CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Biomass Fired Thermic Fluid Heater

Version 01

15/05/2008

A.2. Description of the small-scale project activity:

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The project activity aims to reduce greenhouse gas emissions through the replacement of a furnace oil fired thermic fluid heater with a biomass fired thermic fluid heater. The thermic fluid is used to supply heat primarily for heating and drying operations in the manufacturing process of Work Wear Lanka (Pvt) Ltd. In the pre-project scenario, heat was supplied to the thermic fluid through the combustion of furnace oil in the thermic fluid heater. After implementation of the project activity, the combustion of saw dust has been used to heat the thermic fluid in the new biomass fired thermic fluid heater. The saw dust used as fuel, is available through various saw mills in the vicinity of the project activity. In the absence of the project activity the saw dust would be disposed as solid waste.

The project activity is promoted by Work Wear Lanka (Pvt.) Ltd (WWL). The company was established in 1995 and is in the business of manufacturing industrial gloves, laminated gloves, leather gloves, and sports gloves. The manufacturing process is energy intensive and requires a large amount of heat energy for the curing of latex and special nitrile material. This demand for heat energy is met by a single thermic fluid heater. In order to displace fossil fuel consumption and thereby reduce greenhouse gas emissions, WWL has installed a biomass fired thermic fluid heater for supplying heat to the manufacturing process.

WWL has implemented the project activity keeping in mind aspects of sustainable development. The project activity makes the following contributions to sustainable development in Sri Lanka:

Socio-Economic Benefits

1. The surrounding saw mills generate more business from sale of saw dust which would otherwise be disposed. Therefore, employees of the saw mills in the vicinity of the project activity benefit from an additional source of revenue.
2. Local contractors for installation of equipment, electrical works, and civil works benefit from increased business.
3. The country saves foreign currency due to reduced import of oil.

Environmental Benefits

4. There is less solid waste generation from saw mills supplying biomass to the project activity. The local environment and surrounding communities benefit from reduced disposal of solid waste in rivers and/or on beaches.
5. Less consumption of furnace oil leads to a reduction of NOx and SOx pollutants. These pollutants are known to contribute to acid rain.

Technological Benefits

6. The technology utilized in the project activity, namely the biomass thermic fluid heater, is an environmentally-friendly technology. The technology has been designed to meet the process heat requirements of WWL through consumption of renewable biomass.

A.3. Project participants:

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Name of Party involved (host indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Sri Lanka (Host Country)	Work Wear Lanka (Pvt.) Ltd. (Private Entity)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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The small scale project activity is located in the manufacturing facility of Work Wear Lanka (Pvt.) Ltd. at No: # 78, Biyagama Export Processing Zone, Walgama, Malwana, Sri Lanka.

A.4.1.1. Host Party(ies):

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The host party for the project activity is Sri Lanka.

A.4.1.2. Region/State/Province etc.:

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Gampaha District, Western Province

A.4.1.3. City/Town/Community etc:

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Malwana

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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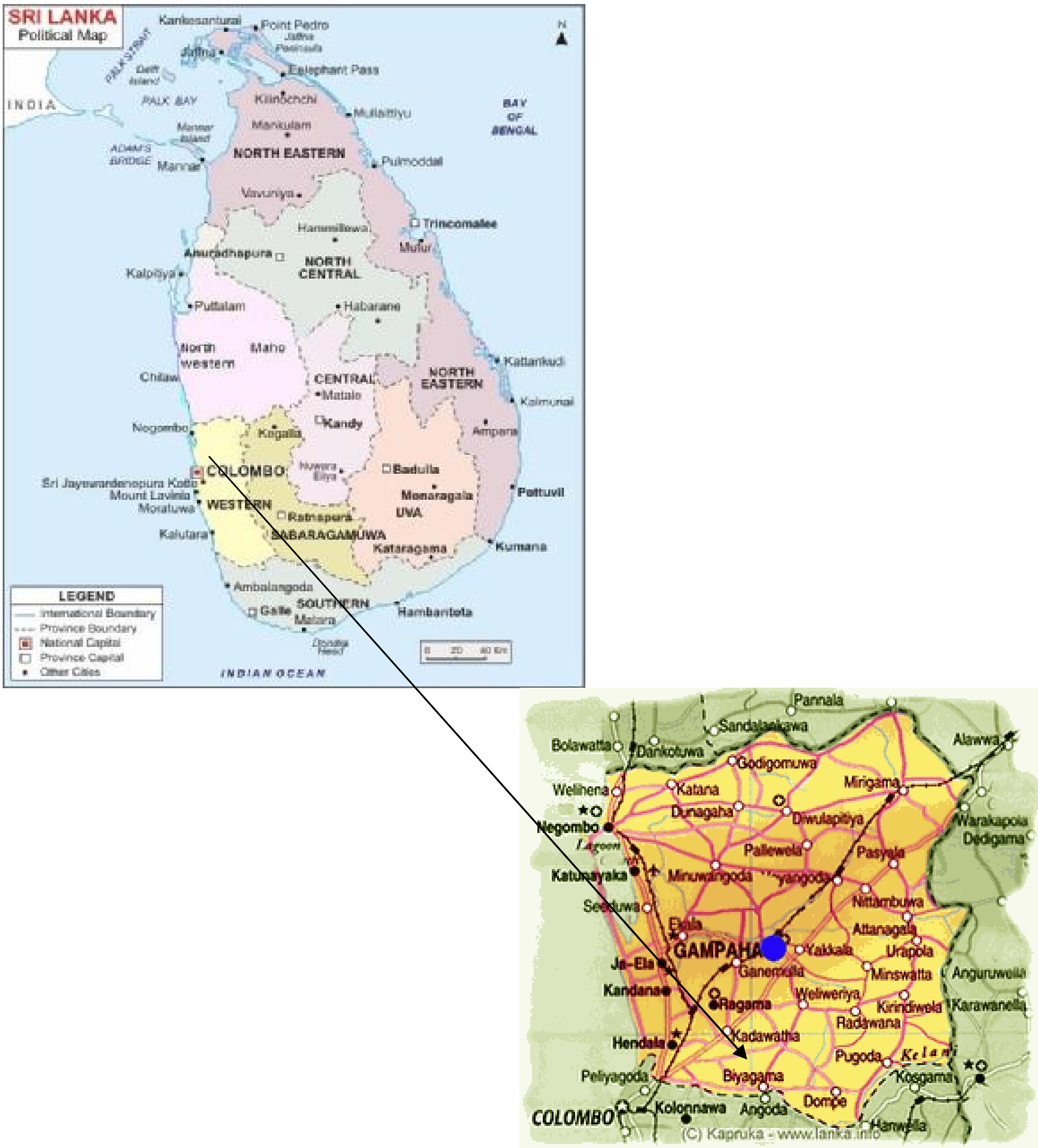
The project activity is located at the manufacturing facility of WWL. The coordinates for the location are latitude 6°57’ north and longitude 80°00’ east. The project activity is located in the town of Malwana, which is 14 kilometres north-west of the Sri Lankan capital, Colombo. The nearest airport to the project activity is Bandaranaike International Airport in Colombo. The location of the project activity has been identified in the maps below.



