

BURKINA FASO

NATIONAL REPORT

AT THE

**EIGHTH MEETING OF THE OZONE RESEARCH MANAGERS OF
THE PARTIES TO THE VIENNA CONVENTION FOR THE
PROTECTION OF OZONE LAYER**

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1 BACKGROUND

Burkina Faso is a landlocked country of 105,869 square miles, located in the heart of Western Africa, approximately 600 miles from the Atlantic Ocean. Ouagadougou, the capital city, has about one million inhabitants. The country borders Benin, Côte d'Ivoire, Ghana, Mali, Niger and Togo. With 13.4 million inhabitants and a density of 13.1 inhabitants per mile², Burkina Faso is one of the most populated states in western Africa. Per capita income is about \$US 1000. Industry is mainly agricultural. Burkina Faso exports cotton, cattle and out-of-season vegetables to Europe. Weather is dry for much of the year with summer temperatures often reaching 45 degC. Principal cities are Bobo Dioulasso, Koudougou and Fado Ngourma.

2 Status of Ratification

Burkina Faso signed the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol (MP) on July 10th. 1989.

The country ratified both the London and Copenhagen Amendments in 1995, and subsequently ratified the Montreal and Beijing Amendments in 2002.

3 INSTITUTIONAL AND REGULATORY FRAMEWORK

General legislative framework

Burkina Faso ratified the Convention of Vienna and the Montreal Protocol on 20th July 1989. The legal basis for subsequent legislation controlling the import and use of ODS goes back to a ministerial edict (no. 91-069/PRES) promulgated on 25th November 1991 and the corresponding decree through which it was enforced (no. 91-0434/MICM) issued on 27th November 1991. The legal basis for ODS legislation was subsequently strengthened by the Law no. 005/97/ADP promulgated on 30th January 1997. This document defined atmospheric pollution as the presence in the air of substances or particles that prejudice health, public safety or the environment, or by the presence in the atmosphere of substances which (among other things) contribute to Global Warming or Ozone Depletion.

Establishment and Role of National Ozone Unit (Bureau National Ozone (BNO))

The BNO was established in 1994 as an entity within the Department of Anti-pollution and Health which answers to the General department for the Preservation of the Environment within the Ministry of Environment. The objective of the BNO is to reduce ODS consumption according to the limits set in the Montreal Protocol for substances listed in Annexes A and C. To achieve this goal, the following specific tasks have been assigned to the BNO:

- To study the import and consumption of ODS
- To communicate data on the import and consumption of ODS to the MP Secretariat
- To organise training, information and awareness-raising programmes to sensitise the general public to the problem of ozone depletion.
- To create a refrigerant recovery and recycling centre.

ODS legislation

Legislation specific to ODS was enacted via a ministerial decree issued on 11th March 1997. This required that a Prior Approval for Import be obtained for the import of any ODS or piece of equipment containing ODS. A Notice to Importers was issued on the same day (97-005/MCIA/SG) by the Ministry of Commerce covering the import of any substance appearing in Annex A of the Montreal Protocol and its amendments or any equipment containing these substances.

The control of ODS import and export on a day-to-day basis is achieved through close co-operation between the Bureau National Ozone (BNO), the Individual Client Centre, and the Customs Service.

The legislation from 1997 required that importers wishing to import shipments of ODS submit an application to the “Centre des guichets uniques” who then established the *bona fides* of the importer and referred the application to the BNO, who would decide if and how much ODS the importer could bring into Burkina Faso. A positive response from the BNO would result in the issuing of the Prior Approval for Import (API - referred to above). The BNO issued permits in accordance with a phased reduction in ODS imports which succeeded in meeting the 50% cut in base consumption required for 2005.

The mechanism described above no longer applies as import of most ODS became illegal in January 2006 (see below). Further documentation is required under normal customs rules for any shipment of goods valued at over 500,000 CFA (769 euros). Any shipment of goods valued at 3million CFA or more (4,614 euros) must be inspected by an accredited goods inspection company. The following describes the current legislative framework governing trade in ODS and ODS-containing equipment.

