UNFCCC Clean Development Mechanism Monitoring Report

Transalloys Manganese Alloy Smelter Energy Efficiency Project

Version 1

CDM registration number 1027

Monitoring period 01/10/04 – 31/03/08

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Project background

Transalloys Manganese Alloy Smelter Energy Efficiency Project has been registered as CDM project by the UNFCCC on 19 October 2007 under reference number 1027.

Further background on this project can be found in the PDD and associated documents, which are available on the UNFCCC website:

http://cdm.unfccc.int/Projects/DB/DNV-CUK1174913531.12/view.html

Parties involved are South Africa (Host Country) and the United Kingdom of Great Britain and Northern Ireland (other Parties). The project participants are

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)
South Africa(host)	Highveld Steel and Vanadium Corporation Limited	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Group Plc	No

Monitoring background

Basis for the calculation of emission reductions is the monitoring plan in the Project Design Document (PDD). The calculation of emission reduction in the PDD applied methodologies ACM0002 (version 6 of 19/05/2006) and AM0038 (version 1 of 29/09/06).

There are no remaining open issues related to monitoring after completion of project validation.

Monitoring results

Emission reduction

The calculated emission reductions amount to **232,457 ton CO2eq.**

Monitoring period covered

This is the first monitoring report of this project. It covers the period 01/10/2004 to 31/03/08.

Presentation of monitoring results – spreadsheet

All monitoring data has been included in an Excel workbook per furnace. As there are 3 furnaces in the project so far there are 3 workbooks. The workbook includes:

1. Overview: Provides project details.
2. F# (furnace ref number: 3, 5 or 7) - Historic & Baseline: Outlines the historic data inputs and baseline emissions calculation.
3. F# (furnace ref number: 3, 5 or 7) – Compositions: Provides details regarding the compositions of various raw materials.
4. F# (furnace ref number: 3, 5 or 7) – Raw & processed data: Contains all monitored data obtained from the site.
5. F# (furnace ref number: 3, 5 or 7) – Project emissions & ER: Outlines the project emissions calculation with raw data inputs and references to data sources. Also states the net emission reduction for the particular furnace.

Calculation methodology

The calculation methodology of emission reductions for this project is summarised below. Please note that data and calculations are cross-checked in order to assure quality.

Calculation was carried out as detailed in the following steps for the data generated:

A) Worksheet *F# (furnace ref number: 3, 5 or 7) - Historic & Baseline*:

1. All monitored data from 1997 to 2003 (7 years) is copied into a table. The data is tons of SiMn produced per year, electricity, coal, coke, paste consumed per year, coke fixed carbon and coke percent volatiles;
2. $QP_{historic}$ is calculated as the average SiMn produced per year over the period 1997 to 2003;
3. sec_b is calculated as the ratio of the electrical consumption to SiMn consumption over 1997 to 2003;
4. $EF_{b,\ coal}$ is the baseline emission factor for coal and is taken as a fixed value from IPCC;
5. $EF_{b,\ coke}$ (baseline emission factor for coke) is determined by summing the monitored coke fixed carbon content and the product of the monitored volatiles % in coke and the IPCC value of carbon % in volatiles per year; this value is then multiplied by the

weight ratio of a mole of CO2 over a mole of C, and averaged over the 1997 to 2003 period;

6. $EF_{b,\ paste}$ (baseline emission factor for paste) is calculated by adding the paste fixed carbon (from supplier specifications) and the product of the volatiles % (from supplier specifications) with carbon % in volatiles (from IPCC for coke as paste has a very similar composition to coke);

7. $EF_{y,\ offset}$ is the grid CEF and has been established on the basis of ACM0002 v6 and is stated in the PDD;

8. $QP_{y,\ max}$ is the SiMn produced at year y and is selected as the smaller figure (i.e. more conservative) between year y SiMn production and $QP_{historic}$ (see step 2). If at year y the furnace has functioned less than 12 months, a factor is introduced to $QP_{historic}$ to correspond to the activity period within year y;

9. $BE_{y,\ offsite}$ (offsite baseline emissions) are the product of $QP_{y,\ max}$ (step 8), $EF_{y,\ offset}$ (step 7) and sec_b (step 3);

