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:

>>

Optimisation of steam generation and distribution systems through various energy efficiency measures at Anil Products Limited, Ahmedabad,

Version: 01

Date: 02/11/07

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

>>

Anil Products Limited which is a starch manufacturing company will be taking up various energy efficiency measures to optimise their steam generation and distribution system at their starch manufacturing plant in Ahemdabad. The project by optimising the steam generation and distribution system will ultimately lead to a decrease in fossil fuel consumption at their steam generating boilers. The purpose of the project activity and the various energy efficiency measures to be taken up at their starch manufacturing plant are further discussed below.

Purpose:

Following are the purpose of the project activity.

The basic objective of the project is to reduce specific energy consumption through implementation of energy efficiency technology, which in turn reduces the fossil fuel consumption in the plant and subsequently reduces the Green House Gas (GHG) emissions.

The company has performed an energy audit study of the steam generation, steam distribution and condensate recovery system. Potential areas of improvements were also identified by which the specific steam consumption could be reduced.

Project Activity:

The proposed project activity is represented below in a tabular form.

Table 1

Area	Proposed energy efficiency measures
Steam generation	• Install complete efficiency monitoring system for the both boilers. • Reduce blowdown losses.

Area	Proposed energy efficiency measures
Steam distribution	• Bypass the de-superheater • Insulate the branch lines as well as .steam lines within the plant. • Meter steam for major sections of the plant. • Install air vents on all strategic locations. • Install moisture separators on main line • Installation of stop valves
Steam Utilization:	• Install steam traps for evaporators in AD, Sorbitol • Pre-heat feed of evaporators of AD, Sorbitol, LG and starch • Compress LP steam for process use
Steam traps:	• Replace all identified faulty steam traps • Install traps with correct choice & properly
Condensate Recovery:	• Install condensate recovery system at all the potential areas • Modify the condensate recovery system to recover maximum heat.

Project's contribution to sustainable development:

The contribution of the project activity towards sustainable development has been addressed under the following pillars of sustainable development.

Social well being:

The benefit from the project activity contributes towards enhances the knowledge, skill and self-confidence level of the employees with new technology and positive environmental benefits.

Environmental well being:

The project activity reduces the specific energy consumption for steam production. It directly reduces the fuel consumption by the facility in terms of coal savings. The reduction in coal consumption corresponds to the reduced emissions of equivalent amount of carbon dioxide from combustion process and reduced GHG emissions in transportation of coal and mining of coal. These efforts result in the reduced consumption of coal (a depleting reserve), which is a primary resource for power generation and a wide range of other industries that can cater to a future demand. Thus project activity contributes towards socio-economic benefits both at micro and macro level.

Technological well being:

With the project activity, the company upgrades its core production process to an energy efficient and cleaner process. The technical skill and knowledge level of the employees of the organization would also be enhanced due to the same.

Economical well being:

The project will have direct economical well being in terms of reduced expenditure for energy. It will also generate indirect economical well being for consultants, equipment suppliers and contractors.

A.3. Project participants:

>>

Table 2

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 (Yes/No)
India (Host)	Anil Products Limited	No

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

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

>>

A.4.1.1. Host Party(ies):

>> India

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

>> Gujarat

A.4.1.3. City/Town/Community etc:

>> Ahmedabad

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

>>

The project activity is taking place within the starch manufacturing plant of Anil Products Limited at Ahmedabad. The information regarding the unique identification of the place along with a map is given below.

City	Ahmedabad
State	Gujarat
Country	India
Latitude	23^0 1'N
Longitude	72^0 41' E

Figure 1

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

>>

The project activity falls under the Category 1: 'Energy Industries' as per 'List of Sectoral Scopes' available in UNFCCC website.

Main Category: Type II – Energy efficiency improvement project

Sub Category: D - Energy efficiency and fuel switching measures for industrial facilities

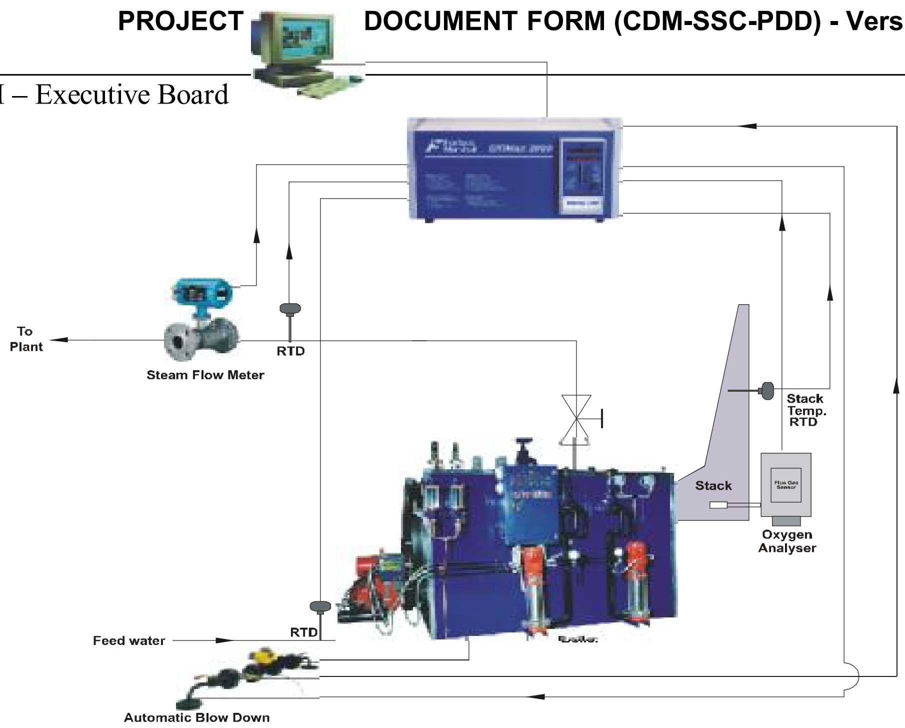
Technology/ measures of the small scale project activity:

The energy efficiency measures for steam generation, steam distribution, steam utilisation, steam traps and in the condensate recovery systems are briefly explained below.

Energy efficiency measures for steam generation:

1. Installation of complete efficiency monitoring systems:

For the FBC & IJT boilers efficiency monitoring system will be provided. By doing so, the present efficiency levels can be maintained at higher levels. The system to be installed is known as "Effimax System". A schematic diagram of the same is given below.



2. Automatic blowdown control system:

The automatic blowdown control system senses and optimises the amount of blowdown. As a result excessive blowdown is avoided resulting in fossil fuel savings.

<u>Energy efficiency measures for steam distribution:</u>

1. Bypassing the de-superheater:

By directly generating dry saturated steam, the ineffectiveness of the DSH will be avoided and hence unnecessary condensate can be eliminated. This will result in a net steam savings and thus indirectly will reduce fossil fuel consumptions.

2. Insulation:

The insulation quality will be upgraded. Insulation of plants like LG and starch in particular are not quit very good. If insulation is redone, steam reduction will be achieved and thus will reduce the net fissil fuel requirement.

3. Replacement of stop valves:

All identified leaking stop valves will be replace by latest designed valves which have much longer life than any other ordinary valves. Replacing all the leaking stop valves will reduce steam loss and thus will reduce fossil fuel input in the boiler.

4. Departmental metering:

Steam meters will be provided for each of the individual plants. These meters will help to monitor and quantify specific energy consumption at the plant.

5. Air vents:

Automatic air vents will be installed at all strategic locations. If steam for a particular section is not required and shut off, the existing high pressure steam will start condensing. During condensation vacuum will create and due to this atmospheric air will be drawn in through leaking holes or flanges. During the next cycle of operation the trapped air will be pushed towards dead ends, higher elevation or inside process equipment. This trapped air over a period of time will enhance corrosion inside pipes or flanges etc.

6. Moisture separators:

2 Nos. of Moisture separators will be installed on the main line. This will help to retain the heat content of the steam and thus will indirectly save fossil fuel input.

Energy efficiency measures for steam utilisation:

1. Installation of steam traps in evaporators:

Steam traps will be installed in single effect evaporators of AD & Sorbitol. This will reduce steam loss and hence will indirectly save fossil fuel input two boilers.

2. Installation of heat exchanger to pre-heat the feed of evaporators:

Condensate coming out of some evaporators contains high quantity of heat. Presently this is locally used without its heat being utilized. Condensate does not return to the boiler house due to fear of contamination. Normally the incoming feed is 40^0C. Now, if a heat exchanger is installed to recover its heat, the incoming feed can be pre-heated. So in effect steam requirement will reduce.

3. Recovery of flash steam:

Flash steam will be recovered by installing flash vessels, thermo compressor system and interconnecting pipings at starch section. In effect, the draw of costly steam from the boiler house will reduce

Energy efficiency measures for steam traps:

1. Installation of proper steam traps system with integrated trap monitoring system:

Proper steam traps will be selected and installed based on differential pressure, condensate quantity and the application. Further a trap performance system will be installed consisting of one detection chamber which will be installed for individual process trap and indicator with connecting cables. The installed system will eliminate following.

- System shut down.
- Trap stripping to identify which traps are responsible for a leak or to decide at random if maintenance is required.
- Wasted labour
- Unnecessary spare parts consumption.

Energy efficiency measures for condensate recovery system:

At present condensate recovery system exists only in three plants and they are not efficient. Their main causes are the existing pumping system. For all other locations the condensate recovery system does not exist. The following measures will be taken to improve the condensate recovery system.

1. Installation of condensate recovery system at all the potential areas:
2. Installation of steam operated pumps with fully "Packaged Pressure Powered Pumps".

All the above energy efficiency measures taken at Anil Product's Limited will ultimately enable Anil Products to reduce specific energy consumption meet the process steam requirement at their starch manufacturing plant. This will result in reduction in fossil fuel consumption at the boilers and thus will directly reduce anthropogenic GHG emission into the atmosphere.

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

>>

Years	Annual estimation of emission reductions in tones of CO_2eq
2008-09	9,083
2009-10	9,083
2010-11	9,083
2011-12	9,083
2012-13	9,083
2013-14	9,083
2014-15	9,083
2015-16	9,083
2016-17	9,083
2017-18	9,083
Total	90,830
Total no of crediting years	**10**
Annual average over the crediting period of estimated reductions (tones of CO_2 e)	**9,083**

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

>>

No official development assistance (ODA) is available for this project activity.

