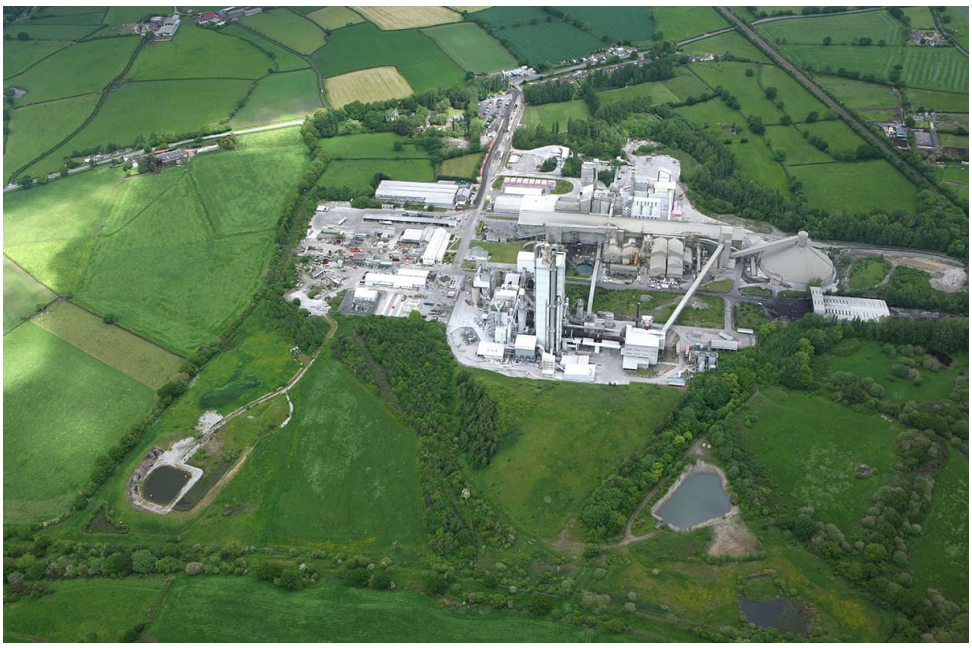
Heidelberg Materials

Heidelberg Materials: Padeswood Carbon Capture Plant – FEED Phase

Effluent & Emissions Summary



Project no. 215000-00190
Document no. Rev 0: 215000-00190-000-PR-LST-00005
21-May-24

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Rev	Description	Originator	Reviewer	Worley Approver	Revision Date
Rev A	Issued for IDC	SC S Chatterjee	AK A Kundu	AK A Kundu	15-Mar-24
Rev B	Issued for Review	SK S Kulkarni	AK A Kundu	AK A Kundu	27-Mar-24
Rev 0	Issued for Design	Shrikant Kulkarni S Kulkarni	Abir kundu A Kundu	Abir kundu A Kundu	21-May-24

Hold Record

Specify any Holds within the document.

Hold No.	Section	Description of Hold

Revision Tracking

Specify significant changes from previous revisions of the document.

Rev.	Section	Description of Change
A	General	Issued for IDC.
B	General	Incorporating IDC comments.
0	General	Incorporating Client comments.

Project Name	Heidelberg Materials: Padeswood Carbon Capture Plant - FEED Phase	Doc. No.	215000-00190-000-PR-LST-00005
Customer	Heidelberg Materials	Revision	Rev 0
Document Title	Effluent & Emissions Summary	Page	4

This document describes the Effluent and Emissions from the OSBL areas. For the ISBL area refer to Technology Provider document Effluent and Emissions List (startup, shut down, emergency) 215000-00190-720-PR-LST-10003 (Appendix-1)

GENERAL NOTE

1. Emergency relief vents are excluded from this summary. See MHI vent list (215000-00190-720-PR-LST-10004) for CO2 vent scenarios provided by the Technology Provider
2. The Process Condensate which is mentioned in the Technology Providers Effluent List is not considered an effluent as it is treated within the WWTP. Water exiting the WWTP is sent to the Quencher as RO reject water.
3. During media regeneration.
4. Flowrate provided for the worst case when downstream T&S pipeline is blocked or there is process upset.
5. For list of HP CO2 venting scenarios see MHI vent list (215000-00190-720-PR-LST-10004)
6. For list of LP CO2 venting scenarios see MHI vent list (215000-00190-720-PR-LST-10004)
7. Only when outbreathing.
8. See Stream no. 710-01 for composition for different modes (215000-00190-710-PR-HMB-00001)
9. Deleted.
10. Continuous Treated Gas to stack flow will be stopped if bypass stream is routed to stack.

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No.	1	2	3	4	5	6
SOURCE	TYPE	PHASE	FLOWRATE	TEMPERATURE °C	COMPOSITION	NOTES
Cooling Tower Exhaust	Continuous	V	57 tph	37	Air saturated with water	
Filter Vent (WWTP)	Intermittent	V	TBC by Vendor	TBC	Air	Note 3
Pond outfall	Intermittent	L	NNF	Amb	Water	
Flue Gas from Kiln to new stack header via bypass	Occasional	V	430034 kg/hr	165	O2/N2/Ar/CO2/H2O	Note 8, 10
Deaerator Vent	Continuous	V	672 kg/hr	132	Steam	
OSBL CO2 Vent to new stack	Occasional	V	112321 kg/hr	38	CO2	Note 4
WWTP Chemical Storage Tanks	Intermittent	V	NNF	Ambient		Note 7
CCP Effluent Storage Tank	Intermittent	V	NNF	Ambient		Note 7
WWTP Filter Media	Intermittent	S				Periodic (during filter changeover)
Pump suction filter Cartridge	Intermittent	S				
HTF drain	Occasional	L	28.4 m3/h	30	Therminol-66	Truck Unloading
Interceptor	Intermittent	L	NNF	Ambient	Hydrocarbons	Truck Unloading
CCP Effluent Tank	Intermittent	L	NNF	33	Water	Truck Unloading
FGD Tank	Intermittent	L	NNF	55	Water	Truck Unloading
RO Reject Tank	Intermittent	L	NNF	31	Water	Truck Unloading
WWT Tanker Loading	Intermittent	L	NNF	TBC by Vendor	TBC by Vendor	Truck Unloading

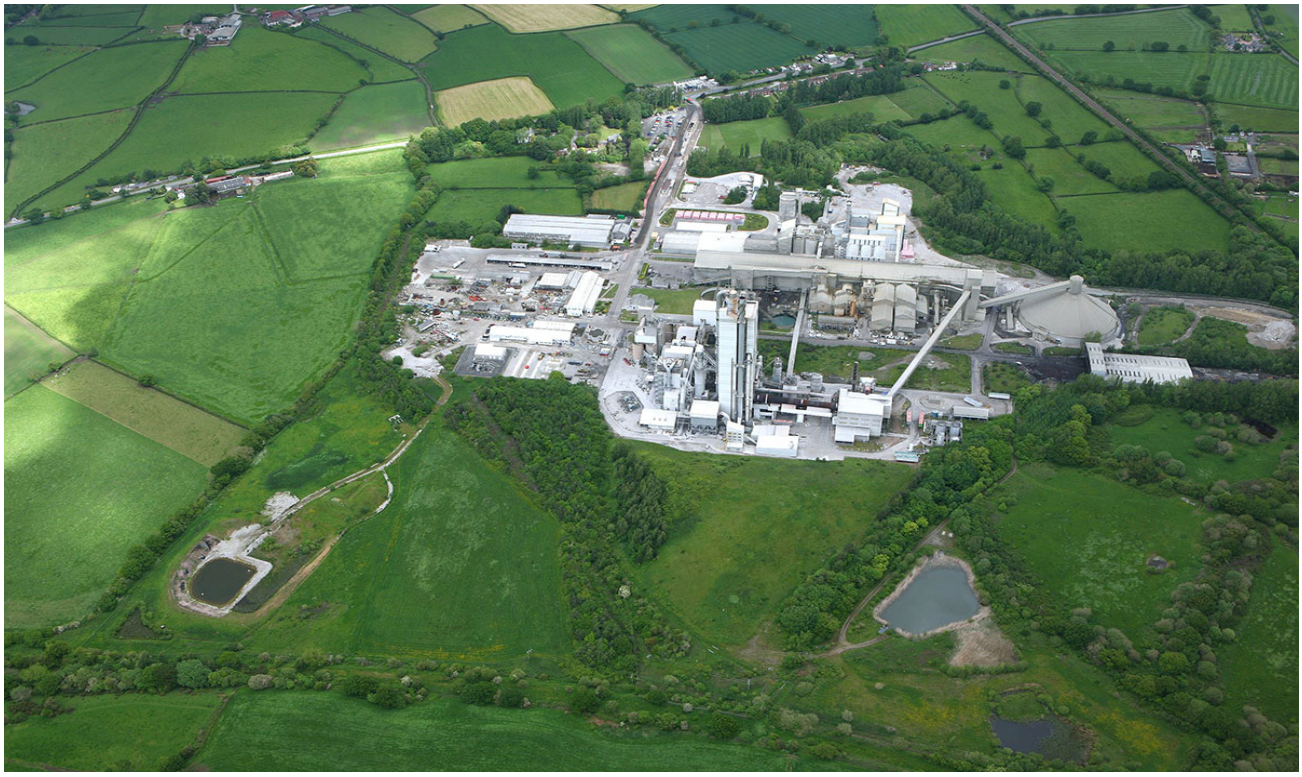
APPENDIX-1

HEIDELBERG MATERIALS

Padeswood Carbon Capture Plant – FEED Phase

Effluent & Emissions List (ISBL)

Document no. Rev A : 215000-00190-720-PR-LST-10003



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Rev	Description	Originator	Reviewer	MHI Approver	Revision Date
Rev A	Issue for Information	Yang	Kamada	Obata	15 May 2024

