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STRATEGY PAPER FOR SMALL FOAM-PRODUCING ENTERPRISES

DETERMINATION OF COST-EFFECTIVE PHASEOUT APPROACHES
FOR
ENTERPRISES WITH RELATIVELY SMALL ODS USE

EXECUTIVE SUMMARY

INTRODUCTION

1. At its Fourteenth Meeting, the Executive Committee, considering the need to address the small ODS consumer sectors in a cost-effective manner, approved a project to develop a strategy to that purpose for the foam sector. It was noted that from the more than 90 approved investment projects in this sector, eight projects showed an annual ODS to be phased-out of 10 ton or less. The cost effectiveness of these projects--calculated as the ratio between funds allocated and amount of ODS to be phased-out--was very poor.

2. The framework for the development of such a strategy was prepared by UNDP's sector expert in close cooperation with the Secretariat, and approved by the Executive Committee as part of the project application. Valuable input was also derived from a paper concerning the calculation of incremental operating costs (IOC) in methylene chloride projects, submitted to, and approved during, the Sixteenth Meeting of the Executive Committee, and the structure of this paper was followed to the extent feasible.

3. It is envisioned to present the draft paper for peer review to a consultants meeting in Paris, July 5 thru 7. The paper will then be completed and submitted to the Secretariat, after taking account of the comments provided.

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4. Prior to the worldwide attempts to phaseout the use of ODSs, the foam industry widely used CFC-11 and CFC-12 and to a lesser extent CFC-114 in its manufacturing processes, making it a sector with one of the largest ODP.

5. The main function of CFCs in the manufacture of foams is that of a blowing agent (non-insulating foams) or, in a combination function, as a blowing and thermal insulation agent (insulating foams). There are many auxiliary functions, such as to act as a softener, as a heat sink, as a viscosity cutter and to impact the product surface. Because of the different functions it is not possible to determine from a technical standpoint, taking processing and product quality into consideration, a universal replacement. Categories, in which the function of the CFC is approximately identical have to be established and per category such an approach can be applied.

6. Production equipment can vary considerably between categories, as well as within a category. A main distinction, independent from categories is, however the application of a (i) continuous production process, or a (ii) discontinuous production process. Naturally, the production size is much more important for continuous equipment than for discontinuous equipment, and a definition of what constitutes a small ODS user will have to take this into account.

7. Within the foam industry, a number of different polymers are used. The main distinction is between (i) Thermoplastic Foams, (Polystyrene, Polyethylene) and (ii) Thermoset Foams (polyurethane, phenolic). For processing purposes, the two groups have very distinctive equipment requirements: extruders/expanders for thermoplastic foams and reactive mixture dispensers for thermoset foams. In thermoset foams, handmix operations are also practiced.

8. Investment projects under the MLF for phenolic foams and for thermoplastic expansion equipment are rare or non-existing. They are therefore excluded from further consideration.

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ANALYSIS OF APPROVED PROJECTS

10. As of January 1995 there have been 104 investment projects or technical assistance projects with an investment character approved by the Executive Committee in the foam sector. This does not include projects focussing on polyol production and projects with refrigerant components (commercial/domestic refrigeration). Grants totalling about US$ 51 million have been approved for the sector, leading to a phaseout of about 10,600 t ODP. Annex-I lists these projects and provides more detailed information.

11. Based on process considerations, these projects have been divided into four categories:

DESCRIPTION	ABBREVIATION
Extruded Polyethylene/Polystyrene Foams	(XPS/PE)
Flexible Polyurethane Foams (Slabstock/Boxfoam process)	(FS/B-PUF)
Flexible/Semi-Rigid Polyurethane Foams (Molded/Integrak Skin)	(F/IS-PUF)
Rigid Polyurethane Foam (Molded, Spray, Panels, Boardstock)	(R-PUF)

Table-1: Functional Foam Categories

12. The costs of the projects relate to equipment, trials, technology transfer, training, other costs related to the installation of new/retrofitted equipment, contingencies and incremental operating costs/benefits. Per category, the percentage of each cost item relative to the total costs[1] of a project is shown below:

COST ITEM	XPE/PS	FS/B-PUF	F/IS-PUF	R-PUF	TOTAL
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Technology Transfer	13	5	3	4	7
Training	3	4	2	2	3
Other Capital Costs	36	3	0	3	14
Incremental Operating costs	(19)	(6)	(18)	15	(2)
Contingencies	10	11	9	9	10
TOTAL	100%	100%	100%	100%	100%

Table-2: Relative Cost Breakdown For Foam Projects

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Table-3: Adjusted Relative Cost Breakdown For Foam Projects

14. It seems justified to conclude, although it is conceded that every project is unique in context and every foam group has its own particulars, that overall, from a statistical standpoint, the cost breakdown is rather similar. Large discrepancies from the relative cost structure should require explanation by those who are responsible for the preparation of such a project.