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

>>

According to Appendix C of Simplified Modalities & Procedures for small scale CDM project activities, 'Debundling' is defined as the fragmentation of a large project activity into smaller components. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities.

According to Para 2 of Appendix C[1]

[1] Appendix C to the simplified M&P for the small-scale CDM project activities, http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf

The proposed small-scale project activity at Anil Products Limited is not a debundled component of a large project activity since there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- with the same project participants;
- in the same project category and technology/measure;
- registered within the previous 2 years; and
- whose project boundary is within 1 km of the project boundary of the proposed small- scale activity at the closest point.

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:

>>

Title: Baseline Methodology for the category II D – Energy efficiency and fuel switching measures for industrial facilities (Version 11, EB 35).

Reference: Paragraph '5 to 10' as provided in Type II.D of 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:

>>

The project activity is covered under Sectoral Scope – 1, Energy Industries (Renewable/non-renewable sources) as per 'List of Sectoral Scopes' available in UNFCCC website. As per Appendix B of the simplified modalities and procedures for small scale CDM project activities, the small scale methodology AMS II.D i.e. "Type II – Energy efficiency improvement projects of category II.D – Energy efficiency and fuel switching measures for industrial facilities" has been selected for the project as it meets the following requirements:

- The project activity is an energy efficiency project implemented at a single industrial facility.
- The energy efficiency measure involves implementation of various energy efficiency measures aimed primarily to optimise the specific energy consumption related to steam generation, distribution and utilisation, thus improving the overall energy efficiency of the site.
- The annual thermal energy savings achieved in the project activity is 23.64 GWh which is below the limit of 180 GWh_{th} as specified in the methodology AMS II.D.
- The project activity directly measures and record the energy use within the project boundary
- The measures implemented can be clearly distinguished from changes in energy use

As explained above, the project activity meets all the applicability criteria of the methodology as well as the stipulations of small scale projects.

B.3. Description of the project boundary:

>>

The project boundary is the physical, geographical location of each measure (each piece of equipment) installed.

As per the Appendix B the project boundary is defined a "the physical, geographical location of each measure (each piece of equipment) installed". The project boundary for the project activity includes all equipment installation points and the equipments / machines affected by the project activity.

B.4. Description of baseline and its development:

>>

Detail of the energy and emission baseline has been developed using the baseline methodology prescribed by the UNFCCC in Appendix B to Simplified M&P for small scale CDM projects activities belonging to Type II.D.

The baseline study is a two-step study conducted to determine the Baseline emissions over the crediting period in absence of project activity.

Step – I: Determination of Energy Baseline

Step – II: Determination of carbon intensity of the chosen baseline

Step I

Energy Savings by Project Activity:

The project activity will save 5629 tonnes of coal/annum considering all the energy efficiency projects in APL.

Therefore, a conventional energy equivalent of 56,290 tonnes of coal for a period of 10 years would be conserved by the project activity. Without the project activity, the boiler would have taken up the same energy and emission of CO_2 would have been occurred due to coal combustion.

Energy Baseline:

In the absence of the energy study and project initiatives taken up by APL, would have continued to consume the same energy consumption. Therefore the energy base line will be the energy consumption of equipments that would have continued without implementation of project activity.

Further as per para 6 of AMS II.D "In the absence of the CDM project activity, the existing facility would continue to consume energy (ECbaseline, in GWh/year) at historical average levels (EChistorical, in GWh/year), until the time at which the industrial or mining and mineral production facility would be likely to be replaced, modified or retrofitted in the absence of the CDM project activity (DATEBaselineRetrofit).

From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline energy consumption (ECbaseline) is assumed to equal project energy consumption (ECy, in GWh/year), and no emission reductions are assumed to occur"

In absence of project activity the existing system would continue to consume energy ECbaseline of 23.64 GWh/year which is at historical average levels of EChistorical of 23.64 GWh/year. The ECbaseline and EChistorical are determined based on the energy baseline values of equipment consumption from past years data before implementation of project activity.

The existing energy inefficient equipment would continue to consume ECbaseline until the time the equipment likely to be replaced in the process of the CDM project activity at January 2020 which is the DATEBaselineRetrofit.

Thus from January 2020 onwards, the ECbaseline would be assumed to equal project activity energy consumption ECy and no emission reductions are assumed to occur after January 2020.

Thus until DATEBaslineRetrofit – January 2020,

ECbaseline = 23.64 GWhth/year = EChistorical

and on/after January 2020

ECbasline = 23.64 GWhth/year = ECy

The estimation of DATEBaslineRetrofit which is the point in time when the existing energy inefficient Compressors would need to be replaced in the absence of the project activity was done by specifically

Step II

As per the provisions of paragraph 7 of approved small scale methodology AMS IID, the emission coefficient (measured in Kg of CO2/ Kg of Coal) for the coal saved had been calculated in accordance with the IPCC default values.

<u>Baseline Emissions:</u>

The main GHG emissions in this system boundary arise from burning fossil fuels for steam generation for starch manufacturing facility.

