Environmental Symposium

Alternative Fuels in Cement Plants

August 23, 2013

Jacksonville, Florida

Who is Titan ?

U.S.A.	
2	CEMENT PLANTS
5	QUARRIES
107	READY MIX PLANTS
14	DISTRIBUTION TERMINALS
9	CONCRETE BLOCK PLANTS
6	FLY ASH PROCESSING PLANTS IN THE U.S.A.
1	FLY ASH PROCESSING PLANT IN CANADA

GREECE & WESTERN EUROPE	
4	CEMENT PLANTS
28	QUARRIES
30	READY MIX PLANTS
4	DISTRIBUTION TERMINALS
1	DRY MORTAR PLANT
1	FLY ASH PROCESSING PLANT

SOUTH EASTERN EUROPE	
5	CEMENT PLANTS
9	QUARRIES
7	READY MIX PLANTS
2	DISTRIBUTION TERMINALS

EASTERN MEDITERRANEAN	
3	CEMENT PLANTS
2	GRINDING PLANTS
15	QUARRIES
4	READY MIX PLANTS

CSR @ TITAN: *do less harm; do more good; WIN-WIN*

Participation in Global Compact and CSR networks	
Global Compact	Group level
	Greece
	Bulgaria
	FYROM
	Egypt
WBCSD/CSI	Group level
	Greece
CSR Europe	Group level
CSR Hellas	Greece

… a long-term commitment to continuous self-improvement through sharing, learning and partnership building…

Why Use AF ?

Society Concerns

- Economic growth leads to over consumption, increasing waste volumes for final disposal
- Urbanization brings together millions, creating need of mass waste disposal
- Human activity destroys the natural environment (i.e. global warming / CO_2)
- Green movement asserts new agenda
- Energy & mineral resources are limited
- Economic costs increase
- Landfill space is very limited
- Not in my back yard (NIMBY) mentality
- Society seeks sustainable solutions

Cement Industry Response

- Fuel costs multiply in the 1970's
- Need to diversify energy resources identified – experiments take place
- Waste & by-products are energy & raw materials that remain un-utilized
- Technology developed to consume alternative fuels with success
- Cement kilns offer perfect solution for all: full energy recovery of the waste, total absorption of ash in clinker & no negative impact on emissions
- Industry receptive to stricter regulation
- WIN-WIN solution provided
- Stakeholders engagement guarantees cooperation & agreement

How the Alternative Fuels Business was created

- In mature markets (like the US & EU) Waste Producers are under very strict regulations to dispose of their waste in an environmentally friendly manner and pay the full cost of their removal/transport/treatment/disposal services

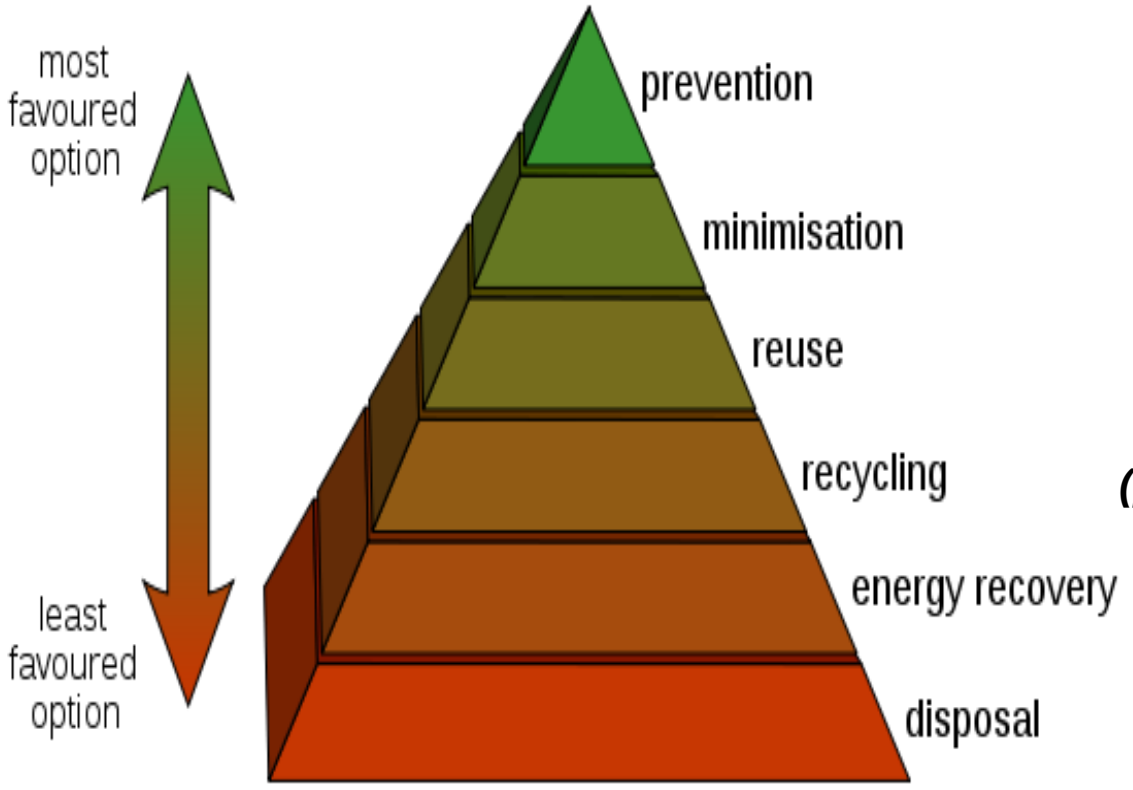
- These regulations have been the outcome of pressures coming from the people themselves since the early 1970's in order to better manage their living environment and stop / reverse the trend of environmental degradation in their respective societies, including the minimization of landfills, reducing global warming, etc

- Indicative such behaviors & practices concern:
  - Reducing (demand/consumption), Reusing & Recycling (products & waste)
  - Separating waste at source (in households, public sector & business)
  - Managing waste streams to create both environmental & economic value
  - Co-operating with industry to provide solutions, like co-processing in cement kilns

Why Use AF in FL?

