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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Seventy-fifth Meeting
Montreal, 16-20 November 2015

PROJECT PROPOSAL: MOROCCO

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

Foam

• Demonstration of the use of low-cost pentane foaming technology for the conversion to non-ODS technologies in polyurethane foams at small and medium-sized enterprises	UNIDO

Pre-session documents of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol are without prejudice to any decision that the Executive Committee might take following issuance of the document.

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT

MOROCCO

PROJECT TITLE(S)	BILATERAL/IMPLEMENTING AGENCY
(a) Demonstration of the use of low-cost pentane foaming technology for the conversion to non-ODS technologies in polyurethane foams at small and medium-sized enterprises	UNIDO

NATIONAL CO-ORDINATING AGENCY	Ministry of Trade, Industry and Crafts

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (ODP TONNES, 2014, AS OF OCTOBER 2015)

HCFCs	49.10

B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2014, AS OF OCTOBER 2015)

HCFC-22	38.3
HCFC-141b	0
HCFC-141b in imported pre-blended polyol	10.8

HCFC consumption remaining eligible for funding (ODP tonnes)	51.23

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

PROJECT TITLE:	
ODS use at enterprise (ODP tonnes):	n/a
ODS to be phased out (ODP tonnes):	n/a
ODS to be phased in (ODP tonnes):	n/a
Project duration (months):	24
Initial amount requested (US $):	297,000
Final project costs (US $):	
Incremental capital cost:	255,000
Contingency (10 %):	25,500
Incremental operating cost:	0
Total project cost:	280,500
Local ownership (%):	n/a
Export component (%):	n/a
Requested grant (US $):	n/a
Cost-effectiveness (US $/kg):	n/a
Implementing agency support cost (US $):	19,635
Total cost of project to Multilateral Fund (US $):	300,135
Status of counterpart funding (Y/N):	N
Project monitoring milestones included (Y/N):	Y

SECRETARIAT'S RECOMMENDATION	For individual consideration

PROJECT DESCRIPTION

1. On behalf of the Government of Morocco, UNIDO as the designated implementing agency has submitted to the 75th meeting a request for funding a demonstration project on the use of low-cost pentane foaming technology for the conversion to non-ODS technologies in the polyurethane (PU) foam manufacturing sector at small and medium-sized enterprises (SMEs), at the amount of US $297,000, plus agency support costs of US $20,790 as originally submitted.

2. In line with decision 72/40[1], the Executive Committee approved funding for the preparation of this project in the amount of US $40,000, on the understanding that its approval did not denote approval of the project or its level of funding when submitted (decision 74/33). The proposal submitted is contained as Annex I to the present document.

Rationale

3. The foam blowing pentane technology has proven viable for replacement of HCFC-141b in the manufacturing of PU foam products. However, due to the flammability of pentanes, the additional safety-related costs increase the overall costs for the conversion above the cost-effectiveness threshold. This has limited the use of this technology particularly in SMEs, which are essential consumers in the foam sector.

Project objective

4. The objective of this proposal is to explore the possibility of reducing the initial capital cost by designing a simple, standardized and easy-to-handle compact foaming machine capable of operating with flammable pentane, equipment and movable ventilation systems serving several products. The technology could be considered as a solution for enterprises that do not have a high production rate, and have a non-regular need for foaming. Many of these would be addressed in stage II of the HCFC phase-out management plans (HPMPs).

Project description

Sector and enterprise data

5. There are 16 SMEs in Morocco using 9.93 ODP tonnes HCFC-141b pre-blended polyols[2] in the manufacturing of PU foam, sandwich panel and soft foam for decoration, which will be converted in stage II of the HPMP.

6. The project will be implemented in one SME, Engequife, which was established in 1998 and was converted from CFC-11 to HCFC-141b pre-blended polyols in its production of insulation foam for commercial refrigeration equipment[3]. It currently produces several commercial refrigeration products, with an average consumption of 0.54 metric tonnes (mt) of HCFC-141b pre-blended polyols.