ODS Legislation via the Union Economique et Monetaire Ouest Africaine (UEMOA)

The UEMOA comprises Togo, Cote d’Ivoire, Benin, Senegal, Mali, Gambia in addition to Burkina Faso. The ODS control mechanism described above became redundant from January 1st 2006 when the UEMOA member states jointly agreed to ban the import and export of all Annexes A, B and E ODS (CFCs, halons, Carbon Tetrachloride, Methyl Chloroform and Methyl Bromide) and equipment containing these ODS apart from equipment required for urgent medical purposes. This was enacted via Regulation No. 04/2005/CM/UEMOA “Harmonisation of regulations concerning the import, trade and re-export of ODS and ODS containing equipment”. This was agreed by the Council of Ministers of the member states in July 2005. It prescribes a tight regime of control which is aimed at preventing the movement of ODS between member states. Some of the relevant articles of the legislation are:

Art 3: Import of ODS and equipment containing ODS will become illegal when this regulation comes into force.

Art 4: Production of ODS and export from the territory of member states is forbidden

Art 5: Application of the provisions of the MP and its amendments in respect of the import from non-member state of ODS or equipment containing ODS is the responsibility of the Ministry in charge of Commerce of the State to which the shipment is destined. Prior authorisation must be provided by the Ministry of Commerce of this state.

Art 7: The BNO of each member state is charged with registering the importers and distributors of ODS and equipment containing it.

Art 8: A Community Ozone Committee (CCO) is created within UEMOA and charged with putting into effect the provisions of the MP relating to ODS

Art 9: A list of ODS and the equipment containing them can be modified through regulations issued by the UEMOA council of ministers following notification by the CCO

Art 10: All contravention of the provisions of the present regulation exposes those carrying out the contravention to the legal sanctions provided by the relevant member state

Art 12: The present regulation enters into force on 1st January 2006 and will be published in the official bulletin of the UEMOA

4 RESEARCH

For small scale research issue a retrofit center as been put in place in Ouagadougou at premises supplied by the government for this purpose. The role of this centre is to:

- Provide technical support for retrofit activities
- Carry out demonstration projects that will identify the preferred retrofit technologies for different types of system in Burkina Faso
- Provide storage for illegal ODS seized by the Customs Authorities

Demonstration of Retrofit technologies

In principle there are two options for retrofitting small to medium sized refrigeration systems and MACs, namely HFC-134a based blends which can be “dropped in” to CFC-12 systems, and hydrocarbon based blends. Both are mixtures of different fluids which mimic the thermodynamic characteristics of CFC-12 and are compatible with mineral or synthetic lubricants used in CFC-12 systems. Strict procedures have to be observed with both technologies in order that a reliable system with acceptable energy efficiency characteristics results from retrofit. Technicians will be taught both types of retrofit and the criteria for selecting which to use in a given situation.

The objectives of the demonstration project to be carried out at the Retrofit Centre are to:

- Establish which retrofit options should be recommended for different classes of system
- Determine whether there are significant differences in energy efficiency between the two options and how energy consumption compares with that of the original CFC-12 system
- Establish whether there are likely to be reliability problems with different types of retrofit

The activities that will be carried out to determine these issues are:

Purchase of systems for retrofitting

Three identical CFC-12 systems of the classes that are to be compared will be purchased in Burkina Faso. These might be domestic refrigerator (probably two types), and a small commercial display case. MACs will also be compared. Standard government limousines will be provided as test vehicles for retrofit comparisons.

Performance testing of retrofitted systems

Testing will require that the Retrofit Centre be equipped with a protected mains power supply to prevent damage to the systems being tested. Two of the three domestic and commercial systems will be retrofitted respectively to hydrocarbon and HFC based blends and their thermostats set to the same level. Prior to this they will be the subject of simple tests (e.g. motor insulation resistance) to determine that the refrigeration equipment is in good condition.

Each group of systems will be located in the same secure area such that each group experiences the same ambient heat load and cannot be casually interfered with. The refrigeration systems will be connected to the mains supply via standard domestic kWh meters.