10. $EF_{b,\ onsite}$ (onsite baseline emission factor) is the sum of the products of the emission factors for coal, coke and paste and their respective consumptions, divided by the overall SiMn production over the period 1997 to 2003;

11. $BE_{y,\ onsite}$ (onsite baseline emissions) in year y are the product of $EF_{b,\ onsite}$ (step 10) and $QP_{y,\ max}$ (step 8);

12. BE_y (overall baseline emissions) are the sum of $BE_{y,\ onsite}$ (step 11) and $BE_{y,\ offsite}$ (step 9);

B) Worksheet *F# (furnace ref number: 3, 5 or 7) – Project Emissions & ER*:

1. All monitored data for the monitoring period is entered into a table. The data is tons of SiMn produced per year [$QP_{y\ monitored}$], electricity [EC_y] (which has been corrected for drift where applicable), coal [$Q_{p\ coal,\ y}$], coke [$Q_{p\ coke,\ y}$], paste [$Q_{p\ paste,\ y}$] consumed per year, coke fixed carbon and coke percent volatiles. This data is taken from the daily measurements in worksheet *F# (furnace ref number: 3, 5, or 7)- Raw & processed data*;

2. $sec_{p,\ y}$ is calculated as the ratio of the electrical consumption to SiMn consumption at year y;

3. $EF_{p\ coal,\ y}$ is the project emission factor for coal and is taken as a fixed value from IPCC. It is equivalent to $EF_{b,\ coal}$;

4. $EF_{p\ coke,\ y}$ (project emission factor for coke) is calculated by summing from each lab analysis report in a year (see worksheet *F# (furnace ref number: 3, 5, or 7)- Raw & processed data*) the monitored coke fixed carbon and the product of the monitored volatiles % in coke (same source as for the fixed carbon) and the IPCC value of carbon % in volatiles; this value is then multiplied by the weight ratio of a mole of CO2 over a mole of C;

5. $EF_{p,\ paste,\ y}$ (project emission factor for paste) is calculated by adding the paste fixed carbon (from supplier specifications) and the product of the volatiles % (from supplier specifications) with carbon % in volatiles (from IPCC for coke as paste has a very similar composition to coke). This approach is equivalent to the one taken for $EF_{b,\ paste}$;

6. $EF_{y,\ offset}$ is the grid CEF and has been established on the basis of ACM0002 v6 and is stated in the PDD (same as in the baseline);

7. $QP_{y,\ max}$ is the SiMn produced at year y and is selected as the smaller figure (i.e. more conservative) between year y SiMn production and $QP_{historic}$ (see baseline, step 2). If at year y the furnace has functioned less than 12 months, a factor is introduced to $QP_{historic}$ to correspond to the activity period within year y;

8. $PE_{y,\ offsite}$ (offsite project emissions) are the product of $QP_{y,\ max}$ (step 7), $EF_{y,\ offset}$ (step 6), and $sec_{p,\ y}$ (step 2);

9. $EF_{p,\ y,\ onsite}$ (onsite project emission factor) is the sum of the products of the emission factors for coal, coke and paste and their respective consumptions, divided by $QP_{y\ monitored}$ i.e. the amount of SiMn production at year y;

10. $PE_{y,\ onsite}$ (onsite project emissions) in year y are the product of $EF_{p,\ y,\ onsite}$ (step 9) and $QP_{y,\ max}$ (step 7);

11. PE_y (overall project emissions) are the sum of $PE_{y,\ onsite}$ (step 10) and $PE_{y,\ offsite}$ (step 8);

12. ER_y (net emission reductions) at year y are the difference between BE_y and PE_y;

Once 12. has been determined, total net emission reductions for the specified time frame are determined and included in the monitoring report.

