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

Seventh Meeting
Montreal, 23-26 June 1992

PROJECT PROPOSAL: VENEZUELA

This document consists of:

- 1. Project for the Conversion of an Expanded Polystyrene Sheet Facility to use Hydrocarbons as Blowing Agent (Plásticos Molanca C.A.)**
- 2. World Bank Initial Executive Project Summary.**

REPÚBLICA DE VENEZUELA
MINISTERIO DE RELACIONES EXTERIORES

República de Venezuela
Ministerio del Ambiente
y de los Recursos
Naturales Renovables



Grupo Interministerial Ad-hoc para la Aplicación del Protocolo de Montreal

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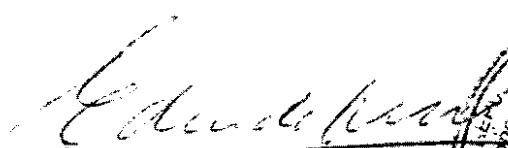
Caracas, 3 de abril de 1992

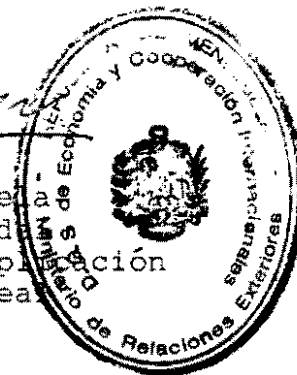
Apreciado Doctor El-Arini:

Tengo el agrado de dirigirme a usted en la oportunidad de consignar, para su consideración por el Comité Ejecutivo del Fondo Multilateral en su próxima reunión de junio, el "Proyecto para la conversión de una instalación de láminas de poliestireno expandido al uso de hidrocarburos como agente espumante", presentado por la empresa Plásticos Molanca C.A.

El Gobierno de Venezuela, a través del Grupo Interministerial Ad-hoc para la Aplicación del Protocolo de Montreal, ha revisado el proyecto en diversas oportunidades durante su elaboración y procedido a su evaluación desde el punto de vista de los requisitos del Fondo, considerando que dicho proyecto, que contribuirá con un impacto significativo en el proceso de sustitución en Venezuela de las sustancias que agotan la capa de ozono, califica para el financiamiento en términos concesionales de todos los gastos en que se deba incurrir para pasar del CFC 12 al butano.

Reiterándole las seguridades de mi mayor consideración, queda de usted, atentamente,


Eduardo López
Representante de Venezuela
en el Comité Ejecutivo del
Fondo Multilateral para la Aplicación
del Protocolo de Montreal



Al Señor Doctor
Omar El-Arini
Director de la Secretaría del
Fondo Multilateral para la
Aplicación del Protocolo de Montreal
Montreal, Canadá

Recibido

CW E. El-Arini
OMAR E. EL-ARINI
2 de abril de 1992

REPUBLIC OF VENEZUELA
MINISTRY OF EXTERNAL RELATIONS

Ad hoc Inter-ministerial Group for the Implementation of the Montreal Protocol

3 April 1992

Dear Dr. El-Arini:

I am pleased to submit, for consideration by the next meeting of the Executive Committee in June, the "Project for the Conversion of an Expanded Polystyrene Sheet Facility to use Hydrocarbons as Blowing Agent", presented by the company Plásticos Molanca.

The Government of Venezuela, through the Ad hoc Inter-ministerial Group for the Implementation of the Montreal Protocol, had the opportunity to review several times the project during its preparation, and evaluated following the Fund's requirements. While this project will significantly impact on the ozone depleting substances phase-out process in Venezuela, as it replaces CFC-12 by butane, it qualifies for financing support all the incremental costs that will incur.

Please accept the assurance of my highest consideration, sincerely yours,

Signed by

Eduardo López
Venezuelan Representative at
the Executive Committee of the
Multilateral Fund for the
Implementation of the Montreal
Protocol

Dr. Omar El-Arini
Chief Officer
Secretariat of the Multilateral Fund for the
Implementation of the Montreal Protocol
Montreal, Canada

PLASTICOS MOLANCA C.A.

**Project for the Conversion of an Expanded
Polystyrene Sheet facility to use Hydrocarbons
as blowing agent**

Project Cover Sheet

Country or Region: Venezuela
Sector Covered: Expanded Polystyrene Sheet Products.
ODS consumption in affected sector: 3.360 tons per year (National consumption of CFC-12).
Project Title: Conversion of an Expanded Polystyrene Sheet facility to use Hydrocarbons as blowing agent.
Project Duration: 1 year.
Project Impact: Phase-out of 259 tons. of CFC-12.
First project in Venezuela.
Proposed Budget: US\$ 1.513.000.
Implementing Agency: World Bank.
Nat. Coordinating Ag.: Ministerio de Relaciones Exteriores (MRE).
Ministerio del Ambiente y de los Recursos Naturales Renovables (MARNR).

Project Summary:

According to the spirit of the Montreal Protocol and Venezuela's program to phase out ODS, Plásticos Molanca C.A. (PMCA) under Venezuelan MARNR guidance has developed this project to replace completely CFC-12 as blowing agent for its Expanded Polystyrene Sheet (EPS) process, the first of its kind in Venezuela.

The project will phase-out almost 260 tons of ODS per year (gross 8% of national consumption). To accomplish this goal, PMCA signed a license agreement with Keyes Fibre Company (USA) and Sekisui Plastics Ltd (Japan), in order to apply their proven Hydrocarbons as blowing agent technology, with more than 35 years experience, in its EPS process.

The total incremental cost of the project is approximately US\$ 1,513,000 and should be completed in one year, starting commercial production by the beginning of the third quarter of 1993.

Project for the Conversion of an Expanded Polystyrene Sheet facility to use Hydrocarbons as blowing agent.

Plásticos Molanca C.A.
Caracas - Venezuela
May 25th. 1.992

1.- Introduction

This project covers all necessary technical matters for converting our present industrial facility for the manufacturing of Expanded Polystyrene Sheet (EPS) to use Hydrocarbons (Butane, Iso-Butane) as blowing agent, totally replacing the use of CFC-12 (Freon 12). This project was prepared by Plásticos Molanca, C.A. (PMCA) under supervision of Sekisui Plastics Ltd. and Keyes Fibre Co. and the help of Venezuelan Ministry for the Environment and Natural Resources (MARNR).

2.- Present consumption of CFC-12 in Venezuela

Total consumption of CFC-12 in Venezuela is 3.360 tons/year.
PMCA consumption of CFC-12 for the production of EPS is 259 tons/year.

3.- Objective

The main objective of this project is to accomplish an immediate phase-out of Ozone Depleting Substances (ODS) in our industrial plant to comply with Venezuela's adhesion to the spirit of the Montreal Protocol. With the production of foam products free of CFC, PMCA will become the pioneer firm in this subject for the Latinamerican Region and consequently will expand its markers, both domestic and export.

4.- Outcome of the Project

PMCA production capacity is 2.592 tons/year of EPS. An average 10% of its weight is the CFC-12 needed for its production, which means an approximate consumption of 259 tons/year of CFC-12. The project will allow PMCA to phase-out 259 tons/year of ODS.

5.- General Information about Plásticos Molanca C.A. (PMCA)

5.1.- PMCA's plant Location and Address

Plant is located at north-center of Venezuela with convenient access from all over.
Address: Av. Domingo Olavarría, Zona Industrial Sur, Valencia, Edo. Carabobo.
Phones: 334690-334691-342573. Fax: 332982. Country Code: 58. City Code: 41.

5.2.- Constitution and Registration

On December 3 1984, the company was registered in the Mercantile Register of the Federal District and Miranda State under N° 56, vol. 49-A first, with an initial capital of Bs. 3.500.000; on December 28 1990, the designation of Adán Celis as Chairman of the Board for the period 1990-92 is registered in the same office under N° 81, vol. 81-A first; on December 28 1990, the increase of the capital of the company to Bs. 10.500.000, is registered under N° 81, vol. 85-A first; on August 23 1991, the increase of the capital of the company to Bs. 17.500.000, is registered under N° 77, vol. 79-A first; on August 29 1991, the increase of the capital of the company to Bs. 117.000.000, is registered under N° 72, vol. 92-A first.

5.3.- Paid Capital and Shareholders:

Plásticos Molanca C.A. (PMCA) has at present a Capital of Bs. 117.000.000 totally paid (approx. US\$ 1.800.000) and is almost entirely owned by Moldeados Andinos C.A., a 19 years old moulded pulp egg packaging manufacturing company:

Shareholders			Capital share	
Productos Moldeados C.A.	Venezuela	Bs.	3.300	(0,0028 %)
Moldeados Andinos C.A.	Venezuela	Bs.	116.996.700	(99,9972 %)

5.4.- Product Line:

PMCA manufacture the following EPS articles which are intended for use in fast food services and for packaging of meats, produces, fruits, bakery products and eggs:

Rectangular trays:	9 models
Round dishes and bowls:	3 models
Fast food packagings:	8 models
One dozen eggs trays:	1 model

6.- Technology of the Project

Technical support: PMCA has technical support from Keyes Fibre Co. (USA) and a license agreement with Sekisui Plastics Ltd. (Japan), one of the largest foam manufacturers in Japan with more than 35 years of experience using hydrocarbons as blowing agent in EPS processes.

Present conditions: PMCA's factory building was constructed, although not completed, considering the safety regulations of JLPA (Japan), NFPA (USA) and Covenin (Venezuela), required for replacing CFC by hydrocarbons. The extrusion line was recently purchased according to Sekisui advise considering its adaptability to hydrocarbon conversion. But use of hydrocarbon as blowing agent introduces a deep change in our existing production procedures and practices. Its explosive properties require very strict safety rules. Most electrical installations, lighting and motors, must be explosion proof, and grounding of all equipment with reliable static elimination systems are absolutely required.

Safety devices: All safety standards were considered upon Sekisui's advise regarding hydrocarbon storing, piping, pumping, handling and testing, in order to prevent and extinguish fires and explosions. All gas sensors will be set at 25 % of the Lower Explosion Limit (LEL) to activate an alarm. If 50 % of the LEL is reached, the complete sheet line will be shut-off automatically.

Special systems: A complete ventilation project was also considered including a high safety factor. Ventilation of main production areas such as extrusion, storage, conversion, grinding, pumping and repelletizing, were carefully considered, using constant running and automatic actuated fans. The recovered sheet from rejected production, which is cut into fluff before being reprocessed, was subject to detailed survey, and a complete handling and storage system was designed for it.

