Waste Co-processing as alternative fuel (AF) and alternative raw material (ARM)
What is waste co-processing?
the utilisation of waste materials as alternative fuel and/or raw materials for the purpose of energy and/or resource recovery.

What types of wastes can be co-processed?
municipal solid wastes, used tyres, ETP sludge, paint sludge, refinery sludge, used oil, solvents etc.

Where the co-processing are practiced?
mainly in energy intensive industries (EII) such as cement, lime, steel, glass, paper and power generation.

What are the benefits of waste co-processing?
Reducing pressure on fossile fuel, reduced green house gas (GHG), minimizing pressure on land used for landfill etc.
Waste Management

- Reduce, Reuse, Recycle (3R)
- Biogas, Biomass, Manure
- RDF (Refuge Derived Fuel)
- Waste co-processing
analogies

- Co-processing
- Resource recovery
- Alternative Fuel/Raw material
Global Practice since 1970s–

Fossil fuels and raw materials have been successfully substituted by different types of wastes in cement kilns in Europe, Japan, United States, Canada and Australia since the beginning of the 1970s (GTZ/Holcim, 2006).
In resource-intensive industries, nowadays, involve the use of waste in their manufacturing processes for the purpose of energy and/or resource recovery and resultant reduction in the use of conventional fuels and/or raw materials through substitution. This phenomenon, familiar as **Co-processing**, is the use of waste as raw material, or as a source of energy, or both to replace natural mineral resources (material recycling) and fossil fuels such as coal, petroleum and gas (energy recovery) in industrial processes, mainly in cement, lime, steel, glass, paper and power generation (wikipedia).
Alternative Fuel (AF)

- Waste materials used for Co-processing are referred to as alternative fuels and raw materials (AFR). Alternative fuels (AF) are predominantly wastes or by-products from agricultural, domestic, forestry or industrial processes comprising biomass (e.g., rice husk), animal meal, sewage sludge, municipal solid wastes, used tyres, spent solvents and waste oils etc.

- A wide range of hazardous waste materials may be co-processed such as; ETP sludge, paint thinners, paint sludge, refinery sludge, used oil, solvents or end-of-line products from the transport sector, Turbocharged Direct Injection (TDI) tar etc. Solids and liquids from the cleanup of past uncontrolled hazardous waste dump sites which can also be blended as AFR into hazardous waste streams.
RDF

RDF is produced from processed municipal solid waste (MSW)
Incinerator versus kiln

Waste burning through kiln was a great discovery while typical incinerators’ chances of forming complex compound like, D&F keeps it in dispute.
HOW EFFICIENT?

- Complete combustion
- Zero ultimate waste
Traditional incineration:

- 2 sec. -> 1200 °C, as the most stringent requirement for high chlorine content wastes
- up to 25 % of slag to get rid of
- up to 10 % of hazardous fly ashes
Advantages of Cement Process

Zero ultimate waste

- The cement process generates neither ash nor clinker needing to be dumped in a tip (it leads to "zero" waste).

- Combustion ashes, made up mainly of the same elements as cement (CaO, SiO2, Al2O3, Fe2O3) are used in its composition.

- Heavy metals are trapped in the cement at molecular level.
Characteristics of the cement process

Two characteristics in particular are of importance

1) Burning conditions
   - high temperature (>2000° in the kiln and up to 1200° in the precalciner)
   - long retention time (5-10 seconds in the kiln and more than 3 seconds in the precalciner)
   - oxidising atmosphere
   - No fly ash since minerals are combined

2) Natural alkali environment
   - freshly formed lime adsorbs SO₂ and neutralises acid gases like HCl
Kiln
As high temperature as 2000 °C inside the kiln
Temperature profile

- Electrofilter: ca. 10 s.
- Preheater: ca. 10 s., 3 s.
- Calciner: ca. 1 min.
- Rotary Kiln: Gas Retention Time: ca. 10 s., Material Retention Time: ca. 30 min.
- Cooler: ca. 1 s., ca. 30 min.

- Gas Temperature
- Material Temperature
Legal requirements
Health requirements
Keep emission limits
CO₂ calculation
Environment impact

Why do we monitor & control AF & ARM Quality?

Stakeholder relationship
Transparency
Trust building
Documentation

Process
Product quality
Production control
Kiln stability

Purchasing
Costs for AF & ARM
Product costs
Contracted parameters
3 Steps for Waste Use

1. **Legal Authorisation**
   - Authorisation Procedure – analysis of impacts, calculation of profitability
   - Plant Specification Form – External and internal constraints to using waste

2. **Supplier Selection/ Waste Qualification**
   - Waste Acceptance Procedure – identification of supplier, more precise specification, analysis of impacts
   - AF/ARM Qualification form

3. **Reception and analyses**
   - Definition of Waste Mastery plan
   - Trial Protocol
   - Ongoing Waste Quality Assessment
THANKS!

Q&D

(Questions, comments &/or discussions)