A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

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Type and category of the project activity

The project activity is classified as Type I: Renewable energy projects, and Category C: Thermal energy for user, as per Appendix B of the 'Simplified modalities and procedures for small-scale clean development mechanism project activities.'

Technology/measure of the project activity

The technology employed in the project activity is a biomass fired thermic fluid heater. The technology has been obtained from India. The following are the components of the main unit:

- Radiant heater exchanger with single helical vertical coil
- Convection heat exchanger consisting of two concentric helical coils
- Interconnecting MS duct in-between radiant and convective coil
- Combustion furnace
- Saw dust feeding system consisting of fuel transfer fan, rotary feeder, service hopper, conveying pipes and venturi feeder
- Bucket elevator of 1TPH capacity to handle sawdust from ground to fuel feeding hopper

The following are the technical specifications of the heater as given by the manufacturer:

Parameter	Unit	Specification
Heater Model		VTB-15
Heater Output	KCal/hr	1,500,000
Saw dust consumption	Tonnes/hr	670
Maximum thermic fluid outlet temperature	°C	280
Thermal Oil Flow	m^3/hr	110
Circuit pressure available	Mlc	38
Stack Temperature	°C	210-220

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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Year	Estimation of annual emission reductions in tonnes of CO_2e
2008 - 2009	4,740
2009 – 2010	4,740
2010 – 2011	4,740
2011 – 2012	4,740
2012 – 2013	4,740
2013 – 2014	4,740
2014 – 2015	4,740
2015 – 2016	4,740
2016 – 2017	4,740
2017 – 2018	4,740
Total estimated reductions (tonnes of CO_2e)	**47,400**
Total number of crediting years	Ten
Annual average of the estimated reductions over the crediting period (tonnes of CO_2e)	**4,740**

A.4.4. Public funding of the small-scale project activity:

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There is no public funding for the small-scale project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

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As per Appendix C of "Simplified modalities and procedures for small-scale CDM project activities", the project activity is not a de-bundled component of a large project activity as there are no registered small-scale CDM activities, nor any application to register another small-scale CDM activity by the same project participant of the same technology or measure (transport) within the last 2 years and located within 1 km of the project boundary.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

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Title: AMS I.C “Thermal energy for the user with or without electricity” Version 13

Reference: Appendix B of the Simplified modalities and procedures for small-scale CDM project activities – Indicative Simplified Baseline and Monitoring Methodologies for selected small-scale CDM project activity categories.

B.2 Justification of the choice of the project category:

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The applicability of AMS IC to the project activity is explained in the table below:

Applicability Condition	Eligibility
This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels.	The project activity utilizes biomass (saw dust) which is a renewable source of energy, displacing furnace oil consumption. The biomass is fired in a thermic fluid heater to produce thermal energy.
Where thermal generation capacity is specified by the manufacturer, it shall be less than 45 MW.	The thermal generation capacity for the thermic fluid heater is 1.7 MW[1]. The eligibility criterion is met.
For co-fired systems the aggregate installed capacity (specified for fossil fuel use) of all systems affected by the project activity shall not exceed 45 MWth.	The project activity is not a co-fired system. This condition does not apply. However as stated above, the thermal capacity of the thermic fluid heater is less than 45 MW.
In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should be lower than 45	The project activity does not involve the addition of renewable energy units at an existing renewable energy facility.

[1] Thermal generation capacity = 1.5 Million kcal/hr * 4.1868/3600/1000

= 1.7445 MW

MWth and should be physically distinct from the existing units.	

As the applicability criteria for AMS IC at met by the project activity, the choice of the project category is justified.

