Table 5: Alternative Comparison

Considerations	ODP	Ability to clean [a]	Simple cleaning process	Cost	Safety [b]	Worker chronic health	Other environmental [c]	Total	Usability [d]
Current Process (carbon tetrachloride)	0	3	4	4	4	0	0	13	0
Alternative Process									
Chlorinated	3	4	3	3	3	2	2	20	20
Aqueous	4	3	0	2	2	3	2	16	0
Aliphatic & Aromatic hydrocarbons	4	2	1	3	2	3	2	17	17
Petroleum distillate speciality blends	4	3	2	1	3	3	2	18	18
HCFC 225cb	2	2	3	0	4	3	1	15	0
HCFC 141b	1	2	3	2	3	3	1	15	15
HFCs and HFE	4	2	3	0	4	4	1	18	0
n-propyl bromide	2	4	3	2	2	1	2	16	16
PFCs	4	1	1	0	4	4	1	15	0

0 = Worst, 1 = Poor, 2 = Average, 3 = Good, 4 = Best

a - Ability to clean drawing paste and other soils from copper and other non-ferrous metals

b - Safety considers workers during cleaning (acute exposure & flammability)

c - Other environmental = VOC, GWP, and Groundwater

d - Usability = This column reflects 0 if there are any zeros in the row

5.1.1 Carbon Tetrachloride

The current cleaning processes generally speaking are very simple. In addition CTC is inexpensive. However, CTC has many critical disadvantages including high ODP, high toxicity, and high global warming potential. Like other chlorinated solvents CTC is heavier than water so if released onto the ground it can quickly cause significant environmental impact. Current cleaning practices are not economical. No attempt is made to collect and recycle CTC. So although the solvent cost per kilogram is low, single pass use of solvent drives total cleaning cost to be much higher than necessary.

5.1.2 Non-Ozone Depleting Chlorinated

Some chlorinated solvents have more cleaning power than CTC. Also, there are many alternative chlorinated solvent-cleaning processes that would significantly reduce solvent emissions and increase recycling. New processes are more complicated than existing cold cleaning manual methods. Worker safety and health concerns are also reduced with lower exposure to a less toxic solvent. Although VOC and GWP for the chlorinated solvents are low, there is still a concern for groundwater contamination.

5.1.3 Aqueous

Aqueous cleaning advantages include non-ozone depleting and a relatively low worker health risk. Disadvantages include the significantly complicated aqueous cleaning process. Challenges with detergent make up, mechanical agitation (e.g., ultrasonics or spray) pure rinse water, wastewater treatment, and drying all contribute.

5.1.4 Aliphatic & Aromatic Hydrocarbons

Although non-ozone depleting, the choice of which non-halogenated hydrocarbon to use is a compromise. Faster evaporation means higher flammability. To increase safety by using a solvent that is non-flammable but only combustible will increase drying time. When making a solvent decision inside this group of alternatives it is also necessary to consider possible residue issues.

5.1.5 Petroleum Distillate Speciality Blends

Non-halogenated hydrocarbons can be blended to emphasise the advantages and minimize most disadvantages found in pure solvents. The prime disadvantage in this case becomes the high cost of these speciality blends.

5.1.6 HCFCs

Although relatively safe and acceptable for worker health; ODP, GWP, lower cleaning power and high cost make HCFCs an unattractive alternative.

5.1.7 HFCs and HFE

Cost and poor cleaning ability (even after blending) rule out this alternative. No ODP, relative safety and low toxicity are the advantages.

5.1.8 n-Propyl Bromide

Strong cleaning ability and cost are attractive features of nPB. ODP and expected high toxicity are disadvantages. Potential for future regulation under the Montreal Protocol also deserves consideration.

5.1.9 PFCs

Expensive, high GWP, slow drying and poor cleaning ability but safety is good and health risk very low.

5.2 Further Consideration of Chlorinated Solvent Alternatives

After reviewing the considerations for the various possible options it is clear that non-ozone depleting chlorinated solvents will provide the best overall solution. Table 6 provides more detailed information to assist with the final selection of the optimal chlorinated solvent for cleaning at HMT.

