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10.05.2023 ISCOWA seminar Amsterdam

MIBA Filler type I in earth Most concrete

Technical Guideline CROW 128 (BRL1804)

Watermanweg 106a
3067 GG Rotterdam
The Netherlands

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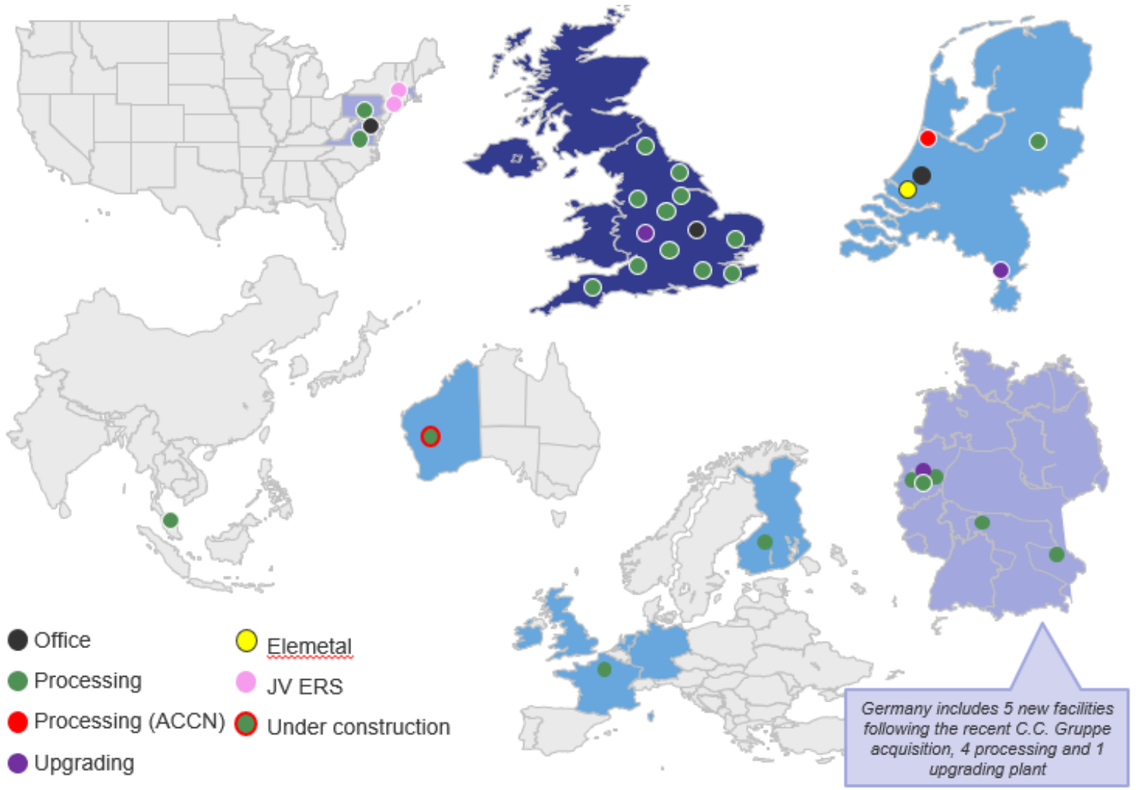
BPG Groep



General

Headquarters in Rotterdam NL

Offices: NL, UK, DE, USA, AU

Production: NL, UK, DE, FR, USA, AU

Production: 31 sites

Metal treatment: 3 sites in NL, UK, DE

> 5 Million IBA per year

> 600 FTE

> € 200 Turnover

Blue Phoenix Group

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Blue Phoenix Europe

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Blue Phoenix Asia

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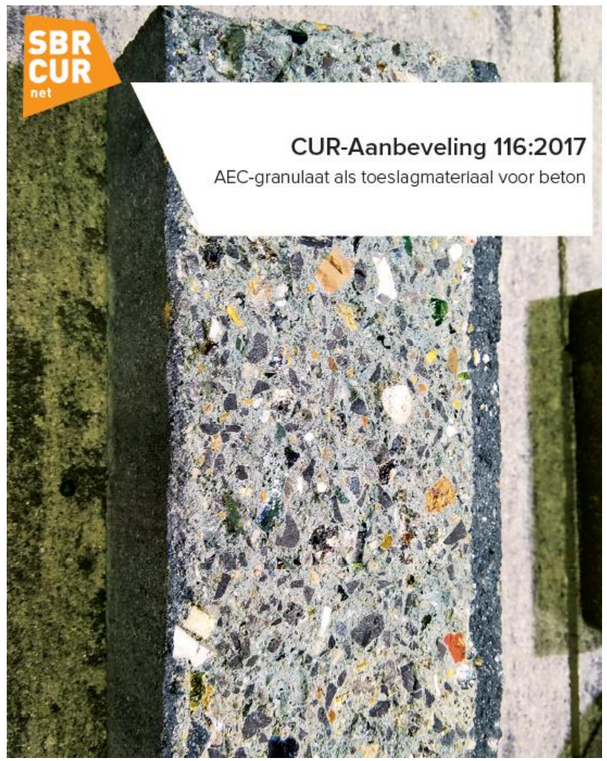
Technical Guidelines on MIBA products



CROW-CUR Recommendation 128:2021

MSWI filler in unreinforced earth-moist concrete

EOTA®

EUROPEAN ASSESSMENT DOCUMENT

EAD 260009-00-0301

December 2016

PROCESSED BOTTOM ASH FROM MUNICIPAL SOLID WASTE INCINERATORS AS TYPE II ADDITION FOR PRODUCTION OF CONCRETE, MORTAR AND GROUT

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Set up CROW 128

First Life		
DutchTechnical Guideline BRL1804	EN 196	EN 1338-1339
Characterization MSWI Filler	**Paste and Mortar Tests**	**Concrete product 1e Life**
3 sources MSWI Filler	Reference	Reference
Chemical analyses	Ground Limestone GL	Ground limestone GL
Particle seize distribution PSD	3 sources MSWI Filler	3 sources MSWI Filler
Elementary composition XRF/XRD	Properties	Properties
Mineralogical composition X-Ray diffraction	Strength	Road salt resistance
	Expansion tests	Water absorption
	ASR	Water evaporation

Recycling		
EN 206	Committee	EN 14405
Concrete product 2e Life	**Simulation innovative crushing/Cement Paste**	**Environmental/crushed concrete product**
traditional crushed	Reference 100% CEM I 52,5N	Concrete product crushed < 4 mm
Partcile seize distribution PSD	75% CEM I 52,5N + 25% GL	Upflow percolation test LS 10
Mix design concrete	75% CEM I 52,5N + 25% MSWI	
concrete aggregate 4-12	Crushed/dried/ground	
river sand 0-4	Exchange 25% cement in new mortar	
Reference	Characterization Mortar	
Ground lime stone		
MSWI Filler		
Characterization concrete		

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Characterisation of MIBA Filler

Property	Unit	MSWI-1	MSWI-2	MSWI-3	Generic requirement in BRL 1804
Insoluble (HCl/Na_2CO_3)	% (m/m)	41.7	43.5	44.1	-
Sulfate, water-soluble (SO_3)	% (m/m)	1.18	0.70	0.88	-
Sulfate, acid-soluble (SO_3)	% (m/m)	2.10	1.31	1.65	≤ 4.0
Chloride, water-soluble	% (m/m)	0.19	0.11	0.29	-
Chloride, acid-soluble	% (m/m)	0.32	0.23	0.42	-
Alkali-equivalent, XRF	% (m/m)	4.8	4.8	4.6	≤ 5.0
Soluble phosphate (P_2O_5)	% (m/m)	< 0.0010	< 0.0010	< 0.0010	-
Metallic aluminum + zinc	% (m/m)	< 0.03	< 0.03	< 0.03	-
TOC	% (m/m)	5.8	2.0	0.69	-
Water requirement, ßp value	V/V	1.54	1.18	1.32	-

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Characterisation MIBA Filler XRF/XRD

Element (as oxide)	MSWI-1	MSWI-2	MSWI-3
Silicon as SiO_2	50.07	47.61	50.46
Calcium as CaO	18.18	17.03	16.41
Iron as Fe_2O_3	7.90	11.04	10.59
Aluminum as Al_2O_3	7.43	8.23	7.98
Sodium as Na_2O	4.13	4.13	3.94
Sulfur as SO_3	2.69	1.60	1.64
Magnesium as MgO	2.39	2.42	2.02
Phosphorus as P_2O_5	1.10	1.23	0.94
Titanium as TiO_2	1.15	1.32	0.98
Potassium as K_2O	1.01	0.97	1.02
Zinc as ZnO	0.54	0.60	0.50
Copper as CuO	0.31	0.38	0.27
Manganese as Mn_3O_4	0.16	0.21	0.18
Lead as PbO	0.11	0.11	0.11
Chromium as Cr_2O_3	0.10	0.11	0.09
Zirconium as ZrO_2	0.14	0.06	0.07
Barium as BaO	0.21	0.27	0.20
Strontium as SrO	0.07	0.05	0.05
Nickel as NiO	0.02	0.03	0.03
Vanadium as V_2O_5	0.01	0.01	0.01