- **Essentially best use of discarded materials that cannot be recycled: the "low-hanging fruit" of alternative fuel options**
- **Local fuels compared to traditional fossil fuels not available in Florida, avoid mining, refining, pipelines, trucking, barges, rail, etc., so lower cost and lower GHG/carbon footprint**
- **Abundant supply of feedstock materials: 17 million TPY of municipal and commercial waste landfilled in Florida last year**
- **3.5 million TPY landfilled in Dade and Broward Counties last year**
- **Approximately 30% is being recycled in Florida (75% Goal by 2020)**
- **Approximately 2-3 million TPY should be available for combustion**

Why Use AF ?



(do not throw away)

(use less resources)

(compost, separate)

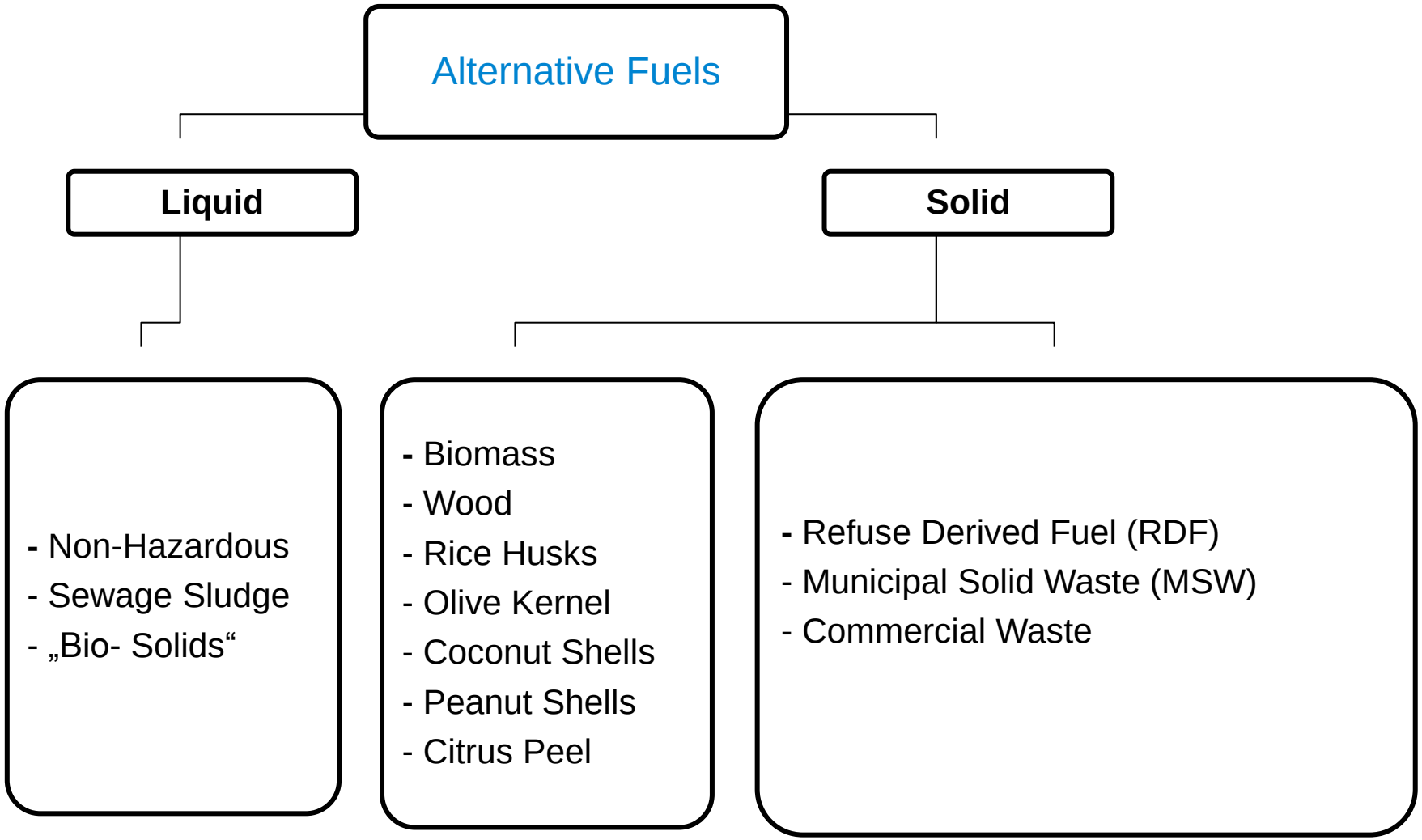
(paper, glass, plastics, etc.)

(RDF & other AF)

(bury it in Landfills)

Direct land-filling is today illegal in Germany, Austria & other EU countries

What are AF ?

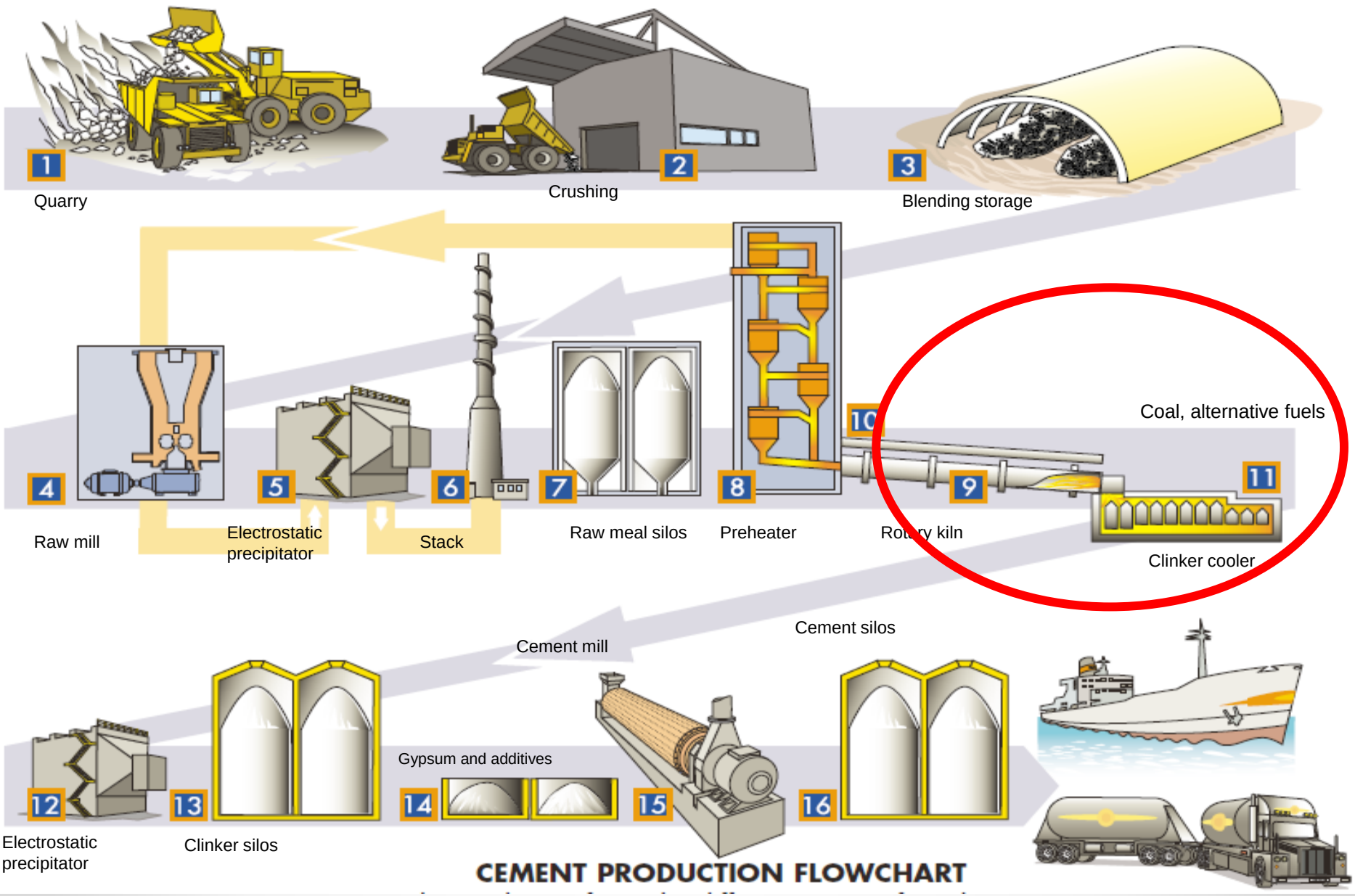

Alternative Fuels
Liquid
Solid
- Non-Hazardous
- Sewage Sludge
- „Bio- Solids“
- Biomass
- Wood
- Rice Husks
- Olive Kernel
- Coconut Shells
- Peanut Shells
- Citrus Peel
- Refuse Derived Fuel (RDF)
- Municipal Solid Waste (MSW)
- Commercial Waste

Example of Refuse Derived Fuel

What are AF ?


CARSCHREDDER
RDF FROM HOUSEHOLD
GRINDINGDUST
TETRAPACK
RUBBER FROM TYRES
RICESTRAW/HUSK
GRANULED PLASTIK
NAPPIES
WASTE WOODCHIPS
COLA CAPS
ANIMAL MEAL
CARPETWASTE
SUNFLOWERSHELLS
RDF FROM PACKING
RDF PAPER/PLASTIC
IMPREGNATED SAWDUST
WOOD CHIPS
SEWAGE SLUDGE
RDF FROM DSD
RDF FROM TEXTILES

How Cement is Made



Using Alternative Fuels in a Cement Kiln is safer than in your house

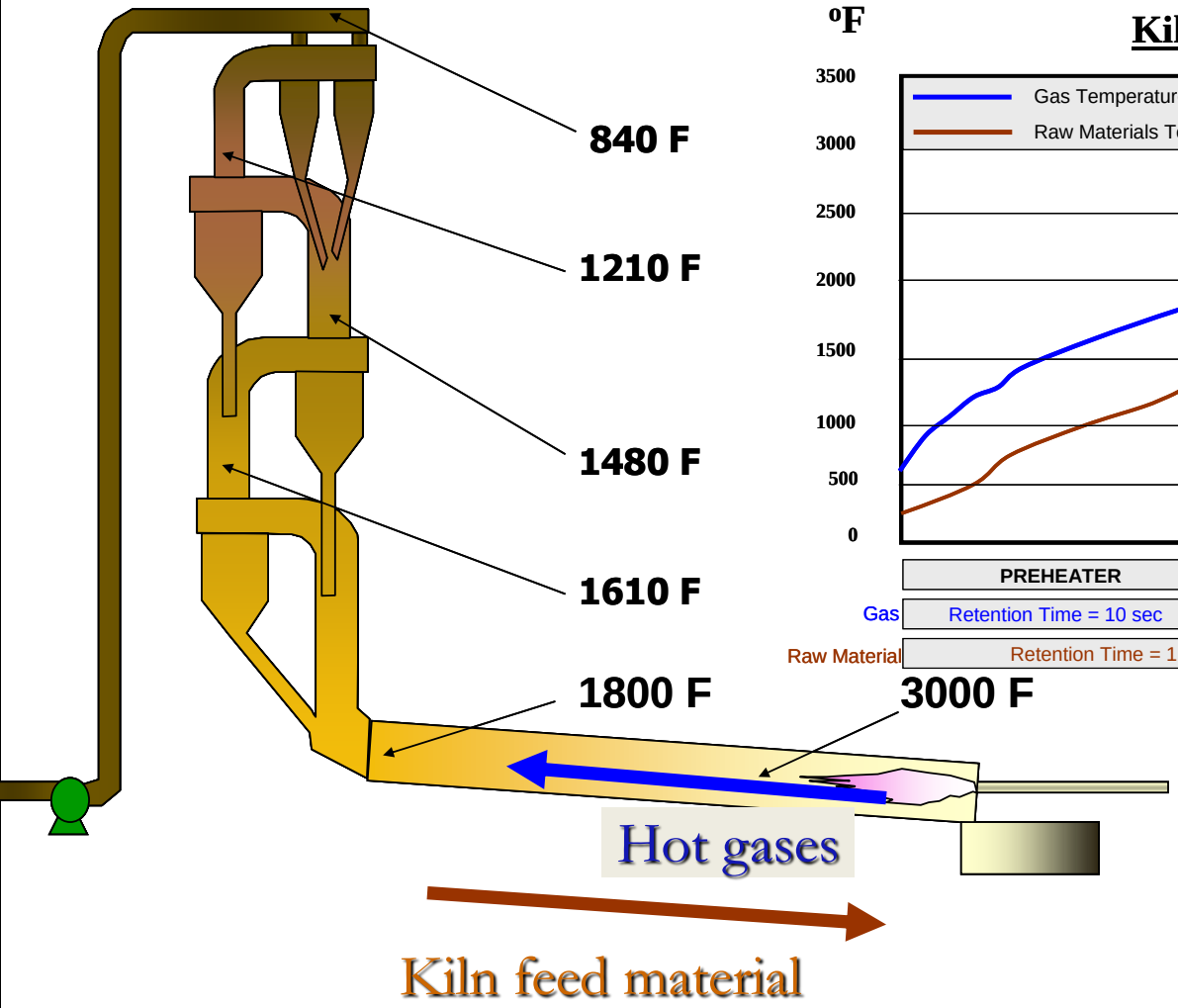
Q: How does combustion in a cement kiln differ from other types of combustion, for example having a fire in my backyard or in the fireplace?