In addition to the emissions arising from coal combustion in starch production additional CO2 emissions occur during the transport of coal from coalmines. Because of a lack of data on average transport distance for coal to the plant (due to variety of coal sources) fuel transport emissions are not included in the system boundary of both the current situation and the project. This also provides a conservative estimate of the emission reductions.

The baseline emissions are arrived at based on the above mentioned baseline emission factor calculated based on the coal consumption within the project boundary in absence of the project activity.

Based on the above, (see section B.6 for calculations) the project activity will reduce around 90,830 tonnes of CO_2 in 10 year of credit period. Since, the project activity is not a baseline scenario, without project activity there will be emission as per the carbon intensity of the baseline (1.4 tonnes CO_2/tonne of coal). Therefore the project activity on implementation would reduce the energy requirement of the system within the project boundary and its associated emissions.

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 the decision 17/CP.7 paragraph 43, a CDM project activity is additional if anthropogenic emissions of greenhouse-gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity. The project activity includes energy efficiency improvement measures with net CO_2 emission reductions through reduced coal consumption for the process. APL has decided to take-up these energy efficiency projects as a step towards curbing GHG emission. The project activity has been initiated to reduce the GHG (carbon dioxide) emissions by sources and would otherwise not have been implemented due to the existence of the barrier(s) discussed below. The decision on investment has been influenced by the Clean Development Mechanism (CDM) related development at the United Nations Framework Convention on Climate Change. The additionality has been further established below in accordance with the UNFCCC guidelines.

Additionality test based on barriers to the proposed project activity

[Reference: Attachment A to Appendix B of the simplified M&P for small-scale CDM project activities]

The project type is not a prevailing practice in the proposed area of implementation.

APL has identified the areas where the energy efficiency improvement in starch production could be adopted and specific coal consumption and its associated emissions could be reduced. The barrier faced by the project proponent to implement the project activity is described below.

Technological Barrier:

The project activity faces the following technological barrier in the form of risks and uncertainties associated with the advanced technology chosen to achieve superior energy efficiency improvements in their starch manufacturing plant. The risks and uncertainties are further accentuated by the fact that APL does not have the technical capacity to implement these improvements in-house. Thus special training program is required to be given by the technology supplier to the plant personnel for efficient and smooth operation of the technology.

The risks and uncertainties associated with each of the energy efficiency measures adopted by the project participants are described below in a tabular format.

ECP No.	Area / recommendations	Potential Risk
1	Steam generation: • Install complete on line efficiency monitoring system for the both boilers. • Reduce blow down losses. By providing on line TDS monitoring and control with waste heat recovery	• Electronic components failure may lead system to fail and the same needs expert technology for repair and maintenance • Needs periodic calibration as reading error may be proved fatal • IBR formalities involved may lead to certain delay • Mal functioning of waste heat recovery from blow down system may lead the boiler water recirculation in the FWT damaging the boiler
2	Steam distribution • Bypass the de-superheater • Insulate the branch lines as well as .steam lines within the plant by providing the insulation pad. • Meter steam for major sections of the plant. By providing density compensated Vortex Type Steam Flow meter • Install air vents on all strategic locations. • Install moisture separators on main line.	• IBR formalities involved may lead to certain delay • Stack temperature may suit up as the overall heat transfer area reduces and hence the Economizer may need to be strengthen- attracts more capital expenditure • Safety hazard in the starch plant in case the steam temperature is higher then 190^0C • If the calibration of the meters have changed, may lead to wrong conclusions, leading to un wanted plant shut down for preventive maintenance schedule • Mal functioning air vent may become the source of live steam leakage. This may add the burden on maintenance budget •
3	Steam Utilization: • Install steam traps for evaporators in AD, Sorbitol. • Pre-heat feed of evaporators of AD, Sorbitol, LG • Compress LP steam for process use.	• The trap monitoring system and trap by pass system involves the electronic components. Failure of these components in the starch plant may lead to break down of the machine for maintenance of the system leading unexpected production loss • Thermo compressor system is instrumentation intensive system and failure of the field instrument may lead system to stop leading heavy steam loss

4	Condensate Recovery: • Install condensate recovery system at all the potential areas. • Modify the condensate recovery system to recover maximum heat.	• The use of condensate as hot water in process shall face the temperature rise as the modified improved system is designed to recycle the condensate at the highest temperature. The condensate used as process hot water may over burn the product and the Colour of the product may change leading the product of inferior quality and may not fetch the market price • In case the contaminated condensate gets recycled in the FWT, the entire boiler water may get contaminated leading to major boiler shut down and major safety risk. This may lead to the major production loss for a month or so • Un-insulated condensate line with higher temperature may lead to safety hazard.

Consideration of fund inflow through CDM route has played an important role for APL to go ahead with the project activity. APL believes fund through the sale of CER will act as a protective cushion for the project activity and will help to overcome the technological barriers associated with advanced technology selected for the project activity. Looking at the technological barriers associated with the project activity it can be stated that project is not a business as usual scenario and without CDM benefit may not sustainable in the long run. Thus the project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

The formulas adopted to estimate emission reduction for each of the four components are explained below.

Emission reduction for improvement in boiler house efficiency:

APL has two boilers in its plant. For the both the boilers following equations will be adopted to calculate emission reduction.

$$BEy = \frac{SG_{PH,baseline}}{\gamma_{SF,baseline}} \bullet 24 \bullet n_{baseline} \bullet NCV_{Coal} \bullet EF_{Coal,IPCC} \bullet OX_{Coal,IPCC} \quad (1)$$

Where:

BE_y	Baseline emission for year y in ton CO_2 e
$SG_{PH, baseline}$	Steam generation per hour in ton per hour (TPH)
$\gamma_{SF, baseline}$	Steam to fuel ratio in the baseline
24	Number of operating hours in a day
$n_{baseline}$	Number of operating days in a year
NCV_{Coal}	Net Calorific Value of coal in Kcal/Kg
$EF_{Coal, IPCC}$	Emission factor of coal as per IPCC ton CO_2/ TJ
$OX_{Coal,IPCC}$	Oxidation factor of coal as per IPCC

$$PE_y = \frac{SG_{PH,project}}{\gamma_{SF,project}} \bullet 24 \bullet n_{project} \bullet NCV_{Coal} \bullet EF_{Coal,IPCC} \bullet OX_{Coal,IPCC} \quad (2)$$

Where,

PE_y	Project emission for year y in ton CO_2 e
$SG_{PH, project}$	Steam generation per hour in ton per hour (TPH)
$\gamma_{SF, project}$	Steam to fuel ratio in the project
24	Number of operating hours in a day
$n_{project}$	Number of operating days in a year
NCV_{Coal}	Net Calorific Value of coal in Kcal/Kg
$EF_{Coal, IPCC}$	Emission factor of coal as per IPCC in ton CO_2/TJ
$OX_{Coal,IPCC}$	Oxidation factor of coal as per IPCC

$$ER_1 = BE_y - PE_y \quad (3)$$

Where:

ER_1	Emission reduction for energy efficiency improvement in boiler house for year y in ton CO_2 e

<u>Emission reduction due to reduction in steam demand in the plant:</u>

$$ER_2 = (SCC_{baseline} - SCC_{project}) \bullet GM \bullet n \bullet NCV_{Coal} \bullet EF_{Coal,IPCC} \bullet OX_{Coal,IPCC} \quad (4)$$

Where,

ER_2	Emission reduction through reduction in steam demand in ton CO_2 e
$SCC_{baseline}$	Specific coal consumption in tons of coal/ ton of grind in the baseline
$SCC_{project}$	Specific coal consumption in tons of coal/ton of grind in the project scenario
GM	Average quantity of maize ground per day in TPD
n	Number of operating days in a year
NCV_{Coal}	Net Calorific Value of coal in Kcal/Kg
$EF_{Coal, IPCC}$	Emission factor of coal as per IPCC in ton CO_2/TJ
$OX_{Coal,IPCC}$	Oxidation factor of coal as per IPCC

$SCC_{baseline}$ and $SCC_{project}$ will be determined by the following equation.

$$SCC_{baseline/project} = \frac{SSC_{baseline/project}}{\gamma_{SF,baseline/project}} \quad (5)$$

Where:

$SSC_{baseline/project}$	Specific steam consumption in tons of steam/tons of grind in baseline and project scenario as the case may be
$\gamma_{SF, project/baseline}$	Steam to fuel ratio in baseline and project scenario as the case may be

$SSC_{baseline/project}$ will be determined by the following equation.

$$SSC_{baseline/project} = \frac{SD_{plant}}{GM} \quad (6)$$

Where:

SD_{plant}	Average steam demand in the plant in TPD in the baseline and project scenario as the case may be
GM	Average quantity of maize ground per day in TPD in the baseline and project scenario as the case may be

<u>Emission reduction for condensate recovery and utilisation:</u>

In the project activity there is no condensate recovery in the baseline, so emission reduction is calculated for the entire condensate recovery and corresponding savings in coal combustion is estimated.

$$ER_3 = \frac{(F_{input,condensate} \bullet \in_{input,condensate} - F_{output,condensate} \bullet \in_{output,condensate})}{NCV_{coal}} \bullet n \bullet EF_{Coal,IPCC} \bullet OX_{Coal,IPCC} \quad (7)$$

Where:

ER_3	Emission reduction for condensate recovery in ton CO_2 e
$F_{input, condensate}$	Flow rate of the input stream to the condensate recovery system in TPD
$\varepsilon_{input, condensate}$	Enthalpy of the input condensate stream to the condensate recovery system in Kcal/Kg
$F_{output, condensate}$	Flow rate of the output stream to the condensate recovery system in TPD
$\varepsilon_{output, condensate}$	Enthalpy of the output condensate stream to the condensate recovery system in Kcal/Kg
n	Number of operating days in a year
NCV_{Coal}	Net Calorific Value of coal in Kcal/Kg
$EF_{Coal, IPCC}$	Emission factor of coal as per IPCC in ton CO_2/TJ
$OX_{Coal,IPCC}$	Oxidation factor of coal as per IPCC

Emission reduction for installation of pre-heat the feed of evaporators:

It was observed that condensate coming out of some evaporators contains high quantity of heat. This is locally used without its heat being utilized. Now, in the project activity heat exchanger is installed to recover its heat, the incoming feed can be pre-heated. So in effect steam requirement will reduce. This will result in reduction in coal combustion and corresponding emission reduction. The following equation is adopted to calculate the emission reduction.

$$ER_4 = \frac{(t_1 - t_2) \bullet s \bullet F \bullet 24 \bullet n}{NCV_{Coal}} \bullet EF_{Coal,IPCC} \bullet OX_{Coal,IPCC} \qquad (8)$$

Where:

ER_4	Emission reduction for installation of pre-heat the feed of evaporators in ton CO_2 e
S	Specific heat of the of the feed in Kcal/kg/^oC
F	Flow rate of the feed in kg/hr
t_1	Temperature of the feed after the project activity
t_2	Temperature of the feed after the project activity
n	Number of operating days in a year
NCV_{Coal}	Net Calorific Value of coal in Kcal/Kg
$EF_{Coal, IPCC}$	Emission factor of coal as per IPCC in ton CO_2/TJ
$OX_{Coal,IPCC}$	Oxidation factor of coal as per IPCC

Emission reduction for installation of pre-heat the feed of evaporators:

Flash steam will be recovered from germ dryer, FRD, flash dryer and oxidiser flash dryer. The emission reduction achieved is estimated through the following equation.

$$ER_5 = \frac{Q_{FS}}{\gamma_{SF,baseline}} \bullet n \bullet NCV_{Coal} \bullet EF_{Coal,IPCC} \bullet OX_{Coal,IPCC} \qquad (9)$$

Where

ER_5	Emission reduction for flash steam recovery in ton CO_2 e
$\gamma_{SF, baseline}$	Steam to fuel ratio in the baseline
Q_{FS}	Total quantity of the flash steam recovered per day from each of the 4 location in ton
n	Number of operating days in a year
NCV_{Coal}	Net Calorific Value of coal in Kcal/Kg
$EF_{Coal, IPCC}$	Emission factor of coal as per IPCC in ton CO_2/TJ
$OX_{Coal,IPCC}$	Oxidation factor of coal as per IPCC

Total emission reduction:

Total emission reduction has been achieved by the following equation.

$$ER = ER_1 + ER_2 + ER_3 + ER_4 + ER_5 \qquad (10)$$

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

(Copy this table for each data and parameter)

Data / Parameter:	$EF_{Coal, IPCC}$
Data unit:	Ton CO_2/TJ
Description:	Emission factor for coal as per IPCC
Source of data used:	IPCC
Value applied:	96.1
Justification of the choice of data or description of	IPCC default value choosen

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$OX_{Coal, IPCC}$
Data unit:	Number
Description:	oxidation factor for coal as per IPCC
Source of data used:	IPCC
Value applied:	0.98
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value chosen
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>

The emission reduction has been estimated by using the equations as described in the section B.6.1. Below given are the results of the same.

Component wise emission reduction		
ER1	2,965	Ton CO2 e
ER2	3,270	Ton CO2 e
ER3	1,619	Ton CO2 e
ER4	161	Ton CO2 e
ER_5	1,332	Ton CO2 e
Total	9,083	Ton CO2 e

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

>>

Year	**Estimation of overall Emission Reductions (tones of CO_2 e)**
2008-09	9,083
2009-10	9,083
2010-11	9,083
2011-12	9,083
2012-13	9,083
2013-14	9,083
2014-15	9,083
2015-16	9,083
2017-18	9,083
2018-19	9,083
Total (tonnes of CO2e)	**90,830**

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	SG_{PH}
Data unit:	TPH
Description:	Steam generation per hour at each of the boiler
Source of data to be used:	Plant
Value of data	17 TPH for FBC boiler and 13 TPH for TG boiler
Description of measurement methods and procedures to be applied:	Will be monitored online with the help of centralised monitoring system Effimax to be installed in the project activity
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	γ_{SF}
Data unit:	Fraction
Description:	Steam to fuel ratio
Source of data to be used:	Plant

Value of data	3.76 in the baseline and 3.84 in the project scenario
Description of measurement methods and procedures to be applied:	Will be monitored online with the help of centralised monitoring system Effimax to be installed in the project activity.
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	NCV_{coal}
Data unit:	Kcal/kg
Description:	Net calorific value of coal
Source of data to be used:	Publicly available data
Value of data	3600
Description of measurement methods and procedures to be applied:	Has been taken from authentic publicly available source
QA/QC procedures to be applied:	
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	N
Data unit:	Number
Description:	Number of days of operation of the plant in a year
Source of data to be used:	Plant records
Value of data	365
Description of measurement methods and procedures to be applied:	From the log book of plant records
QA/QC procedures to be applied:	To be cross checked with commercial data
Any comment:	Data to be archived till 2 years after completion of crediting period
Data / Parameter:	SD_{plant}
Data unit:	TPD
Description:	Steam demand in the plant
Source of data to be used:	Plant records

Value of data	606 in the baseline and 597 in the project scenario
Description of measurement methods and procedures to be applied:	Data will be monitored and recorded through steam meter
QA/QC procedures to be applied:	ISO 9000 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	GM
Data unit:	TPD
Description:	Quantity of maize ground per day
Source of data to be used:	Plant records
Value of data	340
Description of measurement methods and procedures to be applied:	ISO 9001 or similar procedure
QA/QC procedures to be applied:	To be cross checked with commercial data
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	$F_{input, condensate}$
Data unit:	TPD
Description:	Flow rate of the input stream to the condensate recovery system
Source of data to be used:	Plant records
Value of data	To be monitored during crediting period
Description of measurement methods and procedures to be applied:	Data will be monitored and recorded through flow meter
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	$F_{output, condensate}$
Data unit:	TPD
Description:	Flow rate of the output stream to the condensate recovery system
Source of data to be	Plant records

used:	
Value of data	To be monitored during crediting period
Description of measurement methods and procedures to be applied:	Data will be monitored and recorded through flow meter
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	$t_{output, condensate}$
Data unit:	^{0}C
Description:	Temperature of the output stream to the condensate recovery system
Source of data to be used:	Plant records
Value of data	To be monitored during crediting period
Description of measurement methods and procedures to be applied:	Data will be monitored and recorded through thermometer
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	$t_{input, condensate}$
Data unit:	^{0}C
Description:	Temperature of the input stream to the condensate recovery sytem
Source of data to be used:	Plant records
Value of data	To be monitored during crediting period
Description of measurement methods and procedures to be applied:	Data will be monitored and recorded through thermometer
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period
Data / Parameter:	t_1
Data unit:	^{0}C
Description:	Temperature of the feed to LG DEE and starch TEE after the project activity
Source of data to be	Plant records

used:	
Value of data	To be monitored during crediting period
Description of measurement methods and procedures to be applied:	Data will be monitored and recorded through thermometer
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	t_2
Data unit:	^0C
Description:	Temperature of the feed to LG DEE and starch TEE before the project activity
Source of data to be used:	Plant records
Value of data	To be monitored during the crediting period
Description of measurement methods and procedures to be applied:	Data will be monitored and recorded through thermometer
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	F
Data unit:	Kg/hr
Description:	Flow rate of the feed to LG DEE and starch TEE during the project activity
Source of data to be used:	Plant records
Value of data	Estimated
Description of measurement methods and procedures to be applied:	Data will be monitored and recorded through flow meter
QA/QC procedures to be applied:	ISO 9001 or similar procedures
Any comment:	Data to be archived till 2 years after completion of crediting period

Data / Parameter:	Q_{FS}
Data unit:	TPD
Description:	Quantity of flash steam recovered per day

Source of data to be used:	Plant records
Value of data	9.456
Description of measurement methods and procedures to be applied:	Data will be estimated by monitoring system pressure and flash vessel pressure
QA/QC procedures to be applied:	To be cross checked with commercial data
Any comment:	Data to be archived till 2 years after completion of crediting period

B.7.2 Description of the monitoring plan:

>>

As per the approved small scale methodology AMS-IID In the case of replacement, modification and retrofit measures the monitoring shall consist of:

(a) Documenting the specifications of the equipment replaced;

(b) Metering the energy use of the industrial facility, processes or the equipment affected by the project activity;

(c) Calculating the energy savings using the metered energy obtained from sub-paragraph '(b)'

The project activity of APL involves installation of some new equipments and ancillaries in the existing utility system of the plant for improving the efficiency of the steam generation and steam distribution system including condensate and flash steam recovery and utilization of the same for various process requirements. Therefore, this project activity is not the development of a new facility but just an addition to the existing system and thus the project activity will follow the M&V Plan for a retrofit system.

A Monitoring & Verification (M&V) Plan has been developed by APL for monitoring and verification of actual emission reduction. The Monitoring and Verification (M&V) procedures define a project-specific standard against which the project's performance (i.e. GHG reductions) and conformance with all relevant criteria will be monitored and verified. It includes developing suitable data collection methods and data interpretation techniques for monitoring and verification of GHG emissions with specific focus on technical / efficiency / performance parameters. It also allows scope for review, scrutinize and benchmark all this information against reports pertaining to M & V protocols as explained in section B.6.2 and B.7.1.

The M&V Protocol provides a range of data measurement, estimation and collection options/ techniques in each case indicating preferred options consistent with good practices to allow project managers and operational staff, auditors, and verifiers to apply the most practical and cost-effective measurement approaches to the project. The aim is to enable this project have a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures would be to direct and support continuous monitoring of project performance/key project indicators to determine project outcomes, green house gas (GHG) emission reductions.

The project activity's revenue is based on the units (tonnes of coal) that would be saved in comparison to the units (tonnes of coal) that are consumed before the implementation of the project. The monitoring and verification system would mainly comprise of these measures as far as coal consumption and saving of energy are concerned.

The parameters and performance indicators are project specific and have been described in the section B.6.2 and B.7.1.

Monitoring and verification of raw material characteristics (physical characteristics)/ quality is also required to be monitored as it could influence change in efficiency of the equipments and hence the quantum of emission reductions in tonnes of CO_2 equivalent.

The project would employ the monitoring and control equipments that measure; record, report, monitor and control mentioned key parameters. The instrumentation systems for monitoring of the project would mostly comprise microprocessor-based instruments of reputed make with desired level of accuracy. All instruments would be calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time.

