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PROJECT PROPOSALS: BRAZIL

This document consists of the comments and recommendations of the Fund Secretariat on the following projects:

Foam

- Phaseout of CFC-11 by conversion to water-blown technology in the manufacture of integral skin foams (microcellular) at Caloi UNDP
- Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams at Spandy UNDP
- Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane boxfoam at Conter UNDP
- Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Farage UNDP
- Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Posmovil UNDP

Refrigeration

- Phaseout of CFC-11 and CFC-12 by conversion to HCFC-141b technology (foam) and HFC-134a technology (refrigerant) in the manufacture of refrigerated truck trailers at Artica UNDP

**PROJECT EVALUATION SHEET
BRAZIL**

SECTOR: FOAM ODS use in sector (1996): 2,363 ODP tonnes

Sub-sector cost-effectiveness thresholds: Integral Skin US \$16.86/kg
Rigid US \$7.83/kg

Project Titles:

- (a) Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams (micro cellular) at Caloi
- (b) Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams at Spandy.
- (c) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane boxfoam at Conter.
- (d) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Farage.
- (e) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Posmovil.

Project Data	Integral Skin		Rigid		
	Caloi	Spandy	Conter	Farage	Posmovil
ODS phase-out (ODP tonnes)	41	20	12	12	10
Proposed project duration (months)	30	30	30	30	30
Incremental capital cost (US \$)	27,500	226,600	126,500	44,000	37,400
- including contingency (%)	10	10	10	10	10
Incremental operational cost (US \$)	200,100	34,800	36,886	8,770	7,300
Total project cost (US \$)	227,600	261,400	163,386	52,770	44,700
Local ownership (%)	100	100	100	100	100
Export component (%)	0	0	0	0	0
Amount requested (US \$) {Original}	273,800	298,250	85,347	85,347	71,253
{Revised}	227,600	261,400	85,347	52,770	44,700
Cost effectiveness (US \$/kg)	5.55	14.68	7.83	4.84	4.91
National Coordinating Agency	Ministry of Environment – MMA/PROZON				
Implementing Agency	UNDP				
Technical review completed?	Yes				

Secretariat's Recommendations:					
Amount recommended (US \$)	227,600	261,400	85,347	52,770	44,700
Project impact (ODP tonnes)	41	17.8	10.9	10.9	9.1
Cost effectiveness (US \$/kg)	5.55	14.68	7.83	4.84	4.91
Implementing Agency support cost (US \$)	29,588	33,982	11,095	6,860	5,811
Total cost to Multilateral Fund (US \$)	257,188	295,382	96,442	59,630	50,511

PROJECT DESCRIPTION

- (a) **Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams (micro cellular) at Caloi**
- (b) **Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams at Spandy.**
- (c) **Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane boxfoam at Conter.**
- (d) **Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Farage.**
- (e) **Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Posmovil.**

Sector Information

1. Brazil has not reported its ODS consumption data for 1997, therefore its baseline consumption for Annex A Group I controlled substances has not been determined by the Ozone Secretariat. However Annex A Group I consumption data reported to the Ozone Secretariat in 1995 and 1996 were 11,638.6 ODP tonnes and 11,696.3 ODP tonnes, an increase of 0.5%.
2. Information from the inventory of approved projects indicates that as of November 1998 US \$12.42 million had been approved for projects to phase out 1,607 tonnes CFC in the foam sector. US \$3.57 million had been disbursed and 332 tonnes of CFC phased out.
3. The sector background information provided by UNDP is based mainly on 1993 data. 1995 and 1996 consumption figures stated in the background information (9,484 and 10,684 ODP tonnes respectively) are not consistent with the data reported by the Ozone Secretariat which were 14,096.2 ODP tonnes and 12,654.4 ODP tonnes for 1995 and 1996 respectively.

Justification for the Use of HCFC-141b

4. The justification for the use of HCFC-141b provided by UNDP for the projects is reproduced as Appendix I to this evaluation.

Impact of the Project on Country's Montreal Protocol Obligations

5. The project documents indicate that the elimination of the use of CFCs by the projects will not impact on the ability of Brazil to meet the 1999 freeze, but will help it to meet future obligations with the Montreal Protocol. However these obligations are not defined in quantitative terms. Since Brazil's Annex A Group I substances consumption baseline has not yet been determined the impact of the 89.7 tonnes to be eliminated by the projects could not be related to the baseline CFC consumption. The projects will have residual ODP of 5.3 ODP tonnes as a result of the use of HCFC-141b.

