

UNE APPROCHE EUROPÉENNE POUR LES CO-PRODUITS INDUSTRIELS ?

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Maison de la Fédération Nationale du Bâtiment et des Travaux Publics (FNBTP house), Paris





**Production/Use
per year
since 1975:**

about

30 million tonnes

Blast Furnace Slag

and

20 million tonnes

Steel Slag

Source: EUROFER

- 1989 Start European Harmonisation of Road Construction Standards via CEN
- 1993 Meeting of European Slag Producers and Slag Processors, organised by FEhS-Institute, Germany
- 1995 Foundation of the WG „Metallurgical By-products”, organised by FEhS-Institute
- 1998 1st European Slag Conference in Marseilles organised by AFOCO
- 2000 2nd European Slag Conference in Düsseldorf organised by FEhS-Institute and
Foundation of EUROSLAG



EUROSLAG STATUTES

- To create favourable technical, legislative and regulatory prerequisites for the use of slags from the iron and steel making.
- To promote the use of slags at the highest possible specification level with regard to the environment.
- To counter or minimise any obstacles to the use of slags.
- To promote the image of slags to build confidence in members, products and processes.

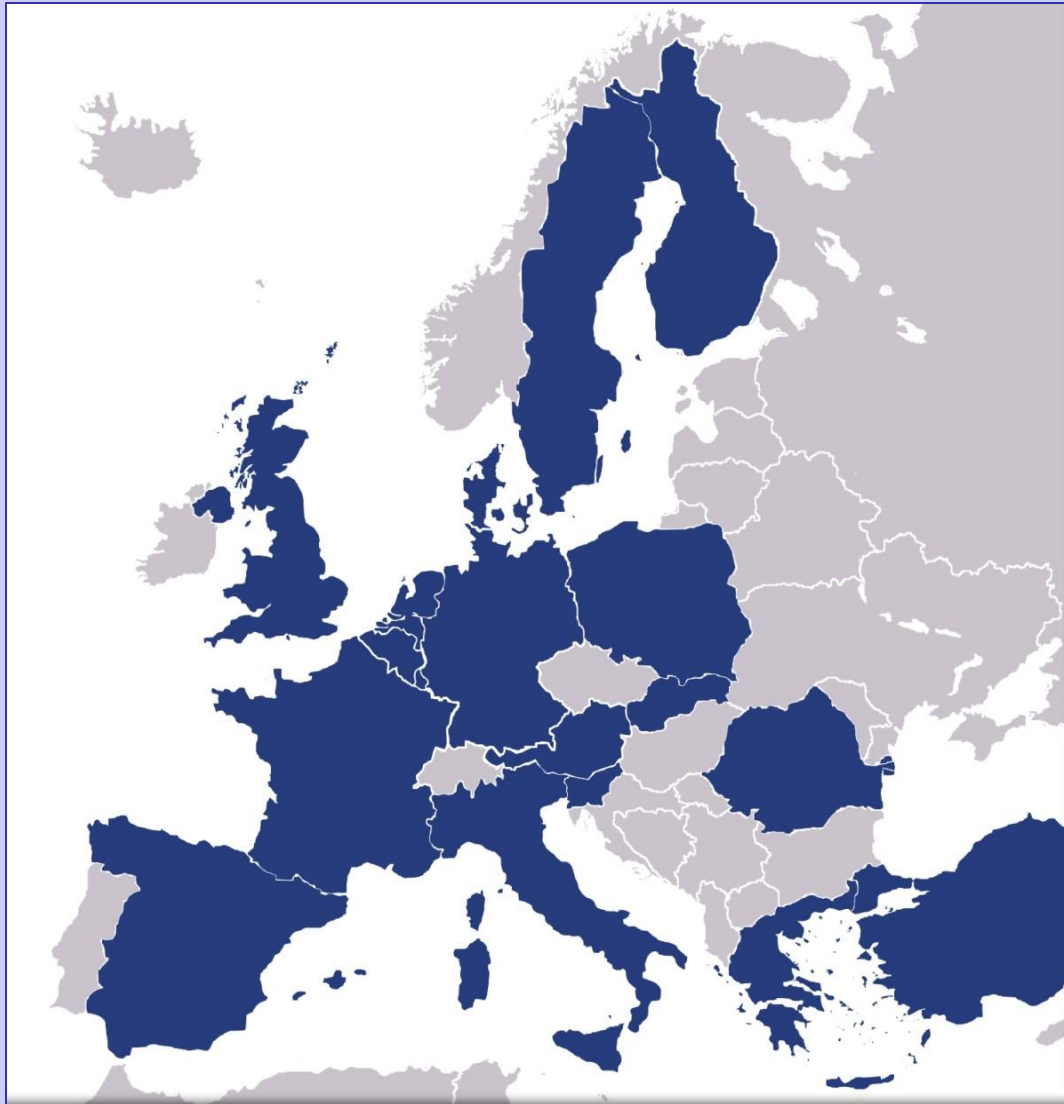
Ordinary Members

- National associations that represent producers and/or processors in their country
e.g. AFOCO, CTPL, FEhS-Institute, MPA, UNESID