A: There are several differences:

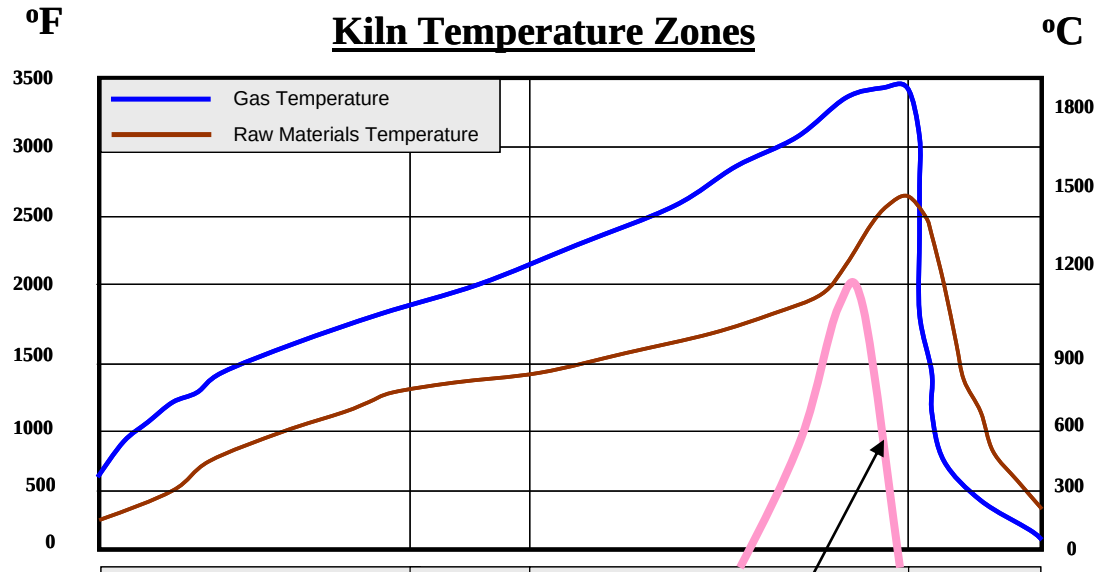
Parameter	Cement Kiln	Backyard Fire
Temperature	>1450°C & stable/constant	Low and variable
Combustion	Complete	Incomplete
Oxygen Levels	Excess oxygen	Lack of oxygen
Pollution Control	Yes	No

The key for controlling emissions and preventing against pollutants [i.e. such as dioxins] is good combustion practice which is fundamental to the cement plant and takes place continuously

Pennsuco Type Kiln



Kiln Temperature Zones



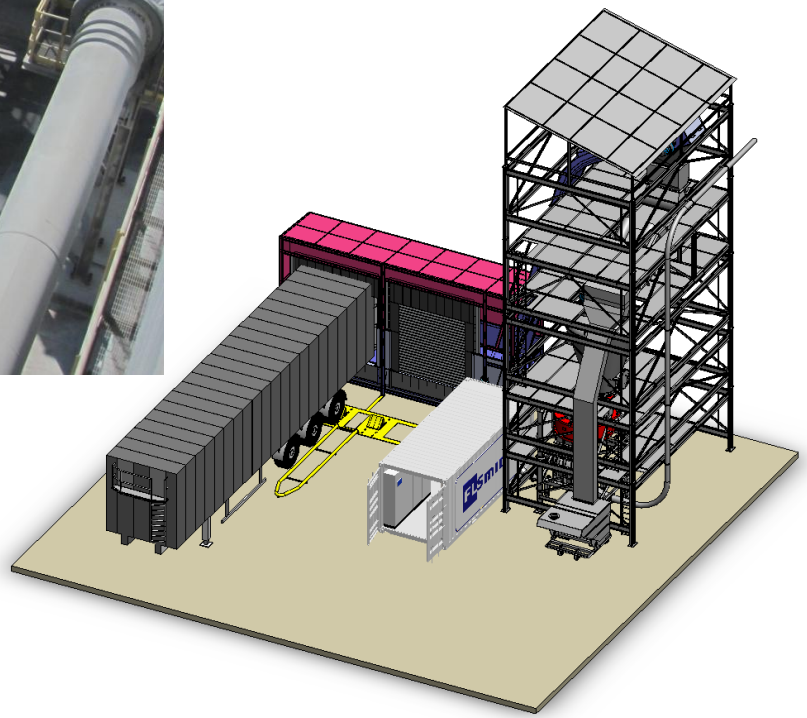
	PREHEATER	CALCINER	ROTARY KILN	COOLER
Gas	Retention Time = 10 sec	= 3 sec	= 10 sec	= 1 sec
Raw Material	Retention Time = 1 min		= 30 min	= 30 min