Proposed activities

7. The project will use pentane-based pre-blended polyols purchased locally as raw material, and connect to a high-pressure pentane foaming machine with two raw-material flow streams. The work will

[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] Table 2 of the document UNEP/OzL.Pro/ExCom/65/42

[3] Approved at the 32nd meeting to convert to a combination of water and HCFC-141b-based systems at a total cost of US $63,722 to phase out 7.2 ODP tonnes of CFC-11.

include design and construction of an isocyanate line, pentane/polyol line, mixing head, safety measures and ventilation system, control panel, installation, trial and training. The implementation will be staged as follow:

(a) Identification of technical needs including engineering and safety requirements;

(b) Review of existing offers of low-cost foam dispensers, negotiating with selected providers on required modifications and selection of equipment to be validated;

(c) Selection of a systems house and pre-packaged systems to obtain raw material for the testing of technology (it is planned to request Manar[4] to provide pre-blended pentanes for the demonstration);

(d) Conducting testing and validating the selected equipment through trial production at Engequife; and

(e) Organizing a workshop to present the outcomes.

8. The project is to be completed in 16 months.

Project costs

9. The estimated cost of the project is US $297,000, as shown in Table 1.

Table 1. Project cost by activity

Activity	Total cost (US $)
Project management (international expert)	15,000
Technical study tour on existing equipment and interested technology providers	10,000
Chemical study tour on chemistry	10,000
Engineering planning and technology adaptation (definition of technical and safety features)	60,000
Manufacturing, purchase and delivery of pentane dispensing machines	90,000
Safety installation	40,000
Foam testing, field evaluation	25,000
Technology dissemination workshop and publication	20,000
Sub-total incremental capital cost	**270,000**
Contingencies (10%)	27,000
Total cost	**297,000**

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Technology innovation and added value

10. The Secretariat noted UNIDO's efforts to formulate a demonstration project for low-cost options for using pentane technology in SMEs in the PU foam manufacturing sector, and linking it to the

[4] A foam enterprise that was converted to cyclopentane technology in stage I of the HPMP.

phase-out activities to be implemented in stage II of the HPMP for Morocco. By addressing the issue of high incremental capital costs that limit the applicability of the technology for SMEs, the demonstration will provide added value to HCFC phase-out.

Replicability

11. The remaining eligible consumption in the rigid PU foam sub-sector is estimated at 30,356 mt[5]. Many enterprises in this sector are SMEs, as most large enterprises have been addressed in stage I of the HPMP. The technology can be applied in many SMEs in the rigid PU foam sub-sector and has widespread replication potential.

12. Upon a request for the justification for selecting Engequife, with a consumption of only 0.54 mt HCFC-141b in pre-blended polyols, UNIDO clarified that this enterprise is representative of the commercial refrigeration sector in Morocco, manufacturing different products including discontinuous sandwich panels, large cold doors, small cold displays and foam blocs. As a SME, Engequife has limited financial resources to support technology conversion and will be the ideal enterprise highlighting the different safety problems related to this technology.

Technical issues

13. The Secretariat queried whether the development of the low-cost pentane machine has been conducted by manufacturers already, given the high potential profit from sales of the developed machine. UNIDO informed that, according to UNIDO's market assessment, no equipment manufacturing company is manufacturing this kind of equipment for the moment, despite all main international suppliers' claim that they are developing solutions to reduce the initial investment cost for hydrocarbon foaming technology for SMEs. The focus of the project is to demonstrate the cost-effectiveness and safety aspects. Cost reductions will be achieved through using the pentane-based pre-blended polyols by eliminating pentane storage tank, polyol and pentane mixing unit and all related piping, safety items and accessories. The ccompact equipment will reduce the safety costs due to a simplified electrical cabinet and reduced number of sensors. Significant cost reduction can also be achieved through standardization of equipment, saving the cost of engineering part of the tailored-made equipment. The costs related to safety installation could also be reduced by designing movable ventilation systems that can be adapted in several foaming operations. The project is not to assist technology suppliers in their technology development, but rather to assist the Fund, implementing agencies, national ozone units and potential beneficiaries to better understand the opportunities for cost reduction and the challenges related to this specific technology upgrade. The development efforts from technology manufacturers could be shown as co-financing at the end of project implementation.