B.3. Description of the project boundary:

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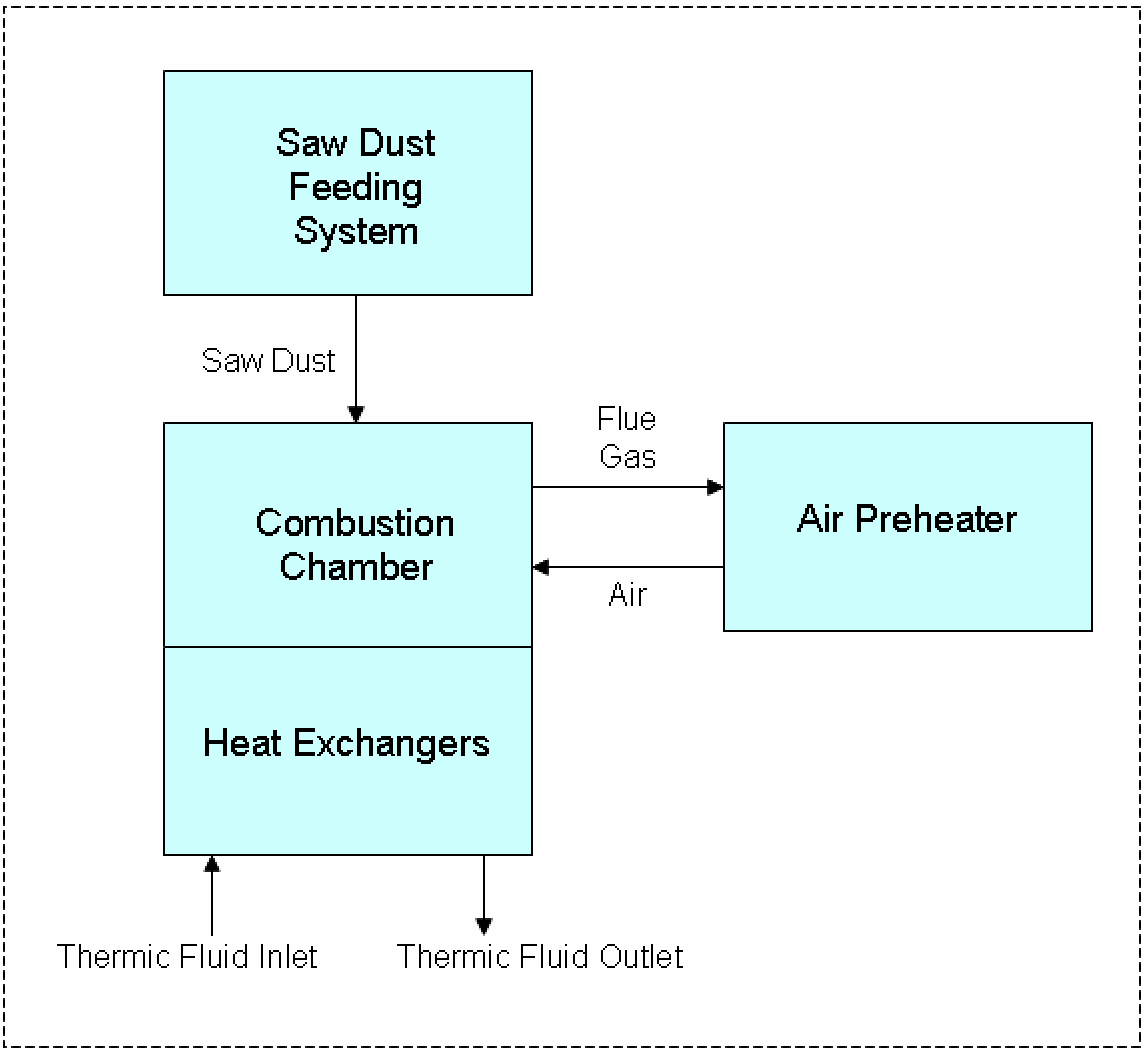
As per AMS I.C, the boundary consists of the physical geographical site of the renewable energy generation. The project boundary encompasses the biomass fired thermic fluid heater, which includes the combustion furnace, air pre heater, heat exchangers, and the saw dust feeding system. A schematic of the project boundary is shown below:



B.4. Description of baseline and its development:

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As per AMS I. C 'For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used.'

In the project activity, biomass consumption is replacing furnace oil consumption, and the baseline is the furnace oil consumption that would have taken place in the absence of the project activity times the emission coefficient for furnace oil displaced. The baseline scenario is therefore continuation of practices in place prior to implementation of the project activity for supplying heat. As per AMS IC, for heat produced using fossil fuels the baseline emissions are calculated as follows:

$$BE_y = \frac{HG_y \cdot EFCO_2}{\eta_{th}}$$

Where,

BEy = the baseline emissions from steam/heat displaced by the project activity during the year y in tCO_2e

HGy = the net quantity of steam/heat supplied by the project activity during the year y in TJ

EF CO_2 = the CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO2 / TJ), obtained from reliable local or national data if available, or otherwise taken as IPCC default emission factor

η_{th} = the efficiency of the plant using fossil fuel that would have been used in the absence of the project activity

The net quantity of heat supplied by the project activity is computed as the enthalpy difference across the heater (Method A) and also using the ratio of fuel consumption to specific fuel consumption (Method B). The lower of the two values are adopted for determination of baseline emissions.

Method A: Calculation of heat supplied to the project activity, using enthalpy difference

$$HG_y = \frac{M_{thermicfluid} \cdot Cp_{thermicfluid} \cdot \Delta T_{thermicfluid}}{1 \times 10^{12}}$$

Where

$M_{Thermic\ fluid}$ = Mass flow rate of thermic fluid in kg/year

$Cp_{Thermic\ fluid}$ = Specific heat of thermic fluid J/kg/°C

$\Delta T_{Thermic\ fluid}$ = Average temperature difference across the heater °C

Method B: Calculation of heat supplied to the project activity, using specific fuel consumption:

$$HG_y = \frac{FC_{sawdust,y}}{SFC_{sawdust}}$$

Where

$FC_{sawdust,y}$ = Consumption of saw dust in the project activity in year y, tonnes

$SFC_{sawdust}$ = Specific fuel consumption of saw dust, tonnes/TJ

The efficiency of the baseline thermic fluid heater is determined ex-ante as the highest measured efficiency of a unit with similar specifications. In this case the efficiency of the furnace oil fired thermic fluid heater which was supplying heat to the process prior to implementation of the project activity has been applied.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

As per Attachment A to Appendix B of the Simplified modalities and procedures for small-scale CDM project activities, project participants must provide an explanation to show how the GHG emission reductions are additional to those that would have occurred in the absence of the project activity. The existence of an investment barrier, technological barrier, barrier due to prevailing practice, and/or other barriers must be demonstrated to explain how the emission reductions are additional.

