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THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
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Item 10 of the provisional agenda[1]

UPDATE ON THE INFORMATION ON ALTERNATIVE TECHNOLOGIES IN THE POLYURETHANE FOAM MANUFACTURING SECTOR FOR ARTICLE 5 COUNTRIES (DECISION 94/58(b))

Introduction

1. At the 93rd Executive Committee meeting, under agenda item "Overview of issues identified during project review," the Secretariat presented the issue of HFCs contained in imported pre-blended polyols in the polyurethane (PU) foam sector in stage I of the Kigali HFC implementation plans (KIPs). During the ensuing discussion, two members emphasized the difficulties faced by some countries in sourcing low-global-warming-potential (GWP) alternatives to HCFCs in the PU foam sector, including pre-blended polyols, leading to project implementation delays, with one of them stating that hydrofluoroolefins (HFOs) were not a sustainable alternative because of their rapid decomposition, a consideration that should be reflected in a Secretariat's note on the issue. Members agreed that the issue of alternatives in PU foam manufacturing should be discussed at the 94th meeting, and that the Secretariat should prepare a separate paper for consideration at that meeting, presenting related experiences, best practices, and information gathered so far.

2. In response to this request, the Secretariat prepared a document (UNEP/OzL.Pro/ExCom/94/58) providing an overview of the HCFC phase-out projects approved in the PU foam sector assisted by the Multilateral Fund, experience in the implementation of these projects, best practices, information on each of the alternatives with low-GWP adopted in the PU foam through the funded projects, information on blowing agent prices and availability, identified challenges and feedback on the adoption of these technologies by region.

3. During the discussions at the 94th meeting, one member noted the persistent lack of availability of HFOs and high HFO prices, questioned the sustainability of converting to other alternatives, some of which

[1] UNEP/OzL.Pro/ExCom/95/1

were deemed by enterprises to be unsuitable for certain applications, and emphasized the broader economic repercussions for Article 5 countries and risk of non-compliance with their obligations under the funding Agreements with the Executive Committee and subsequent penalty payments. Members acknowledged the persisting difficulties faced by small- and medium-sized enterprises (SMEs) regarding HFO availability, while two of them noted that some countries had achieved successful transitions, while implementation appeared to be more difficult for others, with progress levels varying across and within regions. Subsequently, a member introduced a proposal for a draft decision requesting several actions from HFO producers and producer countries, noting that producers were best placed to provide the specific information being sought. He expressed his understanding that, if the issues were not discussed at the present meeting, they would need to be raised at the Meeting of the Parties and that this could result in delays to the implementation of the Kigali Amendment. Later in the meeting, the convener of the contact group introduced a revised proposal that requested the Secretariat and the implementing agencies to prepare a paper providing updated information, rather than the Committee soliciting information directly from HFO producers and producer countries.

4. Following the discussions at the 94th meeting, the Executive Committee decided, inter alia, to request the Secretariat:

(a) In conjunction with the implementing agencies, to prepare a paper, for consideration by the Committee at the 95th meeting, that updated information on the availability of technologies; prices of already selected alternatives in not-yet-completed PU foam sector projects in SMEs; programmes to facilitate access to low-GWP alternatives; and existing barriers to access those programmes by the local system houses in Article 5 countries; and

(b) To update its report contained in document UNEP/OzL.Pro/ExCom/94/58 for consideration at the 96th meeting, with a focus on SMEs in the PU foam manufacturing sector, in particular for spray and insulating foam applications (decision 94/58).

5. In response to decision 94/58(a), the Secretariat has prepared, in cooperation with the implementing agencies, the present document including updated information on the availability of technology, prices, programmes to facilitate access to low-GWP alternatives and existing barriers to access those programmes by local enterprises.

6. For the preparation of this document, the Secretariat requested inputs from the bilateral and implementing agencies during the inter agency coordinating meeting (IACM) held in Montreal from 10 to 12 September 2024 and followed up with a request for written input from UNDP, UNIDO and the World Bank, based on their experience implementing projects in the sector.

7. The Secretariat also contacted representatives of three HFO production enterprises in the margins of the 46th Open Ended Working Group held in Montreal from 8 to 12 July 2024 and followed up with some of them over telephone calls. During this information exchange, the HFO producers shared information on their status and plans for production capacity and product availability.

Updated information received from HFO producers

8. The Secretariat summarizes in the paragraphs below the information from the HFO producers as provided. During the discussions with the HFO producers, one of the enterprises confirmed their plans for production capacity expansion that will triple capacity of HFO-1336mzzZ-based fluids to enable customers to meet the increasing demand. The HFO producer has entered into an agreement with an important fluorinated chemical producer in Asia to produce additional volumes of the substance. The enterprise expects startup to begin in late 2025, followed by full-scale production in early 2026.

