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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Seventy-fourth Meeting
Montreal, 18-22 May 2015

PROJECT PROPOSAL: COLOMBIA

This document consists of the comments and recommendation of the Fund Secretariat on the following project proposals:

Foam

• Demonstration project to validate the use of hydrofluoro-olefins for discontinuous panels and spray foam in Article 5 Parties through the development of cost-effective formulations	UNDP

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT

COLOMBIA

PROJECT TITLE(S)		BILATERAL/IMPLEMENTING AGENCY
(a)	Demonstration project to validate the use of hydrofluoro-olefins for discontinuous panels and spray foam in Article 5 Parties through the development of cost-effective formulations	UNDP

NATIONAL CO-ORDINATING AGENCY	Ministry of Environment, National Ozone Unit

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (ODP TONNES, 2013, AS OF APRIL 2015)

HCFCs	176.65		

B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2013, AS OF APRIL 2015)

HCFC-22	57.9
HCFC-123	2.1
HCFC-141b	115.1
HCFC-142b	0.6
HCFC-141b in imported pre-blended polyol	0.9

HCFC consumption remaining eligible for funding (ODP tonnes)	146.63

CURRENT YEAR BUSINESS PLAN ALLOCATIONS		Funding US $ million	Phase-out ODP tonnes
	(a)		n/a

PROJECT TITLE:	
ODS use at enterprise (ODP tonnes):	13.75
ODS to be phased out (ODP tonnes):	0.44
ODS to be phased in (ODP tonnes):	0.00
Project duration (months):	12
Initial amount requested (US $):	459,450
Final project costs (US $):	
Incremental capital cost:	339,500
Contingency (10 %):	33,950
Incremental operating cost:	36,000
Project monitoring and reporting	50,000
Total project cost:	459,450
Local ownership (%):	100%
Export component (%):	0%
Requested grant (US $):	459,450
Cost-effectiveness (US $/kg):	n/a
Implementing agency support cost (US $):	32,162
Total cost of project to Multilateral Fund (US $):	491,612
Status of counterpart funding (Y/N):	Y
Project monitoring milestones included (Y/N):	Y

SECRETARIAT'S RECOMMENDATION	Pending

PROJECT DESCRIPTION

1. On behalf of the Government of Colombia, UNDP as the designated implementing agency has submitted to the 74th meeting a request for funding a demonstration project to validate the use of hydrofluoro-olefins (HFO) for discontinuous panels and spray foam in Article 5 Parties through the development of cost-effective formulations, at the amount of US $459,450, plus agency support costs of US $32,162. This project is prepared in a response to decision 72/40[1]. The proposal as originally submitted is attached.

Project objective

2. The demonstration project proposes to: validate HFOs as polyurethane (PU) formulations with reduced HFO for discontinuous panels and spray foam; optimise the cost/performance balance to achieve a similar foam thermal performance to HCFC-141b-based formulations; and make a cost analysis of the different HFO/CO_2 formulations versus HCFC-141b-based system.

Sector background and justification

3. The PU foam sector in Colombia manufactures flexible foam (flex-slab and moulded and integral skin), rigid foam and microcellular elastomers (shoe soles). Discontinuous panels and spray foam account for 33 per cent (158 metric tonnes (mt)) and 12.3 per cent (59 mt) of the total HCFC-141b consumption respectively, in Colombia.

4. Several Article 5 Parties opted for converting during the first stage (2011-2015), the largest foam enterprises typically found in the domestic refrigeration and continuous panels sectors to HCs. During the second stage these countries must address the remaining foam sectors (discontinuous panels, spray foam, integral skin), characterised by a multitude of micro, small and medium-sized enterprises that do not have technical and financial resources to handle flammable substances in a safe manner. This factor along with the lack of economies of scale prevents the adoption of flammable blowing agents. The recent developed HFOs have shown in rigid PU foam applications a better thermal performance than the high GWP-saturated HFCs. The main barriers for the introduction of these substances, however, are their high unitary cost and the minimum experience available as this technology has not been demonstrated in conditions prevailing in Article 5 Parties.

Methodology

5. With the aim of analysing two molecules, HFO-1233ze(E) from Honeywell or Arkema and HFO-1336maam(z) from DuPont, the following steps are proposed: planning, formulation development, testing, analysis of results, field tests and technology replication/dissemination of results.

