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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Fifty-second Meeting
Montreal, 23-27 July 2007

PROJECT PROPOSAL: MEXICO

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

Process agent

- Umbrella project for terminal phase-out of CTC — UNIDO

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT
MEXICO

PROJECT TITLE(S)	BILATERAL/IMPLEMENTING AGENCY
(a) Umbrella project for terminal phase-out of CTC	UNIDO

NATIONAL CO-ORDINATING AGENCY	UPO/SEMARNAT

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (ODP TONNES, 2005, AS OF JANUARY 2007)

Annex B, Group II	89.5		

B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2006, AS OF MAY 2007)

ODS	Subsector/quantity			
CTC	0.09			

CFC consumption remaining eligible for funding (ODP tonnes)	n/a

CURRENT YEAR BUSINESS PLAN ALLOCATIONS		Funding US $	Phase-out ODP tonnes
	(a)	1,075,000	89.5

PROJECT TITLE:	Umbrella project for terminal phase out of CTC
ODS use at enterprise (ODP tonnes):	87.29
ODS to be phased out (ODP tonnes):	87.29
ODS to be phased in (ODP tonnes):	0
Project duration (months):	12
Initial amount requested (US $):	1,793,651
Final project costs (US $):	
Incremental Capital Cost:	1,545,495
Contingency (10 %):	154,550
Incremental Operating Cost:	3,806
P & M, Technical Support:	89,800
Total Project Cost:	1,793,651
Local ownership (%):	100
Export component (%):	0
Requested grant (US $):	1,793,651
Cost-effectiveness (US $/kg):	20.55
Implementing agency support cost (US $):	134,524
Total cost of project to Multilateral Fund (US $):	1,928,175
Status of counterpart funding (Y/N):	Y
Project monitoring milestones included (Y/N):	Y

SECRETARIAT'S RECOMMENDATION	Pending

PROJECT DESCRIPTION

Background

1. On behalf of the Government of Mexico, UNIDO has submitted an umbrella project for terminal phase-out of CTC for consideration by the 52nd Meeting of the Executive Committee. The objectives of this umbrella project are:

(a) To phase out the use of 86.6 ODP tonnes of CTC as process agent in the production of chlorine at Coatzacoalcos, Veracruz, Mexico; and

(b) To reduce to almost zero the remaining CTC consumption for laboratory use in 2009 through technical assistance, recognising that there will still be some minimal laboratory uses for which no substitutes have yet been determined.

2. The requested grant is US $1,793,651 plus agency support cost of US $134,524.

Solvent sector and process agent consumption in Mexico

3. The survey conducted in 2007 identified one enterprise using CTC as a process agent and numerous small ones using CTC for laboratory and analytical applications.

4. No specific CTC phase-out projects have been proposed or implemented in Mexico so far, since the consumption of CTC had been mistakenly reported as feedstock. The main use of CTC in the solvent sector in Mexico is by Mexichem Derivados S.A. de C.V. This company is a chlorine and sodium hydroxide manufacturer using CTC as process agent for chlorine recovery in tail gases. In the period from 1994 to 2004 the amounts imported for this use were, by mistake, considered and reported as feedstock. This situation resulted in the establishment of a baseline of zero ODP tonnes, based on the reported zero consumption of CTC for the years 1998 to 2000.

5. In 2004, the Ozone Unit identified this irregularity and carried out a detailed study of the use of the CTC as a process agent in the Mexichem Derivados facility. Following this survey, Mexico asked the Ozone Secretariat to review the case for change of its CTC baseline. The request was considered at the 18th Meeting of Parties and accepted in decision XVIII/29. This decision established the baseline at a level of 187.517 ODP tonnes.

6. The Government of Mexico reported its 2005 CTC consumption to be 89.54 ODP tonnes, exceeding the maximum allowable consumption for that year. It was noted by the Meeting of the Parties that Mexico was in non-compliance with the CTC control measures under the Protocol. In a plan of action, it committed itself to reduce its 2005 CTC consumption to 9.376 ODP tonnes in 2008 and to zero ODP tonnes in 2009. Parties urged the Government of Mexico to work with the relevant implementing agencies to implement the plan of action to phase out consumption of CTC. Decision XVIII/30 of the 18th Meeting of the Parties reflects the above.