- Individual companies that operate in the fields of producing, processing, marketing and/or selling slag, unless these are represented by national organisations.

Associate Members

- Non-European associations or companies of producers or processors of slag
- Producers and/or processors of slag from non-ferrous metals industry





**Austria,
Belgium,
Denmark,
Finland,
France,
Germany,
Greece,
Italy,
Luxembourg,
Poland,
Romania,
Slovak Republic,
Slovenia,
Spain,
Sweden,
Turkey,
The Netherlands,
United Kingdom,
USA**

EUROSLAG is the European association of organizations and companies

The association is concerned with all aspects of manufacturing slag and its utilization as product e.g. for building purposes and as fertilizer.

EUROSLAG deals with promotion of slag as a product, enables exchange of information and research as well as facilitates the interaction with governing bodies.



Activities on:

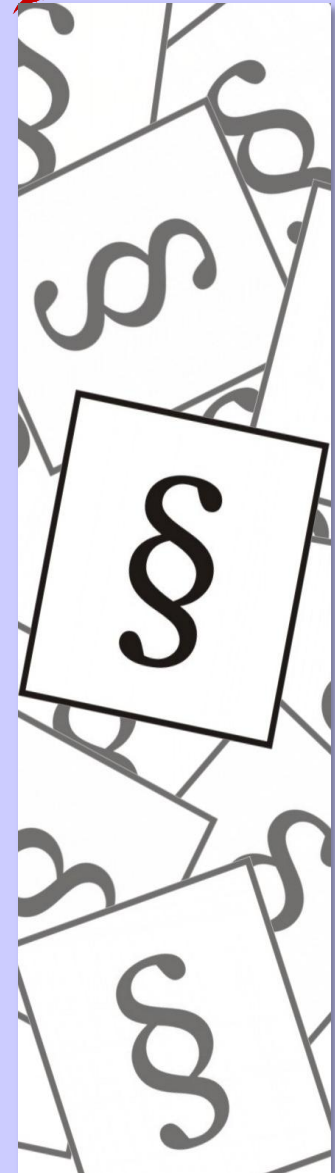
- Legislation
- Standardisation
- Research
- Promotion



What are Slags? Wastes or By-Products?

In the European countries exist two possibilities:

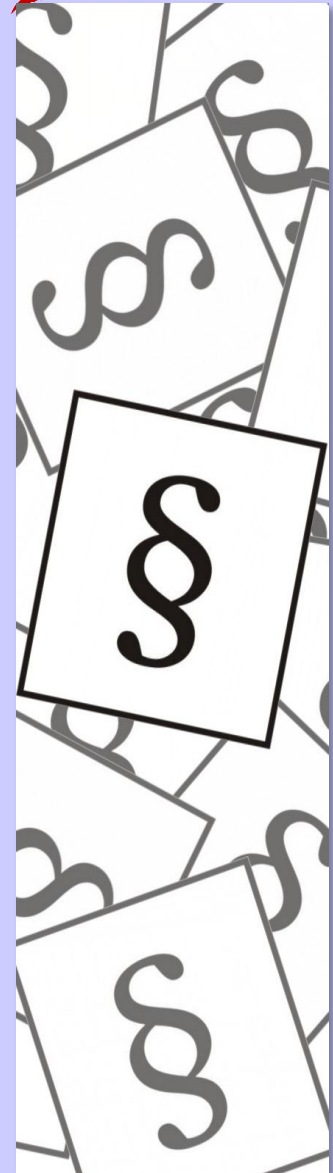
- Slag is **considered as a by-product** already in the liquid state, directly after its manufacture, with or without processing steps.
- Slag is **first considered as waste** but ceases to be waste after a number of recovery measures to become a product or secondary raw material.