6. The participating enterprise is Espumlatex[2], a systems house equipped with 18 blending tanks with capacities that go from 1,500 to 3,000 litres, with a certified quality control laboratory, where the basic properties of the PU systems (free rise density, reactivity, foam thermal conductivity, compression strength, dimensional stability and accelerated aging) are tested. The enterprise is fully committed to test new HCFC alternatives of low GWP and has the required capability (laboratory facilities, technical knowledge and human resources).

[1] The Executive Committee decided *inter alia* to consider at its 75th and 76th meetings proposals for demonstration projects for low global-warming potential (GWP) alternatives to HCFCs within the framework established, and provided criteria for such projects.

[2] During the transition from CFC-11 to HCFCs, two projects were carried out with at Espumlatex: “Retroactive funding for the conversion from CFC-11 to water-based technology in the manufacture of flexible moulded and integral skin foam at Espumlatex-Promicolda” (COL/FOA/32/INV/49) and “Conversion from CFC-11 to HCFC-141b and water-based technology in the manufacture of various PU foam applications at 25 small enterprises centred around systems house at Espumlatex” (COL/FOA/32/INV/48). Espumlatex also served in 2011-2013 as the local systems house for the demonstration project on supercritical CO_2 technology for spray foam undertaken under a Japan-Colombia bilateral project with Achilles Corp.

Project implementation

7. The following activities will be executed:

(a) Work arrangement with Espumlatex to be signed between UNDP and the beneficiary as well as the national ozone unit;

(b) Development of the experimental protocol which includes applications procedure and conditions, properties to test, testing method;

(c) Formulation development and foam sample preparation at Espumlatex using a high-pressure dispenser and a conventional Brett mould. Spray foam applications will be done using a standard Gusmer type injector;

(d) Procurement of a laboratory equipment to measure foam friability. This foam property is considered critical having in mind the urea content achieved with PU high-water formulations;

(e) Testing of foam critical immediate and aged properties such as thermal conductivity, compression strength, dimensional stability and friability;

(f) Field tests at ABC Poliuretanos, a local discontinuous panels manufacturer; the reduction of 4 mt of HCFC-141b associated with this test will be included in the second stage of the HCFC phase-out management plan for Colombia as the phase-out will be achieved at that time, and should be deducted from the starting point then; and

(g) Two dissemination workshops to the Colombian and Latin American industry.

8. The project is expected to have a duration of 12 months.

Project budget

9. The summary of the project cost is detailed in Table 1.

Table 1. Project cost by activity

Activity	Unit cost, (US $)	Quantity	MLF (US $)	Espumlatex contribution (US $)	Total cost (US $)
International technical assistance	25,000	1	25,000		25,000
Planning	5,000	1	5,000		5,000
Formulation development in systems house	220,000	1	184,000	36,000	220,000
Acquisition of friability tester	10,000	1	10,000		10,000
Foam testing (laboratory tests)	57,500	1	42,500	15,000	57,500
PU material for formulation development and testing.	25,000	1	25,000		25,000
Foam testing - field evaluation	250	40	8,000	2,000	10,000
Technology dissemination workshops	20,000	2	40,000		40,000
Sub-total incremental capital cost			**339,500**	**53,000**	**392,500**
Contingencies (10%)			33,950	5,300	39,250
Incremental operating cost at end user (ABC Poliuretanos)	9	4,000	36,000		36,000
Project monitoring and reporting	50,000	1	50,000		50,000
Total cost			**459,450**	**58,300**	**517,750**

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

10. At the 72nd meeting, after consideration of the Overview of approved HCFC demonstration projects and options for additional projects to demonstrate climate-friendly and energy-efficient alternative technologies to HCFCs[3] under agenda item 10, the Executive Committee decided *inter alia* to consider at its 75th and 76th meetings proposals for demonstration projects for low GWP alternatives to HCFCs within the framework established, and provided criteria for such projects (decision 72/40).

11. At the 73rd meeting, the Executive Committee further discussed the low-GWP demonstration projects and feasibility studies on district cooling in the context of the consolidated business plan of the Multilateral Fund[4]. Further to discussions, additional guidance was also provided in order to ensure that the best proposals for demonstration projects were submitted[5].

