Sustainable reuse of iron and steel slags in road applications: Technical requirements for environmental acceptance

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SESSION 8B : National policies and guidelines

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Headlines of the presentation

- Introduction
- General framework: iron and steel slags management and French recycling policy
- Methodological and application guides for recycling in road works
- Environmental acceptance for iron and steel slags: the steel slags application guide
- Conclusion
Introduction

- **What is C.T.P.L.?**
  - French reference industrial organism representing iron and steel slags industry profession (producers and users)

- **Which objectives?**
  - To improve characteristics of slags for their reuse
  - To get a better knowledge on slags properties in the uses
  - To promote and to communicate on main uses to develop the markets

- **Main topics?**
  - Evolution of regulation and standardization for slags uses
  - Development of quality insurance procedure for slags management, towards a true Product approach
  - Information and “education” of stakeholders
  - Active member of EUROSLAG
Framework for iron and steel slags management

- Important volumes of slags: # 6 Mt/year (2010)
- Legal status of waste in France
- Different types of slags from different processes
  - From blast furnace BF, air-cooled (ABS) or vitrified (GBS) slags
  - From basic oxygen furnace: BOF slags (BOS)
  - From electric arc furnace EAF, for carbon (EAF C), stainless or high alloyed (EAF S) steelmaking process
- 75% of volumes reused in public works (building and road constructions)
- Main technical requirements given in Product standards
  - EN 12620, EN 13043, EN 13242 and EN 1744 for aggregates
  - EN 14227-2 for road materials
  - EN 206-1 and EN 15167 for concrete
  - EN 13282 for hydraulic binders

⇒ Lack of environmental requirements for the different uses
French recycling policy

  - General implementation in the “French Ordonnance” n° 2010-1579 (17/12/2010), aiming at:
    - Reduction of volumes and hazards of waste
    - Hierarchy in waste treatment: preparation for reuse, recycling, other valorization process (energy), elimination (storage, incineration, ...)
    - Waste management solutions without any environmental impact on health and other sensitive targets (water, soils, ...)
  - Implementation of art. 5 and art. 6 of the WFD: Waste, EoW, and By-product status:
    - By-Product status: not planned without EC comitology initiative
    - EoW status: French Decree n° 2012/602 implementing art. 6 and defining requirements and procedure to cease to be a waste
    - Waste: elaboration of environmental framework for road uses

- **Need of tools to allow environmental acceptance of waste**
General methodological Guide (1)

- Acceptability of alternative materials in road construction

Where do we stand in relation with the waste classification?

The methodological guide proposes:

1. A simplified procedure allowing the use of waste considered as inert
2. An interdiction of use for hazardous waste
3. A methodology allowing the use of a certain number of non-hazardous waste, under specified conditions
4. For other NH waste, the need for specific studies
Publication in France of the SETRA Guide in March 2011

Translation and notification to the EU in March 2012

Available in English language on SETRA internet site:
Application Guides

Objectives and targets

● **Objectives**

  - To implement the Methodological Guide specifications to a specific waste type,
  - To list and to justify road uses,
  - To define relevant geotechnical and environmental parameters/criteria,
  - To define pairs of materials/uses together with the associated constrains,
  - To define proper mandatory quality insurance procedures for the compliance of the materials to the specifications,

● **Targets**

  - Application Guidelines are drafted to help project owners and specifiers who wish to use alternative materials in their works, or who wish to assess environmental variations during tender call.

● **Progress**

  - MSWI BA Application Guide is ready and will be published before the end of 2012
  - C&D waste Application Guide is in progress and should be ready for 2013
  - *Iron and steel slags Application Guide .... (It is now !!)*
  - No other initiative launched …
Application guide for valorization of iron and steel slags in road works (1)

● **Structure of the Steel Slag Application Guide**
  - Terms and definitions,
  - Description of various slags suitable for use in public works: origin, steelmaking process and main figures,
  - Description of the manufacturing process of the alternative material, as well as of the road material,
  - Prescribed road applications and associated technical specifications and limitations,
  - Quality insurance procedure, including field compliance verification and memorisation of road construction projects
Application guide for valorization of iron and steel slags in road works (2)

- **Road applications « type 1 »**
  
  Usages routiers "type 1"
Application guide for valorization of iron and steel slags in road works (3)

- Road applications « type 2 »

Usages routiers "type 2"
Application guide for valorization of iron and steel slags in road works (4)

