EUROSLAG'24

"SLAGS FOR THE FUTURE...
... THE FUTURE OF THE SLAGS"

2024

23RD – 25TH October

Bilbao Exhibition
Centre(BEC)
LUXUA Room

Slags from Next Generation Steel Making Processes

Suitable for established Applications?

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FEhS – Institut für Baustoff-Forschung e.V.

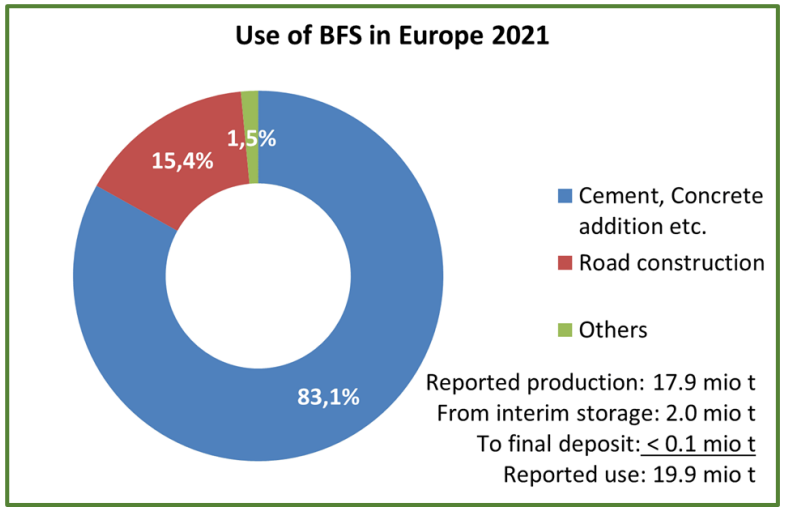
Organizers:

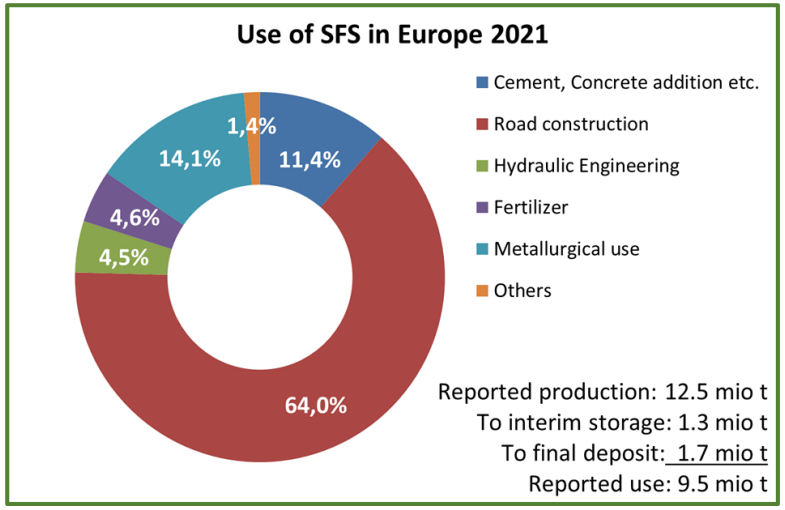
EUROSLAG UNESID SIDEREX PLATEA

Colaboration

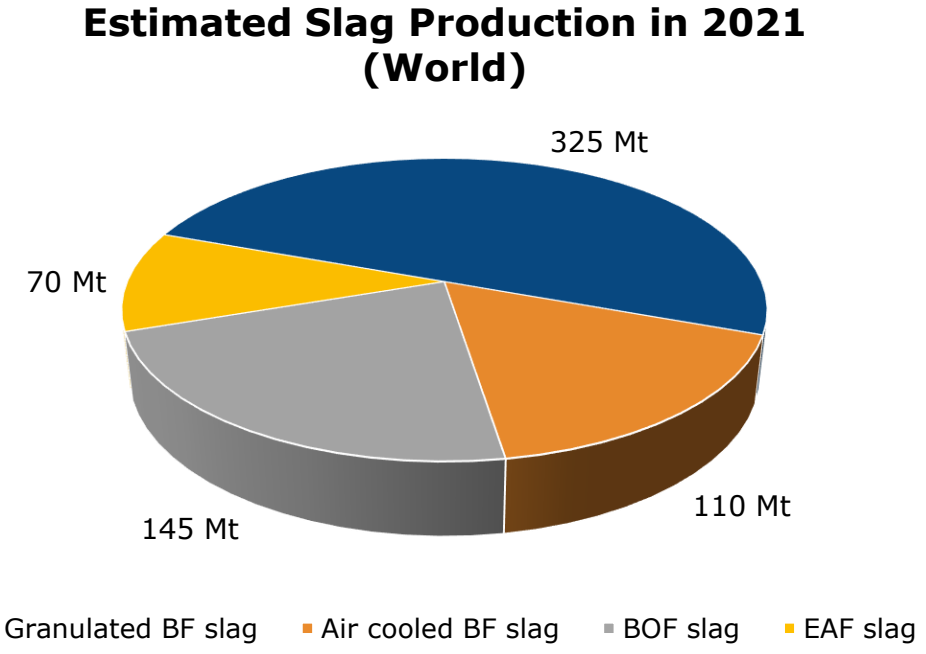
ESTEP

Slag Production





Ref.: EUROSLAG

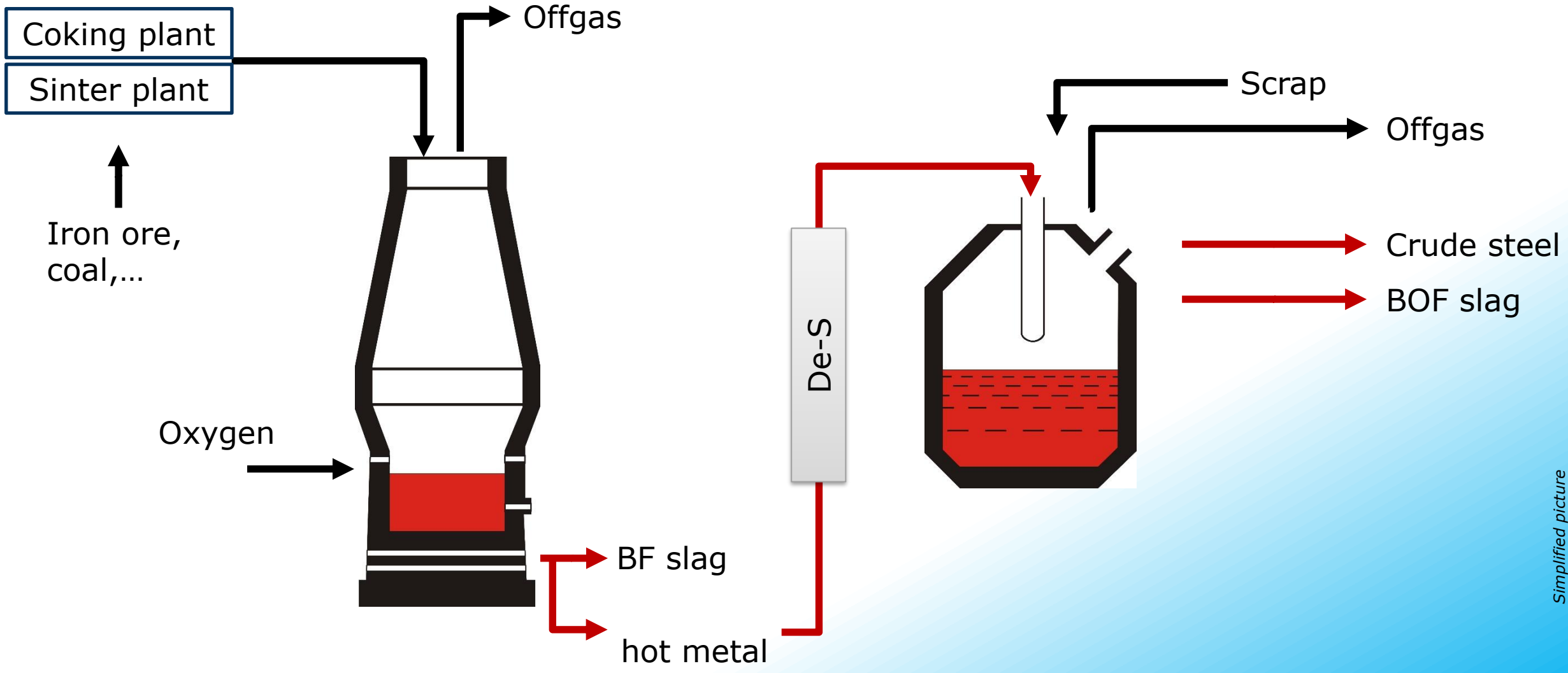


Emmitting approx. 800 kg CO_2 per ton of clinker (60 % of this is due to raw materials)