12. Together with the project proposal contained in the present document, bilateral and implementing agencies submitted project preparation requests and one complete demonstration projects pursuant to decision 72/40. In order to assist the Executive Committee in selecting the best demonstration project proposals submitted pursuant to this decision, the Secretariat had prepared an analysis of all these proposals only with regard to their concepts and how they comply with the guidelines provided by the Executive Committee. This analysis is contained in the document on the Overview of issues identified during project review[6].

13. Accordingly, the Secretariat had not reviewed the demonstration project in terms of technical and costs aspects.

RECOMMENDATION

14. The Executive Committee may wish:

(a) To consider the demonstration project to validate the use of hydrofluoro-olefins for discontinuous panels and spray foam in Article 5 Parties through the development of cost-effective formulations in Colombia in the context of its discussion on proposals for demonstration projects for low global-warming potential (GWP) alternatives to HCFCs as described in the document on the Overview of issues identified during project review (UNEP/OzL.Pro/ExCom/74/13); and

(b) To request the Secretariat to resubmit the demonstration project proposal mentioned in sub-paragraph (a) above, together with its comments and recommendation, to the 75th meeting, in case the Executive Committee selects such proposal.

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[3] UNEP/OzL.Pro/ExCom/72/40.
[4] UNEP/OzL.Pro/ExCom/73/18.
[5] The suggestions made by Executive Committee members are contained in paragraph 97 of document UNEP/OzL.Pro/ExCom/73/62.
[6] UNEP/OzL.Pro/ExCom/74/13.

PROJECT COVER SHEET

COUNTRY: Colombia **IMPLEMENTING AGENCY:** UNDP

PROJECT TITLE: Demonstration project to validate the use of Hydrofluoro Olefins (HFO) for discontinuous panels and spray in Article 5 parties through the development of cost effective formulations

PROJECT IN CURRENT BUSINESS PLAN	
SECTOR	Foam
SUB-SECTOR	Rigid PU (discontinuous panels)
ODS USE IN SECTOR (2013)	479 metric tons (HCFC-141b)
ODS USE AT ENTERPRISE (2013)	125 MT of HCFC-141b in relevant sector
PROJECT DURATION	12 months
TOTAL PROJECT COST:	
Total Project Cost (including co-finance)	US $ 517,750
LOCAL OWNERSHIP	100%
EXPORT COMPONENT	0 % to non-A5
REQUESTED GRANT	US $ 459,450
COST-EFFECTIVENESS	Non applicable
IMPLEMENTING AGENCY SUPPORT COST	US $ 32,162
TOTAL COST OF PROJECT TO MULTILATERAL FUND	US $ 491,612
STATUS OF COUNTERPARTS FUNDING	Received letter of commitment
	Included
NATIONAL COORDINATING AGENCY	Ministry of Environment - National Ozone Unit

Project summary

This projects undertakes the validation of the Hydrofluoro Olefins (HFOs), a low GWP and non flammable option, for discontinuous panels and spray in the scenario of the Article 5 parties through the development of polyurethane (PU) foam formulations with reduced HFO contents that have CO_2, derived from the water-isocyanate reaction, as co-blowing agent. The aim is to optimise the cost/performance balance while achieving a similar foam thermal performance to HCFC-141b based formulations.

Impact of project on Country's Montreal Protocol Obligations

The project aims to contribute to the country obligation to reduce the HCFC consumption as per the Montreal Protocol obligation by converting the current HCFC-141b foam blowing technology to the HFO based formulations. The Colombian discontinuous panels subsector used in 2013 158 tonnes of HCFC-141b. If results were positive a significant portion of this amount could be replaced by this technology during the second stage of the HPMP. A direct impact of this project is the conversion of ABC Poliuretanos including 4 tonnes of HCFC-141b and will be included in the second stage of the HPMP. 4 tonnes of HCFC would eventually be phased-out and deducted from the starting point in Colombia.

Prepared by: Mr Miguel W. Quintero Date: March 22, 2015
Originally Reviewed by: Date:

1. BACKGROUND

1.1. PROJECT BACKGROUND

This project has been prepared as response to the Executive Committee Decision 72/40. It is part of a set of projects with the objective to validate chemical systems for use with non-HCFC blowing agents in the context of Decision XIX/6.
The developing countries will address in the short term the second phase of the HPMP (2015-2020) in the foam sector. One of the most critical subsectors that still uses HCFC-141b and accounts for a significant market portion is the manufacture of **discontinuous panels** and **spray foam** for the construction and the commercial and industrial refrigeration industries. It is characterized by a great number of small and medium sized enterprises without the sufficient knowledge and discipline to handle flammable substances. This factor along with the lack of economies of scale prevents the adoption of hydrocarbons and the introduction of high GWP alternatives such as HFCs would result in a negative climate impact.
This projects undertakes the validation of the Hydrofluoro Olefins (HFOs), a low GWP and non flammable option, for discontinuous panels and spray in the scenario of the Article 5 parties through the development of polyurethane (PU) formulations with reduced HFO contents that have CO_2, derived from the water-isocyanate reaction, as co-blowing agent. The aim is to optimise the cost/performance balance while achieving a similar foam thermal performance to HCFC-141b based formulations.
Further, the project aims to contribute to the country obligation to reduce the HCFC consumption as per the Montreal Protocol obligation by converting the current HCFC-141b foam blowing technology to the HFO based formulations. The Colombian discontinuous panels subsector used in 2013 158 tonnes of HCFC-141b. If results were positive a significant portion of this amount could be replaced by this technology during the second stage of the HPMP. A direct impact of this project is the conversion of ABC Poliuretanos that is included in the second stage HPMP.

1.2. SECTOR BACKGROUND IN COLOMBIA

Colombia became a party to the Vienna Convention and Montreal Protocol on October 16, 1990 and on March 6, 1994 respectively. Colombia also ratified the London, Copenhagen, Montreal and Beijing Amendments. The country is fully committed to the phase-out of HCFCs and willing to take the lead in assessing new HCFC phase-out technologies, particularly in the foam sector.

The Colombian PU market can be spread out in three different industrial sectors: flexible foam (flex-slab and moulded and integral skin), rigid foam and microcellular elastomers (shoe soles). HCFCs are used in rigid foam for thermal insulation and, in marginal quantities, in integral skin.

In PU rigid foam three different segments can be differentiated: domestic refrigeration (refrigerators and freezers), commercial refrigeration (mainly bottle and commercial displays) and industrial thermal insulation for the refrigeration and construction sectors (continuous and discontinuous panels, transportation and spray). While the domestic refrigeration and most of the commercial refrigeration have been converted to hydrocarbons the remaining market players still use HCFC-141b. The main suppliers are local "system houses" (Espumlatex, GMP, Olaflex, Química Industrial y Comercial) that sell two-component systems: a fully formulated polyol, which includes the blowing agent (HCFC-141b), and an isocyanate (Polymeric MDI).
A recent market survey showed that in 2013 out of a total of 1,054 tonnes of imported HCFC-141b, 479 were used in foam manufacture. Table 1 shows their distribution by application. Discontinuous panels and spray account for 33% and 12.3% of the total HCFC-141b consumption respectively.

TABLE 1. 2013 USE OF HCFC-141B IN THE COLOMBIAN FOAM MARKET		
Foam Application	HCFC-141b, kg	%
Commercial Refrigeration	125,904	26.3%
Continuous Panels	132,250	27.6%
Industrial Refrigeration & Construction (Discontinuous Panels)	157,834	33.0%
Spray	59,008	12.3%
Integral Skin	3,662	0.8%
TOTAL	478,658	100.0%

Source: Imports Declarations, Database of the Ministry of Commerce, Industry and Tourism. Personal interviews with key market players (system houses and end users)

2. PROJECT DESCRIPTION

2.1. PROJECT OBJECTIVES

The objectives of this project are:

1. To validate the use as foam blowing agents of the recently developed HFOs in blends with CO_2 for the production of discontinuous panels and spray foam in the context of an Article 5 party. The aim is to optimise the HFO/CO_2 ratio in the cell gas to get a similar thermal performance to HCFC-141b at a minimum incremental operating cost.
2. To make a cost analysis of the different HFO/CO_2 formulations versus the currently used HCFC-141b based system.

2.2. JUSTIFICATION

The Article 5 parties are in the process of preparing the second stage of the HPMPs to be implemented in the 2016-2020 period. Taking into account the priorities defined in Decision XIX/6, particularly those referred to ODP and climate change impact, the developing countries opted for converting in the first phase (2011-2015) the largest foam enterprises typically found in the domestic refrigeration and continuous panels sectors. Hydrocarbons, basically pentanes, were the substances of choice based on their favourable cost/performance balance at large size operations.

The situation is different at the second stage where the countries have to address the remaining foam sectors still using HCFCs. These sectors (discontinuous panels, spray, integral skin) are characterised by a multitude of micro, small and medium size enterprises that do not have the adequate knowledge and operating discipline to handle flammable substances in a safe manner. This factor along with the lack of economies of scale prevents the adoption of flammable blowing agents, while the introduction of high GWP alternatives such as HFCs results in high climate impact within processes which are typically less well engineered.

The recent developed unsaturated HFCs and HCFCs (commonly called HFOs), 1233zd(E) and 1336maam(z), marketed under the trademarks Forane (Arkema), Formacel (DuPont) and Solstice (Honeywell), have shown in rigid PU foam applications such as domestic refrigeration and spray a better thermal performance that the high GWP-saturated HFCs currently used in the developed countries. Their general properties are shown in table 2. They offer a unique opportunity for introducing safe non-flammable technologies that while enhancing energy efficiency will have a positive effect on climate change in terms of greenhouse emissions. Based on the physical properties of these substances (non flammability and relatively high boiling points) it is anticipated that their application does not require the retrofit of the foaming equipment currently in use. This is particularly true and important at the level of small and medium enterprises. Commercial availability has already been established for HFO-1233zd(E). Pilot scale production of HFO-1336mzzm(Z) commenced in late 2014, with full commercialisation expected in 2016. Although for these options availability is likely to be targeted mostly in markets within non-Article 5 Parties where the requirement for improved thermal efficiency is best identified, the demand to leapfrog high GWP alternatives to HCFCs could accelerate distribution to Article 5 regions. There are not legal or commercial barriers for the introduction of these products.

TABLE 2. HFO PROPERTIES			
	Formacel® 1100	***Solstice® Liquid BA***	***Forane® 1233zd***
Common name	1336mzz(Z)	1233zd(E)	1233zd(E)
Chemical Formula	Cis-CF_3-CH=CH-CF_3	Trans-ClCH=CH-CF_3	Trans-ClCH=CH-CF_3
Molecular weight	164	130.5	130.5
Boiling Point (°C)	33	19	19
GWP (100 years	2	1	<7

From the three sectors mentioned above, discontinuous panels and spray foam were chosen for the development of this project taking into consideration the high volume involved (discontinuous panels) and the application particularities (spray foam). Spray foam is produced in-situ, i.e. using portable equipment at the site being insulated, distinction that affects the safety issues related to flammable blowing agents. According to the last FTOC assessment report (2010), in 2008 around 7,300 tonnes of CFCs and HCFCs were used in the discontinuous panels subsector in the developing countries.

Two are the main barriers for the introduction of these substances:

1. Their high unitary cost that is reflected in the final cost of the PU formulation.
2. The minimum experience with these products in developing country conditions. This technology has not been demonstrated in conditions prevailing in Article 5 parties.

The main objective of this project is precisely to remove or attenuate the mentioned obstacles. The formulation science associated to the PU technology and the excellent foam thermal characteristics provided by HFOs open the door for the development of PU formulations with reduced HFO contents that have CO_2, derived from the water-isocyanate reaction, as co-blowing agent. The aim is to optimise the cost/performance balance of these substances, achieving a similar foam thermal behaviour to HCFC-141b at the lowest possible cost, and, simultaneously, to carry out a comprehensive assessment of the HFO performance at developing countries conditions. The project will be conducted at Espumlatex, a recognised local system house equipped with the required injection and testing laboratory facilities, and a field test with selected formulations will be done at ABC Poliuretanos, a typical small manufacturer of discontinuous panels. The reduction of 4 MT HCFC 141b will be included in the second stage HPMP for Colombia as the phase-out will be achieved at that time, and should be deducted from the starting point then.

2.3. METHODOLOGY

With the aim of analysing the two HFO molecules, 1233zd(E) from Honeywell or Arkema and 1336maam(z) from DuPont, in comparison with HCFC-141b, six steps are contemplated for the project development:

1. PLANNING. A statistical experimental design (DOE) will be designed having as factors (or independent variables) the type of molecule and the composition of the cell gas (mole fraction of the physical blowing agent). The responses (or dependent variables) will be the foam properties critical for this application (Lambda value, compression strength, dimensional stability, friability). A commercial HCFC-141b based formulation will be used as control.
2. FORMULATION DEVELOPMENT. The resulting formulations will be prepared at laboratory scale and injected with a conventional high-pressure dispenser. PU spray foam will be applied using a Gusmer type dispenser with an isocyanate/polyol volume ratio of one to one. Catalysis and overall blowing agent amount will be adjusted to have among formulations a similar reactivity and free-rise density. A typical Brett or Lance mould with temperature control will be used to manufacture the panels to test the foam properties. Samples for testing will be done by duplicate.
3. TESTING. The critical immediate and aged foam properties for these applications (Lambda value, compression strength, dimensional stability, friability) will be tested following ASTM or ISO standard procedures.
4. ANALYSIS OF RESULTS: foam performance and formulation cost. A detailed analysis of the resulting foam properties at different HFO levels and the associated formulation cost will be carried out. A typical HCFC-141b formulation will be used as standard.
5. FIELD TEST. A field test with selected formulations will be done at ABC Poliuretanos, a small manufacturer of discontinuous panels and spray operations with typical market characteristics.
6. TECHNOLOGY REPLICATION/DISSEMINATION OF RESULTS. One of the critical outcomes of a demonstration project is the definition of the possibility to replicate the technology in other enterprises, in other regions and in other applications. In the case of HFOs, having in mind that the main barrier for their introduction is the associated formulation cost, it is anticipated that if results are positive and an adequate cost/performance balance is achieved, there is a great potential for the technology to be replicated in other system houses in the country, in Latin America and other regions, and even in other applications such as commercial refrigeration. To assure this, it is planned to conduct two workshops, a first one at local level with the participation of the other Colombian system houses (GMP, Olaflex, Química Industrial y Comercial) and interested end users, and a second one at regional level, where regional system houses, importers and end users will be invited. It is important to note that all the Colombian and several Latin American system houses have shown interest in these products. In addition to the seminars, a detailed technical report will be written with the results of the project. Information on the performance of the HFOs at different mole fractions in the cell gas along with the associated formulation cost (incremental operation cost compared to HCFC-141b) will be delivered. It will serve as starting point for the other system houses to design/develop appropriate HFO based formulations.

2.4. INFORMATION ON PARTICIPATING COMPANIES

Espumlatex

Espumlatex was established in 1959 to serve the automotive industry in Colombia as the main supplier of PU based materials: RIM and sound insulation parts and flex moulded foam for car seats. Throughout all these years it became the leader of PU suppliers in the Andean countries with annual sales of 52 million dollars in 2008. It is certified QS9000/ISO9000, EAQF level Q1 status, ISO14000.

At the end of the eighties Espumlatex expanded its activities to formulate PU systems for the manufacture of thermal insulating and integral skin foams. Its current capacity is estimated in 500 MT per month with an annual current production of 4,000 MT of PU systems, from which 2,000 MT are dedicated to rigid foam materials. 15 % of their PU systems production is exported to Ecuador, Peru and Venezuela. Additional to PU systems they manufacture PU rigid foam sheets for insulation purpose in a process that involves the production of large foam blocks and their subsequent cutting.

The system house production facilities are equipped with 18 blending tanks with capacities that go from 1,500 to 3,000 l. They have mechanical agitation, recirculation and a direct feeding system from the raw materials drums as well as a closed pumping system for raw materials loading. The basic properties of the PU systems (free rise density, reactivity, foam thermal conductivity, compression strength, dimensional stability and accelerated aging) are tested in a certified quality control laboratory.

The consumption of chemicals for the PU systems sold for the manufacture of discontinuous panels during the last 5 years was:

Table 3. Consumption of PU chemicals for Discontinuous Panels at Espumlatex, tonnes

Substance	2009	2010	2011	2012	2013
Polyol	327	381	425	423	462
HCFC-141b	82	96	107	106	115
Polymeric MDI	445	518	578	575	628
TOTAL	854	995	1,110	1,104	1,205

During the transition from CFC-11 to HCFCs the following two projects were carried out with Espumlatex:

- The project COL/FOA/32/INV/49, "Retroactive funding for the conversion from CFC-11 to water-based technology in the manufacture of flexible molded and integral skin foam at Espumlatex-Promicolda", retroactively funded one of the Espumlatex´ divisions, Promicolda, for the conversion from CFC-11 to water and HCFC-141b based technologies in the manufacture of flexible molded and integral skin foam respectively. Promicolda is the Expumlatex´ division that manufactures the car seats and several parts based on integral skin foam for the automotive industry in the Andean Countries. The grant received by Promicolda was US$ 82,020.
- The project COL/FOA/32/INV/48, "Conversion from CFC-11 to HCFC-141b and water based technology in the manufacture of various polyurethane foam applications at 25 small enterprises centred around their systems house Espumlatex", was an umbrella project where 25 SMEs -centred around Espumlatex as the system house- were successfully converted from CFC-11 to HCFC-141b and water based technologies. Total cost of the project was US$ 332,768. Espumlatex received funds for the project administrative expenses and a laboratory equipment (one K factor indicator not suitable to measure lambda values at different temperatures).