Typical boiler

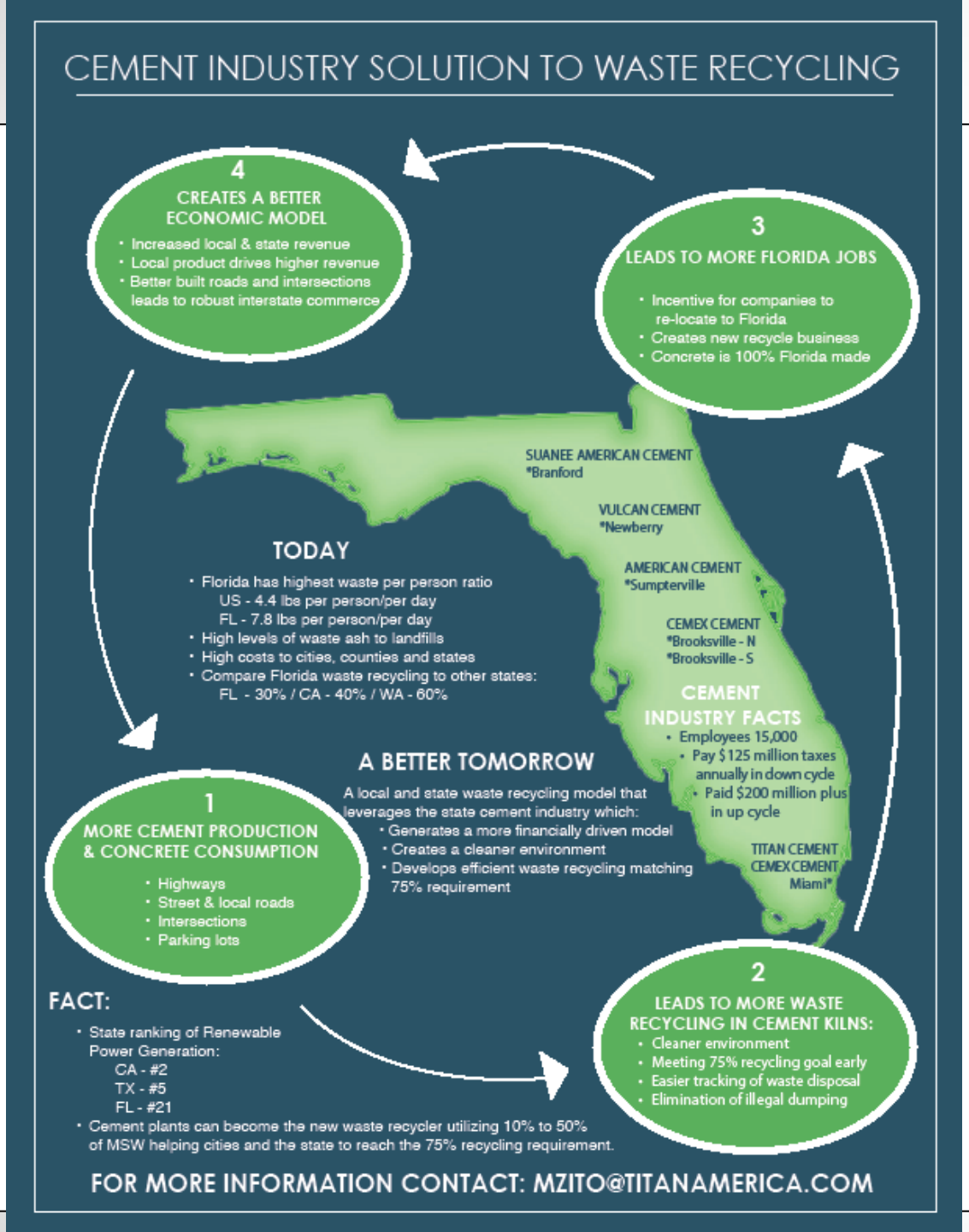
Pennsuco AF Permit – Classified by FDEP and Solid Waste as Recovered Materials and Industrial Byproducts