Using granulated blast furnace slag decreases carbon footprint by approx. 250 Mio. t/a and saves 500 Mio. t/a of natural ressources!

Ref.: Ehrenberg, A.; Algermissen, D.: The Steel Production Transformation Process – Consequences for the Slag Utilisation. Proceedings of 8th International Slag Valorisation Symposium, 18.-20.04.2023, Leuven (Belgium)

Crude steel production by BF + BOF (Today)



Simplified picture

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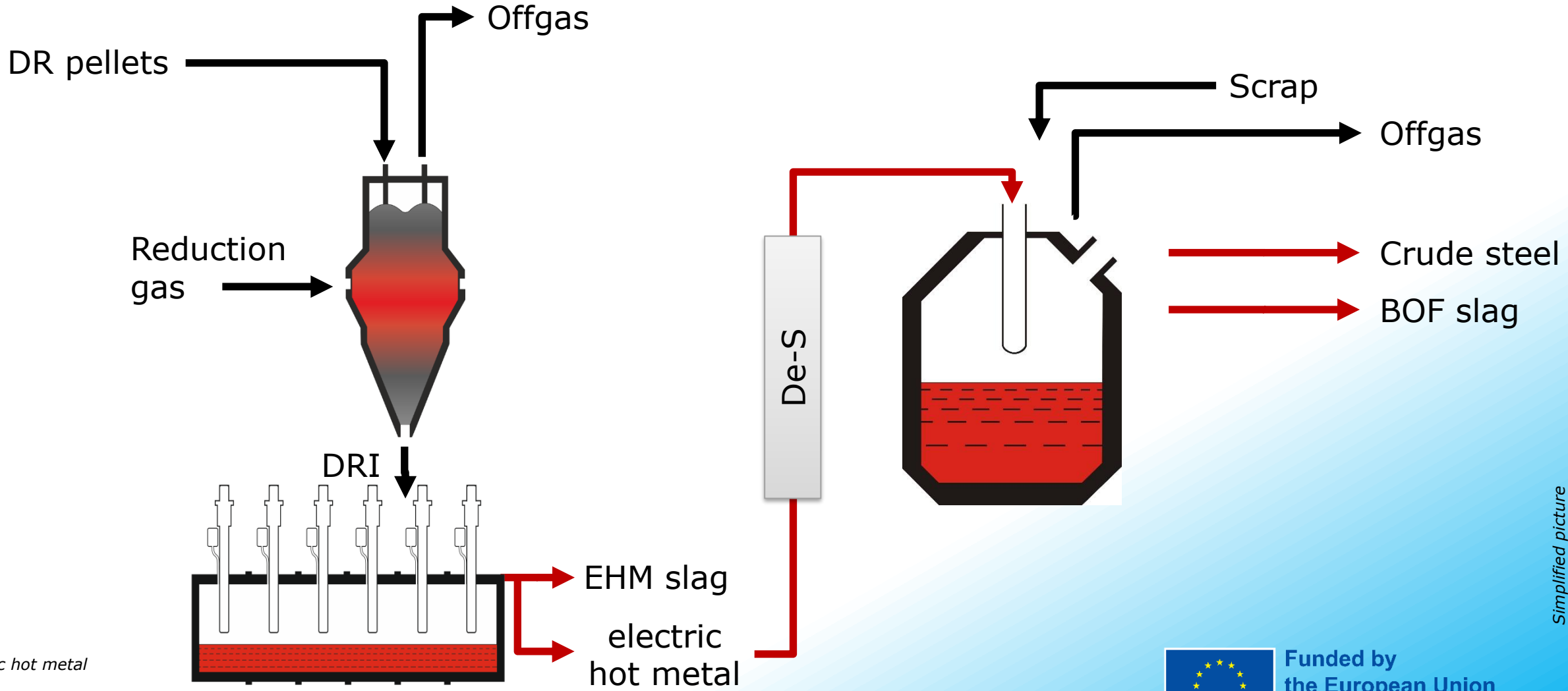
SAVE CO_2