What are Slags? Wastes or By-Products?

**2005 – 2008 Revision of the Waste Framework Directive
as DIRECTIVE 2008/98/EC with conditions for :**

- **By-Products (see Article 5)**
- **End-of-Waste Status (see Article 6)**

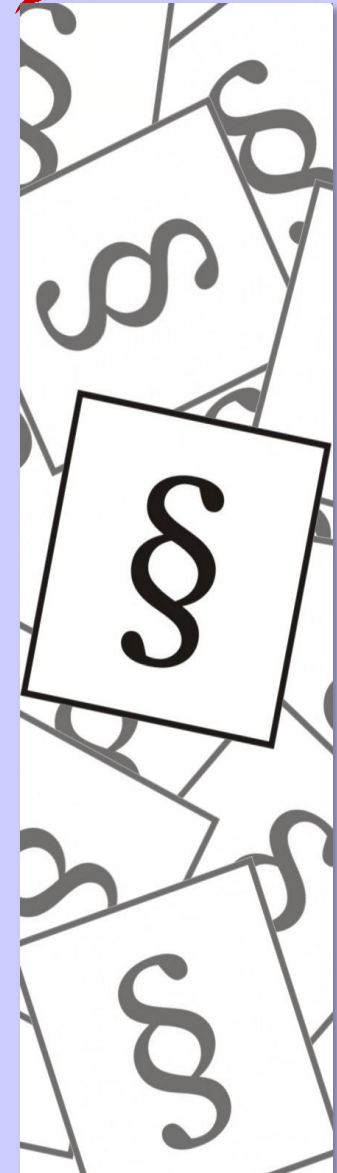


What are Slags? Wastes or (By-)Products?

2007 – 2010 REACH Registration

**Opinion and Decision
of the
European Steel Industry:
*Slags are By-products!!***

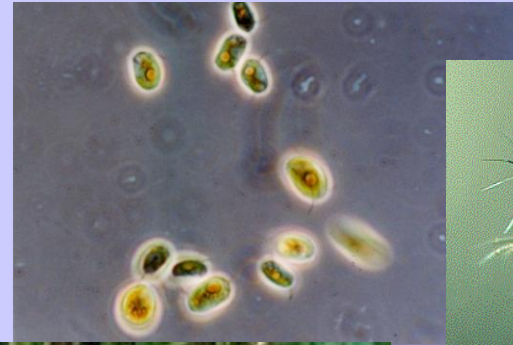
**2010 registration as
Non Hazardous Substances
within a consortium of 160 slag producing and
processing companies**



Tests which were carried out:

Eco-toxicological tests, e.g.

- Growth inhibition of algae
- Short-term and long-term toxicity to invertebrates
- Effects on soil micro-organisms
- Short-term toxicity to plants



Toxicological tests, e.g.

- Cytogenicity studies in mammalian cells
- Gene mutation studies in mammalian cells
- Skin irritation tests
- Eye irritation tests
- Inhalation studies



EUROSLAG representatives are members of:

- CEN/TC 51 "Cement"
- CEN/TC 104 "Concrete" and CEN/TC 104/WG 15 "GGBS"
- CEN/TC 154 "Aggregates"
- CEN/TC 227 "Road Materials"
- CEN/TC 292 "Wastes"
- CEN/TC 260 "Fertiliser"
- CEN/TC 351 "Dangerous Substances"
- CEN/TC 350 "Sustainability of Construction Works"