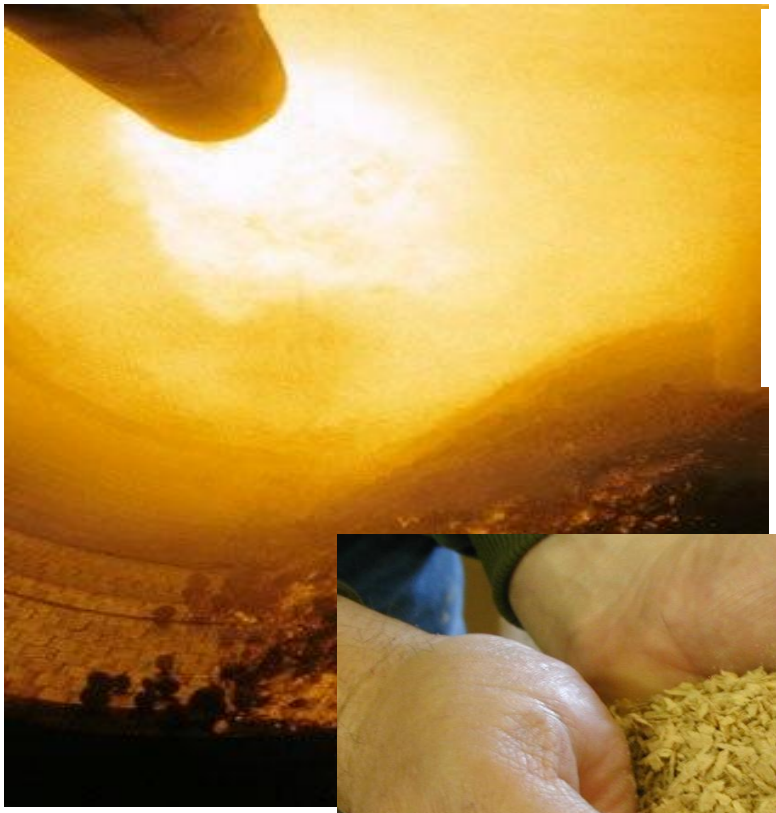
- Variety of alternative solid fuels including combinations of:
  - Plastics
  - Tire-derived fuel
  - Reject roofing shingles
  - Clean cellulosic biomass
  - Manufactured cellulosic biomass
  - Agricultural fibrous organic byproducts
  - Pre-consumer reject paper
  - Carpet-derived fuel
  - Engineered fuels

Equipment Installation in Pennsuco



Opportunity in Florida?





Thank You Very Much…!

TITAN® AMERICA

ANNEX: TITAN EXAMPLE OF MSW to AF USAGE

AF Value Chain

SOURCE

Residential, commercial or industrial waste

WASTE COLLECTOR

Collect, sort, distribute, and possibly pre-process

DISTRIBUTOR / PROCESSOR

Distribute waste, may also prepare to meet specifications of user. Can be separate consulting company or function performed by waste handler

CEMENT PRODUCER

Consumer of the fuels;
May participate or play lead role during initial preparation and handling. Process determines the specifications for type, size and composition of fuels.