15. One of those discrepancies can originate from the amount of ODS to be phased-out. The effect of the the baseline ODS consumption on the cost-effectiveness[2] of a project (further called: "ODS Volume Effect" or "OVE") has been analyzed for approved projects after eliminating the effects

[1] The total costs are not identical with the MLF grant, because of the deduction of foreign ownership.

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of rather "unique" situations, such as early projects (which are all expensive), combination projects (which do not fit well a certain category), demonstration projects (which include more than one technology for demonstration purposes) and other contexts that can be judged as "non-standard".

16. The analysis confirmed a weak OVE for large ODS-users and a strong OVE for small ODS-users and confirm in this way the justification for special considerations for small sized ODS-users.

17. By extending the straight parts of the graphs inwards, it is possible to determine three distinct volume groups in each foam category (Table 4). To fully judge the information that can be derived from this sensitivity analysis it is useful to review the equipment used in the different categories. XPE/PS projects and about 90% of the FS/B-PUF projects use continuous production equipment and show similar OVE. F/IS-PUF and R-PUF projects contain in only one case a continuous production unit, however "packaged in the project with two discontinuous units. Thus seems the conclusion justified that the OVE is more related to the type of equipment than to the type of foam.

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Medium ODS user	25-150	25-150	10-30	10-30
Small ODS user	< 25	< 25	< 10	< 10

Table-4: ODS Users Groups (in baseline ODS t/y)

18. Another comparison that can be made, is to relate the above mentioned users groups to specific "Grant Effectiveness Thresholds" ("GETs") or threshold ranges. This is, expectedly, very feasible for large users and not at all feasible for small users. It can also be concluded that, although the volume ranges for the different groups follow the type of equipment, the GET does not!

ODS USERS GROUP	XPE/PS	FS/B-PUF	F/IS-PUF	R-PUF
Large ODS user	< 2.00	< 1.00	< 6.00	< 8.00
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Table-5: Grant-Effectiveness Thresholds (in US$/kg/y)

19. A last conclusion from the project analysis is that exclusion of incremental operating costs would make the graphical depictions more distinct asymptotic, with less spread of the plotted data, without changing the users groups. There are several reasons for this phenomena:

- In many projects IOCs have not been applied;
- The definition of eligible IOCs has evolved over time;
- Prices vary over time and country (or region);
- There has been no standard in the calculation of such costs during the time that these projects were approved.

- o IOC constitute enlarge of chemical costs and thus variable costs. Variable cost are not, or less, effected by volume considerations.

FACTORS THAT CAN IMPACT THE COST OF PROJECTS

20. It has been stated before that most elements of the incremental operating costs are independent from the OVE. However, practically all incremental capital costs are sensitive to the OVE. The development of cost-effective phaseout approaches for enterprises with small ODS consumption should therefore concentrate on the capital costs. These can be, as mentioned before, broadly divided into

20.1 Costs directly or indirectly related to the production equipment;

20.2 Costs related to the introduction of the technology (e.g. trials, testing, training, technology transfer);

20.3 Contingencies

21. The following parameters have an impact on the capital costs:

21.1 The baseline situation (equipment, facilities, proficiency, product requirements) can modify the costs related to a particular technology (adequate/inadequate facilities, adequate/ inadequate equipment, potential for retrofit, proficiency of staff/workers, specific product demands).

A special case to be addressed is when no baseline equipment exists ("handpour operations"). Such operations are hardly to convert from a safety standpoint without the introduction of equipment.

21.2 The choice of technology provides the basis for the determination of the required capital costs. Specifications of required production equipment and auxiliaries as well as the costs related to the introduction of the technology are determined in this way (Template Costs").

No control over project cost is possible if no control can be exercised over the choice of technology.