Integral Skin Foam**(a) Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams (micro cellular) at Caloi**

6. Caloi will phase out the use of 41 tonnes of CFC-11 in the manufacture of integral skin foam for bicycle seats. Production is to be converted to water blown foam. No changes are anticipated to the current dispensers, mould tables or blending equipment. A small blender will be procured to allow blending for evaluation of new formulas without interrupting and contaminating the production blender (US \$40,000 plus US \$2,000 for transfer pump and fittings). Other costs include trials (US \$15,000), technology transfer and training (US \$10,000) and incremental operating costs (US \$200,100).

(b) Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams at Spandy.

7. Spandy will phase out the use of 20 tonnes of CFC-11 in the manufacture of integral skin foam. Production is to be converted to HCFC-141b technology as an interim step to a final solution. The company will retrofit three low pressure dispensers (Transtecnica) (US \$15,000) and one high pressure dispenser (Hennecke) (US \$5,000). Two low pressure dispensers (Voltan and Sintenor) will be replaced by equivalent capacity low pressure dispensers (US \$75,000) with a discounting fraction of 0.3 applied to the 1986 Voltan dispenser, and one new low pressure dispenser will be purchased to replace the hand mixing operation (US \$60,000). A new blender will replace the current open-top preblender (US \$40,000). Other costs include trials (US \$35,000), technology transfer and training (US \$20,000) and incremental operating costs (US \$34,800). The grant requested is the maximum allowable grant based on ODP elimination for this category.

Rigid Foam**(c) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane boxfoam at Conter.**

8. Conter will phase out the use of 12 tonnes of CFC-11 in the manufacture of rigid polyurethane foam for pipe insulation. The company produces on-site pour foam (20% of production) using a Pumer S-100 low pressure machine and rigid boxfoam blocks (80% of production) which are later cut into pieces. The block foam is produced by manual operations using a bucket and propeller/motor mixing arrangement. The production is to be converted to HCFC-141b as an interim step, with a likely permanent solution being water based formulations. The project includes purchase of a box pour machine to replace a hand mix operation (US \$75,000), and replacement of a low pressure Pumer S-100 dispenser by a high pressure spray/pour foam dispenser (US \$25,000). Other costs include trials (US \$5,000), training and technology transfer (US \$10,000) and contingency (US \$11,500). The project also includes incremental operating costs for two years (US \$50,000). The grant requested is the maximum grant allowable for the application based on ODP eliminated.

(d) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Farage.

9. Farage will phase out the use of 12 tonnes of CFC-11 in the manufacture of rigid polyurethane foam for manufacture of refrigerated and non-refrigerated truck trailers. The production is to be converted to HCFC-141b as an interim step, with a likely permanent solution being water based formulations. The project includes replacement of a low pressure Pumer S-100 dispenser by a high pressure spray/pour foam dispenser (US \$25,000). Other costs include trials (US \$5,000), training and technology transfer (US \$10,000) and contingency (US \$4,000). The project also includes incremental operating costs for two years (US \$96,466). The requested grant is based on the maximum allowable for funding.

(e) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Posmovil.

10. Posmovil is a truck repair facility that also repairs and manufactures truck trailers. Posmovil will phase out the use of 10 tonnes of CFC-11 in the manufacture of rigid polyurethane foam for the insulation of truck trailers. The foam is produced by hand. The ingredients are mixed using a small mechanical agitator in a bucket. The mixture is then poured from buckets into the perimeter of the trailers. The foam is held in place by plywood forms until it is cured. The production is to be converted to HCFC-141b as an interim step, with a likely permanent solution being water based formulations. The project includes replacement of the current hand mix technique by a 20 kg/min high pressure foam dispenser at US \$80,000, with US \$30,000 company contribution. Other costs include trials (US \$5,000), training and technology transfer (US \$10,000) and contingency (US \$6,500). The project also includes incremental operating costs for two years (US \$7,300). The grant requested is based on the maximum allowable funding.

SECRETARIAT S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Secretariat and UNDP discussed the five projects and agreed that:
 - (a) Where low pressure machines are proposed to replace hand pouring processes, the cost of machines should be discounted by 25%.
 - (b) For rigid foam projects producing sandwich panels there should not be the need to include any costs in the incremental operational costs to account for increase in density of the HCFC-141b foam.
 - (c) The cost of the blender (US \$40,000) requested for Caloi for evaluation blending of new formulations is not an eligible incremental cost.

