

USING AGRICULTURAL PLASTIC WASTE (APW) AS ALTERNATIVE SOLID FUEL (ASF) FOR ENERGY RECOVERY IN A CEMENT INDUSTRY KILN – A PILOT TEST

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The problem of APW and the scope of Labelagriwaste project

Every year tons of agricultural plastic waste are burnt or uncontrollably disposed to the environment. The uncontrollable burning releases harmful substances that cause pollution while the accumulation of plastics in the agricultural land results in its irreversible contamination and physical degradation.

The serious environmental problems related to the management of APW at European level, led to a European research project LABELAGRIWASTE¹, aimed at developing an economically viable scheme for the collection and valorization of the agricultural plastic waste destined for recycling or energy recovery. After completing a study of existing schemes (for APW and for other waste streams) and a study of the existing legal framework and the legal tendencies, a first scheme was designed, tested and improved in a pilot test. The results of the tests are described in a series of publications. The part of collection and consolidation of the APW is described in [1], while the APW recycling part is described in [2]. This paper presents the results of a pilot scale test for the energy recovery from APW in a cement industry kiln.

Technical Specifications for Energy Recovery from APW

The agricultural plastic waste stream that cannot be recycled economically might be able to be used as alternative fuel in a cement factory. Energy recovery of APW is done in cement factories because they are already equipped with costly filters and the only additional investment concerns the feeding chain. In addition, the cement factory burns the fuel at high temperatures with adequate residence time to cause the decomposition of the possible harmful components and is equipped with filters in the emission of the gases.

Because the cement factory requires homogeneity in the fuel fed and despite the fact that the alternative fuel replaces a small percentage (5-10%) of the coke burned, the alternative fuel has to be rather homogeneous. This homogeneity requires pre-processing (cutting and mixing) of the agricultural plastic waste streams destined to become alternative fuels. During this pre-processing, samples of the waste are analysed in terms of specific technical requirements.

The agricultural plastic waste stream has to fulfill technical specifications to be accepted as alternative fuel in a cement factory in order to prevent decrease in productivity and continuity of operations. The results of the combustion can affect the quality of the klinker (solid residues) or overload the filters (gas emissions). The specifications of the APW depend on the original composition of the plastic as well as on possible contamination during its use in the fields, removal, consolidation, transportation and pre-processing. This paper proposes technical specifications on the APW that can be universally accepted across Europe. In this work the establishment of these specifications is analysed and their impact justified.

Pilot Test of Energy Recovery from APW in Greece

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A pilot test conducted in the southwestern Greece and described in detail in [1] provided the required steams for piloting the use the APW as alternative fuel in a cement factory. The APW waste streams collected in the pilot test were checked against the specifications of the alternative fuels. A full scale pilot test for energy recovery from APW where all the stages (sampling, testing, labelling, transportation, pre-processing, energy recovery) were piloted, and quantified, is presented in this work. Environmental (combustion emissions and ash composition) and technical parameters (flame and thermal profile of the kiln) were monitored during the energy recovery experiment to establish the feasibility of the energy recovery from APW and the confirmation of the labeling specifications established in the framework of Labelagriwaste.

Conclusions

The feasibility of the APW use as alternative fuel has been analysed through a full-scale experiment in a cement factory and confirmed and the logistic and environmental implications have been investigated in detail. A list of technical specifications has been established for the admission of the APW stream for energy recovery.

References

1. Briassoulis D., Liantzas K. Hiskakis M., ‘Management of Agricultural Plastic Waste (APW) – A Pilot Test in Greece’, paper to be presented in EurAgEng 2008 in Crete.
2. Hiskakis M., Babou E, Briassoulis D., Marseglia A., Godosi Z., Liantzas K.: ‘Recycling Specs for Agricultural Plastic Waste (APW) – A Pilot Test In Greece and in Italy’, paper to be presented in EurAgEng 2008 in Crete.