards, provide technical assistance to factories and promote results among all refrigerator manufacturers.

PROJECT COSTS AND INCREMENTAL COSTS

Project Costs are given in the attached tables. Table 1 shows prices for the old chemicals and projected prices for chemicals compatible with the low CFC formulation. Table 2 gives the project cost breakdown. The revenue streams are incremental operating costs based on the price increases shown in Table 1.

Capital costs for the 13 components, foreign and domestic, total US\$ 8.0 million. The project sponsors have limited their grant request to US\$ 4.0 million; foreign exchange costs. There are no taxes included in the capital cost estimates. Incremental costs for the chemical producers were determined on the basis that only a small increase in chemical price (table 1) could be passed on under market conditions in China. The Bank concurs with this judgement and confirms that there is no double counting of eligible incremental costs in the aggregate projects.

Incremental operating costs are based on the incremental price of chemicals, the incremental quantity of chemicals consumed and the relevant quantity of CFC-11 required, discounted at 12% over a four year period (with no price escalation). For these projects, four years of recurring costs are considered under the presumption that enterprises will subsequently switch to a non-CFC blowing agent as non-CFC technology becomes commercially available.

The total grant request (incremental cost) for the 13 components for total capital and operating costs is US\$ 7.65 million. Of this, US\$ 3.66 million is requested for incremental operating costs over four years.

FINANCIAL AND ECONOMIC ANALYSIS

The internal rates of return calculated in financial and economic terms for the components to this subproject will be presented in the China Investment Bank's (CIB) financial appraisal which will also include the financial viability of the enterprises. A financing plan will be determined in the financial appraisal, and will include all sources, terms and conditions.

PROJECT IMPLEMENTATION

Subproject implementation will be coordinated by MLI under the Project Management office in NEPA. Thirteen enterprises from five ministries namely: MLI, The Ministry of Commerce (MOC), the Ministry of Chemical Industry (MCI), MAA and the Ministry of Machinery and Electronics Industry (MMEI), will participate in this subproject. The ministry responsible for the institutes and factories falling under its jurisdiction will support their activities. Each enterprise will be responsible for actual project implementation. CIB will supervise procurement and disbursements, and be responsible for audit reports. NEPA/CIB will be responsible for quarterly progress reports during implementation. The project employs commercial available technology in China's largest CFC use sector with sufficient technical assistance to ensure project success.

RELATIONS BETWEEN PARTICIPATING ENTERPRISES

The S10 and Liming Institutes supply their technology to Wuxi and Shen Yang petrochemical factories respectively.

Wuxi and Shen Yang supply polyol to Shaung Yang and Xin Fei factories respectively. Shanghai no. 6 Factory supplies polyol to Qindao and Shangling refrigerator factories. Yantai supplies MDI to Qindao.

Da Lian, Tianjin PU and Chengde Commercial Machinery import their polyol material at present but will shift to local supply when available in acceptable quality.

PROJECT RESULTS

This project will remove 660 tons of CFC-11 per year at the end of the second year of project implementation when all components have reached full production.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness with noted caveats was given by the OORG reviewer Dr. Michael Jeffs. A copy of his review is attached.

TABLE 1

Chemical Producer	Product	Price \$US/kg		
		Present	New	Increase
Muti Foam	Polyol	2.250	2.470	0.220
Shen Yang	Polyol	2.250	2.470	0.220
Shanghai #6	Polyol	2.167	2.333	0.166
Yantai Leather	MDI	2.085	2.107	0.024

TABLE 2

Capital Costs (US\$'000)					Incremental Operating Costs (US\$'000)					Total Grant Request	OBS Saving per Year (NT CFC-11)
Enterprise	Local	Foreign	Total	Request	Yr 1	Yr 2	Yr 3	Yr 4	Total Y1		
Research Institutes:											
Liming	141	513	654	513						513	
501 Institute	272	366	638	366						366	
Chemical Producers:											
Shanghai #6	340	400	740	400						400	
Yantai	255	920	1175	920						920	
Muxi	272	230	502	230						230	
Shen Yang	556	175	731	175						175	
Users:											
Shangling	249	225	474	225	255	255	255	255	867	1092	160
Qingdao	1300	183	1483	183	71	71	71	72	242	425	150
Xin Fei	164	175	339	175	148	148	148	148	508	678	75
Shaung Yan	153	175	328	175	123	123	123	123	418	593	100
Chengde	127	175	302	175	131	131	131	131	446	621	65
Dalian	62	175	237	175	68	68	68	68	231	406	10
Tianjin PU	125	275	400	275	280	280	280	280	953	1228	100
TOTAL	4016	3987	8003	3987					3661	7648	660