14. Clarification was sought on the capacity of the machine to be designed and validated. UNIDO clarified that the project will demonstrate the cost-effectiveness of different production outputs (from 5 to 20 mt per year of HCFC-141b consumption) for different molds and items to meet different rigid foam applications.

15. With regard to the use of pre-blended pentane, UNIDO clarified that even though the supply of pentane-based systems for testing is purchased from a local supplier (Manar), the demonstration project will assess the challenges and opportunities related to the supply of pentane-based pre-blended polyol systems including packaging, regulation and cost.

[5] The total remaining eligible consumption in the PU foam sector in all Article 5 countries is estimated at 30,356 mt in Table 2 of document UNEP/OzL.Pro/ExCom/74/49 noted by the Executive Committee at the 74th meeting.

Potential risk and barriers to replication

16. UNIDO identified the final cost-effectiveness of the technology as the main barrier to the implementation and promotion of the technology on a large scale. However, the cost guidelines for stage II of HPMPs will substantially mitigate this risk. The availability of pentane-based pre-blended polyols could also affect the success of the commercial application of this technology.

Project impact

17. The demonstration project is not exclusively designed for Engequife and is not intended to change the complete production baseline equipment of Engequife. Therefore, there will be no direct impact from the demonstration. The indirect impact will be the phase-out of the remaining consumption of HCFC-141b in SMEs (7.9 ODP tonnes) if the technology is proven to be cost-effective and technically viable.

Project implementation and monitoring

18. The project will be implemented over a period of 16 months. The implementation schedule and milestones were provided in the proposal.

Project cost

19. The Secretariat examined the cost schedule and raised questions on the cost of the international expert (US $15,000), asking whether this should be part of the project support cost. UNIDO clarified that the international expert was intended to assist UNIDO in technical aspects related to the technology, and could therefore not be covered by the support costs. However, UNIDO agrees to have this cost absorbed under the contingency line. The revised cost for the demonstration project was reduced by US $16,500 (including the contingency), resulting in a total cost of US $280,500.

Conclusion

20. The Executive Committee may wish to consider approval of this project in light of the guidelines and other projects being considered under the allocated window of US $10 million for this purpose.

RECOMMENDATION

21. The Executive Committee may wish to consider:

(a) The demonstration project on the use of low-cost pentane foaming technology in small- and medium-sized enterprises for the conversion of foam manufacturing capacity in the polyurethane foam sector in Morocco, 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/75/27); and

(b) Approving the demonstration project on the use of low-cost pentane foaming technology in small- and medium-sized enterprises for the conversion of foam manufacturing capacity in the polyurethane foam sector in Morocco, in the amount of US $280,500, plus agency support costs of US $19,635 for UNIDO, in line with decision 72/40.

Annex I

PROJECT COVER SHEET – NON-MULTI-YEAR INVESTMENT PROJECTS

COUNTRY: Morocco

PROJECT TITLE	**IMPLEMENTING AGENCY**
DEMO PROJECT ON COMPACT HC FOAMING EQUIPMENT: **Demonstration of the use of low cost Pentane foaming technology for the Conversion to non-ODS Technologies in PU Foams at Small and Medium Enterprises (SMEs).**	**UNIDO**

NATIONAL CO-ORDINATING AGENCY: Ministry of Trade, Industry and Crafts

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (ODP TONNES)

HCFCs	Xxx		

B: SECTORAL DATA (ODP TONNES, 2008)