Table 6: Non-ozone Depleting Chlorinated Solvent Comparison

Properties	Formula	ODP	GWP	Boiling Point	Evaporate Rate (nBA=1)	Latent Heat (cal/gm)	Flash Point C	Flammable limits (vol % @ 25 C)	Kauri-Butanol Value *	Toxicity
Current Process (carbon tetrachloride)	CCl_4	1.1	1,400	77	7.5	46.4	None	None	113	High
Alternatives										
Methylene chloride	CH_2Cl_2	0	9	40	14.5	78.9	None	14-22	136	Med
Perchloroethylene	CCl_2CCl_2	0	~ 9	121	2.1	50.1	None	None	90	Med
Trichloroethylene	$CHClCCl_2$	0	< 9	87	6.4	56.4	None	8-9	129	Med

* Solvent cleaning power is expressed in terms of the Kauri Butanol value (higher number = higher power)

5.2.1 Methylene Chloride

Methylene chloride (MC) has the lowest boiling point, fastest evaporation rate and highest cleaning power of the three non-ozone depleting chlorinated solvents. Fast evaporation makes it a poor choice for cold solvent (ambient temperature) manual cleaning. Heightened awareness of solvent conservation is required when using MC for this type of cleaning. A final concern is worth noting about small mass parts manually cleaned with MC. In humid

locations it is possible to reduce the temperature of parts enough to cause water moisture to condense on them. This results from the high latent heat of vaporization for MC. For many applications this is not desirable.

As a vapour degreasing solvent the low boiling point means less energy consumption. Because the solvent boils near ambient room temperature it is a good option for temperature sensitive cleaning applications or when parts must be handled soon after leaving the vapour degreaser. Both of these potential benefits are of little value to HMT cleaning applications. Lower boiling point also means reduced cleaning time in the vapour zone because the part being cleaned will reach temperature equilibrium faster and condensation cleaning will stop sooner. Stubborn soils that require a hotter solvent condensate will not be cleaned as effectively with MC. On the other hand, its higher solvent cleaning power may somewhat offset the cooler cleaning temperature.

The storage of MC at ambient temperatures in the pre-summer monsoon period may lead to drum rupture, because the pressure will increase as the boiling point is approached, especially if the drum is accidentally exposed to sunlight. Air-conditioned storage facilities with strict instructions for the use would be necessary.

In short, MC will lead to more emissive manual cleaning and has more complicated storage requirements. It also results in lower temperature and shorter duration vapour degreaser cleaning. The only applicable advantage is reduced energy consumption but this is not enough to outweigh the disadvantages. MC is not the best solvent choice for HMT.

5.2.2 Perchloroethylene

Perchloroethylene (PCE) is at the opposite end of the chlorinated solvent spectrum from MC. It has the highest boiling point, slowest evaporation rate and lowest cleaning power. Lower evaporation rate would seem to be an advantage for cold solvent manual cleaning. However, reduced emissions must be compared with the need for increased drying time.

As a vapour degreasing solvent, PCE consumes the most energy per kilogram of parts cleaned. With the highest vapour temperature, PCE cleaned parts experience the maximum condensation cleaning time before temperature equilibrium is reached and cleaning stops. Parts being cleaned in a PCE vapour degreaser must be able to withstand higher temperatures. Hotter condensate facilitates removal of many otherwise difficult soils but more time is required to let the hot parts cool after removal from the degreaser.

In short, PCE is more suitable than MC for manual cleaning applications if longer drying times are acceptable. Vapour degreasing with PCE is good for difficult soils but energy required and longer cooling time for hotter parts need to be considered.

5.2.3 Trichloroethylene

For many of the critical physical solvent properties Trichloroethylene (TCE) is a good middle of the road option. Boiling point, evaporation rate and solvent cleaning power are all between the other two non-ozone depleting chlorinated options. TCE has an evaporation rate very similar to CTC. It is likely that no difference would be noticed in emission amounts or drying time for cold solvent manual cleaning operations.

For vapour degreasing TCE again offers a centre point solution. Boiling point requires medium energy consumption and allows for medium duration dwell times. Parts emerge at double ambient temperature but not triple as for PCE. So again drying time is in the middle. Cleaning power is one property that is not in the middle. KB value for TCE is more than CTC and leans toward the high end with MC.

In short, TCE seems to offer a good compromise between MC and PCE. TCE is recommended for cleaning at HMT.

5.3 Proposed Cleaning Processes and Requirements

5.3.1 Product Cleaning

Significant change is required to replace CTC product cleaning processes in use today. The following items are required at HMT.

1) 1.0m x 1.0m x 16m batch vapour degreaser for tubes of various lengths up to 15m.
2) Integral solvent distillation unit for the degreaser.
3) Dedicated hoist for the degreaser to load and unload parts baskets.
4) Shop modifications that are required to provide a foundation with sealed containment under all equipment holding TCE, utilities, ventilation ducting, and existing equipment rearranges.
5) Safety shower and eyewash station
6) Personal protective equipment (PPE) to include gloves, apron, safety glasses, and half mask respirator for spill conditions.

Table 7: Equipment Requirements

Required Cleaning Equipment			
Product Cleaning			
1.0m x 1.0m x 16m basket Vapour Degreaser with still	Hoist	Safety shower & eyewash	Shop modifications (civil work)
1	1	1	1

5.4 Additional Considerations

5.4.1 Chemical Supply

Availability of the chosen solvent alternative requires verification. This includes both a primary and secondary source to meet requirements.