Total Project Cost \$11,664,082

Total Grant Request \$7,648,082

Y1 Discounted at 12%

* OORG REVIEW *

50% REDUCED CFC FOAM PROJECT

CHINA - GENERAL COMMENTS

- * The analysis of the two research institute projects shows that the funds requested includes the purchase of basic equipment which is not specific to reduced CFC 11 technology development. Nevertheless, both projects are sound and supportable.
- * Comments without conclusions are given for the four chemical producer projects. Detailed examination of the projects by process engineers is recommended.
- * Detailed appraisals are presented on CFC 11 reduction projects in four refrigerator factories and three panel factories. All projects are supported subject to the comments given in specific cases.
- * Question of small price increase not being sustainable. Given the chemical prices quoted in table 1, the added cost contribution would be \$ 0.51 in a typical unit using 6 kg of foam chemicals. Assuming the total unit manufacturing cost to be the order of \$ 100 then the cost increase is about 0.5% - which is probably capable of being absorbed by the market. Another point, also relevant to incremental cost considerations, is the supposed increased use of chemicals in reduced CFC 11 cases. This would only happen if the foam density increased. Such increases have not been experienced elsewhere.
- * Chemical prices - a comparison of typical world and Chinese market prices is given below :-

S/kg	World	Chinese
MDI	2.20	2.00
Polyol formulation	2.50	2.20

Current taxes and duty levied on imported chemicals are :

MDI	+ 33%
Polyol formulation	+ 47%

These duties are a big incentive to use local chemicals.

- ♦ The incremental cost calculations should be recalculated in those cases (Qingdao, Chengde, Xinfai) where the CFC 11 reduced technology will be progressively introduced. This will substantially change the data. Otherwise, the incremental costs are arithmetically correct on the basis of the data presented. The crux of the question is whether the increased prices for the new chemicals are justified and cannot be passed on to the consumer. Without having details of the raw materials used in the new polyols or how they are made it is difficult to give a definite answer. However, such increases have not been sustained in other markets.
- ♦ A recurring item is funds for visits to China of foreign experts. This is a new factor and a bonus to foreigners which is an entirely novel concept.
- ♦ To my knowledge Yantai do not currently supply a major proportion of the market. A factor is the inferior quality to that of imported MDI. The project seeks to correct this but it is relevant to standard as well as reduced CFC 11 technology.

RESEARCH INSTITUTES

LIMING

Much of the equipment and instruments in the project would be necessary to carry out research in general polyurethane formulation and not be specific to reduced CFC 11 formulation development. Otherwise, the basic programme would appear to be sound and should be supported.

510 RESEARCH

Again, much of the equipment and instruments included in the project would be necessary to develop polyols and formulations and it is noted that a research programme had already been undertaken in 1990. The present project is sound and should be supported.

CHEMICAL PRODUCERS

SEEN YANG PETROCHEMICAL PLANT

The funds requested are for new polyol manufacture and formulation blending capacity. It is not clear whether or not the new polyol and formulation could be manufactured in existing plant. Total costs are in line with expected levels.

SHANGHAI NO 6 PLASTICS FACTORY

The funds requested are for reduced CFC polyols / formulations which have already been developed and include testing equipment. This would appear to duplicate several items in the Shang Ling General Refrigerator factory project with the exception of a polymerisation vessel and importation of foreign materials for comparative purposes.

WUXI FOAM FACTORY

The funds requested are for special equipment to produce reduced CFC polyols. Much of the testing equipment listed would appear to be standard for a polyol plant and not specific to reduced CFC products.