Initially pull down times will be measured for each system. They will then be run for a period of at least 6 months. At the end of this period:

- The aggregate energy consumption of each system for the period will be compared with others in the same class
- The compressors will be cut open and checked for damage to motor windings and components such as the valve plate.

This testing will give a good practical indication of:

- The cooling capacity (kW) of the retrofitted systems compared to the original CFC-12 model (from the pull down tests) and
- The energy consumption over time (kWh) when handling an identical load

As these tests are carried out any unusual practical issues that are unique to Burkina Faso will be identified and incorporated in the overall recommendations (below).

It is intended that the retrofitting of the systems used for the demonstration project should take place during the Train-the-Trainers course in consultation with the International Expert who can advise on the exact form the tests should take. The two staff technicians employed by the Retrofit Centre will be participants in the Train-the-Trainers course and will subsequently be responsible for supervising the tests along with carrying out retrofit work.

Identification of retrofit options

Appendix 1 gives the breakdown of estimated costs for retrofitting typical domestic, small commercial and MAC systems using hydrocarbon and HFC based techniques. In addition to cost, there are safety, energy efficiency and reliability issues that will indicate the best choice. From a technical point of view, hydrocarbons are more robust and likely to lead to retrofit which is more reliable and is slightly more energy efficient. Their use, however, raises safety concerns that have to be addressed. Cost levels are similar for domestic refrigerators and small commercial systems, whereas hydrocarbon retrofit is by far the cheapest option for MACs.

These costs are quite sensitive to the fairly high labour costs charged by workshops in Burkina for a skilled technician's time. The demonstration project will enable the time element involved in each option to be refined and better cost estimates made.

The demonstration project will be carried out in collaboration with the Refrigeration Association, some of whose members will participate in the Train-the-Trainers course. Local experts and the

Bureau National Ozone (BNO) will produce a joint set of recommendations that will address the following:

- The preferred retrofit option for each class of system (with reasons)
- The procedures to be adopted when carrying out retrofit of each class of system

Provision of retrofit toolkits to a selected group of workshops

Appendix 2 provides a list of tools that will be included in each retrofit kit to be purchased for servicing workshops, to be selected by Burkina Faso on the basis of the relatively high amount of repairs they carry out. It is estimated that the budget available will allow the supply of kits to about 45 to 50 workshops.

When CFC-12 systems are retrofitted to other refrigerants, the existing CFC-12 in the system must first be removed. The most common fault on small refrigeration systems is a motor burnout, and the most common fault on MACs systems is a leak. This influences the condition and amount of refrigerant that is likely to be recovered.

- Small refrigeration systems: the burning motor windings create decomposition products that cannot be removed by simple recycling machines. 100% of the charge of this contaminated refrigerant is likely to be recovered.
- MACs: as these are mechanical, open drive systems burnout does not apply. The refrigerant will likely be of acceptable quality slightly contaminated with moisture and acids that can be reliably cleaned by a simple recycling machine. Less than half the charge is likely to be recovered.

Small hand operated recovery pumps will be included in the retrofit kits to enable the refrigerant charge from small refrigeration systems to be recovered. Where this is highly contaminated, it will be stored indefinitely.

In addition to the kits, two MAC dedicated recovery and recycling machines will be purchased in Phase I, one for the Retrofit Centre and the other for a selected servicing workshop. The use of these machines will be closely monitored. Should these enable significant amounts of CFC-12 to be recovered by the retrofit centre and re-used, consideration will be given in Phase 2 to purchasing more for distribution to MACs service workshops. Using the flexibility permitted under TPMP, Burkina Faso and the agency concerned may then decide to alter the budget allocated for the equipment accordingly.

Public awareness raising campaign (PARC)

The general public and businesses in Burkina Faso need to be sensitised to the fact that the price of CFC-12 will rise steeply before 2010 when it will become unavailable. Owners of refrigerant equipment and MACs that still use CFC-12 should therefore have their equipment retrofitted to non-ODS alternative refrigerants the next time their equipment suffers a breakdown that involves opening the refrigerant circuit.