CEN/TC 154 Standards - Annex A (normative) EN 13043 - Aggregates for bituminous bound mixtures

Nr.	Source	Subnr.	Specific material	History of use	Special requirements in standard	Additional requirements identified for inclusion
D	Iron and steel industry	D1	Granulated blast furnace slag (GBS) (vitrified)	No	–	–
		D2	Air-cooled blast furnace slag (ABS) (crystallized)	Yes	Yes	No
		D3	Basic oxygene furnace slag (converter slag, BOS)	Yes	Yes	No
		D4	Electric arc furnace slag (from carbon steel production, EAF C)	Yes	Yes	No
		D5	Electric arc furnace slag (from stainless/high alloy steel production, EAF S)	Yes	Yes	No
E	Non ferrous metal industry	E1	Copper slag	Yes	No	
		E2	Molybdenum slag	Yes	No	
		E3	Zinc slag	No	–	
		E4	Phosphorus slag	Yes	No	



CEN/TC 227 EN 14227-2: Slag Bound Mixtures

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

prEN 14227 - 2

**Hydraulically bound mixtures - Specifications -
Part 2: Slag Bound Mixtures**

**Mélanges traités hydrauliques – Hydraulisch gebundene Gemische
Specifications – Anforderungen –
Partie 2: Mélanges traités au laitier – Teil 2: Schlackengebundene
Gemische**

This draft European Standard is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 227.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for granting this European Standard the status of a national standard in all countries.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official version.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Warning: This document is not a European Standard. It is distributed for information only. It is subject to change without notice and shall not be referred to as a European Standard.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart 36, B-1050 Brussels

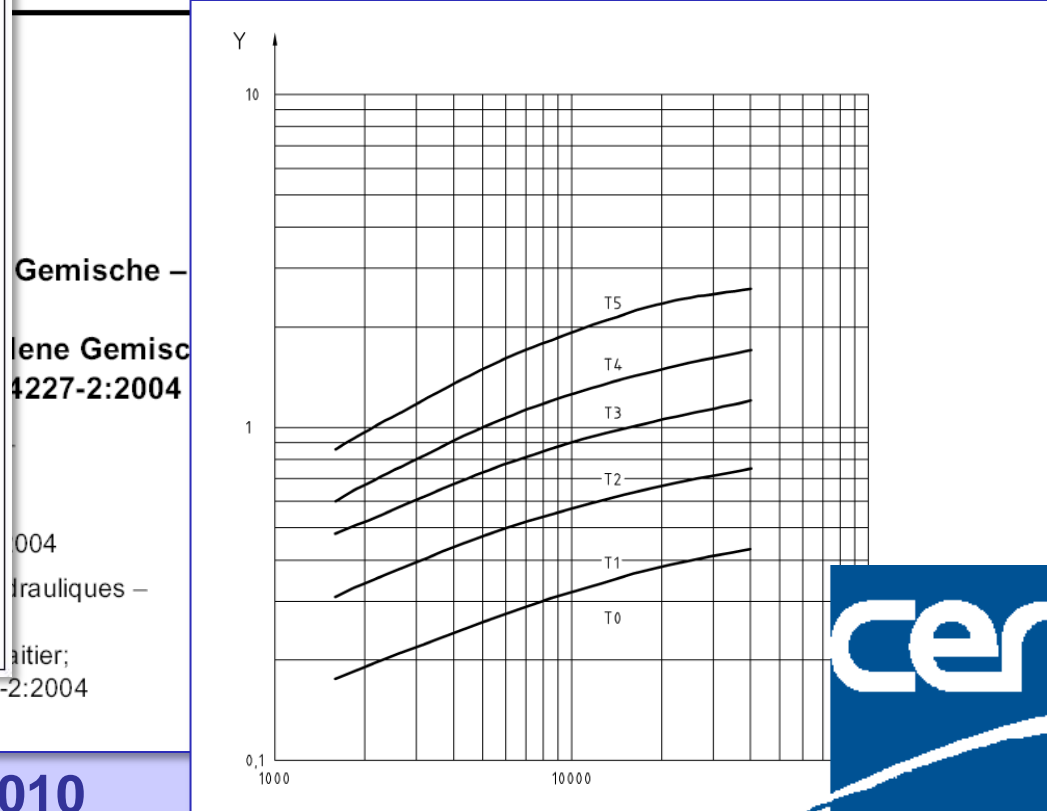
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DEUTSCHE NORM