5.4.2 Single Solvent Solution

The most simplistic approach for choosing an alternative to CTC is to select a single solvent. As was previously discussed, some properties of other alternatives may be more optimal for a portion of the total cleaning requirement at HMT. However, with multiple solvents a disciplined material management system is required to ensure potentially dangerous mistakes do not occur by inadvertently using the wrong solvent. This same argument can be made when considering using stabiliser-free TCE as a cost cutting measure. Stabilised TCE is 50% more expensive and is not required for applications that are completely emissive. However, it is a must for vapour degreasing. Accidental use of the wrong solvent can cause serious problems so is not worth the risk. In addition, the use of non-stabilised TCE requires closer inventory monitoring as it has a shorter shelf life. Stabilised chlorinated solvents last two years or more if sealed and uncontaminated. Shelf life of non-stabilised solvent is closer to six months.

5.4.3 Cleaning Complexity

It is likely that HMT will have very positive experiences after implementation of the alternative cleaning processes. Less solvent will be required. Parts will likely be cleaner because of better processes with a stronger solvent and worker exposure will be dramatically decreased. As usual all of these benefits come with a cost. Cleaning at HMT will become more complex. Initial and maintenance training will be required. In addition to learning how to operate new cleaning equipment, understanding maintenance of solvent chemistry will be required.

Correct Stabiliser

Only special metal-cleaning grades of TCE should be purchased; they will be specially stabilised for this application. The stabiliser systems for nonferrous metals, such as aluminum and copper can be different from those for ferrous metals.

Stabiliser Maintenance

TCE has a slight tendency to create hydrochloric acid when heated in the presence of water. It is therefore important to maintain an adequate level of stabiliser in order to prevent corrosion of metals. This includes both the parts being cleaned and the cleaning equipment itself. Periodic solvent sampling is required to monitor the solvent chemistry. Stabiliser concentrates are available which can be added as needed to maintain a correct chemistry. Under no circumstances should alkali be used to neutralise acids in TCE. Periodically over the course of a year the solvent contents of the vapour degreaser will need to be changed completely. Many variables affect the amount of time between changes. The manufacturer/supplier of TCE should be consulted for detailed discussion of surfaces to be

cleaned and correct maintenance levels to ensure optimum results in terms of the stabiliser system. Cost of stabiliser was considered in Annex 1.

6.0 Safety, Health and Environment

Compliance with safety, health and environmental regulations are ultimately of course the responsibility of HMT. However, it should be noted that an effort was made to research applicable national regulations. The proposed implementation plan described in this project document provides guidance and suggests new processes that will meet all known regulations.

6.1 Safety

CTC is a safe solvent when used correctly. Due to carbon tetrachloride's volatility, inhalation is the principal hazard. However, like all chlorinated solvents it has a vapor density much greater than air so CTC (and MC; PCE, TCE) displaces air within the vessel. This can easily result in asphyxiation (suffocation) because there is no oxygen available. The initial effects of an excessive inhalation exposure are dizziness, loss of coordination, and symptoms of anesthesia. These symptoms may be accompanied by nausea. Excessive exposure may also cause systemic injury (kidney and liver damage). Extremely high vapor levels may increase myocardial irritability (irregular heartbeats) and potentially death.

If at all possible, a system such as self-contained breathing apparatus (SCBA) should be employed with careful monitoring for any spill situations. SCBA means supplying oxygen from outside the oven. It is a dangerous mistake to believe half mask respirators can be used in this application. These mask only filter solvent vapour they do not supply oxygen. It is critical to understand the difference.

6.2 Health

TCE as an alternative to CTC will be a significant improvement from a worker exposure perspective. Not only is TCE less toxic than CTC but correct use of PPE and improved cleaning processes will drastically reduce worker exposure. This will make TCE much more acceptable from both an acute and chronic worker exposure point of view

Training will be provided during implementation to explain the details on how to minimise TCE exposure using PPE. However, the following types of PPE should be employed as soon as feasible to limit CTC exposure in the interim.

Operators should be equipped with the following:

- Gloves: Viton fluoroelastomer, nitrile rubber, neoprene, or polyvinyl alcohol (PVA).
- Apron: Polyvinyl alcohol, neoprene, or nitrile.
- Eye Protection: Safety glasses or their equivalent. Goggles where liquid splash contact is likely.
- Half mask carbon filter respirator should be available for handling in case of spills
- Self-contained breathing apparatus must be provided where persons are exposed to oxygen deprived situations. TCE has heavy vapours that will collect in low poorly ventilated areas.

