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Forte Village / Santa Margherita di Pula (CA) / Ita

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RNING

N C3 / PANORAMA HALL / 9:00-10:40

NIES EXPERIENCES

esidente: Sven Andersson (SE)

, L. Pilenga, M. Heidari, Y. Lazzarini, G. Garuti (IT)
efficiency" approach for sustainable MSW management in emerging countries

(NL)
atment for circular economy

hini (IT)
sed energy from waste plants based on organic rankine cycle technology

. Moulden (UK)
as a method of final municipal solid waste disposal and power generation

:10 Coffee break

N C4 / PANORAMA HALL / 11:10-12:50

OBIC DIGESTION - LAB SCALE TESTS FOR PROCESS ENHANCE-

esidente: Marco Ritzkowski (DE)

klage, D. Rechtenbach, I. Atamaniuk, A Alassali, .A.- C. Graage, P. Pasternak, A. Muntoni, M. Isipato, K. Kuchta (DE)
ion of standardised and adapted inocula for biomethane potential tests

. Luo (HK)
ent of food waste methane-generating platform by enriching acetate and hydro-ction in an integrated pressurized solid-liquid anaerobic reactor

V. Belgiorno (IT)
chemical preatrements for the anaerobic digestion of the organic fraction of solid waste

. Wang, T. Yuan, Q. Xu (CN)
nanganese species on anaerobic digestion

le, O. Abunumah, I. Orakwe, H. Shehu, F. Muhammadsukki, E. Gobina (UK)
biogas to a bio-methane by use of nano-structured ceramic membranes

SESSION D3 / PANORAMA HALL 2 / 9:00-10:40

PYROLYSIS AND GASIFICATION OF BIOMASS

Chair / *Presidente:* Umberto Arena (IT)

L. Yin, B. Yu, S. Hu, Y. Hu, D. Chen (CN)
Study on heat and mass transfer characteristics of biomass particles during pyrolysis

V.E. Messerle, A.B. Ustimenko, O.A. Lavrichshev, N.A. Slavinskaya, Zh.Zh. Sitdikov (KZ)
Gasification of biomass in plasma gasifier

G. Lisak, S. Heberlein, A. Veksha, D. Wu, A. Giannis (SG)
Make it greener - Using renewable biomass charcoal to operate the high temperature slagging gasification facility for municipal solid waste

A. Manali, P. Gikas (GR)
Utilization of primary sieved solids for gasification and energy production

A. Veksha, F. Teoh, V. Chia, A. Giannis, T.T. Lim, G. Lisak (SG)
Recycling of gasification slag from municipal solid waste into catalysts for steam reforming of naphthalene

G. Calì, F. Parrillo, D. Marotto, A. Pettinau, U. Arena (IT)
Air gasification of eucalyptus biomass in a pilot scale fluidized bed reactor

10:40 - 11:10 Coffee break

SESSION D4 / PANORAMA HALL 2 / 11:10-12:50

SUSTAINABLE MANAGEMENT OF SECONDARY RAW MATERIALS

Chair / *Presidente:* Flora Faleschini (IT)

M. Pasetto, E. Pasquini, A. Baliello, G. Giacomello (IT)
30 years research on C&D waste recycling in transport infrastructures: a way to minimize the waste disposal and save natural recources

A. Santamaría, J.T. San José, I. Marcos, J.J. González (ES)
The performance of self-compacting concrete beams incorporating Electric Arc Furnace slag

G. Ascensão, F. Faleschini, M. Marchi, M. Segata, J. Van De Sande, H. Rahier, E. Bernardo, Y. Pontikes (IT)
High temperature resistance of CaO-FeOx-Al_2O_3-SiO_2 alkali-activated materials

E. Dziobek, A. Nowaczek (PL)
Sustainable development in the construction industry – Usage of construction and mining waste as secondary raw materials. Polish case study

N.L. Huong, T.V.N. Tran, L.N. Cham, N.H. Giang, K. Kawamoto (VN)
Application of system dynamic modeling to support construction and demolition waste management policy in Hanoi City, Vietnam

H. Alrobei, A. Sikander, A. Hafiz (SA)
Flexural behavior of reinforced concrete beam by partial replacement of fine aggregate with pond ash

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THE PERFORMANCE OF SELF-COMPACTING CONCRETE BEAMS INCORPORATING ELECTRIC ARC FURNACE SLAG

Amaia Santamaría [1], José Tomás San José [2], Ignacio Marcos [1] and Javier Jesús González [2]

[1]*Department of Mechanical Engineering, University of the Basque Country (UPV/EHU), Spain*
[2]*Department of Mining Metallurgical and Material Science, University of the Basque Country (UPV/EHU), Spain*

