Introduction

Cement is the single most widely used material in the world¹:
• It is estimated that by 2016 the global demand will exceed 4.4 billion tones⁵

Municipal Solid Waste (MSW) generation is expected to reach globally 2.2 billion tones in 2025⁶.

The rising numbers of MSW raise discussions towards the concepts of sustainable development and circular economy.

Waste Management options have been developed in order to minimize the amount of wastes in a sustainable framework. Energy from Waste (EfW) plants incinerate wastes producing heat, power and by-products.

Air Pollution Control (APC) residues:
• are by-products of EfW plants
• can be used in the industrial sector
• have high concentration in chlorides and soluble toxic metals (Zn, Pb, Cu, Cr, Sd) that leads to high alkalinity and corrosiveness and classifies them as hazardous
• due to their pozzolanic properties can be used as aggregates in the cement production

Objectives

The purpose of the review is to examine the use of APC residues from Energy to Waste plants in the construction industry.

More specifically, the feasibility to use APC residues after being treated with washing techniques for cement and concrete products will be examined with focus on the behaviour of metals and compounds that are present in MSWI fly ash.

Methodology

A literature review regarding washing of EfW APC residues and their use in blended cements has been conducted on:
• the composition of washed EfW APC residues
• the leachability of inorganic pollutants in blended cement pastes and mortars that incorporate washed APC residues for different parameters, liquid to solid ratios, time of contact, leachant type.
• the properties of the concrete (compressive strength, reactivity and setting time, mixing ratios) for different APC residues

Results

• 20% MSWI fly ash replacement of cement ensures the properties of cement, as 180-day compressive strength of mortars is enough to use in basic municipal constructions.

• On average a 90% decrease in Cl, 22% increase in CaO and 38% increase in SO₃ between the original and the washed APC’s is observed from the different literatures.

• Washing Treatment led to minimization of Zinc, Lead, Copper and Cadmium that were the toxic metals with the initial higher concentration in the APC residues.

References