New equipment: Special attention was devoted to the addition of new equipment to guarantee that it will bring the safest operation with hydrocarbons.

Training: An intensive training program was established including visits of our technicians to Sekisui plants in Japan and visits of Sekisui and Keyes experts to our factory. Particular emphasis will be on safety, and fire and explosion prevention training. Operators will be trained in Liquefied Petroleum Gases (LPG) handling procedures and techniques. Most of the cost of training is included in our license agreement; PMCA will pay only for travelling and engineering expenses at the time of erection.

7.- Project requirements for Blowing Agent conversion to Hydrocarbons.

Sekisui's technology applied at PMCA guarantees success in converting our present CFC plant to an environmentally safe operation which uses hydrocarbons as blowing agent. Their experience and background helped us selecting the necessary equipment and provided us with engineering expertise during the project stage. Sekisui will supervise directly the conversion work, will give us training and will transfer to PMCA the technology to run the operation safely. A list of necessary items to meet the incremental requirements for the conversion to hydrocarbons as blowing agent follows (the exchange rate used was Bs. 65/US\$):

7.1.- Civil works: Pump room installation - explosion proof wall - mezzanine closure - leak proof roof sealing - access lane - butane tank foundation - coated floors
US\$ 101,000

7.2.- Mechanical works: Pumping system - explosion proof pipes installation - gas detectors - instrumentation
US\$ 95,000

7.3.- Safety Systems: Gas leak detectors - alarms - fire extinguishing devices - fire and smoke detection - instrumentation - extrusion line interlock with gas sensors - control panels - explosion proof fittings - emergency and remote shut down devices.
US\$ 235,000

7.4.- Mechanical Ventilation: Ceiling metal duct work - under floor concrete duct - inlet and exhaust fans - installation - instrumentation - control and power panels.
US\$ 56,000

7.5.- Materials Handling System: Electrically operated lift truck - roll conveyors - silos - electric fans - duct work - instrumentation - control panel.
US\$ 74,000

7.6.- Electrical Installations: Wiring - conduits - explosion proof fittings - wiring support - explosion proof lighting - power supply and distribution - transformers - control panels - instrumentation - grounding - static eliminators.
US\$ 132,000

7.7.- Construction Management: The company would contract an experts firm to take care of construction, payment is calculated as a percentage of the total cost.
US\$ 72,000

7.8.- New Equipment:

7.8.1.-	Complete dual winder	US\$	43,000
7.8.2.-	Antistatic solution application system	US\$	15,000
7.8.2.-	Two portable antistatic eliminators	US\$	15,000
7.8.3.-	Pre-repelletizing shredder unit	US\$	90,000
7.8.4.-	Repelletizing unit	US\$	285,000
Total New Equipment		US\$	448,000

8.- Engineering Services:

After the visit of Eng. Frank Muñoz from World Bank, some technical issues that implied design changes were discussed. The cost of the original project designed by Modulor is now included. Eng. Muñoz survey showed the need to redesign some areas and to prepare a Handbook for the operation of the whole plant in order to avoid any critical situation regarding the safety of the people who will work in it.

8.1.-	Original Project designed by Modulor C.A.	US\$	40,000
8.2.-	Engineering services for changes in the project	US\$	8,500
8.3.-	Handbook of Plant Operation	US\$	9,500
Total Engineering Services		US\$	58,000

9.-	Expertise requirements:	Cost/year	Time	Total
	Project Leader (1)	US\$ 30,000	1 year	US\$ 30,000
	Production Supervisors (4)	US\$ 40,000	6 months	US\$ 20,000
Total Project Expertise requirements				US\$ 50,000

10.- Technology Transfer Expenses

10.1.- Travelling requirements:	to Japan	from Japan	Length (days)	Domestic
Venezuelan Technical Experts				
Project Leader (1)	1	0	7	0
Production Manager (1)	1	0	15	0
Production Supervisors (4)	4	0	15	0
Project Manager (1)	1	0	7	0
Japanese Technical Experts				
Project Leader (1)	0	1	15	2
Engineer (1)	0	1	15	2
Total number of trips	7	2		4

10.2.- Cost of trips to and from Japan:	Cost per unit	Total Cost
Air flight per person	US\$ 2,000	US\$ 18,000
Daily expenses Venezuelan team	US\$ 300	US\$ 26,700
Daily expenses Japanese team	US\$ 300	US\$ 9,000
Total Cost of trips to and from Japan		US\$ 53,700

10.3.- Total Cost of domestic trips:

Since our installations are located 2 hours by road from Caracas, every domestic trip to and from Valencia will cost no more than US\$ 250.

Total Cost of domestic trips US\$ 1,000

10.4.- Total Cost of Japanese Experts:

Since our company has a Technical agreement with Sekisui through Keyes Fibre Co., the cost of the Japanese experts will be only the cost established for the american technicians supplied by Keyes which is US\$ 375 per day.

Total Cost of Japanese Experts US\$ 11,300

Total Technology Transfer Expenses US\$ 66,000

11.- Total Project Cost

Summary of all incremental costs related to the conversion of CFC to hydrocarbons as blowing agent. An estimated 15% has been allocated in case a contingency arises.