ABSTRACT: Social concern over sustainability has motivated many researchers to study the use of steelmaking slag in the construction industry. One among various recognized uses of Electric Arc Furnace (EAF) slag is as coarse aggregate in hydraulic mixes. However, the poor workability of hydraulic mixes manufactured with this type of aggregate is one of the main drawbacks to its commercial use in real structural components. In addition, the bulk of the research to date concerns mass concrete, with little research into Reinforced Concrete (RC) manufactured with EAF slag as aggregate. In this study, real-scale beams are manufactured with self-compacting concrete using EAF slag as aggregate and their performance under flexural loads is examined. The tests demonstrated that real-scale RC components manufactured with self-compacting mixes using Electric Arc Furnace slag as aggregate is indeed possible and that the behavior of EAF slag RC components can be predicted using the existing formulas.

Keywords: Electric Arc Furnace Slag, Self-Compacting Concrete, RC beams, Flexural behavior

1. INTRODUCTION

Waste is one of the overwhelming problems of modern-day society. With dumping sites filled with waste all over the world, we might sum up our waste strategy as: recycle it, reuse it, and reduce it. The steelmaking industry is very important for the economy of the Basque Country (Northern Spain). Almost 1% of the steel manufactured in electric arc furnaces is produced in this territory (10 million tons) (Yearbook, 2015), which has around 506,000 km^2. So, the reduction of steel industry waste in this area is very important. Electric Arc Furnace (EAF) slag also known as black slag is one form of this waste. The objective of this research is to demonstrate that this slag is potentially an excellent raw material for use as coarse aggregate in concrete mixes.

Motz, Geiseler and Koros (Geiseler, 1996; Koros, 2003; Motz & Geiseler, 2001) pioneered the reuse of siderurgical slag in the construction and civil-engineering industries. Following their early investigations, many researchers all over the world have since focused their studies on the reuse of steel slags as aggregate in the construction industry (Yüksel, 2017). There are studies on the use of EAF slags in various areas, such as bedding material for road and railways, water depuration, and

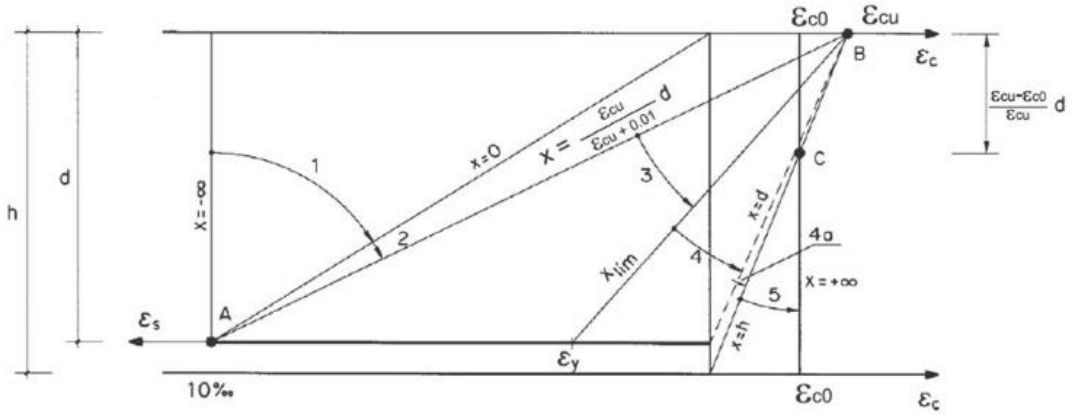

Figure 11. Pivot diagram.

5. CONCLUSIONS

The manufacture and performance of self-compacting RC beams with EAF slag as aggregate have been examined to evaluate the casting process in real-scale elements and the suitability of EAF slag to RC members. The following conclusions may be drawn from the results obtained in this study:

The manufacture of real-scale self-compacting mixes with EAF slag as aggregate has been demonstrated and is therefore feasible. No problems were noted during the casting of the real-scale RC of aggregate segregation or passability through the reinforcement.

The experimental flexural behavior of the RC beams made with EAF slag concrete has been tested and, as predicted by the existing formula, was reasonably good.

The flexural behavior of the EAF slag concrete RC beams has been analyzed in depth, to show in all cases that present the standard behavior of the ordinary RC elements.

Nevertheless, further research should be conducted, to ensure that the behavior of the RC beams incorporating EAF slag could be predicted by standard formulas.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to the following institutions : the Spanish Ministry (MICINN) and FEDER (European Regional Development Funds) through contract RTI2018-097079-B-C31 (MCIU/AEI/FEDER, UE), and, the Basque Government research group (IT1314-19). Finally, our thanks likewise to HORMOR Zestoa as steelmaking slags supplier and to the University of Burgos (EPS -LaMilanera) for their support at several experimental stages.

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