The project activity involves the installation of a biomass fired thermic fluid heater to supply thermal energy to the manufacturing process of WWL. In the absence of the project activity the furnace oil fired thermic fluid heater would have continued to supply heat. The project faces the following barriers to implementation:

Technological Barrier

The following are primary differences between the technology employed in the project activity to conventional furnace oil fired thermic fluid heaters.

- **Quantity of fuel**: As quantity of biomass fuel required for supplying heat in the project activity is much greater than the quantity of furnace oil required in the baseline scenario.
- **Movement of fuel**: Whereas furnace oil is a liquid fuel which can easily be pumped into the combustion furnace, saw dust is a solid fuel and must be delivered on a continuous basis to the heater through an elaborate saw dust feeding system.
- **Ash removal**: The combustion of saw dust leads to the production of ash which must be removed from the combustion furnace via the ash removal doors. This facility was not required in the furnace oil fired heater.

A significant challenge faced by the management of WWL was the logistics requirements for switching to biomass fuel. In comparison to furnace oil, the calorific value of saw dust is low. Therefore the amount of fuel required to generate the same amount of thermal energy is much higher. Whereas the consumption of furnace oil in the pre-project scenario was 2500 Liters per day (or 2 tonnes per day), the saw dust consumption in the project activity is on the level of 12-13 tonnes per day. As a consequence the amount of material which must be stored, handled, and monitored on a continuous basis is much higher in the project activity.

The storage requirements for biomass fuel are significantly different from that of furnace oil. In the case of furnace oil, the fuel is pumped directly from the delivery vehicles to storage vessels. However in the case of saw dust, the biomass is supplied in jute bags which are unloaded and placed in a specially designated warehouse. The warehouse must be sufficiently large to hold biomass required for 5-6 weeks (60-72 tonnes) to ensure continuous supply to the thermic fluid heater. It was necessary to construct as separate storage shed for the biomass fuel to ensure the required storage conditions. The construction of the storage shed necessitated additional resource allocation and engagement of civil contractors.

The requirements for handling and monitoring of the biomass fuel are also more elaborate than that for furnace oil. The furnace oil is supplied to the thermic fluid heater on a continuous basis through pumps and conveying pipes. As saw dust is a solid fuel, it must be loaded via a bucket elevator mechanism into the saw dust feeding system, which includes a, service hopper, fuel transfer fan, rotary feeder, conveying pipes and venturi feeder. It is necessary for the system to supply biomass on a continuous basis so that the operating conditions of the heater remain constant and the quantity of heat supplied to the thermic fluid does not fluctuate. Any lapse in the supply of biomass fuel to the thermic fluid heater could adversely affect curing operations in the manufacturing process of WWL and result in decreased efficiency and business losses. Therefore monitoring the movement of biomass from storage through the feeding system to the heater is essential. In comparison to the feeding system for furnace oil, the saw dust feeding system is more complex and necessitates the constant attention of operation staff.

Apart from the additional requirements for handling and monitoring of fuel in comparison to the baseline, the maintenance requirements are also greater for the project activity. A biomass fired thermic fluid heater requires periodical maintenance at a higher frequency than that required for furnace-oil fired heaters. Whereas, a furnace oil fired heater may run for more than 90 days at a stretch, the project heater needs to undergo maintenance procedures every month. Furthermore, biomass fired heaters produce ash at approximately 3% of the feed weight. This ash has to be removed and safely disposed on a daily basis.

The resources, man-power, planning, and technical know-how required for operation and maintenance of the biomass heater is a definite barrier for the project activity. The CDM project activity has been designed to overcome this barrier through CDM revenues.

Common Practice Barrier

There are presently no manufacturers in Sri Lanka of the technology employed in the project activity. The technology is imported from India and supplied by Thermax Limited. The majority of industries in Sri Lanka derive energy from the combustion of furnace oil. For WWL, the decision to shift from a furnace oil based heater to a biomass based heater was not business as usual.

The project activity is a first of its kind as prior to the project activity there were no businesses in Sri Lanka that were meeting their energy needs using saw dust. As explained in the technological barrier section, specific operational/technological challenges have to be managed in order to ensure smooth functioning of the biomass fired thermic fluid heater in line with the thermal energy requirements. As WWL did not have prior experience with biomass based thermal equipment and the technology was not widely used in Sri Lanka, the project activity is not business as usual. The management of WWL proceeded with implementation of the project despite the barrier, after factoring in aspects of sustainable development and environmental responsibility.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The following table lists the equations used for the estimation of emission reductions in accordance with AMS IC:

Parameter	Equations/Method Used	Methodological choices
Baseline emissions, BEy	$BE_y = \frac{HG_y \cdot EFCO_2}{\eta_{th}}$	The methodology lists different options for calculating baseline emission depending on whether the baseline involves production of heat/steam from fossil fuels, a cogeneration unit consuming fossil fuels, or an existing renewable energy production facility. In this case the baseline is heat produced using fossil fuels and calculations are as per paragraph 10 of AMS IC.
Net quantity of heat supplied by the project activity,	$HG_y = \frac{M_{thermicfluid} \cdot Cp_{thermicfluid} \cdot \Delta T_{thermicfluid}}{1 \times 10^{12}}$	As the project activity involves a thermic fluid heater, the heat supplied is determined as the