ODS Name	Subsector/quantity	Subsector/quantity	Subsector/quantity	Subsector/quantity
HCFC-141b HCFC-22	Foams: xxx Foams: xxx	Refrigeration: xxx Refrigeration: xxx		

HCFC consumption remaining eligible for funding : not yet established

CURRENT YEAR BUSINESS PLAN: **project preparation funds approved**

ODS USE AT ENTERPRISE	n/a (demonstration project)	
ODS TO BE PHASED OUT:	n/a (demonstration project)	
ODS TO BE PHASED IN	n/a (demonstration project)	
PROJECT DURATION:	Months	24
PROJECT COSTS:		
Incremental Capital Cost	US$	255 000
Contingency (10%)	US$	25 500
Incremental Operating Cost	US$	0

Total Project Cost	US$	**280 500**
LOCAL OWNERSHIP:		**n/a**
EXPORT COMPONENT:		**n/a**
REQUESTED GRANT:	US$	**280 500**
COST- EFFECTIVENESS:	US$/kg ODS	n/a
	Applicable threshold	demo proj
IMPLEMENTING AGENCY SUPPORT COST:	US $	**19 635**
TOTAL COST OF PROJECT TO MULTILATERAL FUND:	US $	**300 135**
STATUS OF COUNTERPART FUNDING:		**n/a**
PROJECT MONITORING MILESTONES INCLUDED:		Included

PROJECT SUMMARY

Morocco is a Party to the Vienna Convention and the Montreal Protocol. It also ratified the London, Copenhagen and Montreal amendments. The country is fully committed to the phase-out of HCFCs and willing to take the lead in assessing and implementing new HCFC phase-out technologies, particularly in the foam sector. The remaining HCFCs in Morocco is related exclusively to imported PU systems by Small & Medium Enterprises (SMEs)

The objective of this project is to reduce the breakeven point for the introduction of pentane technology to SMEs in the manufacture of PU foam, in particular in those applications where insulation values are critical (e.g. panel manufacturing, commercial refrigeration, etc.). The project will demonstrate, optimize, validate and disseminate the easy applicability of the technology and consequently, the reliability of the results to SMEs relying on pre-blended polyol systems.

IMPACT OF PROJECT ON COUNTRY'S MONTREAL PROTOCOL OBLIGATIONS

This project is a demonstration project aimed to optimize PU sector technologies and will contribute indirectly to the fulfillment of Morocco's Montreal Protocol obligations. If successfully validated, the optimized technology will contribute to availability of cost-effective options that are urgently needed to implement HCFC phase-out, particularly at SMEs in Morocco and several other countries.

Prepared by: Dr. Allal Jnioui, Dr. Riccard Savigliano **Date:** revised 1st October 2015

PROJECT OF THE GOVERNMENT OF MOROCCO

DEMO PROJECT ON COMPACT HC FOAMING EQUIPMENT – DEMONSTRATION OF THE USE OF LOW COST PENTANE FOAMING TECHNOLOGY FOR THE CONVERSION FROM HCFC-141b IN THE MANUFACTURE OF INSULATION RIGID FOAM AT SMALL & MEDIUM ENTERPRISES

1.0 PROJECT OBJECTIVE

The objectives of this project are to:

Develop and validate a low-cost Pentane technology option for ODS phase-out at Small and Medium Enterprises (SMEs) in Morocco and in those countries with similar conditions;

- Reduce the breakeven point for the introduction of pentane technology to SME in the rigid of PU foam, while guarantee safe application of the technology;
- Demonstrate the easy applicability of the technology and, consequently, the replicability of the results to SMEs;
- Transfer the technology to interested users, in particular those currently relying on pre-blended polyol systems.

The project will therefore substantially contribute to the HCFC phase-out plan in the manufacture of rigid polyurethane insulation foam in Morocco, as planned under during Stage II-HPMP preparation, by identifying the most promising foaming technology for local SMEs.