September 2004

DIN EN 14227-2

DIN



Revision started in 2010

Title: Using Slag as Sorbent to Remove Phosphorus from Wastewater



Partners: ARMINES - Ecole des Mines, France
FEhS-Institute, Germany
ArGe Hüttenkalk, Germany
Epur Nature, France
AKUT, Germany
ArcelorMittal, Luxembourg

Duration: 3 years 01.07.2009 - 30.06.2012



Examples of Common Research work:

- Evaluation of volume stability of steel slag concerning:
test methods, requirements, plant treatment etc.
- Use of steel slag for asphalt, railway tracks & waterways
- Characterisation of slags and other building materials concerning:
 - Contents
 - Mineral structure
 - Leaching behaviour
 - Eco-toxicological and toxicological tests
- Heat recovery by dry granulation
- Transformation of steel slag into clinker



Work Item Promotion

EUROSLAG



Ferrous Slag – Resource Development
for an Environmentally
Sustainable World

6th European Slag Conference
20th – 22nd October 2010, Madrid

Proceedings

EUROSLAG Publication
No. 5

Organized by:



Conference Proceedings

// A product with exceptional variety.
Slag is ideally suitable for a surprisingly wide
variety of applications. //

SLAG: A SOUND CHOICE IN FAVOUR OF ECOLOGY.



Brochures



Technical Leaflet No. 1

Granulated Blastfurnace Slag

Granulated Blastfurnace Slag (GBS) is manufactured from molten blastfurnace slag, a co-product produced simultaneously with iron. Rapid chilling with water or air forms a glassy granular material with latent hydraulic properties. It is used for cement, concrete, mortar, grout and aggregates.

Origin
Iron ores from around the world blended with limestone and/or dolomite and coke are used to produce iron prior to steelmaking process. The blend is sintered which removes moisture, some sulphur and causes the formation of nodules. Lump ore, sinter cake, iron ore pellets and additives form the blastfurnace burden. Precise mixtures of burden and coke are continually fed into the blastfurnace, where the hearth temperature is maintained at around 1500 °C. Molten iron and slag are drawn off at regular intervals from tap holes at the base of the furnace. The quenching of this liquid slag with an excess of water (granulation), air and water (pelletisation) or steam forms a granular product.

Material Characterisation
Molten slag is resembling natural liquid lava. If solidified, GBS is an inorganic, glassy material. The glassy nature is responsible for its cementitious properties. The four major chemical components, calculated as oxides, are CaO, SiO₂, Al₂O₃ and MgO. TiO₂ and MnO are also present and influence the latent-hydraulic properties. Due to the reducing conditions of the blastfurnace heavy metals are mainly transferred into the iron. Remaining trace elements are present in the same amount as it is in natural minerals.



Physical Properties

Glass content	Vol. %	50.4 - 100.0
True density	g/cm ³	2.796 - 3.070
Apparent density	g/cm ³	2.021 - 2.843
Bulk density	g/cm ³	0.608 - 1.027
Porosity	Vol. %	2.5 - 31.2
Sieve size < 0.5 mm	wt. %	3.6 - 78.6
Sieve size < 3.2 mm	wt. %	81.1 - 100.0

The colour of GBS ranges from beige to dark to off white depending on moisture content, chemistry and efficiency of granulation. When it is granulated it has usually white colour. In relation to OPC the material seems to be fairly, and pigments can be used more efficiently.

For each ton iron about 1.6 tons raw material, 330 kg coke, 150 kg coke coal powder and 900 m³ hot air are necessary. About 230 - 300 kg of slag is produced.

The production of high quality iron combined with efficient furnace operation, ensures consistent, high quality blastfurnace slag is produced.

