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Addendum

PROJECT PROPOSALS: SYRIA

Please insert the attached Annex I at the end of document UNEP/OzL.Pro/ExCom/28/42.

Annex I

JUSTIFICATION FOR THE USE OF HCFC-141B

(Extracts from the Project Documents)

(a) Conversion from CFC-11 to HCFC-141b and from CFC-12 to HFC-134a technology in the manufacture of commercial refrigeration equipment at Al-Ihsan Co.

The implementing agency expert appraised the prospective recipient enterprise, Al-Ihsan Co., prior to the preparation of this project document, during August 1998 and had detailed discussions with the technical and managerial personnel of the enterprise, regarding the choice of technology for replacing the existing CFC-based technology, under the project. The enterprise was briefed in detail about the following :

An overview of the available interim (low ODP) and permanent (zero ODP) replacement technologies.

The techno-economic impact of each technology on the products manufactured, and the processes and practices employed by Al-Ihsan Co..

The possible implication of each technology, in terms of its known impact on environment, health and safety, such as ozone depleting potential, global warming potential, occupational health, fire and explosion hazards.

It was emphasized to Al-Ihsan Co., that HCFC technologies are interim in nature due to their residual ODP and therefore may continue to adversely affect the environment, though at a lower scale than CFCs.

It was further explained that HCFCs may become controlled substances under present or future international conventions and will therefore also need to be phased out at a future date, and any investments required for their phase-out and for conversion to safer technologies, may have to be borne by Al-Ihsan Co.

Al-Ihsan Co. preferred selection of HCFC-141b based technology, in their manufacture of commercial refrigeration equipment offering the following reasons:

The fire, explosion and security hazard involved in the implementation of hydrocarbon technology (pentanes) requires extensive and stringent safety precautions & investments and compliance with local safety regulations, in view of their flammability. The present manufacturing facilities of the enterprise are unsuitable for ensuring safe operation with hydrocarbon based technology.

Al-Ihsan Co. has reservations regarding the availability and convenience of procurement of the required grades of pentanes at acceptable prices.

Al-Ihsan Co. have selected HCFC-141b based systems as the conversion technology, as this technology would ensure phase-out of substantial ODP cost-effectively, with no safety hazard, while maintaining the product and processing characteristics at acceptable levels.

Justifications for the use of HCFC-141b are provided for the following two companies. Since they are identical the justifications for one of the companies are reproduced below.

(b) Conversion from CFC-11 to HCFC-141b and CFC-12 to HFC-134a in the production of refrigerators and freezers at Alaman Co.

(c) Conversion from CFC-11 to HCFC-141b and CFC-12 to HFC-134a in the production of refrigerators and freezers at Golden Penguin Co.

The situation is somewhat different when considering alternative foam blowing agents. Table 8 shows the CFC-11 alternatives for foam blowing and their ozone depleting potentials.

Table 8. Alternative blowing agents to replace CFC-11

Foaming Agent	***Ozone Depleting Potential (ODP)***
HCFC 141b	0.11
HCFC 142b	0.065
HCFC 142b + HCFC 22	0.06
HFC 134a	0
Cyclopentane	0

It can be seen that HCFC-141b, HCFC-142b and the blend of HCFC-142b/HCFC-22 all have some ODP and are therefore accepted only as transitional substances.

When considering long-term replacements the field is narrowed to HFC-134a and cyclopentane. In Europe, HFC-134a was used as a blowing agent for a short time, but it was abandoned because it is very expensive compared to CFC-11 and cyclopentane. It is very unlikely that HFC-134a will become a widely used ultimate blowing agent for polyurethane foam in the refrigeration sector.

Lately, all major European manufacturers have already started using cyclopentane to produce polyurethane foam and similar trend is seen in many other parts of the world except North America.

However, cyclopentane is an explosive chemical. Since cyclopentane and polyol cannot be delivered premixed in drums or tanks as is the case with CFC-11 and polyol it is necessary to

provide an expensive explosion proof mixing station. The same applies for the foaming machine.

In order to ensure operational safety when using the highly flammable and explosive cyclopentane and to meet the relevant requirements of the local authorities, it is necessary to install a gas detector system in the foaming department around the foaming machine.

Due to the current layout of the plant where several machines are installed next to each other installation of comprehensive automatic sprinkler fire protection systems is inevitable.

In order to prevent hazards and achieve compliance with established safety rules for the machinery and the plant, a safety exhaust system is also necessary in the foaming department in all areas where cyclopentane is in use and could escape.

All machinery and equipment which may come into contact with pure cyclopentane or cyclopentane/polyol must be explosion-proof and/or encapsulated.

To make the foaming jigs explosion-proof, it is necessary to replace electrical contacts, switches, motors etc. with specially designed explosion-proof ones. All foaming jigs and plugs must be fitted with a good earth connection to avoid sparks generated by static electricity. The workers' clothes and shoes must be made of antistatic material and the floor must be covered with antistatic paint.

As a precaution against static induced explosions, it is also necessary to inject nitrogen into the foaming cavity, immediately prior to the injection of the polyurethane material into the cabinet. This requires installation of N_2 tank, ring line and injection nozzles.

An emergency motor-generator must be provided to supply electric energy for the safety system even in case of black-outs.

Following completion of the installation an international institution in cooperation with local authorities must certify the safe operation of the foaming installation.

These measures would increase the cost of the project by at least US$ 200,000 which would make the cost effectiveness of the project unacceptable. The enterprise has no financial means to complement the grant with the additional funds required for the implementation of the project with cyclopentane technology.

Moreover, the recipient company is a very small enterprise with weak technical support staff especially in the field of maintenance and the present staff would be not able to run the plant and carry out the required maintenance procedures.

On the basis of these considerations Alaman Company has decided to adopt HCFC-141b as a long term replacement for CFC-11 for foam blowing.

The selected conversion strategy leads to the following modification of plant equipment and manufacturing processes: