Monitoring report form for CDM project activity
(Version 07.0)

MONITORING REPORT		
Title of the project activity	Boiler Second Economizer in YANSAB, Kingdom of Saudi Arabia	
UNFCCC reference number of the project activity	10114	
Version number of the PDD applicable to this monitoring report	1.7	
Version number of this monitoring report	1.0	
Completion date of this monitoring report	07/11/2020	
Monitoring period number	01	
Duration of this monitoring period	01/01/2017 – 09/12/2019[1]	
Monitoring report number for this monitoring period	01	
Project participants	YANSAB, Yanbu National Petrochemicals Company	
Host Party	Kingdom of Saudi Arabia	
Applied methodologies and standardized baselines	**Methodology:** AMS-II.D. Energy efficiency and fuel switching measure for industrial facilities, version 13.0 **Standardised Baseline:** Not applicable	
Sectoral scopes	03: Energy demand 04: Manufacturing Industries	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0 tCO_2e	28,743 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	23,018 tCO_2e	

[1] The crediting period start from 01/01/2017, however all economizer on boilers came in operation from 10/12/2018, hence emission reduction calculated from 10/12/2018 onwards.

SECTION A. Description of project activity

A.1. General description of project activity

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YANSAB, Yanbu National Petrochemicals Company, the project proponent, operates in the production of petrochemical products through its industrial complex in Yanbu Industrial City, in the Kingdom of Saudi Arabia.

The project activity involves the installation of secondary economizer in five boilers that has enhance the efficiency of the boilers by increasing utilization of flue gas heat energy before releasing to atmosphere. This leads to reduced fuel gas consumption and GHG released to atmosphere.

Originally, all boilers are designed with one economizer as preheater for BFW (Boiler Feed Water). This means that less heat waste is recovered. This has a noticeable impact on the boilers efficiencies. More importantly, fuel gas consumption (mainly Natural Gas) is considerably high. Therefore, the idea to install a second economiser was initiated. This second economiser is added to the existing boiler packages.

Boiler economizers recover the "waste heat" from the boiler's hot stack gas to transfer this wasted heat to the boiler's feed-water. Because the boiler feed-water is now at a higher temperature than it would have been without a boiler economizer, the boiler does not need to provide as much additional heating to produce the steam requirements of a facility or process, thereby using less fuel. Boiler economizers also help improve boiler's efficiency by extracting heat from the flue gases discharged from the final super-heater section of a radiant/reheat unit or the evaporative bank of a non-reheat boiler. Heat is transferred, again, back to the boiler feed-water, which enters at a much lower temperature than saturated steam.

The baseline shows that the flue gas heat energy generated during the process is partially recovered by an economiser, however there is still a release to the atmosphere without utilization. The project activity has installed in each of the five boilers a secondary economizer to recover the flue gas heat energy generated. Prior to the project activity, the boilers had an efficiency of 91.5% at 49.47% load; due to the project activity the efficiency to around 95%. This reduces the need for fossil fuel consumption and thus reducing GHG emissions.

The construction of the project activity started on 28/01/2015. The commissioning of the economizer on respective boiler and actual start date of operation is listed in table below

S.No.	Activity	Date of commissioning	Date of Actual operation
1	Economizer BO-7101-1 installed	25/11/18	10/12/18
2	Economizer BO-7101-2 installed	21/11/18	10/12/18
3	Economizer BO-7101-3 installed	27/10/18	10/12/18
4	Economizer BO-7101-4 installed	27/07/18	10/12/18
5	Economizer BO-7101-5 installed	05/11/16	10/12/17

As mentioned above the economiser on boiler E become operation dated 10/12/2017 and remaining 4 economisers become operational from 10/12/2018. The project activity is operational since commissioning with normal operation and maintenance.

The project activity has reduced 107.18 GWh energy which resulted emission reductions 28,743 tCO_2e during current monitoring period i.e. from 01/01/2017 to 09/12/2019.

A.2. Location of project activity

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The project is located in the Kingdom of Saudi Arabia at the following coordinates: 23º58’54.7’’N, 38º15’23.5’’E.

Figure A-1: Project Location

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Kingdom of Saudi Arabia (host)	Private entity: YANSAB, Yanbu National Petrochemicals Company	No

A.4. References to applied methodologies and standardized baselines

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The methodology selected is: AMS-II.D. “Energy efficiency and fuel switching measures for industrial facilities” (Version 13.0). The following tools and guidelines were used:

- “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (Version 02)
- “Tool to determine the remaining lifetime of system/equipment” (Version 01)
- “Guidelines on the demonstration of additionality of small scale project activities” (Version 09)

A.5. Crediting period type and duration

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The project activity has chosen fixed crediting period of 10 years, the start date of crediting period is 01/01/2017 and crediting period is from 01/01/2017 to 31/12/2026 (including first and last days).

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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The project activity is implemented and operated as per registered PDD during current monitoring period. The project activity involves adding the second economizer between the existing economizer and stack in terms of flue gas path. Boiler feed water, after being pumped, enters the second and then the existing economizers respectively. The new modifications executed by the manufacturer MACCHI and were imported. The figure below illustrates the project activity after installing the second economizer:

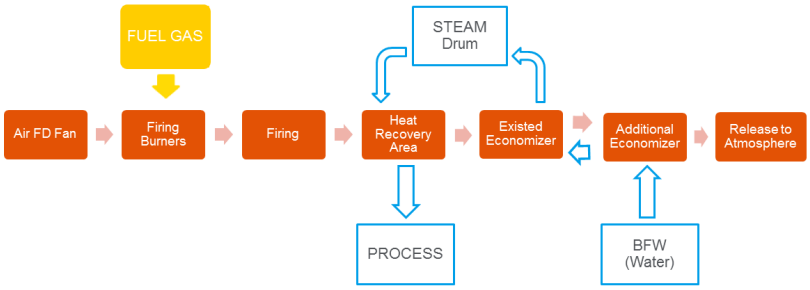

Fig: Project activity

The output of the boiler between the baseline and the project scenario remains the same. The same amount of energy (output) is generated both at the baseline and project scenario. The installation of an additional (external) economizer has a direct impact on the boiler performances since the fuel flow, necessary to produce the same amount of steam, is lower. The consequences are not only related to the higher efficiency, but lower fuel flow fired at given load means lower flue gas temperature and flow in combustion chamber and through the boiler banks. The impact is on the steam temperature.

The efficiency of the boiler is 91% as per original design (baseline). It was noticed that stack outlet temp is above 150^0C (as design). In order to recover this heat waste, a second economizer is installed to warm up boiler feed water (BFW) using exiting hot flue gas. This modification increases boiler efficiency since BFW preheated to a higher temperature and also leads to a sensible reduction in fuel gas consumption to generate super-heated steam.

The second economiser commissioning and start date of actual operation is mentioned in table below

S.No.	Activity	Date of commissioning	Date of Actual operation
1	Economizer BO-7101-1 installed	25/11/18	10/12/18
2	Economizer BO-7101-2 installed	21/11/18	10/12/18
3	Economizer BO-7101-3 installed	27/10/18	10/12/18
4	Economizer BO-7101-4 installed	27/07/18	10/12/18
5	Economizer BO-7101-5 installed	05/11/16	10/12/17

The project activity is operational since date of actual operation of second economiser on each boiler with normal operation and maintenance during current monitoring period. There were no incident occurred during current monitoring period which may impact applicability of methodology or monitoring plan.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

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No temporary deviation taken place from registered monitoring plan or applied approved methodology during current monitoring period.

B.2.2. Corrections

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No correction applied in fixed parameter mentioned in registered PDD during current monitoring Period.

B.2.3. Changes to the start date of the crediting period

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No change in start date of crediting period.

B.2.4. Inclusion of monitoring plan

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There is no inclusion of monitoring plan to the registered PDD that was not included during registration.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

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There is no permanent change from registered monitoring plan or applied methodology.

B.2.6. Changes to project design

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There is no change in project design of registered project activity during current monitoring period.

B.2.7. Changes specific to afforestation or reforestation project activity

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Not applicable

SECTION C. Description of monitoring system

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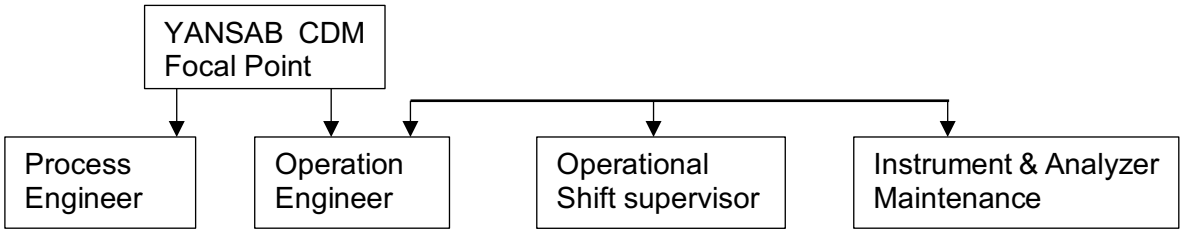
The project monitoring is part of YANSAB's monitoring programme which is integral to the company's third party certified (by British Standards Institute-BSI) for ISO 50001-2018 Energy Management System (EMS) and ISO 9001:2015 compliant Quality Management System (QMS). All monitoring programmes including associated calibrations are within the scope of the EMS & QMS and subjected to several audits and reviews including Internal Audits, SABIC Corporate Audits and Third Party (BSI) audits. Further, YANSAB Operation Management System (OMS) is an integrated system that includes Quality management system, Environmental management system, and Safety management system (SHEM) which is SABIC's Management system that is implemented on all SABIC Affiliates including YANSAB. YANSAB is also certified to the American Chemistry Council Technical Specification Responsible Care® RC 14001.

All the modified facilities are passed through safety review during the design stage (namely HAZOP review) to identify all potential hazards and appropriate mitigations were incorporated during design phase of the project. In addition, there are Standard Operating Procedures (SOPs) available with operating personnel to start, operate and shutdown the boiler safely that include the emergency scenarios of failure also. These SOPs are facilitated by the online instrumentation, Distributed Control System and Emergency Shutdown System.

Through the management systems, monitoring and measurements program, testing and calibration is achieved. Testing and calibration are scheduled through the SAP system and notified by the workflow system to the Instrument division through the SAP maintenance planner.

Management structure and responsibility

YANSAB Management has the overall responsibility for daily operations reporting and assigned a focal point before the start of the crediting period. The CDM project focal point of the proposed activity has the overall responsibility for the monitoring process, including the follow up of daily operations, review of the monitored results/data quality assurance of measurements and process of training new staff.



Position	Responsibilities
YANSAB CDM Focal Point	Supervising the implementation of the monitoring plan
Process Engineer	• Manage whole CDM project activity • Summarized and processing the data.
Operation Engineer	• Collecting and recoding data every month and reporting to CDM project Manager. • Quality Assurance training to operators
Operational Shift Supervisor	Monitor the operation of CDM Project.
Instrument & Analyzer Maintenance	Checking and calibrating the metering & Analysers equipment according to procedure as per SAP PM plan.

The monitoring points will be as follows:

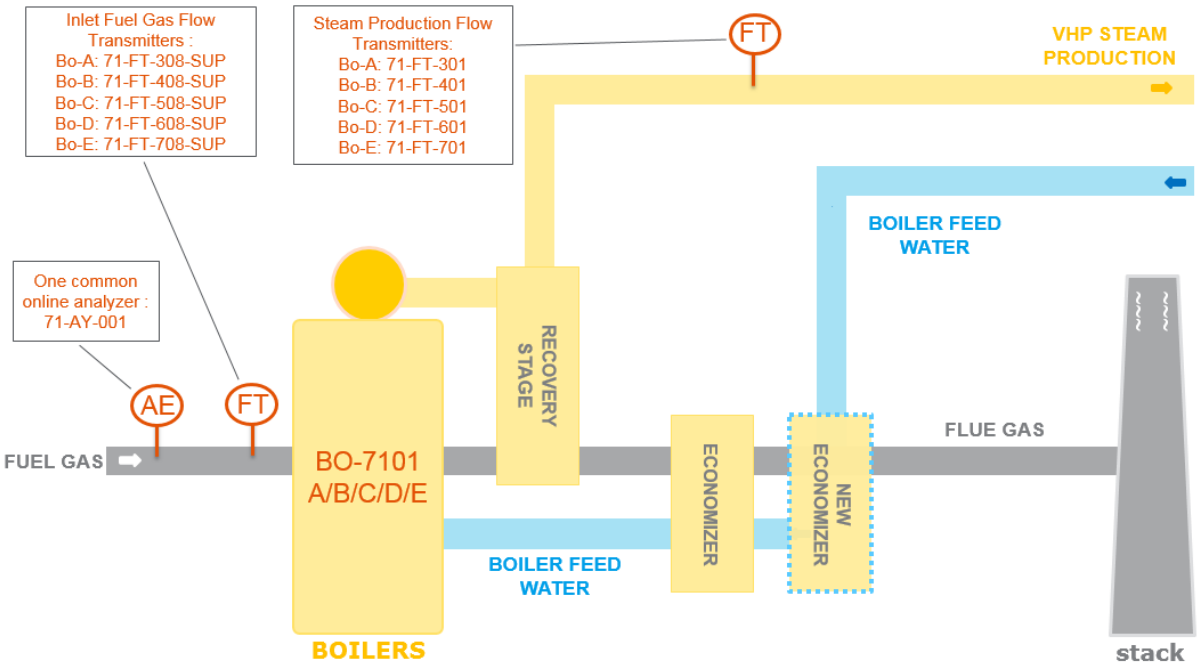


Fig: Single Line diagram

Parameter	Tag Number
Steam Production in Boiler A	71-FI-301
Fuel Gas Consumption in Boiler A	71-FI-308-SUP
Steam Production in Boiler B	71-FI-401
Fuel Gas Consumption in Boiler B	71-FI-408-SUP
Steam Production in Boiler C	71-FI-501
Fuel Gas Consumption in Boiler C	71-FI-508-SUP
Steam Production in Boiler D	71-FI-601
Fuel Gas Consumption in Boiler D	71-FI-608-SUP
Steam Production in Boiler E	71-FI-701

Fuel Gas Consumption in Boiler E	71-FI-708-SUP
Density of Fuel Gas to Boilers	74-AY-001
Gas Composition	By Lab Analysis: Sample Number in LIMS:YN-V-7402

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	$FC_{BL,fuels,j}$
Unit	Tonnes/year
Description	Average annual baseline fossil fuel consumption for fuel type “fuels”
Source of data	YANSAB electronic records (RTIMS)
Value(s) applied	230,909.24
Choice of data or measurement methods and procedures	The data source has been selected because it is metered in real time and data is easily accessible. The QA/QC measured in place is: Monthly sample of fuel gas for composition analysis. Fuel gas controller valves & arrangements are used as QC.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	NA

Data/Parameter	$NCV_{CO2,fuels}$
Unit	MWh/tonne
Description	Average net calorific value of fuel type “fuels” combusted
Source of data	Measured by the project participant
Value(s) applied	13.8239583
Choice of data or measurement methods and procedures	Monthly samples taken to analyse composition of fuel gas.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	NA

Data/Parameter	P_{Hy}
Unit	Tonne / year
Description	Average annual quantity of output (steam) in baseline
Source of data	YANSAB electronic records (RTIMS)
Value(s) applied	3,253,288
Choice of data or measurement methods and procedures	The data of the steam produced has been monitored continuously for the past three years prior to the start of the crediting period. The meters used are pressure & temperature of steam. The data is sent to the plant control room, compiled monthly recording and stored electronically.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	NA

Data/Parameter	$EF_{CO2,fuels,y}$
Unit	tCO2/GJ
Description	Weighted average CO2 emission factor of fuel type “fuels”
Source of data	Calculated
Value(s) applied	0.051104527

Choice of data or measurement methods and procedures	The data is a weighted average of all fuels used to fire the boilers.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	NA

D.2. Data and parameters monitored

Data/Parameter	$P_{PJ,steam,y}$
Unit	Ton
Description	Total quantity of output (steam) in project activity
Measured/calculated/ default	Measured
Source of data	YANSAB electronic records RTIMS
Value(s) of monitored parameter	2017-18:780550 (Boiler E only from 10/12/17 to 09/12/2018) 2018-19:3279695 (all boilers sum from 10/12/18 to 09/12/2019)
Monitoring equipment	Flow meters details given in table below

Boiler	A	B	C	D	E
Make	Yokogawa				
Type	DP Flow Transmitter				
S.No.	91F818183	91F818184	91F818185	91F818186	91F818187
Accuracy	±1%	±1%	±1%	±1%	±1%
Calibration date	5 /7/2020	5/2/2019	2/1/2018	26/7/2017	19/3/2018

Validity of calibration: 5 years

Measuring/reading/recording frequency	Continuous monitoring – real time
Calculation method (if applicable)	The data of the steam produced is monitored continuously during the crediting period. The flow meters use pressure & temperature of steam to calculate the flow. The data is sent to the plant control room, compiled monthly recording and stored electronically.
QA/QC procedures	QA: Steam analyzers QC: Logic to control BFW inlet to the boiler. Calibration are done every five years according to SABIC instrument calibration standards.
Purpose of data/parameter	Calculation of project emissions
Additional comments	NA

Data/Parameter	T_{steam}
Unit	^{0}C (Degree centigrade)
Description	Temperature of output steam in project activity
Measured/calculated/ default	Measured
Source of data	YANSAB electronic records RTIMS
Value(s) of monitored parameter	The yearly average for each boiler as below

	Boiler A	Boiler B	Boiler C	Boiler D	Boiler E
2017-18	NA	NA	NA	NA	492.845
2018-19	485.635	486.050	493.934	501.514	498.731

Monitoring equipment	Temperature gauge Boiler A: Make: Yokogawa; Type: Temperature Transmitter with RTD Element; Serial No.: C2F810984; Accuracy: ±1%; Calibration: 5/10/2017 Boiler B: Make: Yokogawa; Type: Temperature Transmitter with RTD Element; Serial No.: C2F810985; Accuracy: ±1%; Calibration: 21/1/2017 Boiler C: Make: Yokogawa; Type: Temperature Transmitter with RTD Element; Serial No.: C2F810986; Accuracy: ±1%; Calibration: 1/1/2020 Boiler D: Make: Yokogawa; Type: Temperature Transmitter with RTD Element; Serial No.: C2F810987; Accuracy: ±1%; Calibration: 17/7/2019 Boiler E: Make: Yokogawa; Type: Temperature Transmitter with RTD Element; Serial No.: C2F810988; Accuracy: ±1%; Calibration: 9/3/2020 Validity of calibration: 5 years
Measuring/reading/recording frequency	Continuous monitoring – real time, monthly recorded, yearly reporting
Calculation method (if applicable)	The temperature of the steam produced is monitored continuously during the crediting period. The data is sent to the plant control room, compiled monthly recording and stored electronically. The steam temperature is monitored using the temperature transmitter (thermocouple) connected to the DCS. This parameter is used to calculate the enthalpy of steam supplied to process.
QA/QC procedures	Calibration are done every five years according to SABIC instrument calibration standards.
Purpose of data/parameter	Calculation of project emissions
Additional comments	NA

Data/Parameter	P_{steam}
Unit	Bar g
Description	Pressure of the output steam in project activity
Measured/calculated/ default	Measured
Source of data	YANSAB electronic records RTIMS
Value(s) of monitored parameter	The yearly average as below 2017-18: 10.088 2018-19: 10.073
Monitoring equipment	Pressure gauge Make- Yokogawa Type- Gauge Pressure Transmitter S.No.- 91G401356 Accuracy: ±1% Calibration date-10/01/2019 Validity of calibration: 5 years
Measuring/reading/recording frequency	Continuous monitoring – real time, monthly recorded, yearly reporting
Calculation method (if applicable)	The pressure of the steam produced is monitored continuously during the crediting period. The data is sent to the plant control room, compiled monthly recording and stored electronically. The steam pressure is monitored using the pressure transmitter connected to the DCS. This parameter is used to calculate the enthalpy of steam supplied to process
QA/QC procedures	Calibration are done every five years according to SABIC instrument calibration standards.
Purpose of data/parameter	Calculation of project emissions
Additional comments	NA

Data/Parameter	$T_{feedwater}$
Unit	^{0}C (Degree centigrade)

Description	Temperature of feed water going to the boilers
Measured/calculated/ default	Measured
Source of data	YANSAB electronic records RTIMS
Value(s) of monitored parameter	The yearly average as below 2017-18: 105.328 2018-19: 105.475
Monitoring equipment	Temperature gauge Make:Yokogawa Type: Temperature Transmitter with TC Element Serial number: C2G318218 Accuracy class: ±1% Calibration date: 28/7/2020 Validity of Calibration: 5 years
Measuring/reading/recording frequency	Continuous monitoring – real time, monthly recorded, yearly reporting
Calculation method (if applicable)	The data of the steam produced is monitored continuously during the crediting period. The data is sent to the plant control room, compiled monthly recording and stored electronically.
QA/QC procedures	Calibration are done every five years according to SABIC instrument calibration standards.
Purpose of data/parameter	Calculation of project emissions
Additional comments	NA

Data/Parameter	$FC_{,fuels,j,y}$
Unit	Ton/year
Description	Quantity of fuel type “fuels” combusted in process j
Measured/calculated/ default	Measured
Source of data	YANSAB electronic records RTIMS
Value(s) of monitored parameter	2017-18:53955 (Boiler E only from 10/12/17 to 09/12/2018) 2018-19: 224387 (all boilers sum from 10/12/18 to 09/12/2019)
Monitoring equipment	The gas flow meters used are as below

	Boiler A	Boiler B	Boiler C	Boiler D	Boiler E
Make	Yokogawa				
Type	DP Flow Transmitter				
Serial No.	91F818188	91F818189	91F818190	91F818191	91F818192
Accuracy	±1%	±1%	±1%	±1%	±1%
Calibration	4/10/2016	4/2/2019	30/12/2019	15/7/2019	9/3/2020

Validity of calibration: 2 years

Measuring/reading/recording frequency	Continuous monitoring in real time using monitoring equipment and facilities in Distribution Control Station
Calculation method (if applicable)	The data referenced here is for fuels estimated to be combusted during project activity in one boiler. Estimations are based on vendor data. The fuels combusted are monitored continuously with meters: Fuel Gas volumetric flowmeters upstream of individual boiler (71FI308/408/508/608/708) multiplied by Density of Fuel Gas to Boilers (74-AY-001). The data is sent to the plant control room, compiled monthly recording and stored electronically.

QA/QC procedures	QA: QA: Steam flow meters are used to monitor and control steam production QC: Logic to control BFW inlet to the boiler. Calibration are done frequently according to SABIC instrument calibration standards by YANSAB Maintenance Team as following: • Flow meters: Calibration every two years • Density of Fuel Gas to Boilers: every three months.
Purpose of data/parameter	Calculation of project emissions
Additional comments	NA

Data/Parameter	$NCV_{fuels,y}$
Unit	GJ/t
Description	Weighted average net calorific value of the “fuels”
Measured/calculated/ default	Measured
Source of data	Measured by the project participant as the values are not available from the supplier.
Value(s) of monitored parameter	46.33933
Monitoring equipment	Analyser Make: Solatron Type: Specific Gravity Serial number: 3098C / 7950AA1020 Accuracy class: ±1% Calibration date: 16/04/2020 Validity of Calibration: one year
Measuring/reading/recording frequency	Monthly sample of fuel gas for composition analysis performed internally. Calibration are done frequently according to SABIC instrument calibration standards.
Calculation method (if applicable)	Measured by the project participant as the values are not available from the supplier. The measurements undertaken are in line with national regulation “RC regulation”.
QA/QC procedures	QA: Monthly Fuel Gas Composition Monthly analysis by YANSAB Lab. QC: SG analyser on FG feed line to Boilers. Calibration are done frequently according to SABIC instrument calibration standards by YANSAB Maintenance Team.
Purpose of data/parameter	Calculation of project emissions
Additional comments	NA

Data/Parameter	$EF_{CO2,fuels,y}$
Unit	tCO2e / GJ
Description	Weighted average CO2 emission factor for aggregated fuels
Measured/calculated/ default	Calculated
Source of data	Calculated by the project participant.
Value(s) of monitored parameter	2.4 (analysed from 10/12/2018 to 09/12/2019)
Monitoring equipment	NA
Measuring/reading/recording frequency	Monitoring is performed and documented for each delivery.
Calculation method (if applicable)	Calculated by the project participant. The CO2 emission factor is obtained for each fuel delivery, from which weighted average annual values are calculated.

QA/QC procedures	QA: Stack analysers, and yearly stack emission test. QC: Logic to control excess air ratio with fuel gas.
Purpose of data/parameter	Calculation of project emissions
Additional comments	NA

D.3. Implementation of sampling plan

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Not applicable as all parameter monitored.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

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The economiser on boiler E commissioned in 2017 and was operational since 10/12/2017, however stack analysis, NCV analysis and emission factor calculation was not performed as per monitoring requirement, hence PP will not claim emission for boiler E from 10/12/2017 to 09/12/2018. All economiser were operational from 10/12/2018, hence for emission reduction calculation only data from 10/12/2018 to 09/12/2019 is considered in current monitoring period i.e. from 01/01/2017 to 09/12/2019.

From 10/12/2018 to 09/12/2019, the actual steam generation and fuel consumption details as monitored given below

$PP_{J,I,y}$ = 3,279,695 Ton
$FC_{fuel,j,y}$=224,387 Ton

The baseline emission is calculated using below equations

			Reference/Source/Description
BE_y	$\Sigma (SEC_i * PP_{J,I,y}) * EF_{CO2,y}$		Simplified equation
SEC_i	0.981185713	MWh/ton of steam	Energy consumption per ton of steam in baseline.
$PP_{J,I,y}$	3,103,709	T	Quantity of steam in base year
$EF_{CO2,y}$	0.185082251	tCO_2/MWH	Emission Factor. Tab "Fuel Gas Analysis in Base Line". Value in tCO_2/ton of fuel is converted to tCO2/MWH
BE_y	563,633	**tCO_2e**	Calculated

			Reference/Source
SEC_{BL}	$(\Sigma FC_{BL,I,fuels} * NCV_{CO2,fuels})/PH_y$		
$FC_{BL,I,fuels}$	2,30,909.24	t	Average annual baseline fossil fuel consumption for 3 years period.
$NCV_{CO2,fuels}$	13.8239583	MWh/t	Average NCV of fuel combusted. Tab "Fuel Gas Analysis Baseline". Value in GJ/ton is converted to MWH/ton
PH_y	32,53,288	t/yr	Average annual quantity of output (steam) in baseline for 3 years period.
SEC_{BL}	0.981185713	MWh/ton of steam	Energy consumption per ton of steam

Hence, baseline emission from 10/12/2018 to 09/12/2019 is

BE_y= 563,633 tCO_2e

E.2. Calculation of project emissions or actual net removals

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The project emission is calculated as per below

$PE_y = PE_{FF,y}$ (Simplified equation)

$PE_{FF,y}$	$\Sigma FC_{fuels,j,y} * COEF_{fuels,y}$		Equation from "Tool to Calculate Project or Leakage CO_2 / Emissions from Fossil Fuel Combustion" version 02
$FC_{fuels,j,y}$	222,580.20	T	Total fuel gas consumption after project implementation and fuel consumption in base year minus estimated fuel savings, please refer ER sheet
$COEF_{fuels,y}$	2.4031335	tCO_2/t	see below
$PE_{FF,y}$	534,889.84	tCO_2	Calculated

Option B: $COEF_{fuels,y}$	$NCV_{fuels,y} * EF_{CO2,y}$		Equation from "Tool to Calculate Project or Leakage CO_2 / Emissions from Fossil Fuel Combustion" version 02
$NCV_{fuels,y}$	46.33932740	GJ/t	Based on average composition and SABIC Standard for footprint for period 10/12/2018 to 09/12/2018, please refer ER sheet
$EF_{CO2,y}$	0.051859481	tCO_2/t	Average for period 10/12/2018 to 09/12/2018 as per analysis stack emissions, please refer ER sheet
$COEF_{fuels,y}$	2.4031335	tCO_2/t	Calculated

Hence, **PE_y = 534,890 tCO_2e**

E.3. Calculation of leakage emissions

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Paragraph 52 of methodology states that if the energy efficiency technology is equipment transferred from another activity, leakage is to be considered. Since the project activity does not include transfer of technology from another activity.

Hence,
LE_y=0 tCO_2e

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals ($t CO_2e$)	Project GHG emissions or actual net GHG removals ($t CO_2e$)	Leakage GHG emissions ($t CO_2e$)	GHG emission reductions or net anthropogenic GHG removals ($t CO_2e$)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	563,633	534,890	0	0	28,743	28,743

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the PDD (t CO_2e)
28,743	23,018

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

>>
The ex-ante emission reduction estimated in PDD i.e. 23,018 tCO_2e/year based on estimated annual electricity generation. The value is calculated for number of days current this monitoring period i.e. 365 days, the value comes as 23,018 tCO2e.

The annual estimated CER as per registered PDD = 23,018 tCO_2e/year
The corresponding CERs during current monitoring period = (85147 x 365)/365.
The corresponding CERs during current monitoring period = 23,018 tCO_2e

E.6. Remarks on increase in achieved emission reductions

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The emission reduction achieved during current monitoring period is 24.87% higher than ex-ante estimates for the same period due to increased boiler load resulting more energy saving.

E.7. Remarks on scale of small-scale project activity

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The project activity has installed operated as per registered PDD and during current monitoring period the actual energy saving for 2017-18 was 15.51 GWth as only one economiser was operational and during 2018-19 the saving achieved 107.18 GW_{th}, which is well withing small scale threshold i.e. 180GW_{th} as per applied approved small-scale methodology.

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Document information

Version	*Date*	*Description*
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).

Version	Date	Description
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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