The Government strategy

7. The Government of Mexico has set the objective to phase-out CTC consumption by the end of 2008. This target will be achieved through investment and technical assistance components according to the following schedule:

Year (as of 1 January)	CTC Phase-out Target (ODP tonnes)
2007	80.164
2008	9.376
Total	89.54

Technical assistance component

8. CTC consumption of 0.66 ODP tonnes for laboratory and analytical use will be phased out through interaction with the laboratory users. Technology assistance to facilitate sustainability of CTC-free processes will be provided and two four-day national workshops conducted. The cost proposed for the technical assistance component amounts to US$ 89,800.

Investment component

9. The investment component covers the phase-out of the consumption of 86.6 ODP tonnes of CTC as a process agent in the production of chlorine at Mexichem Derivados. The plant began its operations in 1981 as a government-owned enterprise, and now belongs to the Mexichem Group, which is 100% Mexican private ownership. The average chlorine production rate is 675 tonnes/day. Mexichem Derivados is the main producer of chlorine and caustic soda in Mexico.

10. Chlorine and caustic soda are produced from the brine solution of sodium chloride which is received through direct piping from salt mines. The brine is then purified, heated, saturated and fed continuously to the electrolysis cells where the basic electrochemical reaction takes place producing chlorine, hydrogen (gases) and diluted caustic soda (NaOH) solution. The wet gaseous chlorine passes through a drying system. Gaseous dry chlorine and other non-condensable gases are compressed in a screw compressor to reach a pressure of 4.0 bar. The compressed chlorine stream enters the condensers (chilled by CFC-12) where it is cooled to 3.5 °C so that most of the chlorine (95%) changes to the liquid state and is drained to storage tanks. A stream of tail gas from the first liquefaction has a chlorine content of 60%, the remaining being non-condensable compounds. The overall stream is compressed further and subsequently condensed. During this second stage of liquefaction, approximately 50% of the chlorine contained in the tail gas is recovered. In the third stage of the process of chlorine recovery, the remaining gas stream enters into a system in which chlorine is absorbed in cooled carbon tetrachloride, followed by separation of CTC and chlorine. Small quantities of CTC remain in the chlorine after separation.

11. The remaining tail gas (“off gas”), containing CTC vapour enters the CTC control and recovery system where the major portion of CTC is recovered and re-circulated to the chlorine recovery process. Even though the present process uses an additional activated carbon absorption unit for collecting the traces of CTC from the off-gas, a relatively large amount of CTC is lost during the operations every year. In 2006, the total CTC losses (make-up quantity) amounted to

78.75 MT with the total chlorine production to be equal to 251,989 MT. The sources of CTC loss are quantified in the table below based on plant data:

Point No.	Description	Quantity in MT	%
1	Vent emission from CTC main storage tank (working + breathing)	0.045	0.06
2	Fugitive emissions in CTC handling system (pumps, seals, connections, etc)	1.976	2.52
3	CTC fugitive emissions during Cl2 liquid tank car and cylinder filling operations	0.142	0.18
4	CTC fugitive emission from N2 losses during regeneration cycles	0.200	1.19
5	CTC losses via high quality liquid Cl2 product (31 ppm CTC content)	0.930	0.25
6	CTC losses via national standard quality liquid Cl2 product (326 ppm CTC)	22.855	50.26
7	CTC losses via gaseous Cl2 product sent to one main customer (326 ppm CTC content)	39.363	29.18
8	CTC vent emission from Activated Carbon Recovery System (“off gas”)	12.803	16.35
	Total	78.75	100.00

12. CTC can be present in the chlorine sold to customers because the chlorine recovered from CTC absorption contains traces of CTC and is mixed with other chlorine streams. The CTC content in the chlorine gas for sale enters the environment after the chlorine has been used in various chemical processes (chlorination, VCM manufacture, potable water treatment, etc.)