11.1.-	Civil Works	US\$	101,000
11.2.-	Mechanical Works	US\$	95,000
11.3.-	Safety Systems	US\$	235,000
11.4.-	Mechanical Ventilation	US\$	56,000
11.5.-	Materials Handling System	US\$	74,000
11.6.-	Electrical Installations	US\$	132,000
11.7.-	Construction Management	US\$	72,000
11.8.-	New Equipment	US\$	448,000
11.9.-	Engineering Services	US\$	58,000
11.10.-	Project Expertise requirements	US\$	50,000
11.11.-	Technology transfer expenses	US\$	66,000
11.12.-	Contingency (15%)	US\$	208,000
Total Project Cost		US\$	1,595,000

11.- Project Execution Schedule

According to our schedule, Plásticos Molanca C.A. could be producing CFC free EPS after the second quarter of 1993, but this time frame could be improved depending on funds availability.

12.- Financial Schedule

Since full project will need a whole year from starting date to commercial production, the financial schedule we are devising is that the total amount will be needed in the first six months on two similar disbursements, one at the beginning of the project and a second one 3 months later. This will depend, of course, on the scheme which looks appropriate to the World Bank. Nevertheless, for the benefit of having the new technology ready for production in the shortest time, our company would need, if the approval is granted, an authorization to start the works even if the disbursements are going to be delayed for some time. That would mean that the company would incur in financial charges for some time at the commercial banking rates until the funds are received. We hope that this charges could be later reimbursed.

THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEplete THE OZONE LAYER

PROJECT COVER SHEET

COUNTRY: Republic of Venezuela

SECTORS COVERED: Foam

**ODS CONSUMPTION IN
AFFECTED SECTOR:**
(1991 data) Foams: 620 tons/yr.

PROJECT TITLE: Plasticos Molanca C.A. CFC-12 to Hydrocarbon Foaming Agent Conversion Project

PROJECT DURATION: 1 year for implementation

PROJECT IMPACT: ODSs PHASED-OUT: Between 120 and 260 tons annually, depending on expanded polystyrene sheet production level

PROPOSED BUDGET: US\$ 1.6 million of which US\$ 1.3 million incremental costs

IMPLEMENTING AGENCY: World Bank

**COORDINATING
NATIONAL AGENCIES:** Ministry of Environment; Ministry of External Affairs

BENEFICIARY: Plasticos Molanca C.A.

PROJECT SUMMARY

Please refer to attached Executive Project Summary

MONTREAL PROTOCOL (MP) PROJECT FOR VENEZUELA

INITIAL EXECUTIVE PROJECT SUMMARY

Country: Venezuela
Project Name: Plasticos Molanca C.A. CFC-12 to Hydrocarbon
Foaming Agent Conversion Project

Associated Bank Project: None. Free Standing Project

Borrower: None. Montreal Protocol Ozone Trust Fund Grant
Grant Amount: US\$ 1.3 million requested. Total estimated
project cost is US\$ 1.6 million of which
beneficiary will provide approx. US\$ 300,000.

Beneficiary: Plasticos Molanca C.A., a Venezuelan private
enterprise, via a grant from the Bank.

Tentative Appraisal Date: September 1992
RVP Approval Date: November 1992
Board Presentation Date: Not required per modified procedures for GEF and
MP projects.

Environmental Category: B

1. The proposed project is an Ozone Projects Trust Fund (OPTF) grant to Plasticos Molanca, C.A. for the equivalent of US\$ 1,300,000, the estimated incremental cost share of total project cost. The grant will assist Plasticos Molanca C.A., a financially sound private sector enterprise which produces polystyrene dishes and containers, to refit its production facility to permit the substitution of CFC-12 by a hydrocarbon (butane) foaming agent in the production of the expanded polystyrene sheet. The conversion will permit the elimination of 120 tons/yr actual to 260 tons annual CFC-12 consumption at full capacity utilization or from 3% to 7% of total national CFC consumption in 1991. In terms of capital cost per ton of CFC eliminated, the project is extremely cost effective. The proposed operation would be the first in Venezuela to be financed by the Montreal Protocol Interim Multilateral Fund (MPIMF) with the Bank as the implementing agency.

2. Venezuela Ozone Depleting Substance (ODS) Sector Background. Venezuela signed the Montreal Protocol on September 16, 1987, and ratified it on February 6, 1989. As an Article 5 signatory (annual per capita ODS consumption of less than 300 grams), Venezuela is eligible for MPIMF support. ODS's are produced in six developing nations, Argentina, Brazil, China, India, Mexico, and Venezuela. Total production of CFC's and MCF in those nations in 1989 was approximately 70,000 tons, of which Venezuela's share was 4150 tons, or 6%. CFC/Halon consumption in Venezuela in 1990 was 3420 tons, but rose to 3820 tons in 1991, still a decrease of 12% since 1986. Distribution by end use in 1991 was AC/refrigeration 77%; foaming agent 16%; aerosols 4%; Halon fire extinguishers 1%; and solvents 2%. Of the AC/refrigeration share, an estimated 80% was for aftermarket use. MCF consumption in 1991 was 130 tons, down from 570 tons in 1990. All CCl4 (1350 tons in 1991) is used as a chemical intermediate raw material. Per capita annual consumption of CFC's decreased from 270 grams in 1986 to 170 grams in 1990. More detailed national data are found in Annex 1, National Production and Consumption Patterns.