WASTE


COLLECTION


INITIAL PREP & QUALITY CONTROL

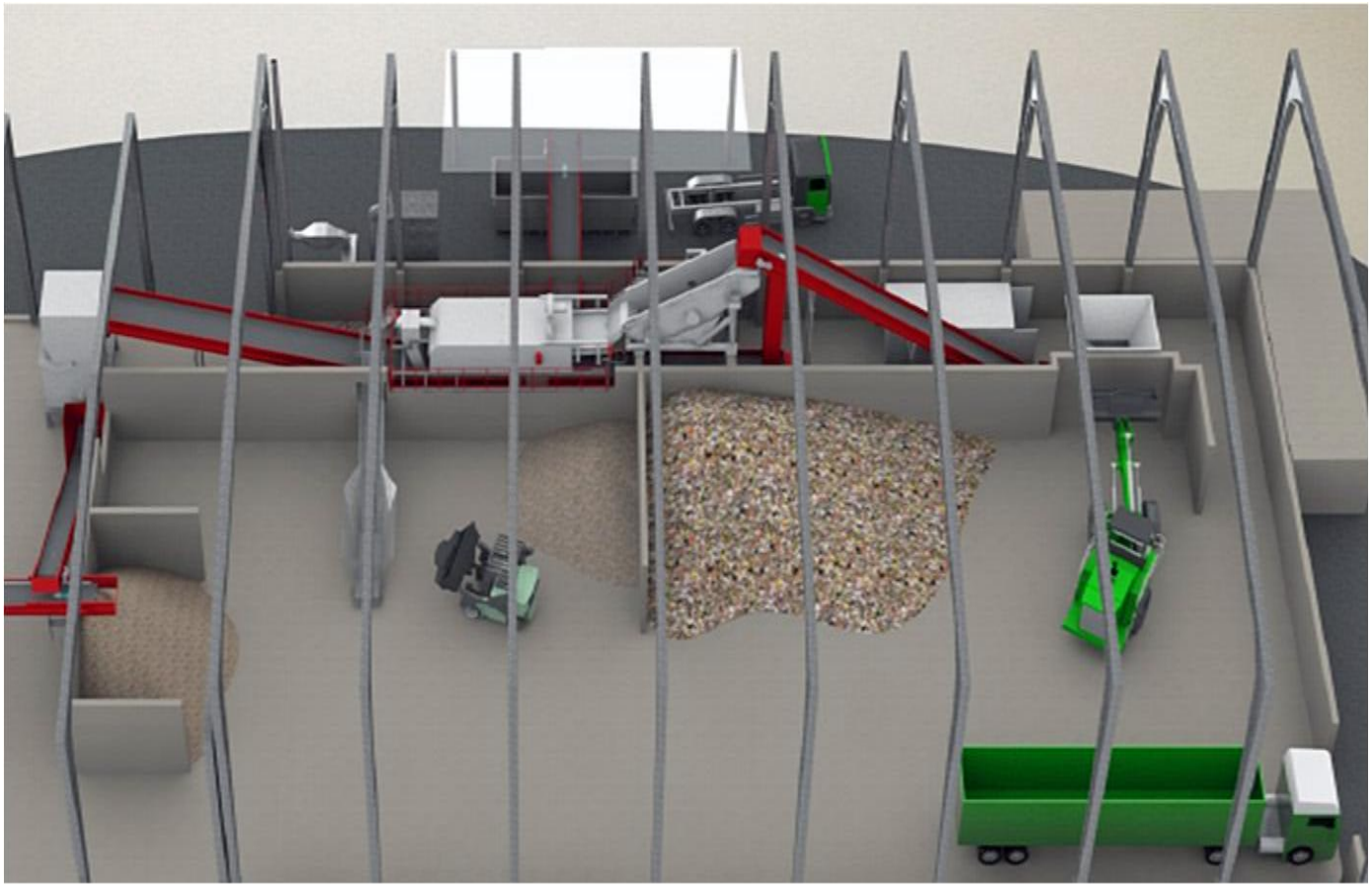

TRANSFER


FINAL PREP & QUALITY CONTROL


COMBUSTION


EMISSIONS


CLINKER



RDF Facility Process Diagram
Titan's Zlatna Panega Plant in Bulgaria

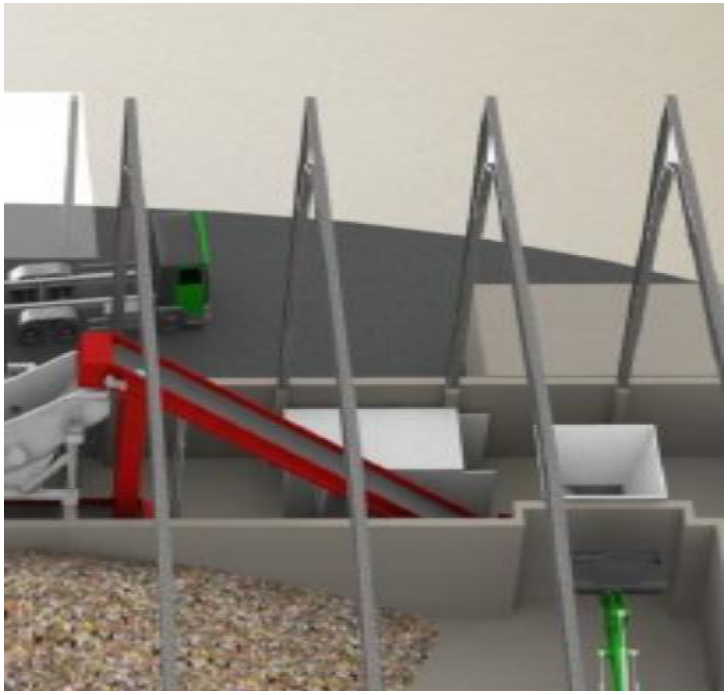
Example of AF Usage

Raw Materials [pre-sorted] from Sofia Landfill
Titan's Zlatna Panega Plant in Bulgaria

Example of AF Usage

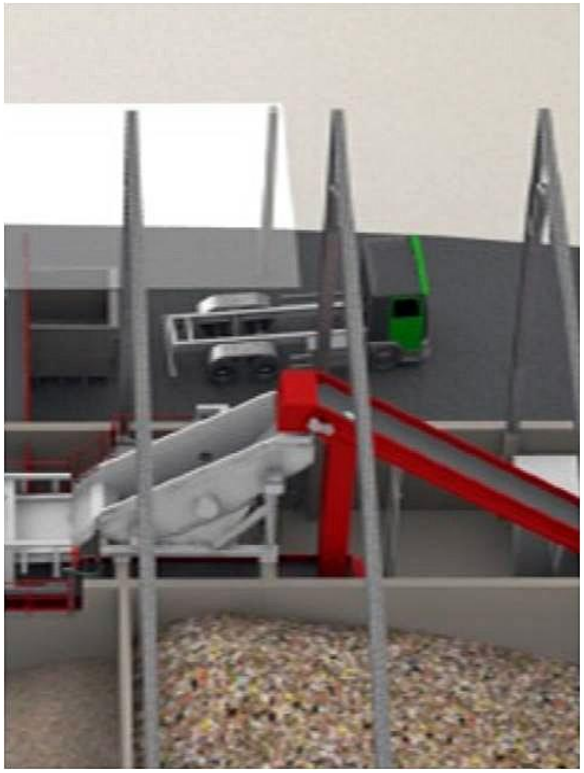
Raw Material Loading
Titan's Zlatna Panega Plant in Bulgaria

Stage I Shredder
Titan's Zlatna Panega Plant in Bulgaria



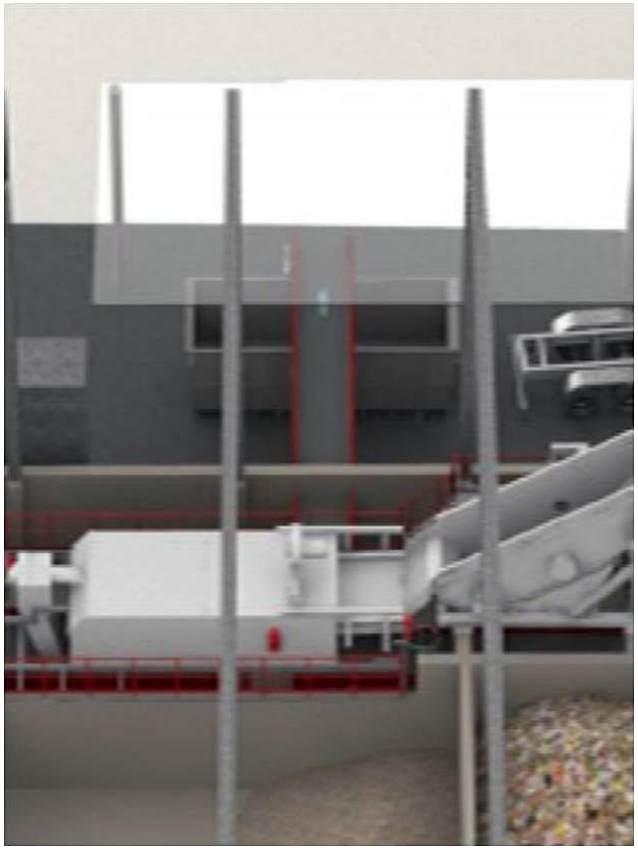
Discharge Conveyor / Material Size ~300 mm
Titan's Zlatna Panega Plant in Bulgaria