Proposed process, technology selection and justification

13. To phase out CTC usage from the present process, four options have been taken into consideration:

(a) To sell the remaining chlorine content in the tail gas directly to one main customer as is;

(b) To react the chlorine gas stream after the first liquefaction step with hydrogen to hydrochloric acid and to sell the hydrochloric acid thus manufactured;

(c) To absorb the chlorine remaining after the first liquefaction step in a caustic soda solution and sell the resulting sodium hypochlorite solution; or

(d) To deep cool the chlorine gas table from the first liquefaction step so that only a very limited amount of chlorine remains, which can then be decomposed to oxygen and sodium chloride after absorption in a caustic soda solution.

14. Economic and market evaluation of the different options has been carried out by the company. The first option could be considered as the most cost effective, but could not be chosen due to downstream use specifications of the customer that could not be fulfilled. The second

option transforms the chlorine content in the tail gas into hydrochloric acid for sale. However, the Mexican market has many large hydrochloric acid producers and the main customers are situated far away, adding significant transportation costs. The installation cost for a 120 t/day capacity HCl (32%) plant is as much as US $4 million, both of which issues make this solution unprofitable. The third option is to absorb the chlorine content into a caustic soda solution and sell the resulting sodium hypochlorite to the market. This option was also found to be ineffective because of high transportation costs and a required investments of about US $3.6 million. The fourth option of using the cascade refrigeration system appears to be the most efficient in terms of chlorine recovery and cost.

15. The incremental capital cost covers the installation of a two stage refrigeration system amounting to US $1,700,045, including 10% contingency. The incremental operating cost (IOC) is calculated on the basis of a comparison of the pre-project and post-project costs for the CTC process agent, steam electricity, chemicals and additional post-project cost to compensate for a decrease in chlorine production. IOC is calculated to be US $3,806. The counterpart contribution to the project covers the cost of training, testing, installation, commissioning, a sniff gas treatment unit, instrumentation and transport amounting in total to US $538,311. The total requested grant for the investment component is equal to US $1,703,851.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

16. Under the technical assistance component, the Secretariat has drawn the attention of UNIDO to decision 45/14 taken at the 45th Meeting. This decision refers to the issue of the phase out of small volumes of CTC and TCA consumption. It indicates that, "depending on the level of consumption, funding for technical assistance would range between US $20,000 and US $40,000, to be determined on a case-by-case basis." Since then, the Executive Committee approved 12 projects with a funding level ranging between US $20,000 and US $40,000. The higher range has been applied to countries with consumption of about 2.0 ODP tonnes. Accordingly, the funding of US $40,000 has been recommended for the CTC technical assistance component in Mexico to phase out 0.66 ODP tonnes of CTC.

17. Under the investment component, the Secretariat noted that the recovery of chlorine in tail gas from production of chlorine applied by Mexichem Derivados is included in the list of uses of controlled substances as a process agent as per decision XVII/7 of the Parties to the Montreal Protocol.

18. The Secretariat has investigated the second option in technology selection to react chlorine emitted from the first liquefaction step with the hydrogen to produce and sell hydrochloric acid. The estimated cost of the installation of the HCL plant (120t/day; 32%) of US $4.0 million appears to be over estimated. There is also the possibility to convert to HCl completely and sell it for ethylene dichloride production, which has a value similar to chlorine and would minimise transport cost. UNIDO has been advised also to assess economic returns from HCl sales over and above the chlorine value, in comparison to the recovery of chlorine by the proposed method. This would potentially reduce the incremental operating cost.

19. The Secretariat noted that the cost of the chosen option appears too high. For example, just the skid base with valves, piping, paint, wiring (material and labour) for high and low stage would represent cumulatively US $518,653. This cost is unusually high for a largely standard cascade refrigeration system installation. Clarifications on this issue and on the quoted cost of refrigeration components have been sought from UNIDO. Additional information and clarifications have also been requested from UNIDO on the methodology of calculating IOC, including potential production of hypochlorite in the sniff gas treatment unit, and on CFC-11 and CFC-12 phase-out from the existing chillers to be scrapped in the process of conversion.

20. The requested additional information had not been received by the Secretariat by the time of preparation of this document and, therefore, the discussion on the outstanding issues has not been completed with UNIDO. The Executive Committee will be informed on the outcome of this discussion at the later stage.

RECOMMENDATION

21. Pending

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