3. Project Background. The principal component of Bank assisted ODS phase out activities in Venezuela will be the MP ODS Elimination Project, a grant line for financing of the eligible incremental costs of ODS reducing or elimination activities. Preparation of this operation has been slowed pending finalization of implementing agency arrangements. At the same time, preparation of Plásticos Molanca C.A., the only CFC phase out industrial conversion project yet identified in Venezuela, is essentially complete. The project has already been submitted directly to the MP Secretariat by the GOV (see letter of April 3 - Annex 2); detailed technical design is complete; and final technical evaluation by a Bank consultant/chemical engineer took place during the week of May 11-15. Given the readiness of the Plásticos Molanca C.A. (PMCA) project, and the lead time until the MP ODS Elimination Project will be effective, the decision was taken at the recent IEPs Review Meeting for the MP ODS Elimination Project to split off Plásticos Molanca from the main project, and process it separately. It will be presented to the MPEC for commitment approval at its June 23-26, 1992 meeting. PMCA is among the first CFC phase out industrial conversion projects in any country to be prepared for MFIMF funding. It, therefore, has high visibility in spite of its relatively modest incremental cost level.

4. Project Objectives. The project's objective is to eliminate the use of CFC-12 in the expanded polystyrene sheet production process through its substitution by a non-ODS hydrocarbon foaming agent.

5. Project Description. Using proven technology acquired under licensing agreements with Keys Fibre Co. (USA) and Seksui Plastics Ltd. (Japan), factory conversion will require refitting the process with explosion proof rated electricals, safety systems, and equipment; and building and ventilation system modifications. The factory building, hydrocarbon storage tanks and process equipment have been designed to COVENIN (Comision Venezolana de Normas Industriales) safety standards and regulations for hydrocarbon use. Electrical installations, lighting, and motors will be explosion proof, and grounding of all equipment with reliable static elimination systems is required. The process and product storage areas require installation of a high volume ventilation system with a high safety factor. New process equipment rated for operation under explosion proof conditions is required, as is a sophisticated, yet easy to operate gas detection system. Detail design, financed by PMCA, was carried out by two Venezuelan engineering groups under the guidance of Seksui.

6. Substitution of a flammable hydrocarbon for non-toxic, non-flammable but ozone layer depleting CFC-12 as a foaming agent required fundamental changes in PMCA's existing production procedures and practices. Butane's explosive properties require very strict safety rules, and intensive supervisor and worker training. A training program has already been established, including visits of technicians to Seksui plants in Japan and visits of Seksui and Keyes experts to the PMCA factory. Most of the training costs are included in the licensing agreements.

7. Technical Evaluation. The Bank's technical assessment consisted of an extensive, in depth review of the project design's technical and safety aspects, and an analysis of the cost estimate. A summary of the detailed technical report is included in Annex 3, "Technical, Safety and Cost Assessment Report." The complete report is available in project files. The summarized conclusions are: i) Seksui's proven hydrocarbon technology and experience have been successfully incorporated in project design; ii) project design is in compliance with Venezuelan safety codes, which are similar to American codes, and which provide adequate safeguards for operations in hydrocarbon environments; iii) the original cost estimate has been revised upward to account for emissions

and inflation; and iv) in the interests of optimization of overall project design, a series of design modifications, detailed in the full report, have been recommended.

8. On the basis of the assessment, the Bank considers the PMCA project to be of sound technical design, and qualified for MPIMF grant financing of eligible incremental costs. At the same time, it is recommended that incorporation of the recommended design modifications into project implementation be a condition of disbursement. Annex 4 indicates approval of the project by the Bank's Ozone Operations Resource Group (OORG) technical expert for foam projects.

9. Project Cost and Financing. The original project cost estimate prepared by PMCA and its consulting engineers totaled US\$ 1,166,000. The cost estimate analysis revealed that several elements of the total cost required to implement the project successfully, most notably construction supervision, adequate contingency, and inflation had not been taken into account. The revised project cost estimate is therefore US\$ 1,600,000.

10. Determination of Incremental Costs. Project implementation results in increased after tax profits due to reduced production costs, the hydrocarbon mix foaming agent being cheaper than CFC-12. The financial rate of return on total project cost is, however, negative in the absence of a subsidy. The eligible incremental project cost was defined, therefore, as the difference between the calculated initial investment which would generate a return equal to the opportunity cost of capital for PMCA (10% in real terms) for the project's incremental net income stream, and the total project cost. The incremental net income stream is the difference in net after tax income for the hydrocarbon (With Project) less CFC-12 (Without Project) case, over a useful project life estimated at seven years. The latter is considered reasonable for an industry with a high rate of technological obsolescence. The calculated initial investment which would produce a 10% rate of return for the incremental net profit stream is approximately US\$ 300,000. This amount will be supported by PMCA through debt financing. The eligible incremental costs will be the balance of total estimated project cost, and amounts of US\$ 1,300,000. MPIMF grant funding will be requested for this amount. The financial analysis upon which the determination is based is available in the project files.