Therefore, a few awareness-raising activities will be implemented to:

- Sensitise the population to the impending scarcity and rising cost of CFC-12

- Present the option of having their equipment retrofitted by workshops whose technicians have been trained and licensed to carry out this activity
- Publicise the officially recommended retrofit options for different types of equipment

The PARC will be implemented through TV and radio news and current affairs slots and newspaper articles following the same pattern as previous PARCs which have been used to promote environmental issues

Expected results and criteria for success

The expected results from this technical assistance programme include:

- Provision of positive recommendations regarding the retrofit technologies to be promoted in Burkina Faso
- Contribution to the phase-out of the remaining CFC consumption before 2010 in a way which minimises the economic impact to the country
- Creation a permanent technology and information resource that will support the refrigeration and MACs industries in Burkina Faso after funding ceases.

The criteria used to measure the success of this programme will be:

- Quality of results acquired from the retrofit demonstration projects
- Numbers of retrofits carried out

Target Audience

All refrigeration and MACs technicians working in legitimate service business throughout Burkina Faso.

Approach

The project will be divided in two phases:

- **Phase I** (during 12 months following implementation):
 - Establish and equip retrofit Centre
 - Carry out demonstration projects
 - Implement first phase of PARC
 - Procure about half of retrofit kits required for distribution to workshops
 - Review results of demonstration projects
 - Consider privatisation of Retrofit Centre
- **Phase II** (after completion of Phase I, for a duration of up to 12 months): Equipment will be procured and distributed to selected workshops.
 - Implement second phase of PARC and publish retrofit recommendations
 - Procure and distribute remaining retrofit kits
 - Monitor and report on equipment use and retrofit projects

Co-operating partners and their role

Bureau National Ozone (BNO):

The BNO will be responsible for organising and over-seeing the Retrofit Centre. This will include fitting out the premises provided for the Centre by the government and hiring the technicians and support staff.

The BNO will be responsible for the final selection of workshops that will receive the retrofit toolkits. Returns from the workshops regarding the number of retrofit operations carried out and amounts of refrigerant recovered will initially be sent to the Centre where the support staff will synthesise these into a monthly report. The BNO will be responsible for providing this report to interested parties. It will also make spot checks on workshops that have received the toolkits to verify the returns and to ensure that retrofit techniques taught on the Training Course are being competently carried out.

The BNO will oversee the Retrofit Demonstration activities and ensure that these are being carried in the fashion agreed with the International Expert and that the technicians are monitoring the systems being tested. As the tests are terminated, the BNO will organise meetings with the Refrigeration Association to determine what conclusions can be drawn from the tests in respect of the most suitable retrofit technologies for Burkina Faso.

The BNO will also be responsible for the Centre's commercial operations. It will ensure that the secretarial support staff maintain proper records of payments and work carried out. The BNO will ensure that the Centre's accounts are prepared and certified in an appropriate fashion at the end of the financial year.

Refrigeration Association:

The Refrigeration Association will provide technical support for the BNO in all the activities described above and any others as required. Its input will be particularly important in drawing conclusions from the Retrofit Demonstration activities, ensuring that the retrofit tests themselves are being properly carried out and that workshops are performing retrofits competently.

Servicing workshops:

The workshops receiving retrofit toolkits will retrofit refrigeration systems and/or MACs and provide details of systems retrofitted and amounts of refrigerant recovered. They will also provide feedback to the BNO on any aspect of the implementation of retrofit in the field that requires comment/

The Retrofit Centre

The Retrofit Centre will be responsible for:

- Carrying out the Retrofit Demonstration Project
- Processing the returns from workshops and providing a monthly report to the BNO
- Providing technical support to all service workshops on Retrofit.