21.3 The application of a technology. Technology is evolving and so is equipment! Technology updates as the recent publication from UNEP's technical Options Committee do address the chemical/technical developments, but do not provide information on related equipment issues. The current preparation of MLF projects templates could at least partly alleviate this, but could also "freeze" a particular status if not properly updated.

A regular re-assessment of equipment requirements compared to technological developments and to baseline conditions is the best cost containing measure possible--and not only for small ODS users.

A particular issue currently at hand and important for small ODS users is that of

21.4 The Adaptability of a Technology. The easier a technology can adapt to baseline conditions, the lower the incremental capital costs. It is conceded that in the past this could go together with increased operating costs, but prices of CFCs have gone up and from replacements down recently.

The closer a technology comes to a "drop-in" solution, the lower the expected costs of a project.

The adaptability is not something that can automatically be concluded from the choice of a technology. There is, for instance, currently a generally perceived need to use high pressure dispensing equipment for replacement technologies in discontinuous operations. In the initial phase of the Fund's activities, all "permanent" technologies indeed required such equipment, whether because of volatility (HFCs) or for mixing efficiencies. In addition, chemical manufacturers recommended high pressure equipment for HCFC-141b (1,500-2,500 psi), because of the chance of destabilization. When pentane formulations emerged, the phenomena of processing a suspension rather than a solution, lead to the same recommendation.

The time has come to revisit those recommendations, because (i) viscosities have dropped in many recently offered systems, making mixing easier, (ii) the suspension of pentane in polyol can in the mean time be made so stable that preblends are now reportedly offered in the (European) market, (iii) LBBA's are not anymore a real issue in polyurethane foam, except in some situations where the price is relatively attractive (India) and (iv) the stability problem of HCFC-141b seems restricted to "rich" systems and the use of plastic liners, and therefore not a universal problem[3].

21.5 The choice of equipment should be related to the technological need, safety requirements and baseline. Anything beyond that is upgrading and should be paid by the recipient.

No control over project cost is possible if no control can be exercised over the choice of equipment.

21.6 The choice of implementation mode. A maximum of localized implementation with strong central technical and cost supervision is believed to be more cost-effective than centralized implementation, or completely localized implementation.

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3 For instance, a company in Guatemala uses an air poweres dispenserwith HCFC-141b instead of the customary high pressure equipment; a company in Malaysia did successful trials with a low ABA-system on a low pressure dispenser.

21.7 The support of the chemical supplier. Much can be said in favor of the provision of independent process expertise, but specifically when it concerns smaller units, such support is difficult to provide in a cost-effective manner. Chemical suppliers, who should be anyway an integrated partner in a process conversion, can provide cost-effective, localized support that always is focussed on what is commercially available. Pre-trials can frequently be done in a supplier's laboratory as well as screening tests and even validation tests.

21.8 Involvement of a process expert is frequently more cost-effective than commercial technology transfer from non-suppliers and more open to a variety of technologies. The disadvantage is that international process expert have frequently travel expenses that approach the costs for daily fees. reducing the frequency of involvement, focussing on development of local expertise and--most important--well planned, combined missions can reduce technical assistance costs by a magnitude.

21.9 Swift implementation can avoid incurring price increases and in such way decrease the need for contingency.

SUMMARY OF FINDINGS

22. Contingency is generally established as 10% of the capital costs and serves to cover unforeseen cost increases, such as currency exchange fluctuations, price increases, etc. Emphasis on local procurement and technical support and swift project implementation can contain--but not completely eliminate-- the need for contingency.

23. The following is a review of the practical application of the mentioned options to reduce costs on small ODS users:

23.1 Technology Restrictions: It is realized that the MLF receives more applications than funds are available. In such a situation it would be logical, to select technologies that provide the maximum ODP reduction per dollar available, certainly for a group of applicants that show cost effectiveness problems anyway based on the low ODS use.

Based on such an approach, the Fund could select per application a preferred conversion technology.

A preliminary suggestion could be:

FS/B-PUF:	Methylene Chloride
XPE/PS:	LPG or Butane
F/IS- PUF:	Water based or HCFC-141b
R-PUF:	HCFC-141b or water based

23.2 Better Adaptable Technologies: The most prevalent issue is the need to use high pressure dispensing equipment for replacement technologies. The time has come to revisit this recommendation. From market observations it is expected that at least in certain applications lower priced equipment would suffice.