XANTAI SYNTHETIC PLASTICS FACTORY

The upgrading of the MDI quality is the issue in this case, particularly in terms of acid level and hydrolysable chlorine. In general these improvements are needed to bring the product into line with the quality of imported MDI and is not specific to the reduced CFC 11 technology. It is, however, in line with the strategy of using domestic chemicals for industrial production.

DALIAN REFRIGERATION WORKS

RECOMMENDATION

The project is supported, subject to the comments listed.

RELEVANCY AND ADEQUACY OF INFORMATION

Lack of information and clarity, particularly on capital items.

TECHNICAL SOUNDNESS

The project proposes 50% reduced CFC technology. This generic technology is well proven, having been used in Europe and elsewhere since 1989 / 1990.

LESSONS FROM EXPERIENCE

None.

ENVIRONMENTAL ISSUES

The project, when implemented, will result in the saving of CFC 11 of about 14 tes per year, based on CFC consumption data for 1989 - 1991. However, this information is for both polystyrene and polyurethane foam-cored panels and the amount to be saved needs to be clarified. Note - the saving is not 97 tes of CFC 11 per year as listed in table 2.

SAFETY ISSUES

None provided that an adequate training programme is in place.

COST EFFECTIVENESS

See general comment on incremental operating cost. Equipment costs are relevant as far as the information given and appear to be reasonable.

OTHER

None.

SHENGDE COMMERCIAL MACHINERY

RECOMMENDATION

The project is supported, subject to the comments listed.

RELEVANCY AND ADEQUACY OF INFORMATION

Mediocre in terms of clarity.

TECHNICAL SOUNDNESS

The project proposes a 50% reduced CFC technology. This is well proven in a generic sense, having been used in panel production in Europe and elsewhere since 1989 / 1990.

LESSON FROM EXPERIENCE

None.

ENVIRONMENTAL ISSUES

The project, when implemented, will result in the saving of CFC 11 of 50 te in 1993, 55 te in 1994 and 85 te in 1995. Note - saving is not 200 te per year as listed in table 2.

SAFETY ISSUES

None provided that an adequate training programme is in place.

COST EFFECTIVENESS

A major point to be clarified is the need to purchase 2 on-site foam and spraying machines at a cost of 500,000 RMB (\$ 90,000). There are supposedly needed to "improve original work conditions". The relevancy to panel production should be investigated before funds are issued.

See general comment on incremental operating costs.

OTHERS

None.

TIANJIN PU PLASTIC FACTORY

RECOMMENDATION

The project is supported, subject to the comments listed.

RELEVANCY AND ADEQUACY OF INFORMATION

Complex presentation of information.

TECHNICAL SOUNDNESS

The project proposes a 50% reduced CFC 11 first step on the path to complete CFC removal. This technology is well proven, having been used in panel production in Europe and elsewhere since 1989 / 1990.

The discussion on subsequent steps, although outside the scope of the current project, involves HCFC 123. Because of toxicology results, this option should no longer be considered. The other route, HCFC 141b, is being followed in developed countries. It is noted that there are safety / flammability equipment included which should be adequate to use with HCFC 141b.

LESSONS FROM EXPERIENCE

None.

ENVIRONMENTAL ISSUES

The implementation of this technology will result in a reduction in the use of CFC 11 of 100 ts per year. Note - this is not 400 ts per year as listed in table 2.

SAFETY ISSUES

None in the 50% reduction project provided an adequate training programme is in place.

COST EFFECTIVENESS

See general comment on incremental operating costs and funds for foreign experts.

The equipment proposed is relevant and the price of \$ 90,000 quoted for the Cannon dispensing machine is in line with the reviewer's experience. The costs for trial production should be further investigated.

OTHER

None.

SHUANGYAN REFRIGERATOR FACTORY

RECOMMENDATION

The project is supported, subject to the comments listed.

RELEVANCY AND ADEQUACY OF INFORMATION

Concise. However, not clear how capital costs total to \$ 327,500 and more detail on purchased equipment costs.