6.3 Environment

6.3.1 Air

The use of vapour degreasers, solvent recycling and solvent reclamation distillation units will greatly reduce air emissions from pre-conversion levels. However, oven liner cleaning will remain to be a high emission cold solvent cleaning application. Efforts should continue to reduce solvent loss in these cleaning applications.

6.3.2 Water

It is never acceptable to introduce halogenated industrial solvents to sanitary or storm water sewer systems as a means of disposal.

6.3.3 Soil

Halogenated industrial solvent should never be allowed to spill onto bare earth, asphalted roads or unsealed concrete. Their relative density allows them to sink below groundwater. This causes toxic contamination of community drinking water drawn from wells and hinders removal efforts.

6.3.4 Disposal

Evaporation served as the primary means of disposal for CTC. In addition to the environmental impact, this method is very wasteful from a financial perspective. Recycling and the use of reclamation stills will dramatically reduce cleaning costs but it will also introduce a more concentrated waste stream known as still bottoms. The disposal of still bottoms should be well planned. In some cases the solvent vendor will provide disposal services for a nominal fee.

7.0 Project Costs

The project cost refers to all costs including incremental recurring costs. As shown in Table 8, the total project cost of US$ 290,195 was calculated as the incremental capital cost of US$ 320,375 minus net incremental operating savings of US$ 30,180 for 4 years discounted at 10%.

7.1 Incremental Capital Cost

As given in Annex 1, the total incremental capital cost is US$ 320,375. The major components of this cost included technical cleaning process support, equipment support, and the purchase and installation of equipment to permit the conversion to TCE solvent and 10% contingency.

7.1.1 Cleaning Process and Equipment Support

HMT has two primary cleaning application, electrical motors and oxygen systems. As previously explained the change from CTC to TCE needs careful study and process standardisation. Material compatibility testing will be required to ensure TCE is not too aggressive for electrical components such as motor winding insulation. The ability to remove all traces of TCE from the different oxygen system components must be ensured. A standardised method must be developed and instituted to measure whether all TCE has been removed. If these conditions cannot be met then another solution will be required for large portions of the oxygen system that are cleaned in place. Standardised testing procedures need to be established and instituted to meet existing cleanliness standards.

Pre-commissioning of complex equipment should be carried out at the site of the Original Equipment Manufacturer (OEM) prior to shipment. Prior to shipment of equipment, batches of actual work-pieces from the factory should be sent to OEM to clean with the proposed alternative and returned to the factory to evaluate if it meets the cleanliness requirements. If the pieces are too heavy to transport, then the work pieces are to be simulated. An expert from the OEM should be present during the installation and start-up at the HMT plants. The existing engineers, operators and maintenance personnel will be trained in operating and maintaining the new equipment.

7.1.2 Technical Consultancy

Technical consultancy will be required to research, propose and document alternative selection. Equipment specifications will be required for the purchase of custom cleaning equipment described in Table 7. Also, staff training is required in safety, health and environmental aspects of TCE use.

7.1.3 Equipment to Purchase and Install

Equipment to be purchased is outlined in Table 7. The project includes funding to prepare the sites for equipment installation. Scope of this work includes providing a foundation with sealed containment, utilities, and existing equipment rearranges.

7.2 Incremental Operating Costs/Savings

If the project were not undertaken, the annual operating cost would be US$ 61,920. The annual operating cost of the implemented project will be US$ 52,400, resulting in annual operating savings of US$ 9,520. Given an equipment lifetime of 10 years and discount rate of 10%, the net value of the first 4 years of incremental operating savings is US$ 30,180. The details are provided in Annex 2.

7.3 Revenues
This project provides HMT with US$ 9,520 in annual incremental operating savings.

7.4 Local Ownership Ratio
HMT is 100% Indian owned therefore, the total proposed Multilateral Fund financing is equal to the total project cost of US$ 290,195.

7.5 Exports
Exports are nil.

7.6 Proposed MLF grant
The proposed MLF grant for this project is calculated as follows:
To the total incremental capital cost (ICC) of US$ 320,375 was deducted the net present value of the incremental operating savings over the first 4 years of the project, which is US$ 30,180. The sum was then multiplied by the 100% Indian ownership ratio of HMT, to yield the resultant grant of US$ 290,195. There are no exports to non-Article 5 countries so the grant remains at US$ 290,195.

