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When the wind of change blows,
some build walls
while others build windmills.

Old proverb.

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Co-processing in cement plants

From waste to energy and raw materials

Cement manufacturing is an energy-intensive process with thermal and electric energy typically accounting for 40% to 50% of production costs (European Commission, 2010). Energy requirements have a major impact on the operating expenditure.

Traditionally, the primary fuels used in the cement manufacturing industry are coal, petroleum coke, natural gas and oil.

These fuels are increasingly being substituted with alternatives, typically residue-based sources (municipal solid waste, tires, waste wood, etc.). Some of these fuels include also alternative raw materials.

Before starting co-processing waste in cement manufacturing, basic quality requirements must be considered;

Waste presents a large variety in terms of physical properties and chemical composition. This means that preparation of an appropriate alternative fuel, in accordance with requirements of the cement plant, is a complex process and requires control by the fuel producer and the cement plant.

IBBL offers the know-how to professionally evaluate and implement alternative fuels and raw materials (AFR) in the cement production.

The benefits for the cement producers to implement co-processing of alternative fuels are

- Reduced use of traditional fuel
- Reduction of natural raw materials usage
- Fulfillment of legal requirements
- Cost reduction

The benefits for the cement producers to hire an independent company like IBBL for implementation of co-processing of alternative fuels are

- Independence from suppliers means freedom in selection of optimum process fitting precisely to the requirements and needs of the Client
- Independence also means flexibility in selection of equipment
- Clear roadmap for the project from starting the investigations up to completion of the project

On the following pages, we would like to inform about

- The IBBL Engineering / Consulting Office
- Environmental protection
- Raw materials for AFR
- Example: municipal waste alternative fuel co-processing
- The 6 steps to implement co-processing with IBBL

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IBBL Engineering / Consulting Office

IBBL Ingenieurbüro Brkic und Labenbacher is your partner during the lifetime of your industrial plant.

IBBL is a state-licensed Austrian Engineering / Consulting Office specialized in process and plant engineering services for the non-metallic minerals industry and the building material industry.

These industries include production of construction aggregates, mortar, lime products like cement and burnt lime as well as gypsum and clay and its products like dry-walls, tiles and bricks.

The services IBBL provides cover the project development in the pre-investment phase as well as engineering and monitoring during project execution. In the operational phase of the plant, IBBL offers various kinds of audits and studies with its respective expert know-how. This includes plant rehabilitation, bottle-neck analysis and upgrades. Of major importance are co-processing of AFR, e.g. fuel shift.

IBBL provides reliable services to our Clients with proven personnel and experienced experts in their respective fields.

IBBL Ingenieurbüro Brkic und Labenbacher GmbH was founded by Dipl.-Ing. Milan Brkic and Dipl.-Ing. Wolfgang Labenbacher. It is based in Vienna, Austria. The company is privately owned by its founders and independent from any equipment suppliers, banks, etc.

Environmental protection

Environmental protection is important for all of us. With current emission levels of green-house gases, a global temperature increase of about 2°C in the coming 20 years is predicted. The cement production contributes about 7% of anthropogenic CO_2 emissions and is the second-largest producer of CO_2 in the industrial sector.

The Cement Sustainability Initiative targets a massive increase of alternative fuel and raw material co-processing in the coming decades to minimize carbon footprint of cement. Fast implementation of such co-processing system will provide the cement producer an advantage against their direct competitors.

Substitution of fossil fuels by alternative fuels conserves non-renewable fuel reserves and reduces greenhouse gas emissions. Biomass and biogenic fractions of waste are considered neutral in terms of CO_2 emission generation from combustion. The use of waste in cement manufacture as fuel leads also to the reduction of waste disposal requirements.

As some alternative fuels include also constituents for clinker and cement production, implementing co-processing can lead to reduced raw material consumption, reduction of clinker-to-cement ratio, reduction of carbon footprint of power production, etc.

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Raw materials

Different kinds of raw materials are used for co-processing. For example:

Waste from municipality needs to be processed before being used as an alternative fuel.

Tires are a very common resource for alternative fuels.

Biological waste e.g. remains from crop or animal farming, sludge from waste-water treatment plants, etc. is a source.

All these materials are used to replace the traditional fuels like oil, coal, gas and pet-coke.

There are a lot of sources and possibilities. These need to be investigated before deciding on the co-processing.