2.0 BACKGROUND AND JUSTIFICATION

In the year 2007, Parties to the Montreal Protocol agreed to accelerate the phase-out of the hydrochlorofluorocarbons (HCFCs) because their increase in global consumption and taking into consideration the substantive climate benefits generated from their phase-out.

In the following years, Parties operating under the Montreal Protocol's Article 5 have formulated their HCFC Phase-out Management Plans (HPMPs) for implementation under financial assistance from the Multilateral Fund for the implementation of the Montreal Protocol (MLF).

To facilitate a smooth transition to ODS alternatives with low global warming potential (GWP), the Executive Committee in decision 72/40 agreed to consider proposals for demonstration projects for additional low-GWP alternatives and invited bilateral and implementing agencies to submit demonstration project proposals for the conversion of HCFCs to low-GWP technologies in order to identify all the steps required and to assess their associated costs.

In particular, Par (b)(i)a. of Decision 72/40 indicates that project proposals should propose options to increase significantly in current know-how in terms of a low-GWP alternative technology, concept or approach or its application and practice in an Article 5 country, representing a significant technological step forward.

The design and introduction of compact and standardized foaming equipment for the safe introduction of pentane technology to SMEs fully fits the actual ExCom decision on demonstration project proposals as defined in ExCom Decision 72/40.

3.0 PROJECT DESCRIPTION

The use of pentane and other HC has proven to be the most accepted alternative technology for the replacement of HCFC-141b in the manufacturing of PU foam products. However, initial investment costs are critical for its introduction and limit the feasibility of the choice only to those large manufacturing companies, ensuring a stable, continuous and intensive manufacturing process.

Small & Medium Enterprises (SMEs) are therefore usually excluded from the selection of pentane units, despite pentane would be the most suitable technical choice with regard to their final products.

The object of this proposal is to demonstrate the possibility of reducing the initial investment costs by designing a complete and compact Pentane foaming technology. This compact system is mainly based on the use of already pre-blended Polyol/ Pentane raw material (POL/C5) and supplied in small and dedicated tank or drums. The POL/C5 blend is then connected to a compact high-pressure pentane foaming machine (PENTA COMPACT FM) which will have two streams flow of raw material.

The PENTA COMPACT FM will be designed with the target to offer a simple, cheap, standardized, reliable and easy handling unit.

In order to allow the safe use of pentane formulation, the unit will include all necessary safety elements of the wet part, including dedicated safety system which will permit to detect and control the possible dangerous conditions that might occur in the normal utilization of the unit.

By doing so, a significant cost reduction can be achieved through a standardization of the equipment, to make sure the engineering part of the “tailored-made” equipment is over.

We also think about reducing the costs related to safety installation by designing, for instance, movable ventilation systems (flexible hoses, for instance) that can be adapted in more wet parts. This is the case for SMS where several moulds are present but usually used in different times.

This complete unit could be considered as a solution for customers who do not have high production rate and a non-regular need for foaming, in particular SMEs.

The project results will be extremely relevant for those beneficiaries to be largely covered under Stage II of HPMP, meaning those companies currently relying largely on pre-blended polyol systems.

4.0 METHODOLOGY DESCRIPTION

During the project preparation phase, UNIDO, in coordination with the NOU, presented the technology idea to the companies using pre-blended polyol systems in Morocco and listed as eligible companies in HPMP-I Stage (see Annex 1).

After inspection visits to different manufacturing plants, UNIDO and NOU representatives identify and selected one suitable beneficiary among those companies ready to take part for this demonstration project.

ENGEQUIFE Company agreed to host the demonstration of the PENTA COMPACT FM at its commercial refrigerator operations to cyclopentane. The company background is detailed in Annex 2.

The Project preparation will identify the main engineering components for the development of a compact unit for the use of pentane in pre-blended polyol system. The machine will be compliant with main safety directives (e.g. CE Directive 2006/42/CE, or similar) and it will be requested to be provided with necessary conformity declaration (e.g. Declaration of Conformity type B, according to the Annex II of CE Directive, or similar).