(d) Spandy:

- (i) For one of the projects the cost of replacement of two low pressure machines with similar low pressure machines was not eligible. It was agreed that the conversion cost should be based on retrofit of the machines. The retrofit costs were agreed as US \$25,000 per machine, which includes retrofit for use with HCFC-141b (US 5,000 each) and retrofit for temperature control (US 20,000 each). The retrofit cost of the high pressure dispenser of this project should be US \$1,000.

11. All the project documents were revised to reflect the above agreement.

12. The sector background information provided in the project documents by UNDP is out of date and may also be inaccurate. Information based on more accurate and recent data would be more relevant in demonstrating the significance of foam sector projects on the country's ODS phase out.

13. As at the time of preparation of this document information obtained from the Ozone Secretariat showed that Brazil had not reported its consumption data for 1997. Unless this is done there will not be any baseline data which could provide the basis for the Executive Committee's evaluation of the impact of approved projects on the ODS phase out of the country.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the five projects with the levels of funding and associated support costs indicated below.

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams (micro cellular) at Caloi	227,600	29,588	UNDP
Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams at Spandy.	261,400	33,982	UNDP
Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane boxfoam at Conter.	85,347	11,095	UNDP
Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Farage.	52,770	6,860	UNDP
Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Posmovil.	44,700	5,811	UNDP

2. The Executive Committee may wish:
 - (a) to request the implementing agencies when preparing projects for the country to provide data in the sector background information that are accurate and relevant and demonstrate the relationship of the ODS phased out in projects in the sector with the country's overall ODS phase out programme or its obligations under the Montreal Protocol.
 - (b) to urge the Government of Brazil to expedite reporting of its ODS consumption data if it has not yet done so, in order to facilitate future evaluation of the impact of Multilateral Fund projects on the country's ODS phase out.

Appendix I

Justification for the Use of HCFC-141b in the Projects Provided by the Implementing Agencies

Integral Skin Foam

(b) Phase out of CFC-11 by conversion to HCFC-141b technology in the manufacture of integral skin foams at Spandy.

1. Spandy was visited by UNDP consultants, Mr. Dan Appleton and Candido Lomba, who came to collect data and to discuss the possible alternative technologies to eliminate the CFCs in the production of polyurethane foams.
2. Spandy decided to use HCFC-141 on an interim basis, due to the following reasons:
 - (a) Pentane – because it is flammable cannot be used by Spandy, which is located in a semi-residential area, in addition to that it requires high investment safety and exhausting systems needed for foams production;
 - (b) Technologies base on water for flexible and integral skin production is not available in Brazil yet.
 - (c) Technologies based on gas are expensive when compared with CFC-11, and they have serious problems related to transportation and storage what would request greater production costs.
3. Considering the above reasons, Spandy will use its own resources to develop technology based on water but, the enterprise will have to use HCFC-141b, for a certain time, because it is the only technical, economical and commercial alternative available and adequate for its kind of production.

Rigid Foam

(c) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane boxfoam at Conter.

4. Conter, a thermal insulation enterprise for industrial plants, after receiving the visit of UNDP consultants, Mr. Matt Bohde and Candido Lomba, who came to collect data concerning the enterprise production process and consumption of ozone layer depletion substance as well as to discuss the possible alternative for CFC-11, opted to use on an interim basis HCFC-141b, taking into consideration that other alternatives are not adequate for the enterprise, due to the following:
 - (a) Pentane – in spite of the fact that it is a definitive solution with excellent technical characteristics, Conter clients (industrials, in general) do not accept the material application with flammable components. In addition, this enterprise is located in a residential area and the fire department, for this reason, does not permit that flammable material be handled.

- (b) Water – does not give to the final product the good thermal insulation characteristics (K factor).
- (c) HFCs and blends – not totally available in Brazil, require high capital costs and hard to process.

5. On the other hand, HCFC-141b, in spite of its contribution to the ozone layer depletion (almost 10% when compared to CFC-11), it is not flammable, it requires lower investment costs, it is easily processed and it gives good technical characteristics to the final product, especially with reference to K factor.

6. Considering the above reasons, Conter will use HCFC-141b as an interim solution wishing the chemical suppliers to develop in a short period of time clean alternatives which will make it possible to eliminate the HCFCs.

(d) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Farage.

7. With the view to eliminate CFC in our process of manufacture of isotherm truck trailers, made with polyurethane, Farage has begun studies to select alternative technologies. When UNDP consultants, Mr. Matt Bohde and Mr. Candido Lomba, came to collect information and to discuss the possible alternative technologies, Farage had already decided, in accordance with its raw materials suppliers, to use HCFC-141b.