Crude steel production by DRP + Smelter + BOF (Future – 2step)



EHM: electric hot metal

Simplified picture

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NextGenerationEU

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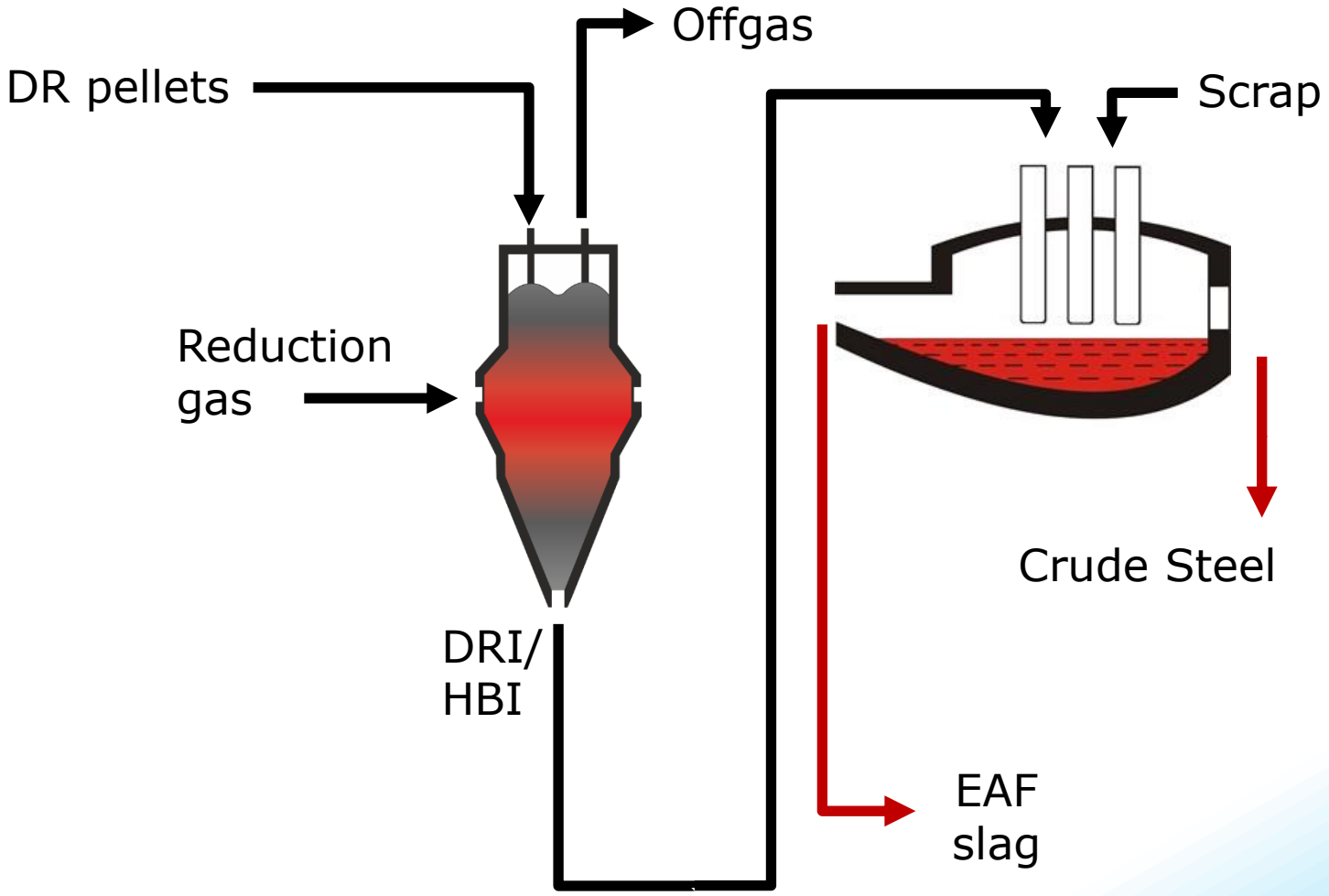
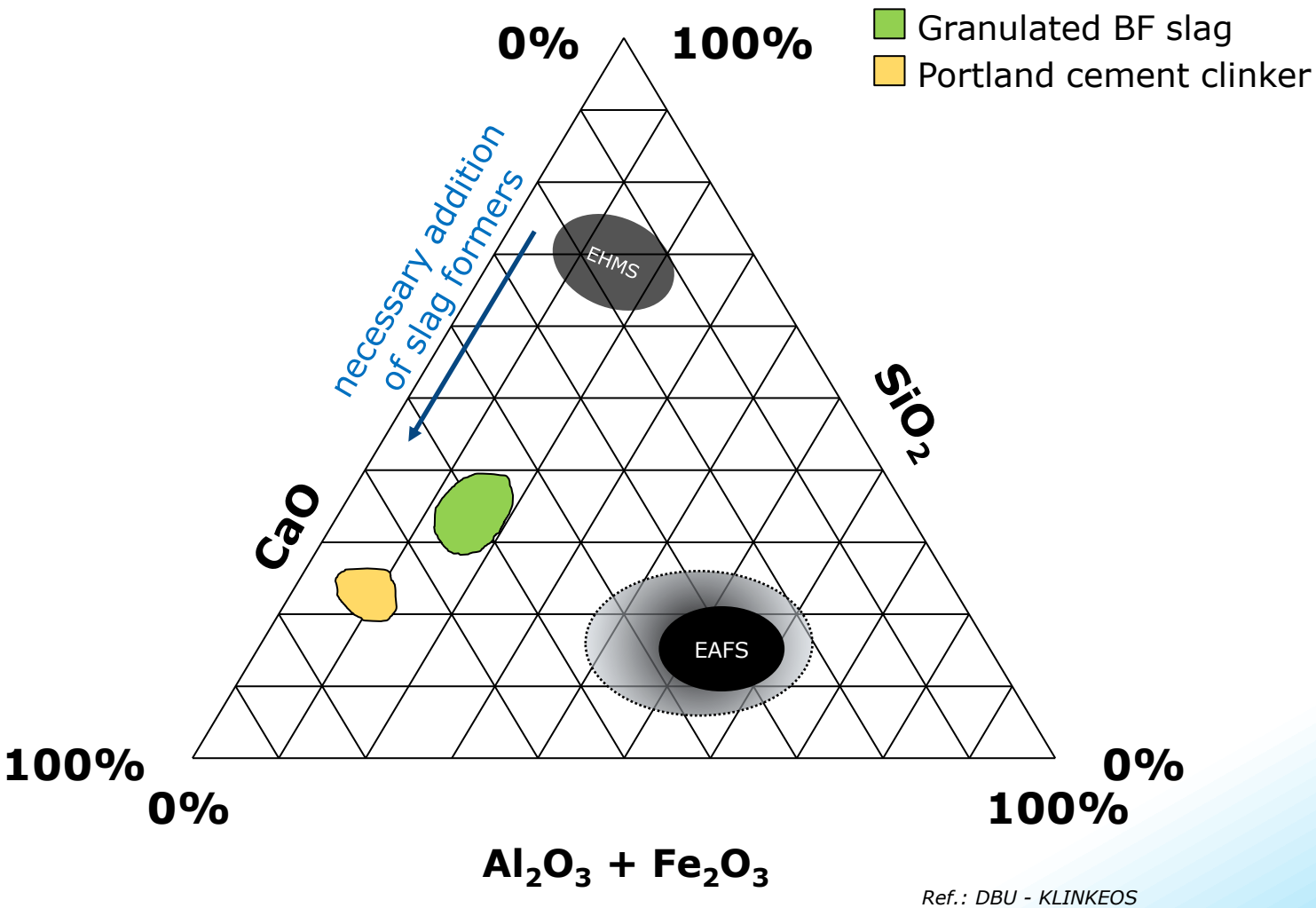
DRIEOS