The design of the services to be provided includes:

- Isocyanate Line, including Pneumatic pump for isocyanate loading into machine day tank, tank group and dosing group
- Polyol+Pentane line, including pneumatic pump for poyol/cyclopentane loading into machine day tank, tank group and dosing group
- Control Panel
- Dedicated Mixing Head, inclusive of hydraulic unit for mixing head operation to run the high pressure mixing head
- Engineering support to cover (among others) engineering for chimneys and canalizations, civil works for ventilation system for the dry area, electrical drawings and electrical lay-out, safety report, manuals on correct and safe use of the machine (operation and maintenance)
- Sensors and ventilation for the wet part
- Safety electric control panel
- Installation, start-up and training

The implementation of the DEMO project on the specific PENTA COMPACT FM will be staged as follows:

1. Identification of technical needs inclusive of engineering and safety requirements (UNIDO, NOU and beneficiary);
2. Review of existing offerings of low cost equipment followed by negotiations with selected providers on required modifications and potential cost savings (UNIDO bidding procedure);
3. Selection of equipment to be validated (UNIDO, NOU and ENGEQUIFE Company);
4. Validation of equipment (technology provider and ENGEQUIFE Company);
5. Workshop to present the outcome(s).

The implementation of the chemical part of the project is envisioned as follows:

1. Selection of a system house willing to cooperate on this DEMO project;
2. Identification of existing prepackaged systems (there are reportedly such systems in Europe and China). For the DEMO project, we will ask MANAR to provide enough drums to test the technology.
   For the follow-up project, we may think about installing a local blending facility. Maybe some of those existing local distributor (Hunstman and others) may agree to support it at a later stage. Those details will be considered during the preparation of the full project and Stage II of HPMP;
3. Supply the chemicals to ENGEQUIFE Company;
4. Conduct trials/tests;
5. Workshop to present the outcome(s).

ExCom's guidance document on the implementation of hydrocarbon safety (UNEP/Ozl.pro/ExCom/25/54) will be adhered to.

5.0 PROJECT COSTS

Cost forecasts for demonstration projects are problematic as these projects are by nature unpredictable.

UNIDO has used to the extent possible guidance provided by the Secretariat in Doc 55/47 Annex III,

DEVELOPMENT/OPTIMIZATION/VALIDATION/DISSEMINATION				
Item	**Description (activity and function of equipment**	**Unit cost**	**Quantity**	**Total cost**
		(US$)		**(US$)**
Project management				
	Technical study tour to equipment manufacturing	10 000	1	10,000
	Chemical study tour to Pentane preblended polyol manufacturing and users	10 000	1	10,000
Engineering and technology adaptation				
	Definition of technical components	20 000	1	20,000
	Definition of safety features	20 000	1	20,000
	Retrofitting of components	20 000	1	20,000
Equipment				
Equipment 1	Metering & piping system for Polyol/C5 blend from a drum	15 000	1	

Equipment 2	Retrofitting or New Compact foaming High pressure dispenser	75 000	1	
	Sub-total equipment			90,000
Safety equipment				
Safety equipment 1	Safety/alarm systems for POL/C5 Metering	5 000	1	
Safety equipment 2	Safety/alarm systems for foaming dispenser	10 000	1	
Safety equipment 3	Enclosure, Ventilation and Extraction system	10 000	1	
Safety equipment 4	Electrical modifications (Control panels, grounding, sealing of electrical control cabinets….etc.)	15 000	1	
	Sub-total safety equipment			40,000
Installation, test and trial	Test trials and Lab controls			10,000
	Training on maintenance and safety			5,000
Safety audit				10,000
Technology dissemination	Workshops, publication, video			20,000
Contingency (10%)				25,500
Total				**280,500**

6.0 PROJECT IMPLEMENTATION AND MONITORING

The project will be implemented using UNIDO's execution modality. The following schedule will be reviewed and reconfirmed and/or modified as necessary by UNIDO. These activities will serve as milestones in the Monitoring Plan for the project. Note that the reference point for all milestones should be from the date of project approval.

