

ANNEX VI**GUIDELINES FOR LIQUID CARBON DIOXIDE PROJECTS**

1. For a trial period of one year:
 - (a) Liquid Carbon Dioxide (LCD) technology, may be applied in flexible slabstock polyurethane foam projects, where the annual CFC consumption of the enterprise is higher than 50 tonnes, except where national regulatory restrictions or other compelling reasons e.g.: the need to meet local market competition, prevent the use of methylene chloride, evidence of which should be attached to the project document:
 - (b) In flexible molded polyurethane foam projects where both LCD and water-blown technologies are viable zero-ODP options, an enterprise would be free to choose its technology subject to the provision that the eligible grant would be based on the more cost-effective of the two technology options.

2. Incremental Capital Costs**(a) Flexible Slabstock Polyurethane Foam Projects**

The calculation of the eligible incremental capital costs of LCD projects should be based on the following:

Category	Cost Element	Cost (US\$)
Technology	Technology acquisition	50,000 ¹
	Technical support	10,000 to 30,000
	Training	10,000
	Trials	15,000
	Commissioning/Certification	10,000 to 30,000
Equipment	LCD Unit	250,000 to 375,000
	CO ₂ transfer system	20,000 to 40,000
	Miscellaneous Metering Units	70,000 to 85,000
Civil works		25,000
Total		460,000 to 660,000²

¹ The technology licence fee is not subject to 10% contingency.

² +10% contingency to be added.

(b) Flexible Molded Polyurethane Foam Projects

The calculation of the eligible incremental capital costs of LCD projects should be based on the following:

Category	Cost Element	Cost (US\$)
Technology	Technical support	10,000 to 20,000
	Trials	10,000 to 20,000
Equipment	LCD Unit	80,000 to 140,000
	CO ₂ transfer system	0 to 25,000
	High pressure metering units	0 to 90,000
Civil works		5,000
Verification testing		5,000
Total Incremental Capital Cost		225,000 to 300,000

3. Incremental Operational Costs/Savings(a) Flexible Slabstock Polyurethane Foam Projects:

The calculation of the eligible incremental operational costs or savings should be based on the following parameters:

Cost Category	Costs Calculation	Cost Range (US \$)
Chemical Costs	Based on estimated total chemical costs for actual level of production before and after conversion.	
Yield loss	4% first year 2% second year 0% third year 0% fourth year	N/A
Other Costs		
• Maintenance	5% of eligible capital items	12,000 - 18,000
• Power	actual power increase	3,500 - 5,000
• LCD tank	actual lease costs ³	4,500 - 5,000

³ Where it is not feasible to lease the LCD tank, the cost of a tank in the range of US \$15,000 - US \$25,000 may be included in the capital costs.

(b) Flexible Molded Polyurethane Foam Projects

The calculation of the eligible incremental operational costs or savings should be based on the following parameters:

Cost Category	Costs Calculation	Cost Range (US \$)
Chemical Costs	Based on estimated total chemical costs for actual level of production before and after conversion.	
Other Costs		
• Maintenance	5% of eligible capital items	4,000 - 11,000
• Power	actual power increase	0 - 5,000
• LCD tank	actual lease costs	0 - 3,000

4. Methodology for the Calculation of Incremental Operational Cost/Savings

The methodology for calculation of the incremental operational costs or savings should be based on the methodology approved for use with methylene chloride projects at the 12th meeting of the Executive Committee .

In particular:

- The cost for chemicals required to manufacture the products produced with CFC technology in the year prior to project preparation will be compared with the costs for the chemicals required for the same level of production of the same products manufactured with LCD technology.
- Incremental yield losses will be based on losses of the finished product produced by the LCD process, calculated at 4% in the first year and 2% in the second year.

The application of the methodology is demonstrated in Appendix I.

APPENDIX I

Application of the Methodology for Calculation of Incremental Operating Costs/Savings in Projects for the Production of Slabstock Foam using Liquid Carbon Dioxide Technology.

- Incremental operating cost/savings for each year will be:

$$IOC^y = (B_2 - B_1) + (C_2 - C_1) + M + P + T + Y^y$$
- Total IOC will be:

$$= NPV \{IOC^1 + IOC^2 + IOC^3 + IOC^4\}$$

where:

y = year 1 to year 4
 B_1 = total annual cost of CFC blowing agent
 B_2 = total annual cost of LCD blowing agent for the same level of production after conversion
 C_1 = total annual cost of other input chemicals
 C_2 = total annual cost of other input chemicals for the same level of production after conversion

M, P, T, represent annual additional cost for maintenance, power and tank lease, respectively.

Y^y is the incremental yield loss for each year, calculated as follows:

$$Y^1 = 0.04 \times \text{level of production with LCD (tonnes)} \times \text{market price of foam (US \$/tonne)}$$

$$Y^2 = 0.02 \times \text{level of production with LCD (tonnes)} \times \text{market price of foam (US \$/tonne)}$$

$$Y^3 = Y^4 = 0.$$

Tabular Presentation

Annual Costs/ Savings (US \$)				
	Year 1	Year 2	Year 3	Year 4
Blowing Agent	$B_2 - B_1$	$B_2 - B_1$	$B_2 - B_1$	$B_2 - B_1$
Other chemicals*	$C_2 - C_1$	$C_2 - C_1$	$C_2 - C_1$	$C_2 - C_1$
Maintenance, power, tank lease	M+P+T	M+P+T	M+P+T	M+P+T
Yield loss	Y^1	Y^2	0	0
Total annual IOC/savings				
NPV total annual IOC/savings				
Total IOC/savings				

* These costs may be omitted if they do not change significantly before and after conversion.