TECHNICAL SOUNDNESS

The project follows the guidelines given in the draft policy document "Short - medium term policy on the reduction of the use of ODS in refrigerator and freezer insulation foam". The proposed 50% reduced CFC 11 technology is well proven.

LESSONS FROM EXPERIENCE

None.

ENVIRONMENTAL ISSUES

The implementation of this technology will result in a reduction of 100 te of CFC 11 per year. Note - this is not 300 te per year as listed in table 2.

SAFETY ISSUES

None.

COST EFFECTIVENESS

See general comments on incremental operating costs and expenses for foreign experts.

The equipment list is relevant.

OTHER

The content of CFC 11 in "old material" seems high at 17%. The foam used per cabinet is high at 10 kg.

XIXEPI (HXEAG) REFRIGERATOR FACTORY

RECOMMENDATION

The project is supported, subject to the comments listed.

RELEVANCY AND ADEQUACY OF THE INFORMATION

Good.

TECHNICAL SOUNDNESS

The project follows the guidelines given in the draft policy document "Short-medium term policy on the reduction of the use of ODS in refrigerator and freezer insulating foam". The proposed 50% reduced CFC 11 technology is well proven.

LESSONS FROM EXPERIENCE

None.

ENVIRONMENTAL ISSUES

The implementation of this technology will result in a reduction of 155 te of CFC 11 over 3 years or 75 te in a full year. Note - this is not 155 te per year as listed in table 2.

SAFETY ISSUES

None

COST EFFECTIVENESS

See general comments on incremental operating costs and expenses for foreign experts.

The equipment listed for purchase is relevant and prices are reasonable.

OTHER

None.

QINGDAO REFRIGERATOR FACTORY

RECOMMENDATION

The project is supported, subject to the comments below.

RELEVANCY AND ADEQUACY OF INFORMATION

The project is complex to follow. It is not clear how the foreign capital cost amounts to \$ 182,900; total intended foreign purchases amount to \$ 101,000 - is the difference, in part, due to funds to visit foreign factories?

TECHNICAL SOUNDNESS

The project follows the guidelines given in the draft policy document "Short-medium term policy on the reduction of the use of CDS in refrigerator and freezer insulating foam".

The proposed 50% reduced CFC 11 technology is well proven. It is noted that this will be applied in a phased manner, starting with one line saving 42 te of CFC 11 in 1993. Note - this is not 420 te per year as listed in table 2.

LESSONS FROM EXPERIENCE

Standardised format :

ENVIRONMENTAL ISSUES

The CFC 11 saved will increase to 214 te by 1995.

SAFETY

None provided that an adequate training programme is in place.

COST EFFECTIVENESS

See general comments on incremental operating costs. The need for new moulds should be investigated.

OTHER

To the reviewer's knowledge much of Qingdao's MDI is imported and not supplied by Yantai.

SHANG LING REFRIGERATOR FACTORY

RECOMMENDATION

The project is supported. There should, however, be further detailed scrutiny of the expenditure items listed under the cost effectiveness heading.

RELEVANCY AND ADEQUACY OF THE INFORMATION

More information on major expenditure items necessary to sanction individual items.

TECHNICAL SOUNDNESS

The project follows the guidelines given in the draft policy document "Short-medium term policy on the reduction of the use of ODS in refrigerator and freezer insulating foam". The conversion to reduced CFC 11 technology thereby saving 50% of CFC 11 used is now well proven.

LESSONS FROM EXPERIENCE

For major items there should be copies of quotations attached to the application.

ENVIRONMENTAL ISSUES

The total saving will be 160 tons of ODS per year.

SAFETY ISSUES

There should be provision for adequate training in the use of new equipment.

COST EFFECTIVENESS

See general comment on incremental operating costs and on expenses for foreign foam specialists.

The purchase of a high pressure dispensing machine for development purposes is supported but the cost estimate of \$ 200,000 should be queried. The output level of 100 l/mm seems to be more than adequate. Basic high pressure dispensing equipment prices are in the range \$ 100,000 to 120,000.

The purpose and quotation for the infrared thermal pharometer and details of other equipment costing \$ 160,000 should also be investigated.

OTHER

None