11. Project Implementation. Plasticos Molanca C.A., itself, will manage project implementation, which will be executed by Venezuelan contractors under third party construction supervision. The GOV's Montreal Protocol Interministerial Working Group (IWG), or FONDUCOZONO, its likely successor, will be responsible for administrative liaison with the Bank. Technical oversight will be provided by the Bank's Ozone Operations Resource Group (OORG). Procurement and disbursement arrangements will be in accordance with Bank guidelines.

12. Project Sustainability. Grant funding is by definition financially non-sustainable for the donor. In operational and environmental terms, the operation is sustainable in that CFC consumption will be permanently eliminated from a production process for which it was 10% by weight of raw material input.

13. Rationale for Montreal Protocol Financing. The grant will provide PMCA with a financial incentive to accelerate the transition to a non-CFC technology in a situation where, in the absence of the subsidy, compliance would have been financially prejudicial to the enterprise.

14. Issues and Actions. There are no major issues. The project is a straightforward well engineered plant modification for a profitable, experienced enterprise with a solid financial structure and an established market niche. Procurement guidelines will require adaptation to allow for purchase of some key process equipment from sole source suppliers. Arrangements for disbursement from the Ozone Trust Fund to the ultimate beneficiary, PMCA, remain to be worked out.

15. Environmental Aspects. Apart from the ozone layer issue itself, the major environmental issue of the project concerns safety of design and operation. Safe design has been adequately addressed by adherence to appropriate design codes. PMCA is acutely aware of the potential dangers during operation, and is addressing this issue through its ongoing training program, and the start up assistance it will receive from Seksul. The high safety factors of the gas detection and the ventilation systems which are required to keep the ambient butane concentration less than its lower explosion limit assure no objectionable butane concentration build up either inside or outside of the factory building under normal operating conditions.

16. Project Benefits. The project's primary benefit will be to assist Venezuela to phase-out between 3% and 7% of current consumption of controlled CFCs with one relatively inexpensive, easy to implement investment. Relative cost effectiveness in terms of least cost per ton ODS eliminated is among the criteria being used to establish funding priorities among eligible ODS phase out activities. This project is extremely cost effective. At full capacity utilization, the process consumes 260 tons of CFC-12 annually. For recent actual CFC-12 consumption of 120 tons/yr. the cost effectiveness ratio is US\$ 13,350 ton/yr, while at full capacity it would be US\$ 6,150 ton/yr. After project implementation, variable production costs will be lower than before, so there are no recurrent incremental costs. As a basis for comparison, unit costs for central chiller retrofits can be as high as US\$ 100,000 per ton CFC substituted, and substitution occurs in small increments, a typical 800 chiller having a refrigerant charge of less than 1,000 kg.

17. Project Risks. The sole major risk is the operational safety issue, for which adequate safeguards are being established. While operation under explosion proof conditions is new to PMCA, the process is well established technology, and the Venezuelan refinery and chemical sector has a long history of successful operation under hydrocarbon environment conditions.

18. Staff Review Arrangements: The following staff are responsible for the Project and for the review:

Task Manager:	Donald J. Rhatigan, LAIEI
Division Chief:	Stephen J. Ettinger, LAIEI
CD Director:	Arneane M. Choksi, LAIDR
RED Chief:	Dennis J. Mahar
Bank Technical Advisor:	Donald Brown
Outside Specialist:	Francisco A. Munoz
(Technical Evaluation)	
OCRG Reviewer:	Mike Jeffs, ICI Belgium

5/28/92

ANNEX 1

VENEZUELA: NATIONAL PRODUCTION AND CONSUMPTION PATTERNS

Production: PRODUVEN C.A., a 50/50 joint venture between PEQUIVEN S.A., a parastatal petrochemical producer, and ATOCHEM (France), is the only Venezuelan CDS producer. The plant is of swing type design with a design capacity of 10,000 tons/yr of CFC-11/12 or 5000 tons/yr HCFC-22. Recent annual output has been about 4000 tons CFC-11 and CFC-12 combined, and 1,500 tons HCFC-22, of which 1000 tons, mostly CFC-11 and CFC-12 has been exported to neighboring countries. PRODUVEN C.A. is expected to announce that a HFC-134a production unit, also with a 10,000 ton/yr design capacity, will go on stream in late 1995 or early 1996. Most production in initial years of operation is expected to be exported to both developed and developing countries, to satisfy what ATOCHEM predicts will be an initial worldwide excess of demand over production. This projection is likely to be even more valid as a result of the recent decision to accelerate the phase out deadline in non-Article 5 countries to 1996. Current thinking calls for continuing CFC and HCFC-22 production in the current fully amortized facility as long as residual demand for these products results in viable capacity utilization rates.

Consumption: National consumption in 1990 was 3,731 tons of CFC's and Halons, of which 326 tons (Halon, and CFC's 113, 114, 115) was imported. Estimated use by major application was 12% aerosols; 8% foaming agent; 75% refrigeration and air conditioning; and 5% other (fire extinguishers, solvents, etc.). Substitution of CFC's in aerosol applications is almost complete, consumption of CFC 12 for this purpose having decreased from 5,000 tons in 1980 to 200 tons in 1990. CFC consumption as a foaming agent for flexible foams in 1990 was only 173 tons, indicating that substantial substitution of CFC 11 by methylene chloride in flexible polyurethane production has already taken place. Total consumption of controlled CFC's has decreased from a maximum of 7,400 tons in 1980 to 3400 tons in 1990. The attached table, "Cuadro 1. Summary of Sales, National Market - Controlled CFCs" summarizes CFC sales in Venezuela for 1990 and 1991. It indicates, unfortunately, a 13.6% increase of CFC consumption from 1990 to 1991. Cuadro 2 indicates the increase took place in all principal applications except aerosols, where CFC use decreased by 30%. Cuadro 2 also indicates a 19% increase in HCFC-22 use, and a 25% decrease in exports from 1990 to 1991. The last table, "Consumption of Controlled Substances by End Use in Venezuela" gives a complete breakdown of CDS consumption in Venezuela by end use for 1990 in a more legible presentation. It demonstrates quite clearly the 77% market share of AC/refrigeration applications in total national CFC consumption.