9. The second HFO producer confirmed that it has been actively working to increase its production capacity of HFO-1233zd, including the expansion of capacity of a plant in North America to become effective in the near future. The enterprise confirmed that available supply could be shipped to countries in South America. At present, this type of shipment is delivered by ISO tanks with capacity for 17 to 19 tons that are loaded at the supplier facility, sealed, transported, imported and received at a facility in the recipient country with the capacity to unload he HFO to smaller tanks and return the ISO tank. The enterprise confirmed that it is currently working on developing logistical options for countries with smaller markets or without facilities for the repackaging and distribution.

10. The third HFO producer indicated that its global availability of HFOs for foam applications has expanded significantly since 2021 through enhanced production capacities, increased investments, and improved supply chain management. Increased investments in manufacturing facilities, particularly in North America and Europe, have further boosted output, while Asia continues to strengthen its role as a key supplier. The enterprise considers that although fluctuating raw material costs present some challenges in fully transitioning the foams industry to low-GWP alternatives, the overall 2024 landscape offers significantly greater availability and supply reliability compared to 2021, a trend the enterprise expects to continue in the coming years. The enterprise also provided more specific feedback about two regions:

(a) In Latin America the availability of their product (HFO-1233zd(E)) has grown significantly since 2022 driven by regional demand for low-GWP alternatives, with countries like Brazil and Mexico having increased adoption of HFO-based foam products. Distribution networks have been expanded, enhancing availability across the region compared to past years. The producer indicated that today, there are strong supply chain networks and ample HFO stock to meet the HFO demands;

(b) HFO availability in Asia has been expanded since 2021 with the addition of two industrial-scale plants. These investments are part of over US $1 billion in research and development and manufacturing capacity for HFO-based foam blowing agents, refrigerants, solvents, and propellants. Their facilities in North America and Asia deliver tens of thousands of metric tonnes of foam blowing agents annually. In 2022, capacity was further expanded by launching a third production facility in Asia and doubling their HFO-1233zd(E) output in North America.

11. In providing information about the existence of programmes to facilitate access to low-GWP alternatives, one of the producers mentioned the existence of a programme called early adopters to facilitate the adoption of low-GWP alternatives at competitive prices.

Updated information received from the implementing agencies

12. At the IACM, agencies shared the issues that some Article 5 countries are facing that are leading to delays in the adoption of low-GWP alternatives in the PU foam sector, including the lack of availability of some technology alternatives in several countries and high costs. Even in cases where the difference in cost between HCFC-141b and alternative technologies is low, a barrier still exists for smaller enterprises when competing with larger enterprises who have not yet converted to an alternative technology. In general, the conversion has been more manageable for larger enterprises which are able to more easily absorb the increase in operational costs. A subsector of concern is spray foam, which requires low-cost/non-flammable formulations. More specific information provided by the agencies upon request, is summarized below.

<u>Availability of low-GWP technologies</u>

13. UNIDO reported that available low-GWP alternatives in the PU foam sector include hydrocarbons (HCs), HFOs and methyl formate. HCs like cyclopentane and n-pentane are widely used, particularly in rigid and integral skin flexible foam applications. However, they pose flammability risks, requiring

additional safety measures. HFO-based blowing agents (HFO-1233zd and HFO-1336mzzZ) are becoming popular due to their near-zero GWP and non-flammability, making them suitable for insulation and other PU foam applications. However, in several countries, while systems houses have been able to test HFOs, they are still not available at a commercial scale. In the case of Argentina,[2] the Government has held extensive meetings with producers and system houses to help facilitate access to HFOs, and though not finalized, progress is being made. Despite some improvements, delivery times for low-GWP alternatives remain lengthy (90 to 120 days), though subsequent orders could benefit from shorter lead times.

14. UNDP provided information about ongoing and completed projects. In Brazil, alternative blowing agents available for use include methyl formate, methylal, HFOs, and water-based systems. In Colombia, pentane/cyclopentane and HFOs are available as well as polyols formulated with HFO. Currently, Colombia has only one supplier of HFO for PU foam, and while there are no issues with availability, challenges persist related to the price of HFOs, and the procurement of catalysts and other additives required for developing HFO-based polyol formulations. In India, assisted enterprises converted to cyclopentane, methyl formate and a very limited number of them to HFOs. In Uruguay, 17 enterprises out of 21 assisted did not complete their conversions due to the lack of availability of the HFO-based system and returned the unused funds.

15. In Chile, large enterprises (e.g., continuous panels) primarily use cyclopentane, while SMEs rely on water, methyl formate, HFCs, and HFOs, which are applied via injection or spray systems. All technologies used are imported, and there are no supply challenges with fully formulated polyols containing HFOs, methyl formate, or HFCs. However, the only system house in the country has faced difficulties acquiring HFOs since June, due to delays by the supplier to provide a quote and send the shipment. In Panama, a systems house supplies PU systems based on HFC blends (HFC-365mfc/HFC-227ea), HFO-1233zd,[3] and cyclopentane; and in Nigeria, the alternative low-GWP technologies in use include cyclopentane, methylal, methyl formate, and HFOs, all of which are imported.