Table 1 – Baseline and project emissions for Furnace 3

Baseline Emissions

$QP_{y, max}$ $QP_{y, max}$ = minimum of ($QP_{y, monitored}$, $QP_{historic}$) Equation (3)

Name	Symbol	Unit	2005	2006	2007	2008
SiMn in year during project activity	$QP_{y\ monitored}$	t SiMn/year	1,920	24,268	21,180	5,011
SiMn production for estimating baseline	$QP_{y\ max}$	t SiMn/year	1,920	19,326	19,326	4,831

$BE_{y, offsite}$ $BE_{y, offsite} = QP_{y, max} \times sec_b \times EF_{y, offsite}$ Equation (2)

Name	Symbol	Unit	2005	2006	2007	2008
Offsite baseline emissions	$BE_{y, offsite}$	tCO_2e	11,731	118,075	118,075	29,519

$EF_{b, onsite}$ $EF_{b, onsite} = \{ \xi\ Q_{b\ coal, i} \times EF_{b\ coal} + \xi\ Q_{b\ coke, i} \times EF_{b\ coke} + \xi\ Q_{b\ paste, i} \times EF_{b\ paste} \} / \xi\ QPi$

Name	Symbol	Unit	All years
Baseline emission factor (onsite)	$EF_{b, onsite}$	t CO_2e/t SiMn	2.62

Calculated using Equation 7. $Q_{b\ coal}$ - Row 8. $EF_{b\ coal}$

$BE_{y, onsite}$ $BE_{y, onsite} = QP_{y, max} \times EF_{b, onsite}$ Equation (6)

Name	Symbol	Unit	2005	2006	2007	2008
Onsite baseline emissions	$BE_{y, onsite}$	tCO_2e	5,037	50,696	50,696	12,674

BE_y $BE_y = BE_{y, offsite} + BE_{y, onsite}$ Equation (1)

Name	Symbol	Unit	2005	2006	2007	2008
Baseline emissions	BE_y	tCO_2e	16,768	168,771	168,771	42,193

Project Emissions

$PE_{y, offsite}$ $PE_{y, offsite} = QP_{y, max} \times sec_p \times EF_{y, offsite}$ Equation (9)

Name	Symbol	Unit	2005	2006	2007	2008
SiMn from Equation 3	$QP_{y\ max}$	t SiMn/year	1,920	19,326	19,326	4,831
Offsite project grid emissions	$PE_{y, offsite}$	tCO_2e	9,936	102,618	111,425	26,784

$EF_{p, onsite}$ $EF_{p, onsite} = \{ \xi\ Q_{p\ coal, i} \times EF_{p\ coal} + \xi\ Q_{p\ coke, i} \times EF_{p\ coke} + \xi\ Q_{p\ paste, i} \times EF_{p\ paste} \} / \xi\ Qpy$

Name	Symbol	Unit	2005	2006	2007	2008
Baseline emission factor (onsite)	$EF_{p, onsite}$	t CO_2e/t SiMn	2.06	2.35	2.53	2.71

$PE_{y, onsite}$ $PE_{y, onsite} = QP_{y, max} \times EF_{p, y, onsite}$ Equation (11)

Name	Symbol	Unit	2005	2006	2007	2008
SiMn from Equation 3	$QP_{y\ max}$	t SiMn/year	1,920	19,326	19,326	4,831
Onsite project emissions	$PE_{y, onsite}$	tCO_2e	3,956	45,508	48,880	13,093

PE_y $PE_y = PE_{y\ (offsite)} + PE_{y\ (onsite)}$ Equation (8)

Name	Symbol	Unit	2005	2006	2007	2008
Project emissions	PE_y	tCO_2e	13,892	148,126	160,305	39,877

Table 2 – Baseline and project emissions for Furnace 5

Baseline Emissions

$QP_{y, max}$ $QP_{y, max}$ = minimum of ($QP_{y, monitored}$, $QP_{historic}$) *Equation (3)*

Name	Symbol	Unit	2005	2006	2007	2008
SiMn in year during project activity	$QP_{y\ monitored}$	t SiMn/year	1,854	40,057	29,929	9,266
SiMn production for estimating baseline	$QP_{y\ max}$	t SiMn/year	1,854	37,767	29,929	9,266

$BE_{y, offsite}$ $BE_{y, offsite} = QP_{y, max} \times sec_b \times EF_{y, offsite}$ *Equation (2)*

Name	Symbol	Unit	2005	2006	2007	2008
Offsite baseline emissions	$BE_{y, offsite}$	tCO_2e	12,278	250,044	198,154	61,350

$EF_{b, onsite}$ $EF_{b, onsite} = \{ \xi\ Q_{b\ coal, i} \times EF_{b\ coal} + \xi\ Q_{b\ coke, i} \times EF_{b\ coke} + \xi\ Q_{b\ paste, i} \times EF_{b\ paste} \} / \xi\ QPi$

Name	Symbol	Unit	All years
Baseline emission factor (onsite)	$EF_{b, onsite}$	t CO_2e/t SiMn	3.06

Calculated using Equation 7. $Q_{b\ coal}$ - Row 8. $EF_{b\ coal}$

$BE_{y, onsite}$ $BE_{y, onsite} = QP_{y, max} \times EF_{b, onsite}$ *Equation (6)*

Name	Symbol	Unit	2005	2006	2007	2008
Onsite baseline emissions	$BE_{y, onsite}$	tCO_2e	5,666	115,387	91,441	28,311

BE_y $BE_y = BE_{y, offsite} + BE_{y, onsite}$ *Equation (1)*

Name	Symbol	Unit	2005	2006	2007	2008
Baseline emissions	BE_y	tCO_2e	17,943	365,431	289,595	89,661

Project Emissions

$PE_{y, offsite}$ $PE_{y, offsite} = QP_{y, max} \times sec_p \times EF_{y, offsite}$ *Equation (9)*

Name	Symbol	Unit	2005	2006	2007	2008
SiMn from Equation 3	$QP_{y\ max}$	t SiMn/year	1,854	37,767	29,929	9,266
Offsite project grid emissions	$PE_{y, offsite}$	tCO_2e	11,562	231,390	199,856	53,613

$EF_{p, onsite}$ $EF_{p, onsite} = \{ \xi\ Q_{p\ coal, i} \times EF_{p\ coal} + \xi\ Q_{p\ coke, i} \times EF_{p\ coke} + \xi\ Q_{p\ paste, i} \times EF_{p\ paste} \} / \xi\ Qpy$

Name	Symbol	Unit	2005	2006	2007	2008
Project emission factor (onsite)	$EF_{p, onsite}$	t CO_2e/t SiMn	4.02	2.85	3.14	2.94

$PE_{y, onsite}$ $PE_{y, onsite} = QP_{y, max} \times EF_{p, y, onsite}$ *Equation (11)*

Name	Symbol	Unit	2005	2006	2007	2008
SiMn from Equation 3	$QP_{y\ max}$	t SiMn/year	1,854	37,767	29,929	9,266
Onsite project emissions	$PE_{y, onsite}$	tCO_2e	7,458	107,746	93,851	27,210

PE_y $PE_y = PE_{y\ (offsite)} + PE_{y\ (onsite)}$ *Equation (8)*

Name	Symbol	Unit	2005	2006	2007	2008
Project emissions	PE_y	tCO_2e	19,020	339,136	293,707	80,823

Table 3 – Baseline and project emissions for Furnace 7

Baseline Emissions

$QP_{y,\ max}$ $QP_{y,\ max}$ = minimum of ($QP_{y,\ monitored}$, $QP_{historic}$) Equation (3)

Name	Symbol	Unit	2004	2005	2006	2007	2008
SiMn in year during project activity	$QP_{y\ monitored}$	t SiMn/year	11,016	36,866	37,030	38,729	10,397
SiMn production for estimating baseline	$QP_{y\ max}$	t SiMn/year	9,849	36,866	37,030	38,729	9,849

$BE_{y,\ offiste}$ $BE_{y,\ offsite} = QP_{y,\ max} \times sec_b \times EF_{y,\ offiste}$ Equation (2)

Name	Symbol	Unit	2004	2005	2006	2007	2008
Offsite baseline emissions	$BE_{y,\ offsite}$	tCO_2e	67,101	251,167	252,284	263,860	67,101

$EF_{b,\ onsite}$ $EF_{b,\ onsite} = \{ \xi\ Q_{b\ coal,\ i} \times EF_{b\ coal} + \xi\ Q_{b\ coke,\ i} \times EF_{b\ coke} + \xi\ Q_{b\ paste,\ i} \times EF_{b\ paste} \} / \xi\ QPi$ Equation (7)

Name	Symbol	Unit	All years
Baseline emission factor (onsite)	$EF_{b,\ onsite}$	t CO_2e/t SiMn	2.96