Example of AF Usage

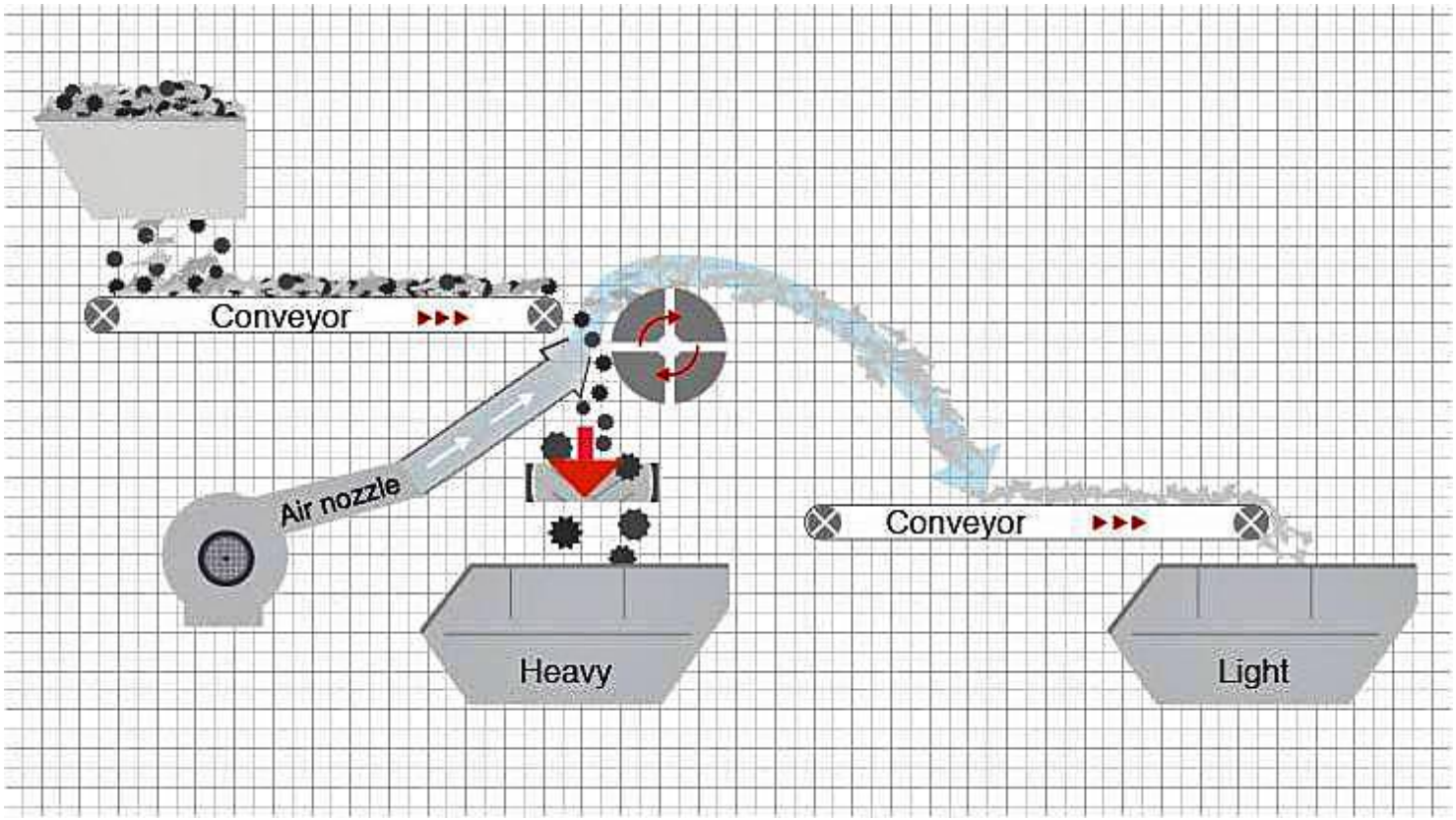


Vibrating Screen / Magnetic Head Pulley
Titan's Zlatna Panega Plant in Bulgaria

Vibrating Screen
Titan's Zlatna Panega Plant in Bulgaria



Wind Sifter (Light Fraction Separation)
Titan's Zlatna Panega Plant in Bulgaria

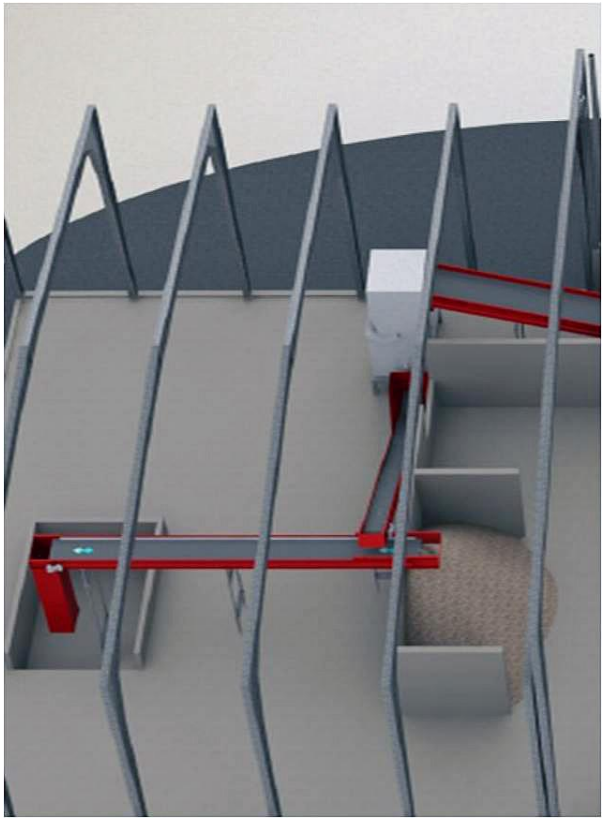


Wind Sifter Diagram
Titan's Zlatna Panega Plant in Bulgaria

Discharge Conveyor to Fine Cut Shredder
Titan's Zlatna Panega Plant in Bulgaria

Fine Cut (secondary) Shredder
Titan's Zlatna Panega Plant in Bulgaria

Example of AF Usage



Finished RDF ~ 25 mm
Titan's Zlatna Panega Plant in Bulgaria

Typical RDF
Titan's Zlatna Panega Plant in Bulgaria