Crude steel production by DRP + EAF (Future – 1 step)



Simplified picture

The aim is a latent hydraulic material



Ref.: DBU - KLINKEOS

EHMS

- Smelter slightly reducing
- Non-negligible amounts of V_2O_5 can remain
- ➢ Latest findings show no negative impact as latent hydraulic material

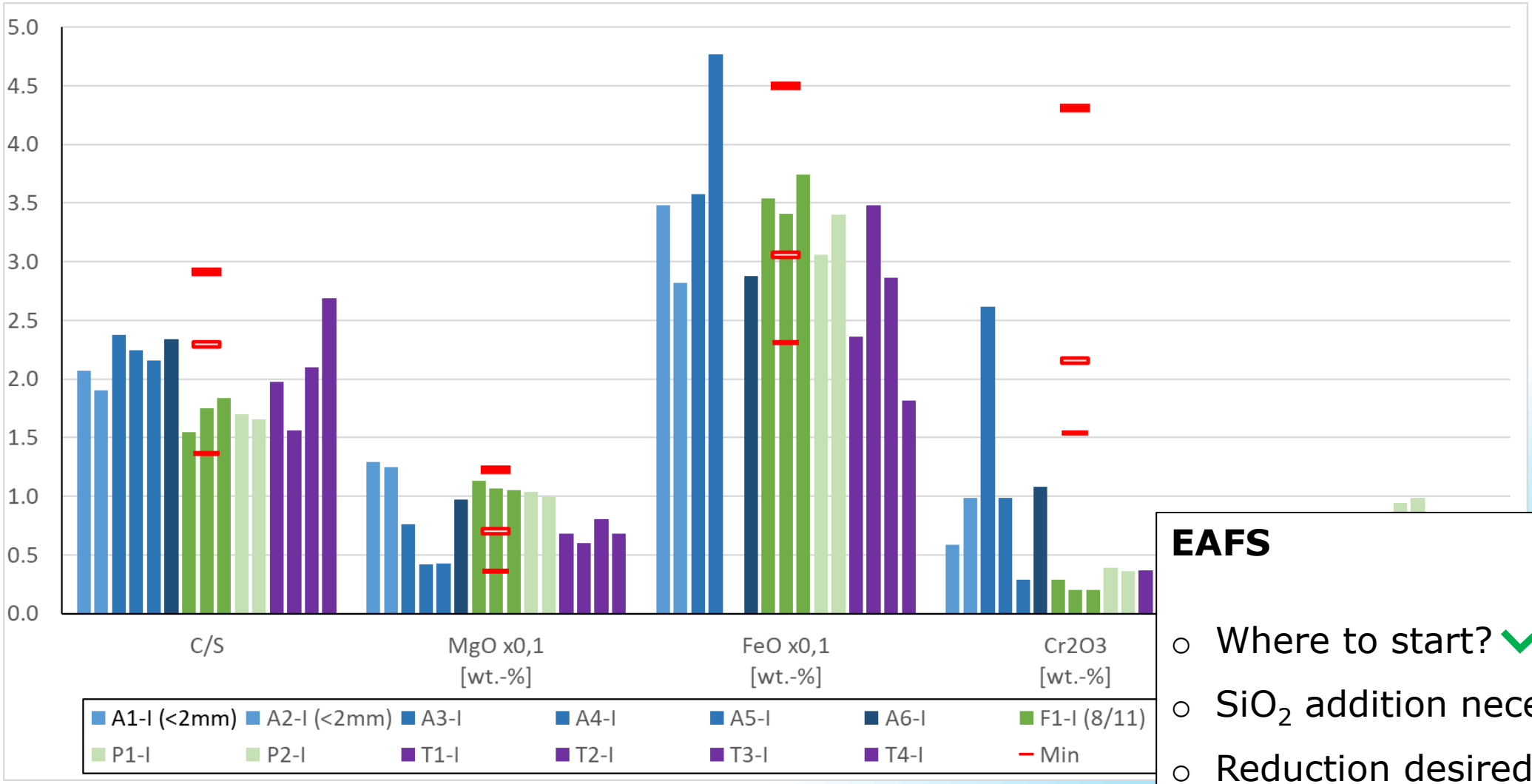
EAFS

- Where to start?
- SiO_2 addition necessary
- Reduction desired?

Where to start?

In total >10 different EAF slag samples, with DRI as iron carrier from 10-95 %, were collected from all over the world and characterized

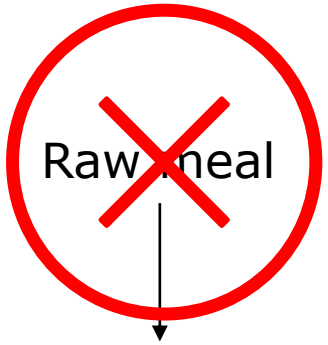
Short overview of the range of main elements



EAFS

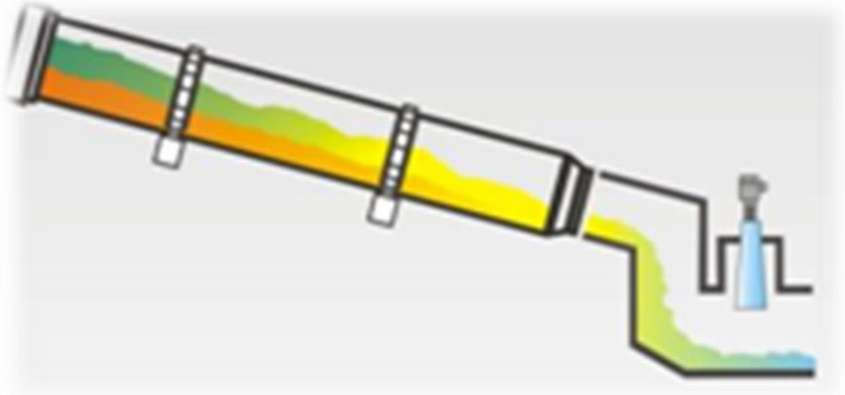
- Where to start? ✓
- SiO_2 addition necessary
- Reduction desired?

Ways to use EAF slag it in cement industry



Cr ⇒ Cr(VI)

2 ppm limit
in Europe

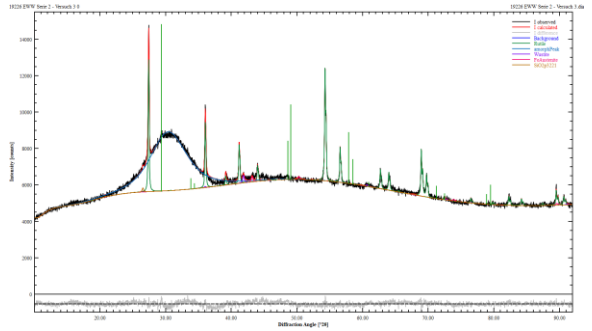


without treatment

hydraulic material ⇒ Viscosity!

with treatment

Decreasing basicity (example – scrap based EAFS)