Mineral	Theoretical formula[2]	202621-1	202621-2	202621-3
Silicates				
Quartz	SiO2	14.8	11.3	15.6
Cristobalite	SiO2	0.2	0.2	0.1
Alkali feldspar	$(NA,K)AlSi_3O_8$	0.6	0.5	0.9
Plagioclase/albite	$(Ca,Na)(Al,Si)_4O_8$	1.0	1.1	1.1
Melilite-type minerals	$(Ca,Na)(Al,Mg,Fe)(Si,Al)_2O_7$	5.0	6.5	5.9
Petedunnite	$Ca(Zn,Mn,Fe,Mg)Si_2O_6$	1.2	1.7	2.0
C_2S^*, larnite	Ca_2SiO_4	1.2	0.1	0.5
Muscovite/mica	$(K,Ca,Na)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$	1.2	0.9	1.1
Carbonates				
Calcite	$CaCO_3$	4.5	4.8	3.1
Sulfates				
Bassanite	$CaSO_4 \cdot 1/2H_2O$	0.6	0.7	1.1
Anhydrite	$CaSO_4$	0.3	0.1	0.1
Oxides/hydroxides				
Magnetite	Fe_3O_4	1.6	2.4	2.2
Hematite	Fe_2O_3	0.8	1.0	0.7
Periclase	MgO	0.2	0.1	0.1
Wüstite	FeO	0.5	0.9	1.0
Rutile	TiO2	0.3	2.1	0.1
Phosphates				
Apatite	Ca5(PO4)3(F,OH,Cl)	0.8	0.9	0.5
Others/amorphous		66.3	66.6	65.8

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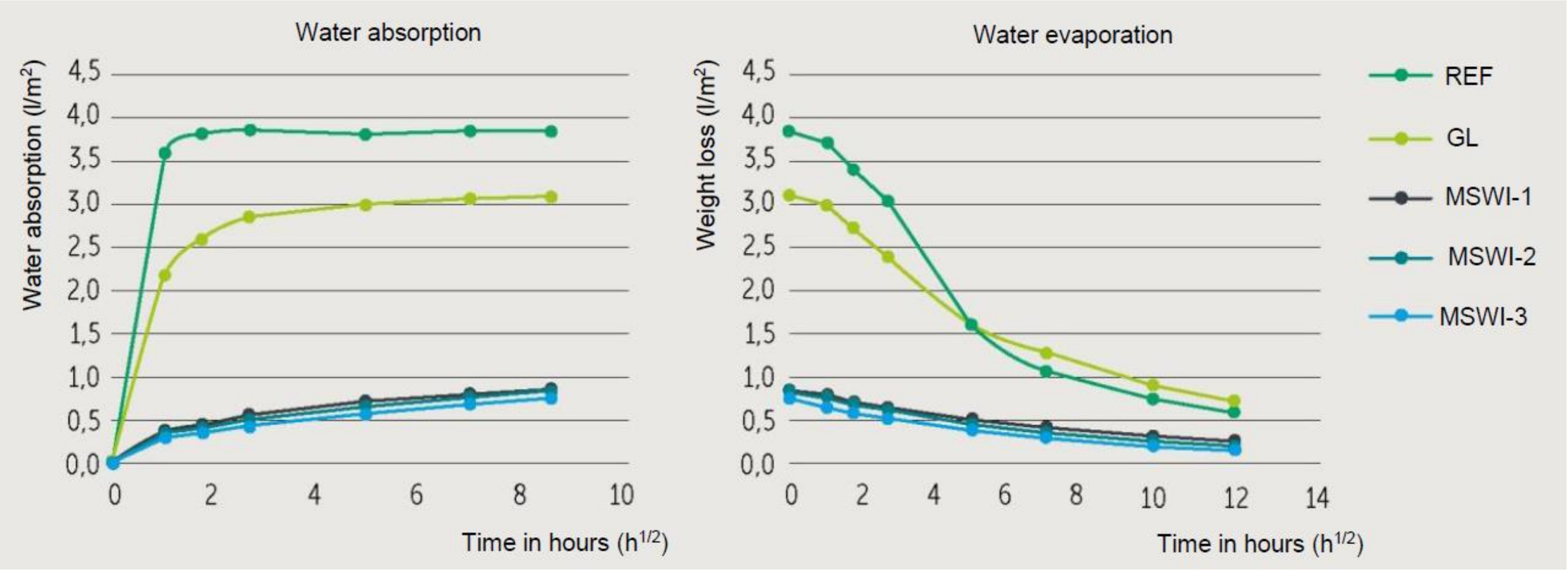
Concrete product (1e Life)