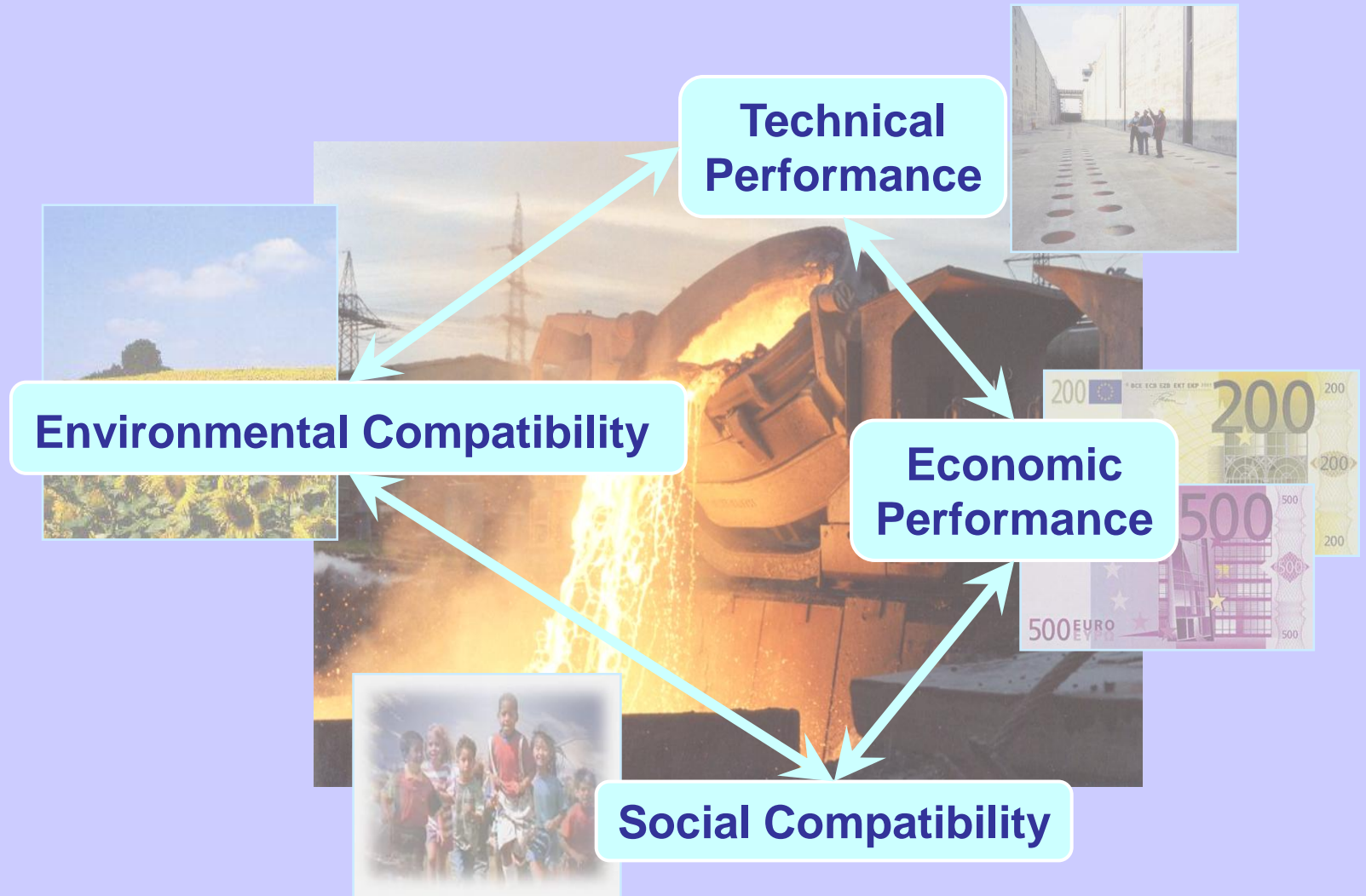
Urgent GBS at a cement plant



Technical Leaflets

Next EUROSLAG Conference
in The Netherlands
October 2013





Using slag products - a contribution to a sustainable development

Many thanks for your attention