HGy	Where $M_{thermicfluid,y} = Q_{thermicfluid,y} \cdot \rho_{thermicfluid}$ OR $HG_y = \frac{FC_{sawdust}}{SFC_{sawdust}}$	enthalpy difference in the thermic fluid across the heater. However, as specified in AMS IC, heat supplied is also determined using fuel consumption and specific fuel consumption (fixed ex-ante). The lower of the two values for HG_y will be adopted for calculation of baseline emissions.
EF CO_2	Default IPCC CO_2 emission factor for furnace oil	The CO_2 emission factor for the fuel that would have been used in the baseline plant may be obtained from local or national data if available. Otherwise, default IPCC CO2 emission factors can be used.
Efficiency of baseline plant, η_{th}	Highest measured efficiency of a unit with similar specifications	Three options are available for determination of efficiency used in the computation of baseline emissions. The options are (a) the highest measured efficiency of a unit with similar specifications, (b) the highest of the efficiency values provided by two or more manufacturers for units with similar specifications, and (c) maximum efficiency of 100%. Since data from the furnace oil fired thermic fluid heater is directly available with the project proponent, the highest measured

		efficiency can be used as the efficiency of the baseline plant.
Project Emissions, PEy	NA	The methodology does not provide options for calculation of project emissions. Since project activities in this category make use of renewable sources of energy, there are no project emissions.
Leakage, Ly	Leakage is not considered as the equipment was not transferred to or from another activity. Also the availability of saw dust is more than 25% in excess of the consumption of saw dust in the region, including that of the project activity. It has been demonstrated that the generation of saw dust from 22 saw mills within a 20 km radius from the project site amounts to 34.5 tons per day. Prior to the project activity, saw dust from these mills did not have any commercial use and was disposed as solid waste. The saw dust requirements for the project activity are up to 13 tons a day. Hence the surplus availability of biomass is at least 62% of the total biomass available in the vicinity of the project activity.	The methodology states in paragraph 16 that leakage is to be considered if the generating equipment is transferred from another activity or if the existing equipment is transferred to another activity.. In addition to AMS IC, attachment C to appendix B of the 'Indicative simplified baseline and monitoring methodologies for small-scale project activities', provides guidance on leakage in biomass project activities. As the project activity makes use of biomass wastes from saw mills, paragraphs 17 and 18 are applicable. Leakage from competing uses for the biomass can be neglected when it is demonstrated that the quantity of

		available biomass in the region is at least 25% larger than the quantity of biomass utilized including the project activity.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	η_{th}
Data unit:	-
Description:	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity
Source of data used:	Plant logbooks
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	As stated in AMS IC, the baseline efficiency can be determined as the highest measured efficiency of a unit. The highest measured efficiency of the pre-project thermic fluid heaters is used to determine baseline efficiency.
Any comment:	-

Data / Parameter:	$EFCO_2$
Data unit:	Kg CO_2 / TJ
Description:	The CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 2.2, Page 2.16
Value applied:	77,400
Justification of the choice of data or description of	As per AMS IC, the default IPCC emission factor is to be used if reliable local or national data is not available. The fuel that would have been used in the baseline plant is fuel oil.

measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	$\mathbf{SFC_{sawdust}}$
Data unit:	Tonnes/TJ
Description:	The specific fuel consumption for saw dust used in the project activity
Source of data used:	Manufacturer's specifications for biomass fired thermic fluid heater
Value applied:	106.68
Justification of the choice of data or description of measurement methods and procedures actually applied :	The specific fuel consumption for saw dust is specific to the biomass fired heater, which has been customized by the manufacturer for the project heater. The manufacturer's specifications for consumption rate of saw dust and corresponding heat generation has been used to determine specific fuel consumption.
Any comment:	

Data / Parameter:	$\mathbf{Cp_{sawdust}}$
Data unit:	KJ/kg/°C
Description:	Specific heat of thermic fluid
Source of data used:	Manufacturer's specifications for thermic fluid
Value applied:	2.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The standard value for specific heat of the thermic fluid at 200°C a per the manufacturer has been applied.
Any comment:	-

Data / Parameter:	$\rho_{thermicfluid}$
Data unit:	Kg/m^3
Description:	Density of thermic fluid
Source of data used:	Manufacturer's specifications for thermic fluid
Value applied:	770
Justification of the choice of data or description of measurement methods and procedures actually applied :	The standard value for density of the thermic fluid at 200°C as per the manufacturer has been applied.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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Emission reductions have been estimated based on the equations described in section B.6.2. As the baseline emissions are calculated based on the heat supplied by the project activity, the actual baseline emissions will be determined ex-post. Estimation of the emission reductions are detailed below:

Emission reductions are calculated as below:

$ER_y = BE_y – PE_y – L_y$

Where

ER_y = emission reductions

BE_y = baseline emissions in the year y

PE_y = project emissions in the year y

L_y = leakage in the year y

Baseline emissions

The following equation is used for calculation of baseline emissions:

$$BE_y = \frac{HG_y \cdot EFCO_2}{\eta_{th}}$$

Where,

BEy = the baseline emissions from steam/heat displaced by the project activity during the year y in tCO2e.

HGy = the net quantity of heat supplied by the project activity during the year y in TJ.

EF CO_2 = the CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO2 / TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.