Component	REF	GL	MSWI-1	MSWI-2	MSWI-3
CEM I 52.5 N	289	219	218	219	219
Filler	0	79	73	73	73
Water (effective)	80	89	106	106	105
Absorption water (in aggregate)	11	11	11	11	11
Sand 0–2	791	791	801	794	790
Granite 2–8	1,154	1,154	1,152	1,177	1,157
'Wbf' (effective)	0.28	0.30	0.36	0.36	0.36
1) Excluding approx. 5% V/V air					

Property	REF	GL	MSWI-1	MSWI-2	MSWI-3
'Wbf' (effective)	0.28	0.30	0.36	0.36	0.36
Volumetric weight (kg/m^3)	2,180	2,210	2,280	2,260	2,270
Ultrasonic velocity (km/s)	3.98	4.07	4.17	4.10	4.06
Calculated dyn. e-modulus (GPa)[1)]	31.0	32.9	35.7	34.2	33.7
Flexural strength (MPa)	5.6	5.6	8.5	7.3	7.6
Volumetric weight (kg/m^3)	2,260	Not calculated	2,280	2,290	2,290
Compressive strength (MPa)	31.7	Not calculated	53.9	51.8	53.6
Flexural/compressive strength ratio (%)	18	Not calculated	16	14	14

Concrete product (1e Life)



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Concrete product (2e Life)

Property	Concrete granulate REF	Concrete granulate GL	Concrete granulate MSWI-3
Concrete composition (kg/m^3):			
CEM I 42.5 N	320	320	320
Water, effective	160	160	160
Absorption water	70	70	66
Concrete granulate 4–22 mm	1,049	1,049	1,049
River sand 0–4 mm	666	666	666
Mortar properties			
Slump (mm)	110	120	130
Flow (mm)	400	390	420
Temperature (°C)	19.3	19.0	18.8
Air content (%V/V)	1.8	1.8	1.9
Volumetric weight (kg/m^3)	2,235	2,255	2,245
Properties of hardened concrete			
Cube compressive strength (MPa) after:			
7 days	36.5	34.1	36.0
28 days	42.4	42.8	44.0
Volumetric weight (kg/m^3) after:			
7 days	2,290	2,290	2,280
28 days	2,290	2,280	2,290
Maximum water ingress (mm)	24	25	13
Chloride migration coefficient (.10^{-12} m^2/s)	22.0	21.6	15.7

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Simulation innovative crushing/Cement paste

Table 13. Properties of 2nd life fillers

Property	Cement	REF	GL	MSWI-3	BRL 1804 requirement
Particle distribution, sieved residues (% m/m):					
0.5 mm	-	0	1	0	-
0.25 mm	-	1	2	1	-
0.125 mm	-	4	6	3	0-15
0.063 mm	-	23	27	22	0-30
Fraction <63 µm	-	77	73	78	-
	100% cement	at 25% (m/m) cement replacement			
Water requirement (% m/m)	24.2	28.6	29.0	29.0	-
Start of setting (min)	140	190	195	220	-
Difference in value compared to cement	-	+50	+55	+80	<120
End of setting (min)	170	240	235	260	-
Difference in value compared to cement	-	+70	+65	+90	<120
Soundness (mm)	0.0	0.5 0.5		0.0	<10
Compressive strength (MPa) after:					
7 days	39.8	35.0	32.3	31.9	-
28 days	47.7 (100%)	41.7 (87%)	38.5 (81%)	40.6 (85%)	> 65%
Flexural strength (MPa) after:					
7 days	6.8	6.3	5.8	5.5	-
28 days	7.5 (100%)	6.8 (91%)	6.7 (89%)	6.5 (87%)	-
Volumetric weight (kg/m^3) after:					
7 days	2,260	2,200	2,200	2,210	-
28 days	2,238	2,201	2,181	2,200	-