- Road applications « type 3 »
  Usages routiers "type 3"
Application guide for valorization of iron and steel slags in road works (5)

- **Drafting of the decision grid, defining:**
  - Authorized road applications
  - Environmental limit values in compliance leaching, based on experimental studies and feedback experiences (scientific knowledge on slags behaviour)
  - Limitations linked to the intrinsic properties of the material (pH) and the geometry (thickness) of the road work
  - Limitations linked to the environmental boundaries (e.g. sensitive environmental targets)
  - Limitations linked to the work construction phase
Application guide for valorization of iron and steel slags in road works (6)

<table>
<thead>
<tr>
<th>Environmental reference</th>
<th>Road applications Limitations</th>
<th>Local boundaries Limitations</th>
<th>Work phase Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compliance control &lt; reference 1</strong></td>
<td>Road applications “type 1” &lt; 3m</td>
<td>Road work shall be: - out of flood-threatened areas - ≥ 50 cm above the highest level of 50 years water mark - distance ≥ 30 m of watercourses, lakes or ponds - out of close protection perimeter around drinking water supply area - out of sensitive areas in relation to aquatic environment (national Park, …) Or hydrogeologist-expert judgment</td>
<td>Temporary storage max. 1000 m³ or 1 week of work Beyond 1000 m³ hydrogeologist-expert judgment</td>
</tr>
<tr>
<td><strong>Compliance control &lt; reference 2</strong></td>
<td>Road applications “type 1” &lt; 3m Road applications “type 2” &lt; 6m</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compliance control &lt; reference 3</strong></td>
<td>Road applications “type 1” and “type 2” without any restriction Road applications “type 3” and pH &lt; 12</td>
<td>Out of national park</td>
<td>No limitations</td>
</tr>
<tr>
<td></td>
<td>Road applications “type 1” and “type 2” without any restriction Road applications “type 3” and pH &gt; 12</td>
<td>Road work shall be: - distance ≥ 30 m of watercourses, lake or ponds - out of close protection perimeter around drinking water supply area - out of sensitive areas in relation to aquatic environment (national Park …) Or hydrogeologist-expert judgment</td>
<td></td>
</tr>
</tbody>
</table>
Quality insurance procedure, defining:

- Tasks and duties of stakeholders (producer, manufacturer, seller ...) throughout the supply chain
- How to check the characteristics of the fabricated alternative materials:
  - Sampling procedure to get representative samples
  - Define environmental characteristics – pH, electric conductivity, As, Ba, Cd, Cr, CrVI, Cu, Hg, Mo, Ni, Pb, Sb, Se, Zn, fluorides, chlorides and sulphides
  - Define leaching compliance procedure (EN 12457-4)
  - Define the minimum frequency for verification of conformity
- Recommendations to ensure traceability of reused materials and give guarantee throughout the supply chain
Verification of the environmental conformity

<table>
<thead>
<tr>
<th>Capacity* of the manufacturing plant</th>
<th>Minimum frequency for compliance assessment</th>
<th>Evolution of compliance assessment</th>
<th>List of parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant &lt; 30 000 T/year*</td>
<td>1 sample every 3 months</td>
<td>If 12 consecutive samples are all &lt; limit values, possibility to check only 1 sample / 6 months</td>
<td>If 12 consecutive samples are all &lt; (limit value)/2, possibility to check only compliance assessment for the parameter <strong>once a year</strong></td>
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* Capacity in T/year assessed on the base of year n-1 for compliance assessment performed during year n.
** Only for plants using compliance assessment with a pre-requisite analysis before delivering and using road materials in the road applications.
Conclusions

- **Reuse of iron and steel slags in road works:**
  - Existing technical specifications in EN standards, including specific requirements for slags
  - Suitable construction products used for several decades, without any problems … if respect of requirements!
  - Environmental characteristics are known, checked and suitable for road work applications
  - The Application Guide will be the technical and the regulatory base for further step: EoW status

End-users get all guarantees – technical & environmental performance – to use good sustainable resources, and preserve natural resources only for engineering uses
Special thanks to …

- SETRA, French Ministry in charge of Environment and ADEME for collaboration and fruitful exchange

- Iron and Steel industry (APERAM, ArcelorMittal, Ascometal, Industeel le Creusot, LME-Trith, RIVA, SLAG, Ugitech, V & M, WINOA) and corresponding industrial slags suppliers (Eiffage, Eurogranulats, Harsco Metals and Minerals, Phoenix Services, SCREG, SGA and SLAG,) for technical and financial support
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