Espumlatex also served in 2011-2013 as the local system house host for the demonstration project on Supercritical CO_2 technology for spray foam undertaken under a Japan-Colombia bilateral with Achilles Corp.

The company is fully committed to test new HCFC alternatives of low GWP and has the required capability (laboratory facilities, technical knowledge and human resource). Its contribution to the project has been quantified in US$ 58,300 (see table 5).

3. PROJECT IMPLEMENTATION MODALITY

Project will be implemented by UNDP as an implementing agency. Relevant activity such as equipment procurement, recruitment of experts, foam testing will be arranged under the UNDP Financial Rule and Regulation.

The following activities will be executed:

- Work arrangement with local System House to be signed between UNDP and the beneficiary as well as the National Ozone Unit (NOU).
- Development of the experimental protocol which includes application procedure and conditions, properties to test, testing methods etc.
- Formulation development and foam sample preparation to be done at Espumlatex laboratory facilities using a high-pressure dispenser and a conventional Brett mould. Spray foam application will be done at Espumlatex facilities using a standard Gusmer type injector.
- Procurement of a laboratory equipment to measure foam friability. This foam property is considered critical having in mind the high urea content achieved with PU high water formulations.
- Testing of foam critical immediate and aged properties such as thermal conductivity, compression strength, dimensional stability and friability.
- Conduction of a field test at ABC Poliuretanos, a local discontinuous panels manufacturer.
- Delivery of two dissemination workshops to the Colombian and Latin American industry.

<u>Project implementation time schedule</u>

Table 4. Project Implementation Time Schedule

ACTIVITY	2015			2016	
	Q2	Q3	Q4	Q1	Q2
Approval	*				
Grant transfer to UNDP		*			
Work Arrangement between UNDP and beneficiary		*			
Detailed project planning. Development of experimental protocol		*			
Import of HFO samples		*			
Procurement & delivery of equipment to measure friability		*	*		
Formulation Development		*	*	*	
Foam testing		*	*	*	
Analysis of results: performance versus cost				*	
Field testing at a local discontinuous panels manufacturer					*
Dissemination workshops					*
Reporting & Final review					*

4. PROJECT BUDGET

The summary of the project cost is as follows:

Table 5. Project cost by activity

Activity	Unit cost, US$	Quantity	Total Cost US$	Espumlatex contribution US$	MLF US$
International technical assistance	25,000	1	25,000		25,000
Planning	5,000	1	5,000		5,000
Formulation Development in System House	220,000	1	220,000	36,000	184,000
Acquisition of Friability tester	10,000	1	10,000		10,000
Foam Testing (Laboratory tests)	57,500	1	57,500	15,000	42,500
PU material for formulation development and testing.	25,000	1	25,000		25,000
Foam testing - Field evaluation	250	40	10,000	2,000	8,000
Technology Dissemination Workshops		2	40,000		40,000
Sub total incremental capital cost			**392,500**	**53,000**	**339,500**
Contingencies			39,250	5,300	33,950
Incremental Operating Cost (IOC) at end user (ABC Poliuretanos)	9	4,000	36,000		36,000
Project monitoring & reporting	50,000	1	50,000		50,000
Total Cost			517,750	58,300	459,450

Notes:

Project management: Cost for national expert is included. The expert is expected to provide technical advices for preparation, local monitoring and reviewing of project.

Formulation Development: The formulations will be prepared at Espumlatex laboratory facilities by company personnel.

Provision of equipment: The project plans to acquire a laboratory equipment to measure foam friability according to ASTM test.

Foam testing: All the foam properties will be determined at Espumlatex laboratory facilities by company technicians.

Dissemination workshop: Cost to organize the dissemination workshops is included. Two workshops will be organized, both in Colombia, a first one for the local industry and a second one for Latin America.