η_{th} = the efficiency of the plant using fossil fuel that would have been used in the absence of the project activity

The heat supplied to the project activity is determined as the lower of the following two computations:

Method A: Calculation of heat supplied to the project activity, using enthalpy difference

$$HG_y = \frac{M_{thermicfluid} \cdot Cp_{thermicfluid} \cdot \Delta T_{thermicfluid}}{1 \times 10^{12}}$$

Where

$M_{Thermic\ fluid}$ = Mass flow rate of thermic fluid (kg/year)

= Thermic fluid flow rate x density of thermic fluid x hours of operation

$Cp_{Thermic\ fluid}$ = Specific heat of thermic fluid (J/kg/°C)

$\Delta T_{Thermic\ fluid}$ = Average temperature difference of the thermic fluid across the heater (°C)

Method B: Calculation of heat supplied to the project activity, using specific fuel consumption:

$$HG_y = \frac{FC_{sawdust,y}}{SFC_{sawdust}}$$

Where

$FC_{sawdust,y}$ = Consumption of saw dust in the project activity in year y, tonnes

$SFC_{sawdust}$ = Specific fuel consumption of saw dust, tonnes/TJ

Project Emissions

As explained in section B.6.1 there is no project emissions due to the project activity.

Leakage

As explained in section B.6.1 there is no leakage from transfer of equipment to or from the project activity. There is also no leakage from competing uses of biomass in the project activity.

The following table summarizes the values applied to the parameters used in estimation of emission reductions.

Parameter	**Value Applied**	**Units**	**Source**
Mass flow rate of thermic fluid, $M_{Thermic\ fluid}$	660,660,000	Kg/year	Calculated from estimated flow rate, operating hours and density of thermic fluid
Density of thermic fluid, $\rho_{thermicfluid}$	770	Kg/m^3	Manufacturer's specifications
Operating hours	7800	Hours	
Flow rate of thermic fluid	110	m^3/hour	Manufacturer's specifications
Specific heat of thermic fluid, $Cp_{Thermic,\ fluid}$	2500	J/(kg*°C)	Manufacturer's specifications
Temperature difference across heater, $\Delta T_{Thermic\ fluid}$	31.88	°C	Logsheets
Fuel consumption, $FC_{sawdust}$	5226	Tonnes/year	
Specific fuel consumption, $SFC_{sawdust}$	106.68	Tonnes/TJ	Manufacturer's specifications
Heat supplied to project activity during year y as calculated using method A	52.65	TJ/year	Calculated as product of mass flow rate, specific heat and temperature difference for thermic fluid

Heat supplied to project activity during year y as calculated using method B	48.99	TJ/year	Calculated as ratio of fuel consumption to specific fuel consumption
Heat supplied to project activity during year y, HG_y	48.99	TJ/year	Minimum value of HGy calculated using method A and method B.
CO_2 Emission factor for baseline fuel, $EFCO_2$	77.4	tCO_2/TJ	Emission factor for residual fuel oil as per IPCC
Efficiency of baseline heater, η_{th}	0.8	Dimensionless	Highest efficiency in furnace oil fired heater based on measurements
BEy	4740	tCO_2/year	Calculated as per methodology equation
PEy	0	tCO_2/year	As per methodology
Ly	0	tCO_2/year	As per methodology and biomass assessment report
ERy	4740	tCO_2/year	Baseline emissions less project emissions less leakage

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Sl. No.	Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
1.	2008-2009	0	4,740	0	4,740
2.	2009-2010	0	4,740	0	4,740
3.	2010-2011	0	4,740	0	4,740
4.	2011-2012	0	4,740	0	4,740
5.	2012-2013	0	4,740	0	4,740

6.	2013-2014	0	4,740	0	4,740
7.	2014-2015	0	4,740	0	4,740
8.	2015-2016	0	4,740	0	4,740
9.	2016-2017	0	4,740	0	4,740
10.	2017-2018	0	4,740	0	4,740
Total (Tonnes of CO_2e)		**0**	**47,740**	**0**	**47,740**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**HG_y**
Data unit:	TJ
Description:	Net quantity of heat supplied by the project activity during the year y
Source of data:	The data will be determined from measurements of thermic fluid oil flow rate and temperature difference across the heater
Value of data:	48.99
Brief description of measurement methods and procedures to be applied:	The heat supplied will be the minimum value calculated: 1. as the product of mass flow rate of thermic fluid, temperature difference of thermic fluid across heater, and specific heat of thermic fluid, and 2. as the ratio of fuel consumption and specific fuel consumption
QA/QC procedures to be applied (if any):	It is derived value from the flow rate of thermic fluid and temperature difference. By taking care of calibration schedule for those parameters, Quality assurance will be ensured.
Any comment:	

Data / Parameter:	**$Q_{thermicfluid}$**

Data unit:	M^3
Description:	Volume flow rate of thermic fluid during the year y
Source of data:	Thermic fluid heater logbook
Value of data:	8,58,000
Brief description of measurement methods and procedures to be applied:	The load (kW) of the pump supplying thermic fluid to the heater will be monitored using an ammeter. The performance curve of the pump will be used to determine volumetric flow rate of thermic fluid based on the load and impeller diameter. The product of volumetric flow rate, respective operating hours, and density of thermic fluid will be taken to derive the mass flow rate of the thermic fluid.
QA/QC procedures to be applied (if any):	The ammeter will be calibrated once in six months.
Any comment:	

Data / Parameter:	$\Delta T_{thermic}$
Data unit:	Degrees Celsius
Description:	Average temperature difference of the thermic fluid across the heater
Source of data:	Thermic fluid heater logbook
Value of data	31.88
Brief description of measurement methods and procedures to be applied:	The inlet and outlet temperatures to the heater will be monitored using a thermocouple. The average temperature difference will be recorded.
QA/QC procedures to be applied (if any):	The thermocouples will be calibrated once in six months
Any comment:	

Data / Parameter:	FC_y
Data unit:	Tonnes
Description:	Saw dust consumption in the project activity in year y

Source of data:	Thermic fluid heater logbook
Value of data	5,226
Brief description of measurement methods and procedures to be applied:	The consumption of saw dust will be monitored using a weigh bridge.
QA/QC procedures to be applied (if any):	The weigh bridge will be calibrated once in six months
Any comment:	

B.7.2 Description of the monitoring plan:

>>

The monitoring plan aims to measure the net heat supplied by the project activity to the manufacturing process. The heat supplied to the project activity is determined from both metered data and estimated using specific fuel consumption. The minimum of the two values is used in calculation of baseline emissions. Therefore both fuel consumption and the enthalpy difference across the heater are monitored.