(a)

(b) IMPLEMENTATION SCHEDULE

Activity / Month*	**0**	**1**	**2**	**3**	**4**	**6**	**9**	**10**	**11**	**12**	**14**	**16**
(i) MF Project approval	**X**											
Submit Project doc. For signature	**X**											
Project document signature		**X**										
Study tours organized			**X**	**X**								
Equipment procurement					**X**	**X**	**X**					
Installation /retrofitting of equipment							**X**	**X**	**X**			

Training								**X**	**X**	**X**		
Testing and trials									**X**	**X**	**X**	
Production start-up										**X**	**X**	
Interim dissemination of the results										**X**	**X**	
Final report with full sets of trial data												**X**

(c) MILESTONES FOR PROJECT MONITORING

TASK	MONTH*
(a) Project document submitted to beneficiary for commitment	0
(b) Project document signature	1
(c) Study tours organized	1
(c) Bids prepared and requested	2
(d) Contracts Awarded	4
(e) Equipment Delivered	9
(f) Training Testing and Start of trial runs	10
(g) Interim dissemination of the results	12
(h) Final report with full sets of trial data	16

*** as measured from project approval**

7.0 PROJECT IMPACT

Direct Benefits:

Foaming SME enterprises will benefit from the development of low cost equipment for the use of Pentane technology.

This project will help to many SMEs to phase-out 24 ODPt of HCFC-141b in Morocco by allowing them higher standard-products. The phase-out will be finally achieved through the implementation of the follow-up phase-pout project, as part of Stage II of HPMP of Morocco.

However, the impact of the DEMO project in terms of final phase-out associated to the technology can be much higher than what indicated. Indeed the technology has very large chance to be relocated in all countries in the world and to achieve much higher phase-out impact.

PENTA COMPACT FM technology can be used by SMEs in other countries.

The project employs commercially available and environmentally acceptable technology.

Indirect Benefits:

The project will also boost significantly Montreal Protocol's efforts to meet obligations under the HCFC phase-out targets by granting the application of low-GWP latest technologies to SMEs.

8.0 DISSEMINATION STRATEGY

The dissemination of the different results of the new technology will be done with different tools, in order to reach national companies, regional interested parties (NOU, companies, etc.) but also MLF and other implementing agencies and NOUs.

The dissemination Strategy will include a combination of activities such as: workshop, technical brochure, technical and economic data, etc.

9.0 PROJECT REPORTING

A final report can be expected 16 months after project approval. Interim reporting will follow existing reporting guidelines.