23.3 Mass Purchases: Many equipment suppliers offer substantial rebates for bulk purchases.

23.4 Local Procurement: Specifically in the flexible boxfoam area, there is a lot of equipment that could be locally made if detailed engineering drawings would be provided and some supervision be provided. Such is foreseen in Umbrella projects in Indonesia, Malaysia and The Philippines.

23.5 "Drop-In" Technologies: Methylene Chloride and HCFC-141b are as close to drop-in solutions as possible. Many companies, when under pressure to switch, have transferred to these technologies on their own or with some help of suppliers, and, although some experienced a considerable "learning curve", were able to manage.

23.6 Local Expertise: It is not always easy to find locally qualified experts. The ODS phaseout program is not supposed to create life long careers. Even local chemical suppliers have frequently only theoretical knowledge that has been transferred from international technology centers, and are not capable to provide detailed back-up or to adapt to less sophisticated situations. However, with on-the-job training, this could be improved and, as much of the program is repetition, local experts could at least take over a part of the program, reducing the involvement from international experts to supervision and exceptional cases. The umbrella projects in Indonesia, Malaysia and The Philippines are designed to include national experts. The Malaysian project, based on strong local support in management and in process expertise, and local (mass) procurement under supervision of an international expert and adapted technology has been progressed to the extent that it may be used for standardization purposes.

23.7 Combination of Technical Assistance Missions: This is already standard procedure with most Implementing Agencies.

23.8 Standardized Training/Specifications: UNDP uses a standard manual, developed by a process expert as guideline to all XPE/PS implementations. Such procedures could be expanded into other areas. For instance, Indonesia could use procedures from Malaysia in its box foam project and adapt easily to local use.

24. There is no apparent systematic difference in OVE between small users in small countries and small users in large countries. Differences that were observed, were mostly related to prices of chemicals, special individual approaches or settings or--rather frequently--related to the time of project preparation. The Fund policies have evolved over time and the projects mirror this.

RECOMMENDATIONS

25. It is recommended to divide the foam sector for the purpose of a fair judgement of the ODS Volume Effect (OVE) into four foam categories and three ODS user groups. The large and medium ODS users groups should be assigned a Cost Effectiveness Threshold (CET) as follows (size in ODP-t/y; threshold in USD/ODP-kg/y):

ODS USERS GROUP	XPE/PS		F-PUF S/B		F/IS-PUF		R-PUF	
	size	t'hold	size	t'hold	size	t'hold	size	t'hold
Large ODS user	> 150	< 2.00	> 150	< 1.00	> 30	< 6.00	> 30	< 8.00
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Legend: XPE/PS: Extruded polyethylene/Polystyrene
F-PUF S/B: Flexible PU Foam (Slbastock/Boxfoam)
F-PUF M/IS: Felxible/Integral Skin PU foam (Molded)
R-PUF: Rigid PU Foam (Boxfoam, Molded, Panels, Sprayfoam)

26. It is recommended to make projects in the small users group subject to the following procedures:

26.1 A country with a significant amount of small ODS users per foam category (>5) will prepare one group phaseout project per category.

26.2 For countries without an insignificant amount of small ODS users per foam category (<5), the Implementing Agency will attempt to prepare a regional group project.

27. A group project should address in a satisfactory manner the cost savings obtained by addressing the following issues:

a) <u>Choice of technology.</u> The technologies listed below are recommended. Any deviation from these technologies requires proper justification.

CATEGORY	TECHNOLOGY
XPE/PS	LPG or Butane
F-PUF S	Methylene Chloride
F-PUF B	Methylene Chloride, if needed supplemented with forced Cooling
F-PUF M/IS	Water Blown or HCFC-141b
F-PUF	Water Blown or HCFC-141b

b) Baseline Equipment. Existing equipment has to be used with reasonable retrofit costs. If no baseline pouring equipment is available (only relevant to boxfoam and molded), the following equipment can be provided:

Boxfoam:	Pumps for transfer of hazardous chemicals
Molded :	Air operated dispensing equipment

Any related incremental benefits such as decreased chemical losses should be addressed properly.

c) Procurement. Potential effects from joint procurement and from potential local procurement for suitable items should be addressed.

d) Tecnology Introduction Costs. The project should address:

(i) The potential use of expertise from local chemical suppliers and/or local experts and its effect on the project costs;

(ii) The potential use of international experts for supervision only and the effect on the project costs;

(iii) The possibility of joint training sessions and its effect on the project costs;

(iv) Availability of existing and available experience in the same area, including but not limited to specifications, bids, training programs.