The enthalpy difference across the heater is determined from mass flow rate of thermic fluid, temperature difference of thermic fluid across the heater, and specific heat of thermic fluid. The mass flow rate of thermic fluid is determined using the pump performance curve and measured ammeter readings for the pump driving the thermic fluid. The performance curve for the pumps correlates pump load to thermic fluid flow rate, based on impeller diameter.

The operation and maintenance staff will be responsible for recording ammeter readings, thermic fluid flow rate readings, temperature readings, fuel consumption, and operating hours for the project activity. The data will be recorded in logbooks and collated in monthly reports. Maintenance issues that arise in the day to day operation of the thermic fluid heater will also be reported in the monthly reports. The monthly reports will be assessed by the operation manager and submitted to the CDM team. The calibration of the ammeter and temperature indicators will be carried out on an annual basis. The structure of the operation and maintenance staff and detailed monitoring information is given in Annex 4.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>
15/05/2008

Mr. A.R. Ravi Kumar

Work Wear Lanka (Pvt.) Ltd.

No. 78 Biyagama Export Processing Zone, Walgama

Malwana, Sri Lanka

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
26/09/2006

C.1.2. Expected operational lifetime of the project activity:

>>
15 years, 0 months

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
15/09/08 or upon registration of the project activity

C.2.2.2. Length:

>>
10 years, 0 months

SECTION D. Environmental impacts

>>

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>

The project activity is located in the Biyagama Export Processing Zone at Walgama. The Central Environmental Authority of Sri Lanka has delegated the responsibility of environmental management in Free Trade Zones to the Board of Investment (BOI) of Sri Lanka. Workwear Lanka (Pvt) Ltd. has obtained the necessary environmental clearance for the installation of the biomass fired thermic fluid heater from BOI.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

There are no environmental impacts due to the project activity.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

The stakeholders identified for the project are listed below:

- Elected body of representatives administering the local area
- Neighbouring industries
- Fuel supplier
- Consultants
- Equipment suppliers

Identified stakeholders were invited for a discussion on the project activity and the date and venue was informed to them through formal invitations. The stakeholder consultation meeting was conducted on 18/01/2008 at Work Wear Lanka (Pvt) Ltd. The meeting was attended by all the stakeholders. The equipments and technology used in the project activity, prospective benefits of GHG reduction and contribution to sustainable development was appraised by the project promoter to the stakeholders through a presentation in English and in the regional language (Sinhalese).

E.2. Summary of the comments received:

>>

The local stakeholders did not have any concerns regarding the project activity. Some questions were asked on the potential of biomass as a source of energy in Sri Lanka and the concept of clean development mechanism. The questions were addressed by the representatives of the project promoters. Overall the feedback received from the project promoters was positive.

E.3. Report on how due account was taken of any comments received:

>>

The local stakeholders did not have any concerns regarding the project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Work Wear Lanka (Pvt.) Ltd.
Street/P.O.Box:	
Building:	No. 78 Biyagama Export Processing Zone, Walgama
City:	Malwana
State/Region:	Western Province
Postfix/ZIP:	
Country:	Sri Lanka
Telephone:	+94-11-2465362
FAX:	+94-11-2465364
E-Mail:	ravi@lankasafety.com
URL:	www.midassafety.com
Represented by:	
Title:	Mr.
Salutation:	
Last Name:	A.R.
Middle Name:	Kumar
First Name:	Ravi
Department:	Project Manager
Mobile:	+94-77-3634614
Direct FAX:	+94-11-2448223
Direct tel:	+94-11-2437575
Personal E-Mail:	rattravanam@yahoo.co.in

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

Annex 3

BASELINE INFORMATION

Key elements to determine baseline

The baseline emissions are arrived at by multiplying the quantity of fossil fuel savings with an emission coefficient of the fossil fuel displaced (Residual Fuel Oil in this case).

Emission coefficient of Fuel oil

The emission coefficient of fuel oil is referred from "***2006 IPCC guideline for national GHG inventories***", and it is given as: 77,400 Kg CO_2/TJ

Net Calorific Value of Fuel oil

NCV (Net Calorific Value) of Fuel oil is referred from "***2006 IPCC guideline for national GHG inventories***", and it is given as: 40.4 TJ/Gg