16. The World Bank provided no updated information to the previously reported HFO-1233zd production facilities established in China and India in 2022.

Prices of selected alternatives in small and medium-sized enterprises (SMEs)

17. The implementing agencies provided available prices based on several of the projects implemented in Article 5 countries, noting that those prices vary depending on the specific circumstance of each country:

(a) UNIDO provided prices for HFOs (HFO-1233zd(E) at US $20.00/kg and HFO-1336mzzZ at US $30.00/kg); HCs (cyclopentane: US $1.80-3.00/kg; n-pentane: US $1.10-2.00/kg) and HFCs (HFC-245fa and HFC-365/227 at US $6.50-16.00/kg); and

(b) UNDP provided available prices in Brazil for methyl formate (US $3.83/kg) and methylal (US $2.30/kg); in Colombia for HFO (US $17.00 to 19.00/kg (through a distributor)) and polyols formulated with HFO (US $6.50 to US $8.00/kg); and in Chile for water-based fully formulated polyol (US $3.30/kg plus tax), and for HFO-fully formulated polyols (US $5.50/kg plus tax). Importers of fully formulated polyols in Chile reported that for spray applications, HFO formulations are approximately 5 per cent more expensive than HFC formulations, and for injected applications the cost variation increases to around 10 per cent.

[2] Details on the report from Argentina can be found in paragraphs 16 to 28 of document UNEP/OzL.Pro/ExCom/95/20.
[3] HFOs in pre-blended polyols are also exported to Costa Rica (paragraph 23, UNEP/OzL.Pro/ExCom/95/50).

Programmes to facilitate adoption of low-GWP alternatives and barriers to access them

18. UNIDO mentioned in its report the early adopters programme offered by one of the HFO producers, the World Bank did not have updated information on this matter, and UNDP reported that programmes to facilitate adoption of low-GWP alternatives by HFO producers are not available in the countries they assist. However, some of those countries have government initiatives to facilitate adoption of low-GWP alternatives:

(a) In India, the Central Institute of Petrochemicals Engineering and Technology (CIPET) Government of India, along with the Ozone Cell and the Ministry of Environment, Forest and Climate Change (MoEFCC) provided technical support to foam manufacturing enterprises under stage II of the HPMP including workshops, trials, onsite demonstrations and support, practical hands-on-training and product validation. CIPET also provided the testing facilities for low-GWP formulations and foam products certification; and addressed issues related to physical technology conversions of the enterprises. The technical assistance support of CIPET to the enterprises proved to be the key for successful sustainable implementation of complete phase-out of HCFC-141b in foam manufacturing sector;

(b) Colombia has, for the adoption of HCs as blowing agents, tax incentives for importing foam manufacturing equipment, including safety items; and

(c) In Chile, the Ozone Unit with the Ministry of Housing and Urban Development is introducing HCFC- and HFC-free PU foam as an option for the subsidies provided by the state for thermal insulation in housing.

Observations

19. The information provided above is an update to the information already shared with members in document UNEP/OzL.Pro/ExCom/94/58. According to the HFO producers and the information received by the Secretariat, there is increased production capacity and availability of HFOs at the global level, and there are ongoing efforts by HFO producers on defining logistical aspects to ensure that HFOs reach smaller markets.

20. Regarding availability of low-GWP alternatives in the PU foam sectors in Article 5 countries, the reports provided by the implementing agencies indicate availability of HCs, methyl formate, methylal, water-based technology and HFOs. However, commercial-scale availability of HFOs remains limited in several countries.

21. Regarding pricing, the limited data from a few countries reveal significant price variations among alternatives within the same country, as well as differences in the prices of identical alternatives across countries. While some countries have reported improvements in HFO availability, challenges related to their pricing persist.

22. Apart from the early adopters programme offered by one HFO producer to promote technology adoption at competitive prices, no further details about similar initiatives were available. The information received from the implementing agencies indicates that countries are in general not aware of the programme. However, some Article 5 governments have implemented measures to support the transition to low-GWP alternatives in the PU foam sector. These measures include providing technical assistance through specialized agencies, offering tax incentives for importing foam manufacturing equipment (including safety components), and incorporating HCFC- and HFC-free PU foam as an eligible option for state subsidies aimed at thermal insulation in housing projects.

23. In line with decision 94/58, the Secretariat will update the report contained in document UNEP/OzL.Pro/ExCom/94/58 for consideration at the 96th meeting, including updated information provided by the implementing agencies on the on availability and prices of alternatives in the PU foam sector in Article 5 countries.

RECOMMENDATION

24. The Executive Committee may wish:

(a) To note document UNEP/OzL.Pro/ExCom/95/85 including an update on the information on alternative technologies in the polyurethane (PU) foam manufacturing sector for Article 5 countries;

(b) To consider the information contained in the document referred to subparagraph (a) while discussing the issue of alternatives in the PU foam sector; and

(c) To note that the Secretariat will update the report contained in document UNEP/OzL.Pro/ExCom/94/58 for consideration at the 96th meeting in line with decision 94/58.