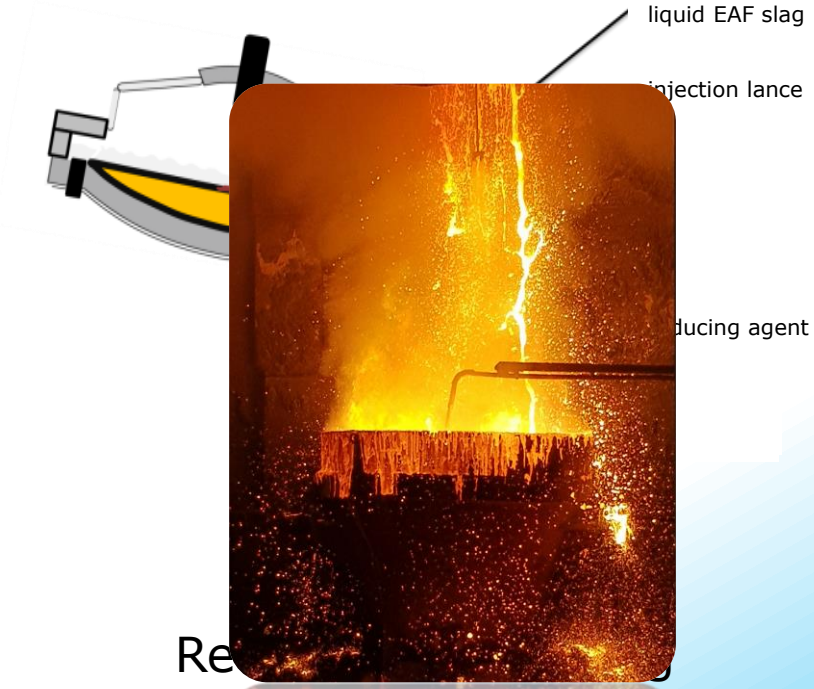
EAFS

- Where to start? ✓
- SiO_2 addition necessary ✓
- Reduction desired?

Reduction desired?

EAF slag (Scrap)	CaO	SiO_2	MgO	Al_2O_3	Cr_2O_3	FeO	Fe_2O_3	MnO	P_2O_5
	(wt.-%)								
Carbon reduction	49.9	20.6	12.6	11.5	0.12	0.28	0.49	2.96	0.11
Defined reduction 1	23.1	20.7	8.98	8.90	2.08	15.1	2.4	7.72	0.37
Defined reduction 2	26.8	24.0	9.10	8.41	1.49	10.9	2.96	8.16	0.39

Metal	C	Si	Mn	P	Cu	Sn	Cr	Mo	Ni	V
	(wt.-%)									
Carbon reduction	6.0	0.22	6.04	0.42	0.03	0.002	3.6	0.01	0.03	0.24
Defined reduction 1	0.4	5.0	1.2	0.10	0.14	0.011	0.85	0.03	0.09	0.04
Defined reduction 2	1.37	7.0	4.1	0.09	0.14	0.006	1.20	0.05	0.07	0.10



Ref.: BMBF - KONDEOS

Re
during tapping

Be careful with overfoaming!

~~200-250 kg hot metal per t of EAF slag!~~

100-150 kg hot metal per t of EAF slag!

Necessary development of a „Hybrid slag pot" as treating vessel ?

Summary & Outlook

Summary and Outlook

- Electric hot metal slags from smelter seems to be comparable to blast furnace slag (also with mentioned trace elements)
- DRI based EAF slag will be different to scrap based EAF slag according to
  - DRI origin
  - Steel product (e.g. flat production → necessary slag work)
- Several research projects in the recent years on scrap based slag show possibility to use slag in cement industry
- First pilot plant for water granulation of scrap based EAF slag is under construction in Germany!
- Transferability of DRI based EAF slag needs to be validated
- Regulations must be ready for these materials!
  Most European countries have their own regulations, often with strict total chromium limits.

Public available Deliverables

The research leading to these results has received funding from the European Union's Research Fund for Coal and Steel research programme under grant agreement number: 101112665

EUROSLAG'24

INSTITUT FÜR BAUSTOFF FORSCHUNG fehs

Join our workshop in Duisburg on 05./06. March 2025 in Duisburg!

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