28. It is recommended to address recent technology developments and the related impact on equipment specifications in more detail. Specifically the following issues should be addressed:

(i) Is the specification of high pressure equipment still justified;

(ii) Is it possible to make differences in equipment requirements between the different types of molded foams such as flexible, rigid/general and refrigeration, integral skin/rigid/semi-rigid.

(iii) What additional zero ODP technologies beside water, pentane and gaseous HFCs can be anticipated with sufficient assurance that equipment specifications could be designed with such technologies in mind as future permanent technology

29. It is recommended to initiate/designate group demonstration projects in all applicable foam (sub)categories. Where possible suitable existing projects should be selected.

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Small ODS user	> 9.00	> 8.00	> 11.00	> 20.00

Table-5: Grant-Effectiveness Thresholds (in US$/kg/y)

19. A last conclusion from the project analysis is that exclusion of incremental operating costs would make the graphical depictions more distinct asymptotic, with less spread of the plotted data, without changing the users groups. There are several reasons for this phenomena:

- o In many projects IOCs have not been applied;
- o The definition of eligible IOCs has evolved over time;
- o Prices vary over time and country (or region);
- o There has been no standard in the calculation of such costs during the time that these projects were approved.

- o IOC constitute enlarge of chemical costs and thus variable costs. Variable cost are not, or less, effected by volume considerations.

FACTORS THAT CAN IMPACT THE COST OF PROJECTS

20. It has been stated before that most elements of the incremental operating costs are independent from the OVE. However, practically all incremental capital costs are sensitive to the OVE. The development of cost-effective phaseout approaches for enterprises with small ODS consumption should therefore concentrate on the capital costs. These can be, as mentioned before, broadly divided into

20.1 Costs directly or indirectly related to the production equipment;

20.2 Costs related to the introduction of the technology (e.g. trials, testing, training, technology transfer);

20.3 Contingencies

21. The following parameters have an impact on the capital costs:

21.1 The <u>baseline</u> situation (equipment, facilities, proficiency, product requirements) can modify the costs related to a particular technology (adequate/inadequate facilities, adequate/ inadequate equipment, potential for retrofit, proficiency of staff/workers, specific product demands).

A special case to be addressed is when <u>no baseline equipment</u> exists ("handpour operations"). Such operations are hardly to convert from a safety standpoint without the introduction of equipment.

21.2 The <u>choice of technology</u> provides the basis for the determination of the required capital costs. Specifications of required production equipment and auxiliaries as well as the costs related to the introduction of the technology are determined in this way (Template Costs").

No control over project cost is possible if no control can be exercised over the choice of technology.

21.3 <u>The application of a technology</u>. Technology is evolving and so is equipment! Technology updates as the recent publication from UNEP's technical Options Committee do address the chemical/technical developments, but do not provide information on related equipment issues. The current preparation of MLF projects templates could at least partly alleviate this, but could also "freeze" a particular status if not properly updated.

A regular re-assessment of equipment requirements compared to technological developments and to baseline conditions is the best cost containing measure possible--and not only for small ODS users.

A particular issue currently at hand and important for small ODS users is that of

21.4 The Adaptability of a Technology. The easier a technology can adapt to baseline conditions, the lower the incremental capital costs. It is conceded that in the past this could go together with increased operating costs, but prices of CFCs have gone up and from replacements down recently.

The closer a technology comes to a "drop-in" solution, the lower the expected costs of a project.

The adaptability is not something that can automatically be concluded from the choice of a technology. There is, for instance, currently a generally perceived need to use high pressure dispensing equipment for replacement technologies in discontinuous operations. In the initial phase of the Fund's activities, all "permanent" technologies indeed required such equipment, whether because of volatility (HFCs) or for mixing efficiencies. In addition, chemical manufacturers recommended high pressure equipment for HCFC-141b (1,500-2,500 psi), because of the chance of destabilization. When pentane formulations emerged, the phenomena of processing a suspension rather than a solution, lead to the same recommendation.