These fuels can be used as fuel or raw material in the pyro-process of the clinker production or in order to generate electrical power.

Co-processing of municipal waste

From the numerous possibilities of co-processing, as example, the pre-processing and firing of municipal waste is presented.

Municipal waste is heterogeneous with varying physical properties and chemical composition. In most cases, it needs initial treatment before being used as alternative fuel in order to comply with operational requirements from cement production and environment.

A requirement from clinker production side is fore sure to consider the additional input of chlorine in the pyro-process during the investigation. In case of necessity, measures need to be taken (by-pass). From environmental side, availability of certain heavy metals needs to be considered.

The pre-processing facilities for municipal waste vary on the properties of the waste. A non-separated household waste with a high content of biological matter typically requires, after a first step of shredding, some drying as it contains up to 80% biological matter and water.

The drying can be achieved by a mechanical system like a rotary drum dryer in combination with waste heat from pyro process or a biological system. The biological drying plant uses the bacteria population to produce heat which is evaporating the water.

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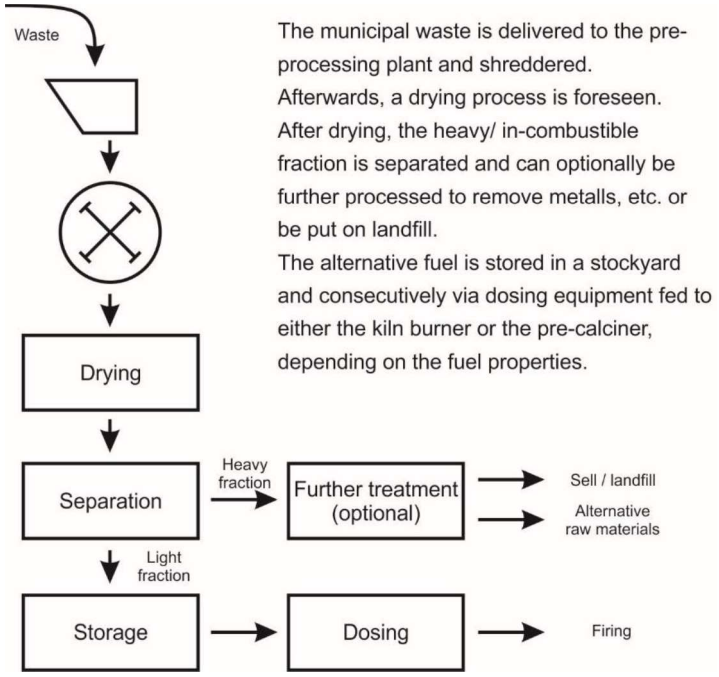
After the drying, a separation process is foreseen to remove the heavy/ the non-combustible fraction from the alternative fuel. This can be achieved by, e.g. a drum sieve.

The heavy fraction can be further processed to remove resell metals like copper; solid remains like stones can be used as alternative raw materials.

The following chart provides an overview on the process.



6 steps to implement co-processing with IBBL

1

Waste mapping

The first step is to evaluate the sources of the alternative fuels; i.e. the quantities, availability and properties, collecting system and conditions, etc. This information is essential for the design of the co-processing system.

2

Site investigation

The team of experts evaluate the conditions at the existing plant. This includes to evaluate available space for the equipment installation, evaluate existing machinery for abilities of co-firing, limitations, etc.

3

Basic engineering

Basic engineering combines process calculations, conceptual design, project schedule and estimation of project costs.

Basic engineering can be extended to full feasibility study.

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4

Tendering

Tendering of equipment supply, construction and erection following the approved production process.

The tendering process is managed by IBBL. Tenders are prepared, offers compared and negotiated in order to secure implementation of the project targets.

5

Engineering and equipment supply

The detail design of the project is done, the equipment manufactured.

IBBL manages and monitors the project. This includes, e.g. follow-up on time schedule, drawings review and manufacturing inspection.

6

Plant construction and operation

Installation of the supplied equipment, modification of the existing system and the commissioning are carried out.

IBBL manages site, supervises the activities on site (erection and commissioning) and supports the Client during establishing proper operation.

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Further services

With our long-term experience in plant engineering and construction, IBBL is in the position to offer, together with partners, also equipment delivery as well as construction and erection services.

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