8. This is because, this material is completely available in Brazil, with adequate prices, and even though more expensive, it is easy to process and gives to the final product characteristics that are similar to the product obtained with CFC-11, especially in relation to the thermal insulation factor, which does not happen with the water-based systems.

9. In the case of pentane, Farage cannot use this technology because it is located in a residential area and, because the material is flammable. Official regulatory bodies responsible for safety and environment control do not permit production processes with this kind of product.

10. On the occasion of UNDP experts' visits, it also discussed the use of HFCs but these substances are not completely tested and approved and they are not available in Brazil, in addition to being too expensive.

11. Due to the above, Farage will use, as an interim solution, HCFC-141b, knowing that in the near future other new technologies will appear, totally free from ozone depleting substances, which will enable the elimination of HCFC-141b, without any other request for financial support and no return to the Multilateral Fund.

(e) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Posmovil.

12. Posmovil, an enterprise that manufactures and repairs truck trailers, made with polyurethane, confirms that it received the visit of UNDP consultants, Mr. Matt Bohde and Candido Lomba, who came to collect data concerning our production and the enterprise

consumption of ozone layer depletion substances, as well as to discuss the possible technology alternatives for CFC-11.

13. On this occasion, it was clear that pentane would be a definitive technology available in Brazil, with excellent technical characteristics but with the disadvantage of being flammable and to requiring a high investment cost. Posmovil did some studies and realized that this technology could not be adopted due to the security matters, since there are residences and commercial establishments in its neighbourhood.

14. On the other hand, another technology presented by UNDP consultants, technology based on water, while it does not present security problems, does not give to the final product the thermal insulation required by Posmovil products.

15. As for the HFCs, Posmovil realized that they are products in developing phase/tests, they are hard to process (gaseous), too expensive, and, in addition, they are not completely available in Brazil.

16. Therefore, Posmovil decided to use HCFC-141b on an interim basis, knowing that it must be changed, as soon as possible, by a product totally free of ozone depleting substances. The HCFC-141b is completely tested, approved and available in Brazil. It is easy to process and it gives the final product similar technical characteristics as the ones obtained with CFC-11.

**PROJECT EVALUATION SHEET
BRAZIL**

SECTOR: REFRIGERATION ODS use in sector (1996): 2,363 ODP tonnes

Sub-sector cost-effectiveness thresholds: Commercial US \$15.21/kg

Project Titles:

Phase out of CFC-11 and CFC-12 by conversion to HCFC-141b technology (foam) and HFC-134a technology (refrigerant) in the manufacture of refrigerated trucks and trailers.

Project Data	Commercial	
	Artica	
ODS phase-out (ODP tonnes)		22.3
Proposed project duration (months)		24
Incremental capital cost (US \$)		180,730
- including contingency (%)		10
Incremental operational cost (US \$)		2,893
Total project cost (US \$)		183,623
Local ownership (%)		100
Export component (%)		0
Amount requested (US \$) {Original}		210,013
{Revised}		183,623
Cost effectiveness (US \$/kg)		8.23
National Coordinating Agency	Ministry of Environment – MMA/PROZON	
Implementing Agency	UNDP	
Technical review completed?	Yes	

<i>Secretariat's Recommendations:</i>		
Amount recommended (US \$)		183,623
Project impact (ODP tonnes)		22.3
Cost effectiveness (US \$/kg)		8.23
Implementing Agency support cost (US \$)		23,871
Total cost to Multilateral Fund (US \$)		207,494

PROJECT DESCRIPTION

Phase out of CFC-11 and CFC-12 by conversion to HCFC-141b technology (foam) and HFC-134a technology (refrigerant) in the manufacture of refrigerated trucks and trailers.

Background for commercial refrigeration sub-sector in Brazil

1. The latest consumption figures reported to the Secretariat show an increase from 9,484 ODP tonnes in 1995 to 10,684 in 1996, including 5,748 ODP tonnes in the refrigeration sector.
2. The Executive Committee previously approved 17 projects in the commercial refrigeration sub-sector, and four projects in the domestic refrigeration sector for the phase out of 1,932 ODP tonnes.
3. It is stated in the proposals that “these projects will contribute to Brazil meeting its obligations towards the Montreal Protocol.”
4. Artica will phase out the end use of 22 tonnes of CFC-11 and 1.7 tonnes of CFC-12 in the manufacture of refrigerated truck trailers and installation of refrigeration equipment in cold rooms. The foam production is to be converted to HCFC-141b technology. The refrigeration system will be converted to HFC-134a.
5. Justification for the selection of HCFC-141b to replace CFC-11 in foaming operations is provided in the Annex to the project evaluation.
6. The company will replace one existing low pressure dispenser with one 60 kg/min high pressure dispenser with a lorry, and purchase a small manual preblender. The baseline refrigerant charging machines and CFC-12 leak detectors will be also replaced with a new HFC-134a semi-automatic charging board, and a HFC-134a leak detector. A new vacuum pump is also requested in the proposal. Other costs include trials, technology transfer and training, and incremental operating costs for two years.
7. It is stated that the existing foam dispensers and evacuation units will be destroyed upon replacement.
8. A list of project milestones is included. The UNDP will oversee the implementation of this project and provide technical support.