=====;
 : CUADRO No 1 :
 : PRODUCTOS SUJETOS AL ACUERDO DE MONTREAL :
 : RESUMEN DE VENTAS EN Kgs. :
 : MERCADO NACIONAL :
 : =====;

1 VARIAC. :
 : PRODUCTOS ACUM. 91 ACUM. 90 ACUM 92/91 :
 : Kgs Kgs (%) :
 : -----;
 : F11 764.900 527.157 43,10% :
 : F12 2.896.098 2.710.006 6,87% :
 : F/MEZCLAS 48.530 52.748 -8,00% :
 : F115 52.193 37.514 39,13% :
 : F113 48.600 23.580 106,11% :
 : F114 7.250 4.400 64,77% :
 : -----;
 : TOT. NAC. 3.817.571 3.355.405 13,77% :
 : =====;

MERCADO NACIONAL

CUADRO No 2 ANALISIS POR TIPO DE MERCADO (Kgs)

=====;
 : MERCADO ACUM. 91 ACUM. 90 PROMEDIO PROMEDIO PROMEDIO PROMEDIO :
 : PRODUCTO ULT. 3/M ANO ACT ANO 1990 ANO 1989 :
 : =====;

AEROSOL

F11	26.880	23.900	1.867	2.240	1.992	2.672
F12	52.660	146.406	5.297	4.905	12.201	20.918
FMEZC	38.530	42.660	3.000	3.211	3.638	6.154
F113	36.000	14.700	3.200	3.000	1.225	1.920
F114	50	1.000	17	4	83	100

TOTAL	160.320	229.666	13.380	13.360	19.139	32.763
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LIMPIEZA INDUSTRIAL

F11	132.560	105.149	7.869	11.046	8.762	10.998
F113	12.600	8.880	1.600	1.050	740	1.050

TOTAL	145.160	114.029	9.469	12.096	9.502	12.048
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ESPUMA

F11	373.880	227.124	34.782	31.157	18.927	17.030
F11-S	155.680	118.160	14.187	12.973	9.847	5.740
F12	77.300	57.150	6.900	6.442	4.763	3.860
F22	0	0	0	0	0	0
FMEZC	10.000	9.088	0	833	757	600

TOTAL	616.860	411.522	55.869	51.405	34.294	27.230
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FRIO INDUSTRIAL

F11	75.900	52.824	5.902	6.325	4.402	4.931
F12	2.753.936	2.506.450	242.276	229.995	208.871	236.622
F22	1.671.097	1.385.112	146.612	139.258	115.426	136.370
F113	0	0	0	0	0	0
F114	7.200	3.400	1.533	600	293	400
F502	101.939	73.270	12.900	8.495	6.106	5.940
F11-S	0	0	0	0	0	0

TOTAL	4.616.074	4.021.056	409.223	384.673	335.088	384.263
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TOTAL NAC.	5.538.414	4.776.273	487.941	461.535	398.023	456.305
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MERCADO	ACUM. 91	ACUM. 90	PROMEDIO ULT. 3/M	PROMEDIO AÑO ACT	PROMEDIO AÑO 1990	PROMEDIO AÑO 1989
---------	----------	----------	----------------------	---------------------	----------------------	----------------------

TOTAL x PRODUCTOS						
F113	46.600	23.520	4.800	4.050	1.965	2.970
F114	7.250	4.400	1.350	604	367	500
F11	1.068.500	872.327	97.140	89.042	72.694	59.195
F12	3.339.734	3.412.632	291.289	278.311	284.391	311.879
FMEZC.	48.530	52.748	3.000	4.044	4.396	6.754
F22	1.809.519	1.519.062	154.844	150.793	126.589	145.674
F502	111.520	84.000	13.800	9.293	7.000	16.615
=====						
TOT. GENERAL	6.433.653	5.968.809	566.223	536.138	497.401	533.587
=====						

TABLE Nº 2
CONSUMPTION OF CONTROLLED SUBSTANCES BY END USE IN VENEZUELA*
(1990 METRIC TONS)

Controlled Substance	Aerosols	Foams		Solvents	Sterilization	Refrigeration				Flu. Estig. and Other ^a	Total (% of All CFC USE)
		Flex	Rigid			Domestic	Industrial/Commercial	MACs	Total		
CFC-11	47 (8%)	153 (29%)	276 (51%)				69		69		545 (17%)
CFC-12	170 (7%)	20 (1%)	37 (1%)		16 (1%)	695 (10%)	1433 (19%)	376 (5%)	2506 (70%)		2749 (80%)
CFC-113	13 (2%)			21 (40%)					12 (20%)		46 (1%)
CFC-114							10		10 (100%)		10 (1%)
CFC-115							36		36 (100%)		36 (1%)
TOTAL	230 (7%)	173 (5%)	313 (10%)	21 (1%)	16 (1%)	848 (12%)	1538 (21%)	376 (5%)	2633 (70%)		3386 (100%)
Halon-1211										22 (100%)	22 (3%)
Halon-1301										10 (100%)	10 (31%)
TOTAL										32 (100%)	32 (100%)
MCF	100			100						370	570

* Data on carbon tetrachloride is not included because it is not available.