Annex 4

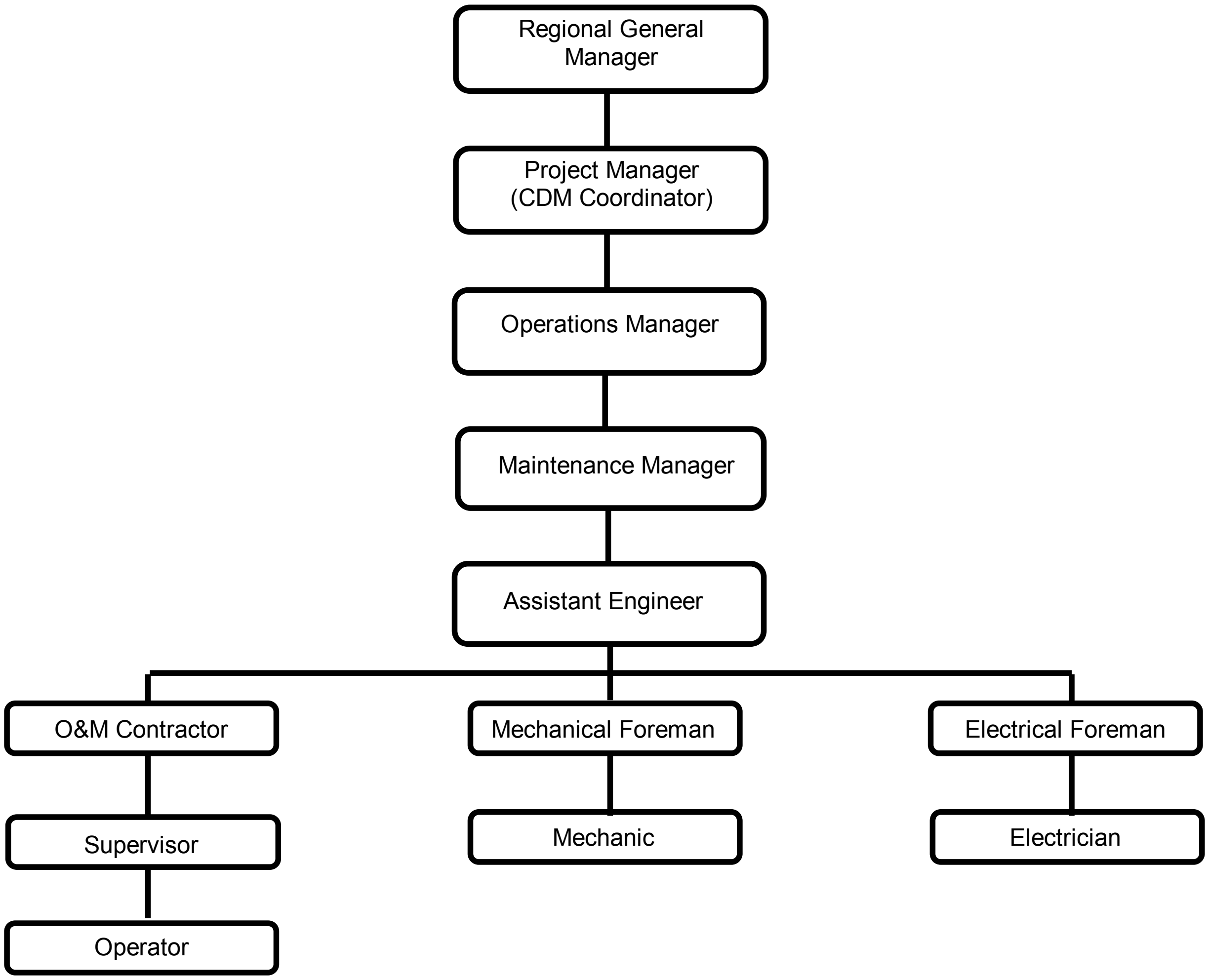
MONITORING INFORMATION

CDM Team

Monitoring is carried out by the operations and maintenance staff working on the thermic fluid heater. The O&M staff report to the Assistance Engineer, Maintenance Manager, and Operation Manager. The Maintenance and Operation Managers in turn report to the Project Manager who is the CDM coordinator for the project activity. Finally, the Project Manager reports to the Regional General Manager who heads the CDM team for the project activity. The CDM team consists of the Maintenance Manager, Operation Manager, Project Manager, and Regional General Manager. The CDM team has the following responsibilities and functions:

- Ensure operation of the project activity in compliance with the CDM Project Design Document
- Ensure accuracy of data by proper maintenance and calibration of monitoring equipment
- Ensure documentation of maintenance activity and changes to monitoring equipment for the project activity
- Monitor emissions reduction generated by the project activity and maintain records of relevant data for verification of CERs
- Review performance of the project activity periodically

The organization of the CDM team is given below:



Data to be Monitored

1. Inlet temperature of thermic fluid to heater
2. Outlet temperature of thermic fluid to heater
3. Ammeter reading for pump
4. Saw dust consumption

Monitoring Equipment

1. Thermocouples
2. Ammeter

3. Weighing bridge

Monitoring and Recording Frequency

Temperature and thermic fluid flow rate data:

Temperature data and ampere data is recorded daily in logbooks. Based on ampere data, impellor diameter of the pump, and the performance curve of pump, the flowrate of thermic fluid is derived and recorded. On a monthly basis, a consolidated report is generated and submitted to the CDM co-ordinator.

Biomass Consumption Data:

The biomass is weighed at the point of delivery to the saw-dust storage facility. The frequency of monitoring is as per frequency of stock receipt. These recorded values are presented in monthly consolidated reports and submitted to the CDM co-ordinator.

Data Archiving

Consolidated reports will be archived electronically on a regular basis.

CDM Review Procedures

The Operation Manager and Maintenance Manager review the documentation of data on a monthly basis. The CDM team reviews the performance of the heater, implementation of the monitoring procedures and other aspects of the CDM project on a biannual basis.

Calibration Frequency

Calibration of monitoring equipment is carried out once in six months. Records for calibration will be maintained by the CDM team.

Quality Assurance

The temperature indicators, flow meter, and Weigh Bridge are checked for accuracy at the time of calibration.

Uncertainties related to GHG Emissions

There are no uncertainties envisioned in relation to GHG emissions.

Training Procedures

The operation and maintenance staff have completed the necessary training for operating and maintaining the biomass thermic fluid heater. Additional training may be conducted as and when required.

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