SECRETARIAT S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. Justification for the use of HCFC-141b technology in foam operations is provided by UNDP.
2. The company is involved in foaming operations for insulated truck bodies and assembly and installation of refrigeration units in refrigerated trucks, trailers and cold rooms. The Secretariat discussed with UNDP the calculated consumption of ODS used by the enterprise, incremental capital and operating costs. Adjustments to the budget for capital cost were made to reflect the technological upgrade associated with the purchase of a lorry.

RECOMMENDATIONS

1. The Secretariat recommends blanket approval of the project at the level funding as indicated in the table below.

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Phase out of CFC-11 and CFC-12 by conversion to HCFC-141b technology (foam) and HFC-134a technology (refrigerant) in the manufacture of refrigerated trucks and trailers.	183,623	23,871	UNDP

Appendix I

Justifications of the selection of HCFC-141b to replace CFC-11 in foaming operations in Artica

1. ODS phase out technologies for rigid PU foams in thermal insulation applications are:

CLASSIFICATION	Liquid Technology	Gas Technology
Low ODP Technologies ("Interim")	HCFC-141b HCFC-141b/HCFC-22	HCFC-22
Non-ODS Technologies ("Permanent")	(Cyclo) pentane, water, liquid HFCs (-365, -345fa)	HFC-134a

2. The selection of the alternative technology is governed by the following considerations:

- (a) Proven application and reasonable maturity of technology
- (b) Cost-effective conversion, in view of one-time as well as recurrent costs
- (c) Local availability of substitute, at acceptable pricing
- (d) Support from the local systems suppliers
- (e) Critical properties to be maintained in the end product
- (f) Meeting established standards on environment and safety

3. Following is a discussion of the mentioned technologies in view of these criteria specifically applied for the operations of Artica ("pour-in-place") or "PIP" foaming):

- (a) HCFC-141b has an ODP of 0.11. Its application is proven, mature, relatively cost-effective and systems that fit Artica's applications are locally available. HCFC-141b can, however, be destabilizing in higher concentrations, being a strong solvent, which would lead to the need to increase the foam density. As an interim option, its application would only be recommended if permanent options do not provide acceptable solutions.
- (b) HCFC-22 has an ODP of 0.05. It is not suitable for PIP applications because of frothing.
- (c) HCFC-141b/ HCFC-22 blends can reduce the solvent effect of HCFC-141b alone and therefore allow lower densities while maintaining acceptable insulation values. The blends are, however, not available in Brazil or neighbouring countries. On-site multi-component blending would significantly increase the one-time project costs. In addition, the technology is not proven for PIP applications. Being an interim option, the same restrictions as for HCFC-141b would apply.
- (d) (Cylco)pentane cannot be used – and never has been used – for PIP applications,

where ever –changing ambient conditions do not allow to provide the required safety.

- (e) Water-based systems are more expensive (up to 50%) than other CFC-free technologies due to reductions in insulation value (requiring larger thickness) and lower cell stability (requiring higher densities). They are also currently not available in Brazil, although this may change in the next two years based on Multilateral Fund sponsored activities. Water-based formulations tend to be most applicable in relatively less critical applications, such as in-situ foams and thermoware. In PIP for insulated trucks, while in principle feasible, it would required increase in wall thickness, which is not feasible.

4. Based on the before mentioned, the use of HCFC-141b is the only currently feasible option and is recommended to be employed as an interim solution. This can be followed in the future by water-based technology of liquid HFCs. The equipment installed under this project allows these technologies without further adaptations. The enterprise would incur, however, higher production costs that cannot be quantified at this time.

5. The enterprise has accepted this recommendation. It has also been informed that HCFC's are transitional substances, and that under present Multilateral Fund rules, they will not be able to seek additional funding from the Multilateral Fund at a later date to convert to zero-ODP technologies.