7.7 MLF Grant Calculation

Table 8: Total Project Grant

Cost / Plant	ICC	ICC contingency	ICC total	IOC	NPV of 4 years IOC	Total Project Cost
HMT	291,250	29,125	320,375	-9,520	-30,180	290,195

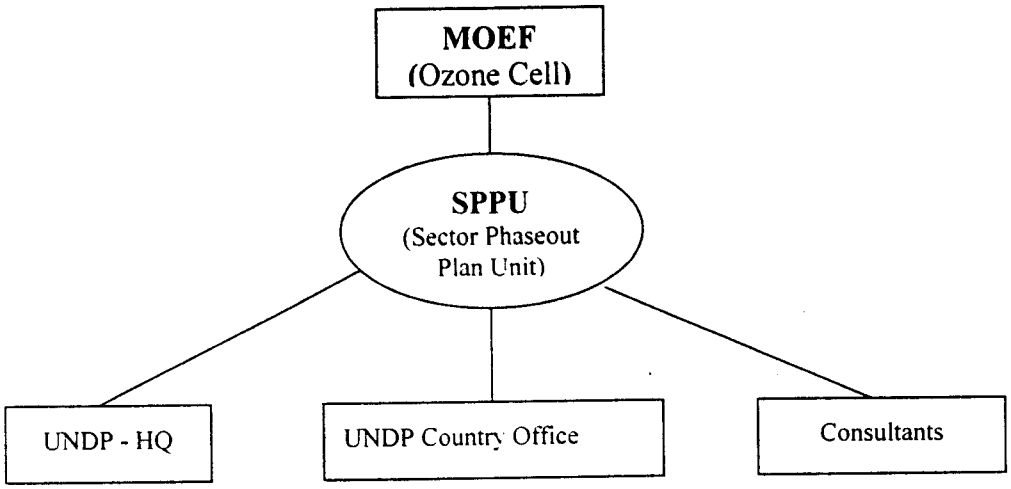
7.8 Financing Plan
MLF funding is a grant and is limited to the incremental capital costs and operational savings as calculated above.

8.0 Project Implementation
The project will be carried out at HMT.

8.1 Required Regulatory Action
No regulatory action, other than routine permitting, will be required to implement this project.

8.2 Direct Project Impacts
The project will eliminate annually 48 metric tonnes and 53 ODP tonnes from HMT.

8.3 Project Management and Implementation
Ozone Cell, Ministry of Environment and Forest will administer the Project, an allocation has been allocated to facilitate management coordination, monitoring and performance verification responsibilities of the MoEF. As designated by the Government of Japan, with the concurrence of the Government of India, UNDP will implement this project under Direct Execution (DEX) modality. In close coordination with the Ozone Cell and the Sector Plan Phase-out Unit (SPPU), UNDP India Country Office and Montreal Protocol Unit will undertake all phase out activities at these four enterprises. As such, the programme will be implemented using the following structure:



The attached Operational Mechanism for Implementation (OMI) developed under IND/02/G66 – Foam Sector Phase-out Plan and IND/03/G62 – Refrigeration (Manufacturing) Sector Phase-out Plan that has been successfully applied to facilitate implementation of these two sector plans, will serve as a framework for implementation of UNDP activities under this project, to the extend relevant and applicable, generally in line with the role and responsibilities of various actors as described in the OMI.

8.4 Implementation Schedule

TASK	2004												2005											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1 a) MLF approval & funding				X																				
b) Financial appraisal				X																				
c) sub-grant agreement						X																		
2. a) Equipment. Specification						X	X	X																
b) Equipment. Selection								X	X	X														
c) Equipment Procurement										X	X	X	X	X										
d) Installation														X	X	X								
3 a) Trial & start up																X	X	X						
b) Training Certification																		X	X	X				
4 a) First disbursement														X	X	X								
b) Second disbursement																	X	X	X					
c) Final disbursement																				X	X	X		
5 Report submission																							X	X

8.5 Milestones for Project Monitoring

ACTIVITY	No later than
Grant Agreement submitted to beneficiary	June 2004
Grant Agreement signature	July 2004
Bids prepared and requested	July 2004
Contracts awarded	November 2004
Equipment delivered	April 2005
Commissioning and trial runs	June 2005
De-commissioning and/or destruction of redundant baseline equipment	August 2005
Submission of project completion report (needed to satisfy the requirements for project completion reports)	December 2005

Annex 1: Incremental Capital Cost Calculations

Breakdown of Incremental Capital Cost

HMT ICC					
	Description of cost item	**Unit**	**Unit cost, (US$)**	**Quantity**	**Total cost, (US$)**
1	**Technical Cleaning Process and Equipment Support**				
1.1	Material compatibility testing, Cleaning process standardization, Reliability testing, Equipment commissioning and user training	set	3,000	1	3,000
1.2	Alternative research, proposal and documentation, Equipment specifications, Environmental, Health and Safety training	set	5,000	1	5,000
	Sub-total				**8,000**
2	**Equipment to Purchase and Install**				
2.1	**Product Cleaning**				
2.1.1	1.0m x 1.0m x 16.0m basket Vapour Degreaser (VD) with integrated still	ea	250,000	1	250,000
2.1.2	Hoist to load parts baskets	ea	5,000	1	5,000
2.1.3	Safety shower & eyewash	ea	500	1	500
2.1.4	Shop modifications (civil work)	ea	15,000	1	15,000
2.2	Transportation (approximately 5%)				12,750
	Sub-total				**283,250**
	Total				**291,250**
	Contingency, 10%				**29,125**
	Total investment cost, US$				**320,375**