^a For methyl chloroform, this includes: athletic shoe soles (2%), primary metals industry (3%), adhesives (3%), construction (1%), and miscellaneous metal cleaning (3%).

**PLASTICOS MOLANCA C.A.
CARACAS, VENEZUELA**

EXPANDED POLYSTYRENE SHEET FACILITY

**PROJECT FOR THE CONVERSION OF CFC-12
TO HYDROCARBONS AS THE BLOWING AGENT**

TECHNICAL, SAFETY AND COST ASSESSMENT REPORT

**PREPARED BY: F. A. MUNOZ
MAY 25, 1992**

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I - INTRODUCTION

This report covers a technical, safety and cost review and assessment of a project for the conversion of an existing Expanded Polystyrene Sheet (EPS) Facility to use Hydrocarbons (Butane, Iso-Butane) as the blowing agent, totally replacing the use of CFC-12 (Freon 12). The project, is for Plasticos Molanca C.A., Caracas, Venezuela at their Valencia facility. This project is the first of its kind in Venezuela.

The process design, engineering and detail design of the project is virtually complete. The design work was performed by Modulor, C.A., a competent, full service engineering firm located in Caracas. The design is based on Sekisui Plastics' Ltd (Japan) proven technology using hydrocarbons as a blowing agent, with more than 20 years experience. The conversion to hydrocarbons as the blowing agent requires extensive changes in production procedures and practices due to the explosive properties of the hydrocarbons used. Due to Plasticos Molanca's lack of operating experience with Butane, the detailed transfer of Sekisui's technology became a critical factor to the success and safety of the project. The transfer of technical information included a plant visit of Sekisui's plant in Japan by Plasticos Molanca's technical personnel; a detail review by Sekisui of the plant design drawings and documents prepared by Modulor C. A. with resulting comments and recommendations; a visit of Plasticos Molanca's Plant in Valencia by Sekisui's technical personnel and face to face technical discussions between Plasticos Molanca's, Modulor's and Sekisui's personnel; a second review by Sekisui of Modulor's design drawings revised to incorporate the agreed upon changes at the above meeting. The comments and recommendations of the second review in the form of marked-up drawings have not been received by Plasticos Molanca as of the date of this report; however, a report has been received covering the most important points.

Personnel from Plasticos Molanca will be trained by Sekisui in Japan. Sekisui will provide experienced personnel to assist Plasticos Molanca in the start-up of the plant.

II SUMMARY & CONCLUSIONS

Based on the extensive and in-depth technical, safety and cost review and assessment performed, it was concluded that:

- A. Sekisui's proven hydrocarbon technology and experience has been successfully incorporated into the design of the plant.
- B. The Venezuelan codes and standards which are similar to those of the U.S.A. have been adhered to.
- C. The estimated cost of the plant adjusted as recommended in Section IV represents reality.

It is therefore, recommended that the World Bank grant Plasticos Molanca C. A. the necessary Montreal Protocol Funds to convert their Valencia plant from CFC-12 (Freon 12) to hydrocarbons (butane, iso-butane) as the blowing agent, contingent on the implementation by Plasticos Molanca of the recommendations listed in Section IV. Plasticos Molanca C. A. has indicated that they accept and will abide by the recommendations.



Polyurethanes

ANNEX 4

ICI Polyurethanes Group

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To DON RHATIGAN

CC TOM WALTZ

FAX 102-676-0259

Company Name

WORLD BANK LA 1 G 1 ROOM I 7156

From

MIKE JEFFS

Date

27-5-92

Time
No. of pages following cover note

0

Cover note
REF. VENEZUELA PROJECT CFC 12 → BUTANE
PLASTICOS MUCANA

PROJECT IS APPROVED ON BASIS OF BUTANE BEING ONE OF
 ACCEPTED CFC 12 ALTERNATIVES IN THIS APPLICATION - ZERO ODP
 SOLUTIONS BECAUSE IT IS BASICALLY A NON-HIGH PERFORMANCE
 INSULATION; REQUIREMENT, DESCRIPTION INDICATES SAFETY ISSUE
 IS BEING ADEQUATELY ADDRESSED BUT WOULD SUGGEST REGULAR
 FOLLOW-UP WORKER TRAINING/RETRAINING AND CERTIFICATION OF
 THIS TAKING PLACE

REFERENCE #10N CFC - MAY BE FAVORABLE VERSUS CHILLER

 EXAMPLE BUT APPEARS LESS SO VERSUS OTHER FOAM PROJECTS
 -ALMOST TIME I'VE SEEN SO FAR,

REGARDS

Mike Jeffs

Confirmation Required: _____

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 Telephone (609) 423-8300 Ext. _____

*****THANK YOU*****