FOR REVIEW

DISTRIBUTION	
PM	E
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PROCESS	-
MACHINE	-
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UNIT	-
PIPING	-
I&C	-
ELECT.	-
CIVIL	-
CONST.	-
HM	E
Worley	-
EMEA	-
VENDOR	-
TOTAL	-

MITSUBISHI HEAVY INDUSTRIES

EFFLUENT & EMISSIONS LIST (ISBL)

PROPRIETARY & CONFIDENTIAL

ORDER NO.	**583360**
PROJECT	HMUK
Approved	Data
	S.Sudo
DISCIPLINE	KM-CDR Group
APPROVED	T.Kamada
CHECKED	O.Miyamoto
PREPARED	K.Yang
	K.Nakayama
JAPAN EXPORT CONTROL	☐ On the control list ■ Not on the control list
DRAWN DATE	**24/4/2024**

OWNER: Heidelberg Materials

PROJECT

Heidelberg Materials Padeswood Carbon Capture Plant Project

DWG. NO.

8382M-B 543 - S00 - 0010

REV.

0

SUMMARY OF REVISIONS							Doc No. : 8382M-B 543 - S00 - 0010
Cover Sheet		Item	Original		Revision		Reasons
Rev.	**Date**	No.	**Rev.**	**Description**	**Rev.**	**Description**	
0	24/4/2024		0	First issue			

EFFLUENT & EMISSIONS LIST (MODE 1)

CONFIDENTIAL

No.	1	2	3	4	5	6	7
ITEM	Treated Gas from CCP Flue Gas Stack (720-SK-001)	Filter Media from Guard Filter and Solvent Sump Filter (720-FU-002, 720-FU-003)	Activated Carbon from Carbon Filter (720-FU-004)	Dehydration Adsorbent in Dehydration Unit (730-ZZ-002)	O_2 Removal Catalyst in O_2 Removal Reactor (730-RA-001)	O_2 Gas from H_2 Generation Unit (730-ZZ-001)	H_2 Gas from H_2 Generation Unit (730-ZZ-001)
Quantity (Expected)	304,254 Nm^3/h	720-FU-002 : 0.1 m^3/Filter *1) *2) 720-FU-003 : 0.1 m^3/Filter *1) *2)	10.3 m^3 *1) (per 1 year) *2)	20 m^3 *1) (per 3 years) *2)	2.9 m^3 *1) (per 4 years) *2)	3 Nm^3/h *1)	9 L/min from PSA Dryer (Intermittent)
Temperature	100 °C			-	-	-	-
Composition	Composition H_2O 8.96 vol% N_2 + Ar 81.7 vol% O_2 8.35 vol% CO_2 0.99 vol% Impurity *1) SOx *2) < 3.5 mg/Nm^3-dry (10%O_2) CO *2) < 13 mg/Nm^3-dry (10%O_2) NH_3 < 3 mg/Nm^3-dry (10%O_2) HCl *2) < 1.3 mg/Nm^3-dry (10%O_2) HF *2) < 0.2 mg/Nm^3-dry (10%O_2) NOx as NO_2 *2) < 65 mg/Nm^3-dry (10%O_2) CH_2O (formaldehyde) < 5 mg/Nm^3-dry (10%O_2) *3) C_2H_4O (acetaldehyde) < 5 mg/Nm^3-dry (10%O2) *3) Amine < 1 mg/Nm^3-dry (10%O_2) TOC (excluding aldehydes) < 10 mg-C/Nm^3-dry (10%O_2) *3) Particulate < 1 mg/Nm^3-dry (10%O_2)	Polypropylene or Nylon or eq. ~100 wt% PM Trace Rust Trace Activated carbon Trace	*3 Activated Carbon Approx. 55 wt% Water Approx. 45 wt% Unburnt Carbon Trace Amine Trace Degraded product Trace	Alumino-silicate gel, Molecular Sieve, etc. *3) Solid Beads Type, etc. *3)	*3) Al_2O_3 : Balance Pd : 0.3 - 0.4 wt% Solid Beads Type, etc. *3)	O_2 + Moisture	H_2 + Moisuture
Note	*1) These are dependent on the impurity level of the inlet flue gas. *2) SOx, CO, HCl, HF and NOx is not produced in the CO_2 capture plant. *3) To be confirmed by CHP vendor after CHP paid study.	*1) To be verified based on vendor's information.Disposal of the filter media shall be in accordance with the site environmental regulation. *2) The typical frequency of replacement for new filters is less than once per year during normal operation, excluding the commissioning or re-start periods.	*1) Disposal of the activated carbon shall be in accordance with the site environmental regulation. *2) Activated carbon is recommended to be replaced once per year. *3) To be verified based on vendor's information.	*1) To be verified based on vendor's information. *2) Expected lifetime is 3 years as per vendor's information. It will vary depending on actual plant condition. *3) Adsorbent material depends on vendor selection.	*1) To be verified based on vendor's information. *2) Expected lifetime is 4 years as per vendor's information. It will vary depending on actual plant condition. *3) Catalyst material depends on vendor selection.	*1) To be verified based on vendor's information.	*1) To be verified during detailed engineering.

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