Calculated using Equation 7. $Q_{b\ coal}$ - Row 8. $EF_{b\ coal}$ - Cell E28. $Q_{b\ coke}$

$BE_{y,\ onsite}$ $BE_{y,\ onsite} = QP_{y,\ max} \times EF_{b,\ onsite}$ Equation (6)

Name	Symbol	Unit	2004	2005	2006	2007	2008
Onsite baseline emissions	$BE_{y,\ onsite}$	tCO_2e	29,112	108,969	109,453	114,475	29,112

BE_y $BE_y = BE_{y,\ offsite} + BE_{y,\ onsite}$ Equation (1)

Name	Symbol	Unit	2004	2005	2006	2007	2008
Baseline emissions	BE_y	tCO_2e	96,212	360,135	361,738	378,336	96,212

Project Emissions

$PE_{y,\ offsite}$ $PE_{y,\ offsite} = QP_{y,\ max} \times sec_p \times EF_{y,\ offsite}$ Equation (9)

Name	Symbol	Unit	2004	2005	2006	2007	2008
SiMn from Equation 3	$QP_{y\ max}$	t SiMn/year	9,849	36,866	37,030	38,729	9,849
Offsite project grid emissions	$PE_{y,\ offsite}$	tCO_2e	64,478	222,263	235,596	214,178	52,231

$EF_{p,\ onsite}$ $EF_{p,\ onsite} = \{ \xi\ Q_{p\ coal,\ i} \times EF_{p\ coal} + \xi\ Q_{p\ coke,\ i} \times EF_{p\ coke} + \xi\ Q_{p\ paste,\ i} \times EF_{p\ paste} \} / \xi\ Qpy$

Name	Symbol	Unit	2004	2005	2006	2007	2008
Project emission factor (onsite)	$EF_{p,\ onsite}$	t CO_2e/t SiMn	2.47	2.39	2.49	2.69	2.72

$PE_{y,\ onsite}$ $PE_{y,\ onsite} = QP_{y,\ max} \times EF_{p,\ y,onsite}$ Equation (11)

Name	Symbol	Unit	2004	2005	2006	2007	2008
SiMn from Equation 3	$QP_{y\ max}$	t SiMn/year	9,849	36,866	37,030	38,729	9,849
Onsite project emissions	$PE_{y,\ onsite}$	tCO_2e	24,333	88,026	92,323	104,232	26,763

PE_y $PE_y = PE_{y\ (offsite)} + PE_{y\ (onsite)}$ Equation (8)

Name	Symbol	Unit	2004	2005	2006	2007	2008
Project emissions	PE_y	tCO_2e	88,811	310,289	327,919	318,410	78,994

Table 4 – Emission reductions

Furnace 3

Emission Reduction

$ER_y = BE_y - PE_y$	$ER_y = BE_y - PE_y$ *Equation (13)*

Name	Symbol	Unit	2005	2006	2007	2008
Baseline emissions	BE_y	tCO_2e	16,768	168,771	168,771	42,193
Project emissions	PE_y	tCO_2e	13,892	148,126	160,305	39,877
Emission reduction	ER_y	tCO_2e	2,876	20,645	8,466	2,316

TOTAL ER Furnace #3	**34,303**

Furnace 5

Emission Reduction

$ER_y = BE_y - PE_y$	$ER_y = BE_y - PE_y$ *Equation (13)*

Name	Symbol	Unit	2005	2006	2007	2008
Baseline emissions	BE_y	tCO_2e	17,943	365,431	289,595	89,661
Project emissions	PE_y	tCO_2e	19,020	339,136	293,707	80,823
Emission reduction	ER_y	tCO_2e	-1,076	26,295	-4,112	8,838

TOTAL ER Furnace #5	**29,945**

Furnace 7

Emission Reduction

$ER_y = BE_y - PE_y$	$ER_y = BE_y - PE_y$ *Equation (13)*

Name	Symbol	Unit	2004	2005	2006	2007	2008
Baseline emissions	BE_y	tCO_2e	96,212	360,135	361,738	378,336	96,212
Project emissions	PE_y	tCO_2e	88,811	310,289	327,919	318,410	78,994
Emission reduction	ER_y	tCO_2e	7,401	49,846	33,819	59,925	17,218

TOTAL ER Furnace #7	**168,209**