10.0 ANNEXES

Annex-1: List of Eligible companies in HCFC-141b in pre-blended systems

Annex-2: Enterprise background

Annex-3: Environmental Assessment

Annex-4: Company Letter of Commitment

Annex-5: Independent technical review

ANNEX-1

LIST OF ELIGIBLE COMPANIES IN HCFC-141b IN PRE-BLENDED SYSTEMS

Enterprise		Year of establishment	II stage conversion (Y/N)	Consumption (Mt) / year			
				2007	2008	2009	Application
1.	SIAFMO	1999	Y	0.5	0.5	0.5	PU Foam for commercial refrigeration
2.	COMAFRO	1986	Y	.	1.1	1.3	
3.	PROMAGHREB	1997	N	36	36	0	
4.	CFL	N.a.	Y	0.45	0.5	0.4	
5.	ENGEQUIFE	N.a.	Y	0.52	0.5	0.6	
6.	SMIFAM	1982	Y	0.7	0.8	0.8	
7.	AMF	1990	N	1.15	1.1	0.9	
8.	POLYTECH	N.a.	N	15.1	17.6	25.2	
9.	Alom du Nord	N.a.	Y	0.8	1.4	1.2	
10.	MAFIDEC (Frimac)	N.a.	Y	0.3	0.2	0.2	
11.	SONYAFROID	N.a.	Y	6.3	6.7	7.1	
12.	FIRST CLIM	N.a.	Y	4.5	4.8	5.1	
13.	LAHDAR	N.a.	Y	4.5	4.8	5.1	
14.	SCULTEX	N.a.	N	1.6	1.9	1.2	Soft foam for decoration
15.	PANAF	1985	Y	19	19	19	Sandwich panels
16.	INTERFER	N.a.	Y	5	3.99	4.9	
Total Polyols (Mt)				***96.42***	***100.89***	***73.5***	
Total HCFC-141 (Mt)				***227.12***	***218.99***	***192.6***	
Total HCFC-141 (ODPt)				**24.98**	**24.09**	**21.19**	

ANNEX-2

ENGEQUIFE: ENTERPRISE BACKGROUND

1. GENERAL INFORMATION & COMPANY BASELINE DATA

ENGEQUIFE Company is 100 % indigenous Moroccan limited liability company, producing several commercial refrigeration articles. The different items are made of rigid polyurethane foam and other components to obtain optimal mechanical and thermo insulating properties for different models depending on customer's demand. ENGEQUIFE Company is one of Medium Seize Enterprise (SME) of the commercial refrigeration producers in Morocco.
Majority of ENGEQUIFE customers are local shops. ENGEQUIFE Company employs about 20 personnel.
The company was established in 1998 and is located in Casablanca. Contact information is as follows:

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ENGEQUIFE Company is producing several different articles: Discontinuous sandwich panels, cold-room doors, displays and commercial refrigerators.

2. PRODUCTION FACILITY

The current ENGEQUIFE production facility for commercial refrigeration is based on three foaming lines. A locally sourced system with HCFC141b/ Polyol blend in drums is used in the wet part to deliver blended polyol to the three lines.

For the scope of demonstrating the PENTA COMPACT FM, ENGEQUIFE agreed to test it at the line "Doors Foaming line CANNON HP40", which consists of:

- Storage tanks and dosing station for chemicals (Blended polyol & MDI)
- Control panels
- High Pressure mixing head. The mixing head is moving manually from one mold to another mold to pour PU chemicals using open system.
- Tree (3) jigs for molds.

The relevant data of the existing equipment under this project are as follow:

Line	Foamed Parts	Equipment	Brand Name	Capacity (kg/min)	Year of Purchase
L1	Doors	H-40	CANNON	40	1998

To produce rigid foam, ENGEQUIFE is currently using a pre blended polyol with HCFC-141b as blowing agent. Chemical suppliers are:

Name	Type of Chemical
Huntsman	Polyol Blend, MDI
BAALBEK	Polyol Blend, MDI
URANI	Polyol Blend, MDI

Tests and results will be based on current business management and manufacturing practices.

ANNEX-3

ENVIRONMENTAL ASSESSMENT

Hydrocarbons are zero ODP replacements for the use of HCFCs in foam applications. They provide, in addition to having no ozone depletion potential, a considerable reduction in global warming potential as the following table shows:

SUBSTANCE	GWP[1]	MOLECULAR WEIGHT	INCREMENTAL GWP[2]
HCFC-141b	630	117	Baseline
Cyclopentane	11	72	-1,259

[1] Taken from IPCC's Fourth Assessment (2007)

[2] Derived from comparing GWPs compared to the baseline on an equimolar base. It should be noted that in practice formulators may make changes such as increased water or ABA blends that impact the global warming effect

The technology complies so with MOP decision XIX/6 in view of the desire to minimize negative environmental side-effects.

ANNEX-4

ENGEQUIFE: COMPANY LETTER OF COMMITMENT

(provided in separate file)

ANNEX-5

INDEPENDENT TECHNICAL REVIEW

(provided in separate file)