Annex 2: Incremental Operating Cost Calculations

Breakdown of Incremental Operating Cost

HMT IOC						
	Description of cost item	**Unit**	**Unit cost, (US$)**	**Quantity**	**Pre-project total cost (US$)**	**Post-project total cost (US$)**
1.0	**Chemicals**					
1.1	CTC	kg	0.94	48,000	45,120	
1.2	Trichloroethylene, stabilised	kg	1.50	10,000		15,000
1.3	Stabiliser replenishment estimated at 0.5% of total solvent use.		40	50		2,000
1.4	Dräger tubes for workplace solvent exposure measurements (4/mo.)	ea	1	48		48
	Sub-total				**45,120**	**17,048**
2.0	**Electricity**					
2.1	1.0m x 1.0m x 16m basket Vapour Degreaser (VD) with integrated still, (1VD x 40kw x 0.66 run hr/hr x 16hrs/day x 300days)	kWh	0.115	126,720		14,573
2.2	Hoist to load parts baskets, (5kw x 1 hoist x 1.5 hrs/day x 300days)	kWh	0.115	2,250		259
	Sub-total					**14,832**
3.0	**Labour**					
3.1	Operator, CTC; 6 employees/shift, 2 shift/day, = 12 annual workers	annual worker	1,400	12	16,800	
3.2	Operator, TCE; 6 employees/shift, 2 shift/day, = 12 annual workers	annual worker	1,400	12		16,800
	Sub-total				**16,800**	**16,800**
4.0	**Personal Protection Equipment**					
4.1	Gloves ($5x20/mo), apron ($10x5 mo), safety glasses ($3x20/mo), and half mask respirator or cartridges ($20x 5 mo)	month	310	12		3,720
	Sub-total				**0**	**3,720**
TOTAL PRE- and POST-PROJECT COSTS/YEAR					**61,920**	**52,400**
TOTAL INCREMENTAL OPERATING SAVINGS/YEAR						**- 9,520**
NPV of 4 YEARS IOS at 10%						**- 30,180**

Annex 3: List of Equipment to be Destroyed for Project Completion

None

Standard annex to sub-programme documents for use in countries, which are not party to the Standard Basic Assistance Agreement (SBAA).

1. The standard text below must be attached to and will become an integral part of every sub-programme document to be signed by a Government, which has not yet signed the SBAA. The attachment of annex is a pre-condition to the approval of any new sub-programme in those countries, whether the approval takes place at headquarters of the field. It is the Resident Representative's responsibility to ensure that annexe is incorporated in all sub-programme documents prior to signature by the Government.

2. The regional bureaux are responsible for monitoring adherence to this required procedure. If a country refuses to sign the annex, this becomes a matter of policy that must be refereed to the Administrator.

3 Subsection 2.0, below, lists that Government, which have signed the SBAA. The standard annex to the sub-programme document set out below is required only if the country does not appear on this list.

1.0 Standard Text: Supplemental Provisions to the Sub-programme Document: The legal context

General responsibilities of the Government, UNDP and the executing agency

1. All phase and aspects of UNDP assistance to this sub-programme shall be governed by and carried out in accordance with the relevant and applicable resolutions and decisions of the competent United Nations organs and in accordance with UNDP policies and procedures for such sub-programmes, and subject to the requirements under UNDP Monitoring, Evaluation and Reporting System.

2. The Government shall remain responsible for this UNDP-assisted development sub-programme and the realisation of its objectives as described in this Sub-programme Document.

3. Assistance under this sub-programme document being provided for the benefit of the Government and the people of (the particular country or territory), the Government shall bear all risks of operations in respect of this sub-programme.

4. The Government shall provide to the sub-programme the national counterpart personnel training facilities, land, buildings, equipment and other required services and facilities. It shall designate the Government Co-operating Agency named in the cover page of this document (hereinafter referred to as the "Co-operations Agency"), which shall be directly responsible for the implementation of the Government contribution to the sub-programme.

5. The UNDP undertakes to complement and supplement the Government participation and will provide through the Executing Agency the required expert services, training, equipment and other services within the funds available to the sub-programme.

6. Upon commencement of the sub-programme the Executing Agency shall assume the responsibility for sub-programme execution and shall have the status of an independent contractor for this purpose. However, that primary responsibility shall be exercised in consultation with UNDP and in agreement with the Co-operating Agency Arrangements to this effect shall be stipulated in the Sub-programme Document as well as for the transfer of this responsibility to the Government or to an entity designated by the Government during the execution of the sub-programme.