The time has come to revisit those recommendations, because (i) viscosities have dropped in many recently offered systems, making mixing easier, (ii) the suspension of pentane in polyol can in the mean time be made so stable that preblends are now reportedly offered in the (European) market, (iii) LBBA's are not anymore a real issue in polyurethane foam, except in some situations where the price is relatively attractive (India) and (iv) the stability problem of HCFC-141b seems restricted to "rich" systems and the use of plastic liners, and therefore not a universal problem[3].

21.5 The choice of equipment should be related to the technological need, safety requirements and baseline. Anything beyond that is upgrading and should be paid by the recipient.

No control over project cost is possible if no control can be exercised over the choice of equipment.

21.6 The choice of implementation mode. A maximum of localized implementation with strong central technical and cost supervision is believed to be more cost-effective than centralized implementation, or completely localized implementation.

[3] For instance, a company in Guatemala uses an air poweres dispenserwith HCFC-141b instead of the customary high pressure equipment; a company in Malaysia did successful trials with a low ABA-system on a low pressure dispenser.

21.7 The support of the chemical supplier. Much can be said in favor of the provision of independent process expertise, but specifically when it concerns smaller units, such support is difficult to provide in a cost-effective manner. Chemical suppliers, who should be anyway an integrated partner in a process conversion, can provide cost-effective, localized support that always is focussed on what is commercially available. Pre-trials can frequently be done in a supplier's laboratory as well as screening tests and even validation tests.

21.8 Involvement of a process expert is frequently more cost-effective than commercial technology transfer from non-suppliers and more open to a variety of technologies. The disadvantage is that international process expert have frequently travel expenses that approach the costs for daily fees. reducing the frequency of involvement, focussing on development of local expertise and--most important--well planned, combined missions can reduce technical assistance costs by a magnitude.

21.9 Swift implementation can avoid incurring price increases and in such way decrease the need for contingency.

SUMMARY OF FINDINGS

22. Contingency is generally established as 10% of the capital costs and serves to cover unforeseen cost increases, such as currency exchange fluctuations, price increases, etc. Emphasis on local procurement and technical support and swift project implementation can contain--but not completely eliminate-- the need for contingency.

23. The following is a review of the practical application of the mentioned options to reduce costs on small ODS users:

23.1 Technology Restrictions: It is realized that the MLF receives more applications than funds are available. In such a situation it would be logical, to select technologies that provide the maximum ODP reduction per dollar available, certainly for a group of applicants that show cost effectiveness problems anyway based on the low ODS use.

Based on such an approach, the Fund could select per application a preferred conversion technology.

A preliminary suggestion could be:

FS/B-PUF:	Methylene Chloride
XPE/PS:	LPG or Butane
F/IS- PUF:	Water based or HCFC-141b
R-PUF:	HCFC-141b or water based

23.2 Better Adaptable Technologies: The most prevalent issue is the need to use high pressure dispensing equipment for replacement technologies. The time has come to revisit this recommendation. From market observations it is expected that at least in certain applications lower priced equipment would suffice.

23.3 Mass Purchases: Many equipment suppliers offer substantial rebates for bulk purchases.

23.4 Local Procurement: Specifically in the flexible boxfoam area, there is a lot of equipment that could be locally made if detailed engineering drawings would be provided and some supervision be provided. Such is foreseen in Umbrella projects in Indonesia, Malaysia and The Philippines.

23.5 "Drop-In" Technologies: Methylene Chloride and HCFC-141b are as close to drop-in solutions as possible. Many companies, when under pressure to switch, have transferred to these technologies on their own or with some help of suppliers, and, although some experienced a considerable "learning curve", were able to manage.

23.6 Local Expertise: It is not always easy to find locally qualified experts. The ODS phaseout program is not supposed to create life long careers. Even local chemical suppliers have frequently only theoretical knowledge that has been transferred from international technology centers, and are not capable to provide detailed back-up or to adapt to less sophisticated situations. However, with on-the-job training, this could be improved and, as much of the program is repetition, local experts could at least take over a part of the program, reducing the involvement from international experts to supervision and exceptional cases. The umbrella projects in Indonesia, Malaysia and The Philippines are designed to include national experts. The Malaysian project, based on strong local support in management and in process expertise, and local (mass) procurement under supervision of an international expert and adapted technology has been progressed to the extent that it may be used for standardization purposes.

