

Converting Waste to Energy in the Cement Industry – Morocco

Problem: Inappropriate disposal and incineration of waste endangers health and environment

Disposal of household and industrial waste in Morocco is characterised by major deficiencies. Waste, including hazardous and municipal solid waste is disposed of in an uncontrolled manner with direct negative impact on health and environment. At the same time, methane escapes from waste disposal sites and CO₂ continues to be emitted from the continued incineration of primary sources of energy. In the region of Casablanca alone, more than 3,000 tons of household wastes are generated each day. The government of Morocco has developed, supported by the World Bank and German development cooperation, national legislation on refuse management and recycling. The municipal waste management plan requires new controlled landfills, rehabilitation of old landfills and recycling of 20% of the material by the year 2020. Funds of EUR 4.5 billions are allocated.

The co-processing of pre-treated waste as an alternative fuel (AF) in cement plants is widely implemented in industrialised nations. It helps to reduce waste volumes and conserve natural primary energy resources, contributes towards reduction of emissions on landfills and has a positive effect on the energy costs for the cement industry. However, the feasibility of such a concept in Morocco remains challenging because of a lack of capacity and suitable competence of relevant actors. Furthermore, the characteristics and quantities of non-hazardous solid waste from municipal, commercial or industrial production are relatively unknown.

Our partners

Ciments de l'Atlas (CIMAT) S.A. produces different specification of cements and concrete for the Moroccan market. It was founded in 2007 and runs two cement plants and is the main private partner in the project. ThyssenKrupp Polysius AG, one of the leading engineering companies worldwide equips the cement and mineral industries and has over 150 years of experience in the construction of complete production lines.

Contribution by CIMAT

- Determination of the catchment area, logistical challenges and arrangements
- Review of the relevant clinker burning process and projection of future processing requirements
- Establishment of an emission analysis and estimation to future emissions
- Decision on investment in a waste treatment plant

Contribution by ThyssenKrupp Industrial Solutions

- Establishment of the engineering and production concept based on waste composition
- Evaluation of AF potential
- Analyze emission of local cement works

Contribution by GIZ

- Facilitation of access to the public sector, especially legislative requirements and official permits
- Establishment and provision of data and information on waste mass flows
- Development of quality assurance system ((introductory guide)
- Assistance for an inclusive approach of the informal sector and social cohesion
- Project steering, coordination and monitoring

Strategy and activities

The project developed and established a mass flow management system serving the recovery of energy and useful materials from commercial, industrial and domestic waste with high calorific content by conversion to quality controlled AF. It involved the private sector, municipalities, the informal sector and waste management authorities. The project established a baseline on available waste resources and logistics in the project region. Volumes and quantities, composition and calorific values were determined and the collection system and its inherent logistics were evaluated. The resulting parameters for energy production (particle size, calorific value, emissions, etc.) were established before designing and engineering the necessary technological adjustments and subsequent investment.



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Potential investors for a waste pre-treatment plant were identified and a multi-year contract for the supply of kiln and the operations negotiated.

Apart from the technological challenges, the partnership ascertained the necessary regulatory environment. The relevant authorities had to arrange the necessary public permits and a process of negotiation on appropriate legislation or regulation was launched.

The project partners are aware that an appropriate waste supply chain requires an approach which is inclusive of the current actors, many of which are operating informally. A Poverty Impact Assessment (PIA) determined the impact of this project on the existing service providers and on the many individuals who rely on waste disposal as a means of survival. It revealed several opportunities to involve the informal workers and the poor and to begin a measured process of integration in cooperation with the National Initiative for Human Resource Development (INDH). A final workshop was organised for the local collectors of Béni Mellal in October 2015 particularly to train the collectors to become familiar with

- The net product of usable waste fractions
- Organisation of work in form of cooperation
- Creation of productive (green) jobs.

Relevance for the partners

CIMAT does not focus its capacity on designing and engineering the necessary pre-processing of waste as an appropriate alternative fuel. A sustainable engineering process allows substantial reduction of operating costs and creates a positive public image. The essential commercial concern of ThyssenKrupp Polysius is to facilitate the supply of the necessary process-engineering, equipment and components for the implementation of co-processing at a CIMAT plant.

Expected outcomes

Waste fractions from the Moroccan waste industry around the cement plant and the volume, characteristics and composition of the available waste were analysed. The alternative fuel needs can be met from household, industrial and informal sector waste, with household waste offering the greatest market potential. The project partners agreed on the criteria which the collected waste must meet for processing as alternative fuel. All the information needed to develop a supply chain for high calorific waste fractions is available. Based on a Poverty Impact Assessment (PIA), a strategy to incorporate the informal sector into the formal waste supply chain was produced, and a project proposal for waste collection and separation could be drafted together with a local NGO.

For the waste-processing plant, quality criteria for alternative fuels were defined and the amount of high calorific waste needed to produce alternative fuels was determined. In conjunction with Thyssen-Krupp, a process technology strategy was developed for the production and processing of high-quality alternative fuels. A business model for the plant operator was developed.

The construction of the new waste disposal centre is envisaged for 2016. The facilities will have to be constructed and operated in such a way that the recoverable quality-certified secondary products can be made available at affordable (fixed and variable) prices.

Regulation governing the use of waste materials for co-incineration was established and the directive regarding the use of waste as secondary fuel has been implemented.



Objective:	Environmental and resource protection by processing and co-processing of quality assured alternative fuel for the cement industry out of commercial, industrial and municipal solid wastes
Partner:	Ciment de l'Atlas (CIMAT) S.A., Morocco, ThyssenKrupp Polysius AG, Germany
Duration:	2013 – 2015

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