7. Part of the Government's participation may take the form of cash contribution to UNDP. In such cases, the Executing Agency will provide the related services and facilities and will account annually to the UNDP and to the Government for expenditure incurred.

(a) Participation of the Government

1. The Government shall provide to the sub-programme the services, equipment and facilities in the quantities and at the time specified in the Sub-programme Document. Budgetary provision, either in kind or in cash, for the Government's participation so specified shall be set forth in the Sub-programme Budgets.

2. The estimated cost of items included in the Government contribution, as detailed in the Sub-programme Budget, shall be based on the best information available at the time of drafting the sub-programme proposal. It is understood that price fluctuations during the period of execution of the sub-programme may necessitate an adjustment of said contribution in monetary terms; the latter shall at all times be determined by the value of the services, equipment and facilities required for the proper execution of the sub-programme.

3. Within the given number of man-months of personnel services described in the sub-programme document, minor adjustments of individual assignments of sub-programme personnel provided by the Government, may be made in consultation with the Executive Agency, if this is found to be in the best interest of the sub-programme. UNDP shall be so informed in all instances where such minor adjustments involve financial implications.

4. The Government shall continue to pay the local salaries and appropriate allowances of national counterpart personnel during the period of their absence from the sub-programme while on UNDP fellowships.

5. The Government shall defray any customs duties and other charges related to the clearance of sub-programme equipment, its transportation, handling, storage and related expenses within the country. It shall be responsible for its installation and maintenance, insurance and replacement, if necessary, after delivery to the sub-programme site.

6. The Government shall make available to the sub-programme - subject to existing security provisions - any published and unpublished reports, maps, records and other data, which are considered necessary to the implementation of the sub-programme.

Patent rights, copyrights and other similar rights to any discoveries or work resulting from UNDP assistance in respect of this sub-programme shall belong to the UNDP

Unless otherwise agreed by the parties in each case, however, the Government shall have the right to use any such discoveries or work within the country free of royalty and any charge of similar nature.

8. The Government shall assist all sub-programme personnel in finding suitable housing accommodation at reasonable rents.

9. The services and facilities specified in the Sub-programme Document which are to be provided to the sub-programme by the Government by means of a contribution in cash shall be set forth in the sub-programme Budget. Payment of this amount shall be made to the UNDP in accordance with the Schedule of Payments by the Government.

10. Payment of the above mentioned contribution to the UNDP on or before the dates specified in the Schedule of Payments by the Government is a prerequisites to the commencement or continuation of sub-programme operations.

(b) Participation of the UNDP and the executing agency

1. The UNDP shall provide to the sub-programme through the Executing Agency the services, equipment and facilities described in the Sub-programme Document. Budgetary provision for the UNDP contribution as specified shall be set forth in the Sub-programme Budget

2. The Executing Agency shall consult with the Government and UNDP on the candidature of the Sub-programme Manager* who, under the direction of the Executing Agency, will be responsible in the country for the Executing Agency's participation in the sub-programme. The Sub-programme Manager shall supervise the experts and other agency personnel assigned to the sub-programme, and the on-the-job training of national counterpart personnel. He shall be responsible for the management and efficient utilisation of all UNDP-financed inputs, including equipment provided to the sub-programme.

3. The Executing Agency, in consultation with the Government and UNDP, shall assign international staff and other personnel to the sub-programme6 as specified in the sub-programme Document. select candidates for fellowships and determine standards for the training of national counterpart personnel.

4. Fellowships shall be administered in accordance with the fellowship regulations of the Executing Agency.

5. The Executing Agency may, in agreement with the Government and UNDP, execute part or all of the sub-programme by subcontract. The selection of subcontractors shall be made, after consultation with the Government and UNDP, in accordance with the Executing Agency's procedures.

6. All material, equipment and supplies which are purchased from UNDP resources will be used exclusively for the execution of the sub-programme, and will remain the property of the UNDP in whose name it will be held by the Executing Agency. Equipment supplied by the UNDP shall be marked with the insignia of the UNDP and of the Executing Agency.

7. Arrangements may be made, if necessary, for a temporary transfer of custody of equipment to local authorities during the life of the sub-programme, without prejudice to the final transfer.

8. Prior to completion of UNDP assistance to the sub-programme, the Government, the UNDP and the Executing Agency shall consult as to the disposition of all sub-programme equipment provided by the UNDP. Title to such equipment shall normally be transferred to the Government, or to an entity nominated by the Government, when it is required for continued operation of the sub-programme or for activities following directly therefrom. The UNDP may, however, at its discretion, retain title to part or all of such equipment.

9. At an agreed time after the completion of UNDP assistance to the sub-programme, the Government and the UNDP, and if necessary the Executing Agency, shall review the activities continuing from or consequent upon the sub-programme with a view to evaluating its results.