23.7 Combination of Technical Assistance Missions: This is already standard procedure with most Implementing Agencies.

23.8 Standardized Training/Specifications: UNDP uses a standard manual, developed by a process expert as guideline to all XPE/PS implementations. Such procedures could be expanded into other areas. For instance, Indonesia could use procedures from Malaysia in its box foam project and adapt easily to local use.

24. There is no apparent systematic difference in OVE between small users in small countries and small users in large countries. Differences that were observed, were mostly related to prices of chemicals, special individual approaches or settings or--rather frequently--related to the time of project preparation. The Fund policies have evolved over time and the projects mirror this.

RECOMMENDATIONS

25. It is recommended to divide the foam sector for the purpose of a fair judgement of the ODS Volume Effect (OVE) into four foam categories and three ODS user groups. The large and medium ODS users groups should be assigned a Cost Effectiveness Threshold (CET) as follows (size in ODP-t/y; threshold in USD/ODP-kg/y):

ODS USERS GROUP	XPE/PS		F-PUF S/B		F/IS-PUF		R-PUF	
	size	t'hold	size	t'hold	size	t'hold	size	t'hold
Large ODS user	> 150	< 2.00	> 150	< 1.00	> 30	< 6.00	> 30	< 8.00
Medium ODS user	25-150	< 9.00	25-150	< 8.00	10-30	< 11.00	10-30	< 20.00
Small ODS user	< 25	> 9.00	< 25	> 8.00	< 10	> 11.00	< 10	> 20.00

Legend:
XPE/PS: Extruded polyethylene/Polystyrene
F-PUF S/B: Flexible PU Foam (Slbastock/Boxfoam)
F-PUF M/IS: Felxible/Integral Skin PU foam (Molded)
R-PUF: Rigid PU Foam (Boxfoam, Molded, Panels, Sprayfoam)

26. It is recommended to make projects in the small users group subject to the following procedures:

26.1 A country with a significant amount of small ODS users per foam category (>5) will prepare one group phaseout project per category.

26.2 For countries without an insignificant amount of small ODS users per foam category (<5), the Implementing Agency will attempt to prepare a regional group project.

27. A group project should address in a satisfactory manner the cost savings obtained by addressing the following issues:

a) <u>Choice of technology.</u> The technologies listed below are recommended. Any deviation from these technologies requires proper justification.

CATEGORY	TECHNOLOGY
XPE/PS	LPG or Butane
F-PUF S	Methylene Chloride
F-PUF B	Methylene Chloride, if needed supplemented with forced Cooling
F-PUF M/IS	Water Blown or HCFC-141b
F-PUF	Water Blown or HCFC-141b

b) <u>Baseline Equipment.</u> Existing equipment has to be used with reasonable retrofit costs. If no baseline pouring equipment is available (only relevant to boxfoam and molded), the following equipment can be provided:

Boxfoam:	Pumps for transfer of hazardous chemicals
Molded :	Air operated dispensing equipment

Any related incremental benefits such as decreased chemical losses should be addressed properly.

c) <u>Procurement.</u> Potential effects from joint procurement and from potential local procurement for suitable items should be addressed.

d) <u>Tecnology Introduction Costs</u>. The project should address:

(i) The potential use of expertise from local chemical suppliers and/or local experts and its effect on the project costs;

(ii) The potential use of international experts for supervision only and the effect on the project costs;

(iii) The possibility of joint training sessions and its effect on the project costs;

(iv) Availability of existing and available experience in the same area, including but not limited to specifications, bids, training programs.

28. It is recommended to address recent technology developments and the related impact on equipment specifications in more detail. Specifically the following issues should be addressed:

(i) Is the specification of high pressure equipment still justified;

(ii) Is it possible to make differences in equipment requirements between the different types of molded foams such as flexible, rigid/general and refrigeration, integral skin/rigid/semi-rigid.

(iii) What additional zero ODP technologies beside water, pentane and gaseous HFCs can be anticipated with sufficient assurance that equipment specifications could be designed with such technologies in mind as future permanent technology

29. It is recommended to initiate/designate group demonstration projects in all applicable foam (sub)categories. Where possible suitable existing projects should be selected.