Justification of choice of methodology

Project activity would include a set of energy efficiency measures. The project monitoring would include:

- Monitoring of flow rate, temperature and pressure of condensate streams
- Metering the steam consumption in the plant
- Calculating the difference in equivalent specific coal consumption after and before project implementation, which is equivalent to total energy saved

- Calculation of steam to fuel ratio of the boiler before and after the project to estimate equivalent coal savings.

The quantity of emission reduction unit claimed by the project will be the total emission saved from reduced coal consumption. Therefore it is justified to check the total coal consumption from total steam consumption by the process and compare this specific unit of coal consumption with pre-project stage historical data of coal consumption of the said boundary.

GHG Sources

There is no direct onsite emission from the project boundary. The project activity will only include some technical modifications in the plant, which will contribute to the enhanced energy efficiency of the process without generating any additional GHG emission.

The indirect off-site GHG source would be the emission of GHGs involved in the process of transportation for procurement of equipments. However, considering the project life, the total coal consumption savings and the emissions to be avoided in the life span of 20 –25 years emissions from the above-mentioned source are too small and hence neglected.

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

>>
Date of completion of the baseline methodology and monitoring methodology: 27/06/2007

APL and its associates has determined the baseline and monitoring methodology for the project activity. The entity is a project participant listed in Annex-I where the contact information has also been provided.

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:

>>
Starting date of the project activity: 01/08/2007

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

>>
15 years

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

C.2.1. Renewable crediting period

N.A

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:

>>
01/10/2007 or date of registration of the project activity which ever is later.

C.2.2.2. Length:

>>
10 years

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 does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India.

However the project proponent has given due weightage to the environmental aspects of the project activity. Basic philosophy of these project activities involving implementation of energy efficiency measures is driven by the concept of developing enhanced heat recovery and heat utilization with acceptable impact on the environment.

Air pollution: The project activity in the starch-manufacturing unit of APL involves a set of energy efficiency measures for the up-gradation of existing steam distribution system. These projects which involve reduced steam consumption through enhanced heat recovery from the condensate and improved efficiency in steam generation, distribution and utilisation and similar energy efficiency measures ultimately end-up in savings of coal consumption to meet energy requirement for the process. Reduced coal consumption at the boiler end results in reduced CO2 emissions from the plant. Moreover, the reduced steam consumption in the process helps in avoiding the following problems associated with the generation of steam in coal-fired boilers.

- Fly ash and SO2 emission from the flue gas generation in the coal fired boilers.
- Leakage of flue gas from various joints of ducting
- Leakage of dust through rotary air lock valves and slide gates provided in the system and leakage of cinder from glands and joints

Also due to reduced coal consumption in the plant the associated emissions related to the transportation of coal from coalmines to the plant get partially eliminated.

Noise Pollution: The project activity will not contribute to any additional noise pollution.

Wastewater: APL has a well-designed Effluent Treatment Plant (ETP) of adequate capacity to handle the wastewater. Any effluent generated from the project activity will be treated in the ETP and the treated water will be recycled to the process.

Solid waste: Reduced coal consumption in the plant helps in reducing, to some extent, the problems related to the bottom ash disposal from the boiler. There is however a proper ash handling system in place.

Monitoring

APL undertakes regular monitoring of waste water and emissions generated from different unit operations. It is compliant to the regulatory norms and operates with necessary clearances from the relevant statutory bodies.

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:

>>

Environmental impacts are not considered to be significant.

SECTION E. Stakeholders' comments

>>

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

>>

The proposed energy efficiency measures taken up at starch manufacturing unit of APL in Ahmedabad will be implemented solely by APL. The project activity will take up various measures to reduce specific energy consumption for steam generation and steam utilisation at their plant. The improved energy efficiency will ultimately reduce fossil fuel combustion of FO/lignite and will thus achieve equivalent amount of GHG emission reduction.

APL has identified the following stakeholders in the project activity.

- Local community
- Employees of APL
- Technology supplier

APL has conducted a stakeholder's meet on 12th July 2007 at their starch manufacturing plant in Ahmedabad. The meeting was intended to make the stakeholders aware about the project activity and to address all possible comments of the identified stakeholders. The summary of the same is provided below.

E.2. Summary of the comments received:

>>

The meeting was attended by representatives of all the identified stakeholders. Stakeholders enquired about the project, about Kyoto protocol and CDM procedures, about the current trend in carbon trading market etc, all of which were satisfactorily replied by the project promoter. A copy of the minutes of the meeting is attached as a separate enclosure along with the PDD for reference.

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

>>

No adverse comments were received during the stakeholder meet.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Anil Products Limited
Street/P.O.Box:	Anil Road, P.O Box: 10009
Building:	
City:	Ahmedabad
State/Region:	Gujarat
Postfix/ZIP:	Ahmedabad: 380025
Country:	India
Telephone:	+91-79-22203222
FAX:	+91-79-22200731
E-Mail:	asit@anil.co.in
URL:	www.anil.co.in
Represented by:	
Title:	Dy General Manager
Salutation:	Mr
Last Name:	Selarka
Middle Name:	Bharat
First Name:	Asit
Department:	Finance
Mobile:	09374954611
Direct FAX:	+91-79-22200731
Direct tel:	+91-79-22203222
Personal E-Mail:	asit@anil.co.in

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no funding available from Annex 1 countries for the project activity.

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

- - - - -