Supporting and follow up actions

As described above, all registered workshops in Burkina Faso will provide monthly returns to the Retrofit Centre, which will then synthesize this information and report to the BNO regarding the amount of ODS refrigerant phased out by retrofitting and amounts of refrigerant recovered

<i>Domestic Refrigerators</i>		
	Hydrocarbon retrofit	HFC-134a blend retrofit
	\$21.02	\$6.95
<i>Equipment</i>		
Labour	\$8.00	\$13.75
Total retrofit cost	\$29.02	\$20.70
<i>Small commercial systems</i>		
	Hydrocarbon retrofit	HFC-134a blend retrofit
	\$30.77	\$19.88
<i>Equipment</i>		
Labour	\$8.00	\$13.75
Total retrofit cost	\$38.77	\$33.63
MACs		
	Hydrocarbon retrofit	HFC-134a blend retrofit
	\$33.13	\$94.08
<i>Equipment</i>		
Labour	\$7.50	\$16.25
Total retrofit cost	\$40.63	\$110.33

Appendix 2

Tool kit for Burkina Faso Workshop

Domestic & Comm Package		MACS only	
Gauge manifold	44	Gauge manifold	44
Set 3 hoses	25	Set 3 hoses	25
Electronic Leak detector	210	Electronic Leak detector	210
Small pipe bender	35		
Swaging/Flaring kit	106		
Multimeter	102		
Recovery unit and cylinder	350	Recovery unit and cylinder	350
Charging unit with vacuum pump	733	Charging unit with vacuum pump	733
Oil acidity tester	10	Oil acidity tester	10
Aluminium soldering kit	13		
Heat seal stick	12	Hydraulic hose crimping m/c	762
Inspection mirror	7.5		
Heat shield	21		
Deburring tool	20		
Piercing valve	16		
Crimping pliers	40		
1 Litre Charging Still	150		
Brazing/welding kit with oxygen		Probably owned by all workshops	
Tube cutter	22		
Small tube cutter	13		
Capillary cutter	7.5		
Dry powder extinguisher	50	Dry powder extinguisher	50
Nitrogen cylinder and gauges	150	Nitrogen cylinder and gauges	150
HC Gas alarms	100	selected HC Gas alarms	100
	2237		2434
Selection for non flammable retrofit	2087		
	allow		
	\$ 2,500		\$ 2,500

Appendix 3
Equipment for Retrofit Centre

<i>Equipment for Retrofit Centre</i>	<i>USD approx cost</i>
Selection of general handtools engineering and workshop equipment	4000
Selection of specialised refrigeration tools and instruments	4000
Selection of consumable materials	800
Power protection system for Retrofit Testing	2000
2 x MACs Recovery and Recycling machines	6000
Computer and printer for secretarial support staff	1200
Total	18,000

Appendix 4 Financial Model of Retrofit Centre

Financial Model of Retrofit Centre				Based on HFC-134a based MACs Retrofit			
					Rate of Return	42%	
					Costs in USD		
	General						
		Working Days in year		220			
		Hours per working day		8			
		Average energy consumed per day		0.75	kW		
	Variable Costs						
		Costs Electricity/kWh		\$0.12			
		Electricity cost per year		\$158			
		Wages per man month		\$208	(incl social costs)		
	Fixed Costs						
		Premises: rent		\$50	per month		
		Building maintenance		\$10	per month		
	Material costs						
		Parts and materials per retrofit		\$94			
	Other						
		Number of technicians		2			
		Retrofits per day		2.50	max 5	retrofits	
		Price paid per retrofit		\$120	Utilisation factor	50%	
		Gross Profit per day		\$130			
		Gross Profit per year		\$1,555			

Cash Flow								
	Investment costs							
	Preparation of premises				750			
Year	1	2	3	4	5	6	7	8
Costs								
Investment	750							
Fixed								
Premises	600	600	600	600	600	600	600	600
Delivery								
Civils Work								
Maintenance	120	120	120	120	120	120	120	120
Variable								
Purchase								
Elec.	158	158	158	158	158	158	158	158
Filters								
Wages	416	416	416	416	416	416	416	416
Revenue								
Sale Ref.	1555	1555	1555	1555	1555	1555	1555	1555
Handling								
Acidic Ref.								
Grant								
Profit	-489	261	261	261	261	261	261	261
% costs	-24%	20%	20%	20%	20%	20%	20%	20%
Cumulative	-489	-228	32	293	554	815	1076	1336

There is no observing station relating ozone matters in Burkina Faso