10. UNDP may release information relating to any investment oriented sub-programme o potential investors, unless and until the Government has requested the UNDP in writing to restrict the release of information relating to such sub-programme.

May also be designated Sub-programme Co-ordinator or Chief Technical Adviser, as appropriate.

Rights, Facilities, Privileges and Immunities

1. In accordance with the Agreement concluded by the United Nations (UNDP) and the Government concerning the provision of assistance by UNDP, the personnel of UNDP and other United Nations Organisation associated with the sub-programme shall be accorded rights, facilities, privileges and immunities specified in said Agreement.

The Government shall grant UN volunteers, if such services are requested by the Government, the same rights, facilities, privileges and immunities as are granted to the personnel of UNDP.

3. The Executing Agency's contractors and their personnel (except nationals of the host country employed locally) shall:

(a) Be immune from legal process in respect of all acts performed by them in their official capacity in the execution of the sub-programme;

(b) Be immune from national service obligations;

(c) Be immune together with their spouses and relatives dependent on them from immigration restrictions;

(d) Be accorded the privileges of bringing into the country reasonable amounts of foreign currency for the purposes of the sub-programme or for personal use of such personnel, and of withdrawing any such amounts brought into the country, or in accordance with the relevant foreign exchange regulations, such amounts as may be earned therein by such personnel in the execution of the sub-programme; and

(e) Be accord together with their spouses and relatives dependent on them the same repatriation facilities in the event of international crisis as diplomatic envoys.

4. All personnel of the Executing Agency's contractors shall enjoy inviolability for all papers a documents relating to the sub-programme.

5. The Government shall either exempt from or bear the cost of any taxes, duties, fees or levies which it may impose on any firm or organisation which may be retained by the Executing Agency and on the personnel of any such firm or organisation, except for nationals of the host country employed locally, in respect of:

(a) The salaries or wages earned by such personnel in the execution of the sub-programme;

(b) Any equipment of the sub-programme or which, after having been brought into the country, may be subsequently withdrawn therefrom;

(c) Any substantial quantities of equipment, materials and supplies obtained locally for the execution of the sub-programme, such as, for example, petrol and spare parts for the operation and maintenance of equipment mentioned under (b), above, with the provision that the types and approximate quantities to be exempted and relevant procedures to be followed shall be agreed upon with the Government and, as appropriate, recorded in the Sub-programme Document; and

(d) As in the case of concessions currently granted to UNDP and Executing Agency's personnel, any property brought, including one privately owned automobile per employee, by the firm or organisation or its personnel for their personal use or consumption or which after having been brought into the country, may subsequently be withdrawn therefrom upon departure of such personnel.

6. The Government shall ensure

(a) Prompt clearance of experts and other persons performing services in respect of this sub-programme; and

(b) The prompt release from customs of:

(i) Equipment, materials and supplies required in connection with this sub-programme; and

(ii) Property belonging to and intended for the personal use or consumption of the personnel of the UNDP, its Executing Agencies, or other persons performing services on their behalf in respect of this sub-programme. except for locally recruited personnel.

7. The privileges and immunities referred to in the paragraph above, to which firm or organisation and its personnel may be entitled, may be waived by the Executing agency where, in its opinion or in the opinion of the UNDP, the immunity would impede the course of justice and can be waived without prejudice to the successful completion of the sub-programme or to the interest of the UNDP or the Executing Agency.

8. The Executing Agency shall provide the Government through the Resident Representative with the list of the personnel to whom the privileges and immunities enumerated above shall apply.

9. Nothing in this Sub-programme Document or Annex shall be construed to limit the rights, facilities, privileges or immunities conferred in any other instrument upon any person, natural or juridical, referred to hereunder.

Suspension or termination of assistance

1. The UNDP may be written notice to the Government and to the Executing Agency concerned to suspend its assistance to any sub-programme if in the judgement of the UNDP any circumstance arises which interferes with or threatens to integration of the successful completion of the sub-programme or the accomplishment of its purpose UNDP may, in the same or subsequent written notice, indicate the under which it is prepared to resume its assistance to the sub-programme. Any such suspension shall continue until such time as such conditions are accepted by the Government and as the UNDP shall give written notice to the Government and the Executing Agency that is prepared to resume its assistance.

2. If any situation referred to in paragraph 1, above, shall continue for a period of fourteen days after notice thereof and of suspension shall have been given by the UNDP to the Government and the Executing Agency, then at any time thereafter during the continuance thereof, the UNDP may be written notice to the Government and the Executing Agency terminate the sub-programme.

3. The provisions of this paragraph shall be without prejudice to any other rights or remedies the UNDP may have in the circumstances, whether under general principles of law or otherwise.