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Environmetal: crushed concrete

Component	Cumulative leaching L/S 10 (mg/kg)		
	Concrete granulate REF	Concrete granulate MSWI-3	Max. value in BBK
pH	12.5–12.8	12.5–12.8	-
Antimony	<0.0040	0.0060	0.32
Arsenic	<0.050	<0.050	0.9
Barium	6.4	11	22
Cadmium	<0.00100	<0.00100	0.04
Chromium	0.16	0.27	0.63
Cobalt	<0.030	<0.030	0.54
Copper	0.071	0.13	0.9
Mercury	<0.00040	<0.00040	0.02
Lead	<0.100	<0.100	2.3
Molybdenum	0.037	0.071	1
Nickel	<0.050	<0.050	0.44
Selenium	<0.0070	<0.0070	0.15
Tin	<0.020	<0.020	0.4
Vanadium	<0.20	<0.20	1.8
Zinc	<0.20	<0.20	4.5
Fluoride	2.6	2.3	55
Chloride	61	110	616
Sulfate	60	52	2,430
Bromide	<0.80	<0.80	20

Conclusion

4 Conclusions: Suitability of MSWI filler

Based on the studies conducted, we can conclude that the MSWI filler produced by Blue Phoenix Group is suitable for use in unreinforced, non-construction concrete products made with dry or earth-moist concrete mortar.

The study also showed that, when MSWI filler is used in these products, the material streams generated when the concrete in question is recycled (concrete granulate and powder fraction) can be reused as a raw material in a 2nd life concrete. This application of MSWI filler is therefore fully circular in terms of the aspects within the scope of this study.

Requirements MIBA Filler

MSWI filler must meet the requirements set out in the table below.

Property	Method	Requirement
Particle distribution	NEN-EN 933-10	100% < 2 mm 85–100% < 125 µm 70–100% < 63 µm
Alkali content, expressed as Na_2O equivalent	X-ray fluorescence spectrometry (XRF) NEN-EN 196-2	≤ 5.0%(m/m) [1)]
Methylene blue adsorption	NEN-EN 933-9	≤ 1.2% (m/m)
Chloride content	NEN-EN 196-2	≤ 1.0%(m/m) [2)]
Sulfate content – SO_3	NEN-EN 196-2	≤ 4.0%(m/m) [3)]
Effect on strength [4,5)]	NEN-EN 196-1	≥ 65%
Effect on setting time [4)]	NEN-EN 196-3	< 120 minutes
Determination of soundness [6)]	NEN-EN 196-3	< 10 mm
TOC content	NEN-EN 13639	≤ 6% (m/m)
Metallic Al + Zn content	CUR Recommendation 116	≤ 0.2% (m/m)

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Registriert ECHA: Ende Abfall

ECHA
EUROPEAN CHEMICALS AGENCY

Blue Phoenix Group B.V.
Watermanweg 106a
3067 GG, Rotterdam
Netherlands (the)

SUBMISSION NUMBER: **FJ932847-26**
SUBSTANCE NAME: **Ubryon**
COMMUNICATION NUMBER: **INQ-C-2114613207-58-01/F**

COMMUNICATION RELATING TO YOUR INQUIRY DOSSIER SUBMITTED UNDER REGULATION (EC) NO 1907/2006

The European Chemicals Agency (ECHA) has concluded the assessment of your inquiry dossier.

Based on the information in the inquiry dossier, ECHA has provided the following inquiry identifiers:

Inquiry number: **06-2120926605-53-0000**

EC/List[1] number for this substance: **939-997-0**

EC/List name for this substance: **Reaction products of metal-free bottom ash from municipal solid wastes incineration with water and with or without lime**

The above identifiers need to be included in your registration dossier.

The information given in your inquiry was sufficient to provide the identifiers listed above. However, it remains your responsibility to decide with the other potential registrants and previous registrants whether the substances you each manufacture/import are sufficiently similar to be jointly registered.

Planning Demonstration Plant

- Demonstration installation: Q1-2022-Q2 2023
- Commissioning - Q3/Q4 2023
- Program testing - Q1-Q4 2024
- 1T/H: Fully Industrialised and Automated.
- Test supplies MIBA Filler to Germany, Belgium und France precast industry
- Commercial Installation - 2026 10-25 T/H

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Planning Demonstration Plant