PEF ARTICLE

In mid 2011, Zlatna Panega Cement plant commissioned its new installation for alternative fuels. In July, testing of the shredding equipment was performed and in August the first energy recovery from the new alternative fuels was successfully accomplished.

This new alternative fuels installation, the first of its kind within the TITAN Group, is designed for the production of PEF (Processed Engineered Fuel). PEF is a fuel with uniform, constant quality made from various non-recyclable waste materials with variable quality. Its main raw waste material come from the Municipal Solid Waste (MSW) deposited in the Sofia landfill, while the PEF is enhanced by the use of other carefully selected high heat value (HHV) industrial, commercial or biomass waste.

It should be noted that Zlatna Panega Cement has an Integrated Pollution Prevention Control (IPPC) permit for the energy recovery of hazardous and non-hazardous wastes.

The project was accomplished together with Evolution Environmental Group LLC ("E2"), a Company with 35 years of experience in the utilization of alternative fuels in the US and Europe.

PEF Production Line

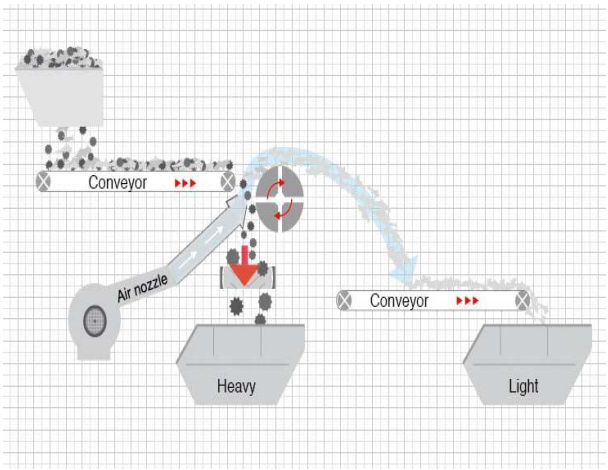
The delivered waste materials are deposited inside the building and fed by clamshell loader into the primary shredder, manufactured by "M&J", which shreds them at 10 tons per hour with an output size ranging between 100-200 mm. The shredded materials are then transported by belt conveyor to the second stage for further treatment.

Unloading of truck with RDF

Feeding with clip in primary shredder

Separation of the useful light fraction from inert materials is achieved though the vibrating screen "Spaleck", with screen sieve openings of 30 mm. The purpose of this vibrating screen is to remove inert material (small rocks, glasses, metals, dirt, and sand), which are then transported out of the building and deposited in a reject container.

Vibrating screen and wind sifter



Wind sifter – separation technology

After the vibrating screen the materials enter in the "Westeria" Wind Sifter. The purpose of the wind sifter is to further separate the light fraction (drier and two dimensional particles) from the heavy fraction (wet, heavier and three dimensional particles). The heavy fraction is again transported outside of the building into the reject container (the operation of the wind shifter is explained in the scheme above).

The separated light fraction is then transported by conveyor belt into the secondary shredder, manufactured by "Weima" Fine Cut with a productivity of 10 tonnes per hour and output particle size of 20-25 mm. The shredded materials are finally transported by conveyor belt to the reverse belt, where two options are possible: (a) to feed the ready PEF into the "Schenck" pneumatic system, eventually going to the main burner of the kiln or (b) to pile stocks on the storage floor.

Secondary Shredder "Weima"

Conveyor belt feeding the "Schenck" system

Metal separator before "Schenck" system

PEF piled in storage area

Three metal separators are placed a along the PEF production line, to remove unwanted metal particles from the system. All the separated metals are then transported out of the building as rejects.

Metals separated from the production line

Truck used for the rejects from the production line

An additional dosing and feeding belt is installed between the windsifter and the secondary shredder. Its purpose is for other homogenous material (i.e. HHV waste and/or materials) to be fed into the production line in order to enhance the final quality of the main stream of materials.

Feeding of additives (rice husk) by front loader

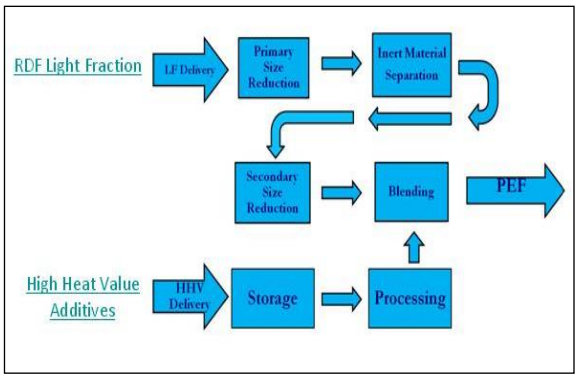
End part of the production line

A “Schenck” feeding system is used to transport the produced PEF from the processing building to a purpose build silo by pneumatic pipe line. In the silo additional homogenization is performed. The PEF is finally extracted through a dosing system and pneumatically fed to the main burner of the kiln.

The Waste Materials used for PEF production

In general, many varied waste materials can be used for the production of PEF. The main waste stream is RDF (Refused Derived Fuel) delivered from three waste separation installations sourcing their original waste from the MSW of the Suhodol Sofia landfill. RDF contains mainly non-recyclable plastics, paper, textile, foils and other burnable materials. The quality of RDF usually varies from day to day and delivery to delivery, so it needs to be uniformed to satisfy the energy needs of the clinker production process.

RDF (non-recyclable plastics, paper, textile, foil, etc.)



PEF production principal

For the improvement of the quality of RDF, high heat value industrial & commercial streams are used like textiles, plastics, plastic bumpers, plastics from appliances, shredded rubber and other.

Industrial non-recyclable textile and foam

Tire chips (shredded rubber)

Car bumpers and plastics from appliances from dismantling of old cars and appliances

For improvement of the quality (moisture) of the RDF and in order to help the transportation through the pneumatic system and extraction from the silo, biomass waste materials are also used, such as rice husk, sunflower husk, saw dust, etc.

In all cases, every waste material that is used in the PEF production process undergoes vigorous quality control through initial and process tests, according to the high standards set by Zlatna Panega Plant qualified experts.

Saw Dust

Rice Husk

Current Status

After the testing of the shredding and feeding equipment (in July and August), in the following two and a half months (September to November), the installation gradually processed and recovered with success the following materials: RDF, industrial textile, car bumpers, appliances plastics, sunflower husk, rice husk, saw dust, artichoke and cigarettes. The total quantities and key quality characteristics of this commissioning and learning period are presented in the Table below.

2011	PEF [t]	NCV [kcal/kg]	PEF [%h.b]	PEF Cl [%]
August	20.33	3009	0.16	N.A
September	136.09	5104	3.39	0.81
October	400.97	4413	5.62	0.55
November	808.674	3933	8.05	0.88

The total investment cost for the entire PEF installation has been €5,7 million.

Future Steps

Zlatna Panega just started successfully this new challenging activity and we have a lot still to learn. The main challenge is to gain further experience in the production of a uniform fuel by using many different materials with inconsistent quality. In future, the Zlatna Panega Plant intends to increase gradually the feeding of PEF by making it more stable and convenient for use.

In the near future, the Plant intends to test other high calorific value materials and to include them in the PEF production, while at the same time, we intend to start another environmentally friendly project for using animal meal as alternative fuel, as well as locally produced biomass from energy crops.

The responsible use of alternative fuels brings many benefits to both society and the Company. The prosperity of the company itself is dependent on benefiting society in consideration of all its advantages and disadvantages. Learning from our own mistakes and using the huge potential of the cement industry will create opportunities in the utilization of non-recyclable waste materials to benefit all stakeholders.

The use of alternative fuels significantly decrease the needs of land filling waste in the municipalities, a practice which is already forbidden in many European countries. The conditions under which the alternative fuels are thermally recovered in cement kilns are much more favorable and safer than the conditions in incinerators, due to almost twice the higher temperatures (2000°C), as well as the encapsulation of the ash into the clinker, leaving no waste residues. The emissions of CO_2 are decreased, due to the biomass content in the alternative fuels (40-100%) and thousands of tonnes of conventional fuels are thus preserved.

Finally, the development of waste processing facilities opens new working places, creates logistic opportunities, conserves fossil fuels that would have to be imported and adds value to materials that would otherwise be discarded, offering thus a real sustainable solution to environmental preservation.