

Alternative Fuel Solutions from FLSmidth



One Source

Jaleel Rahman. M – Process Design
jmm-in@flsmidth.com



Why Alternative Fuels?



Integration of Alternative Fuels solution with Cement plants



FLSmidth Key Products for Alternative Fuel Solutions



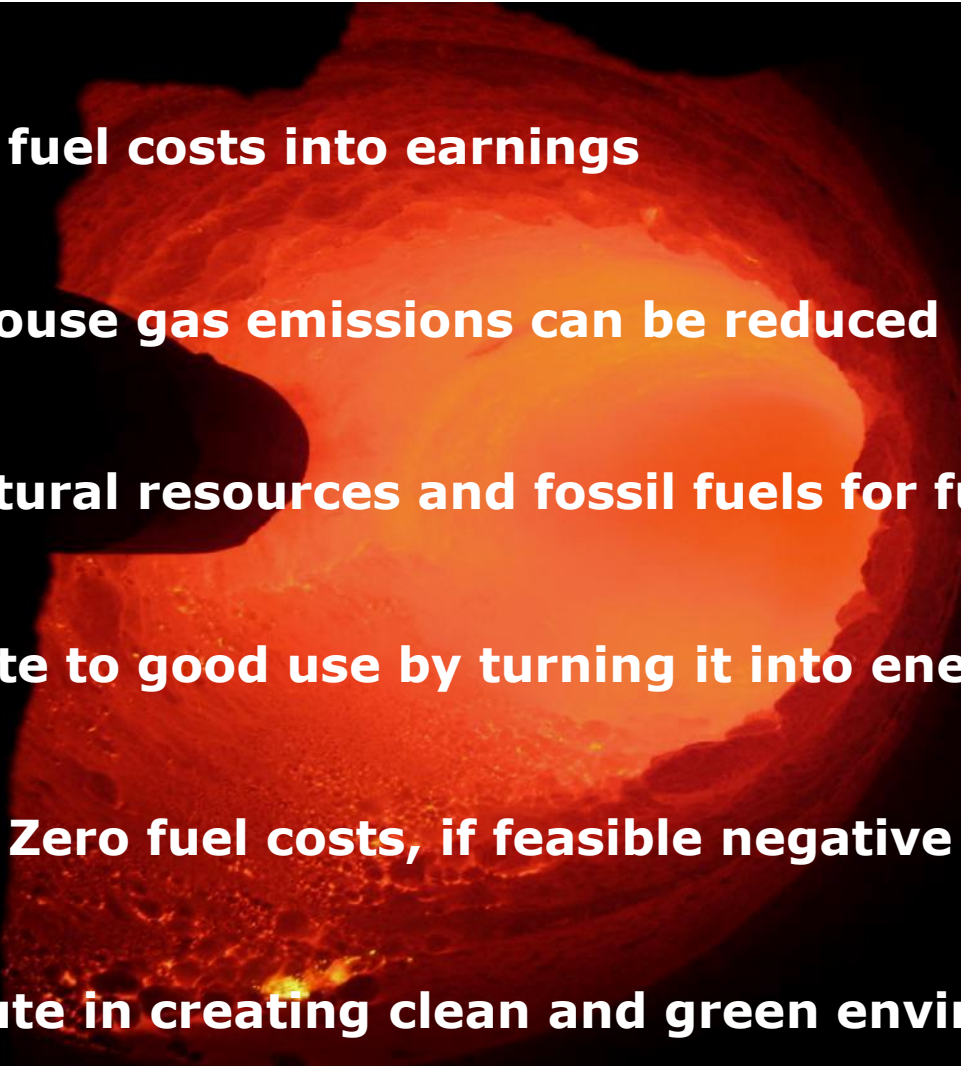
FLSmidth Global Experience in Alternative Fuels



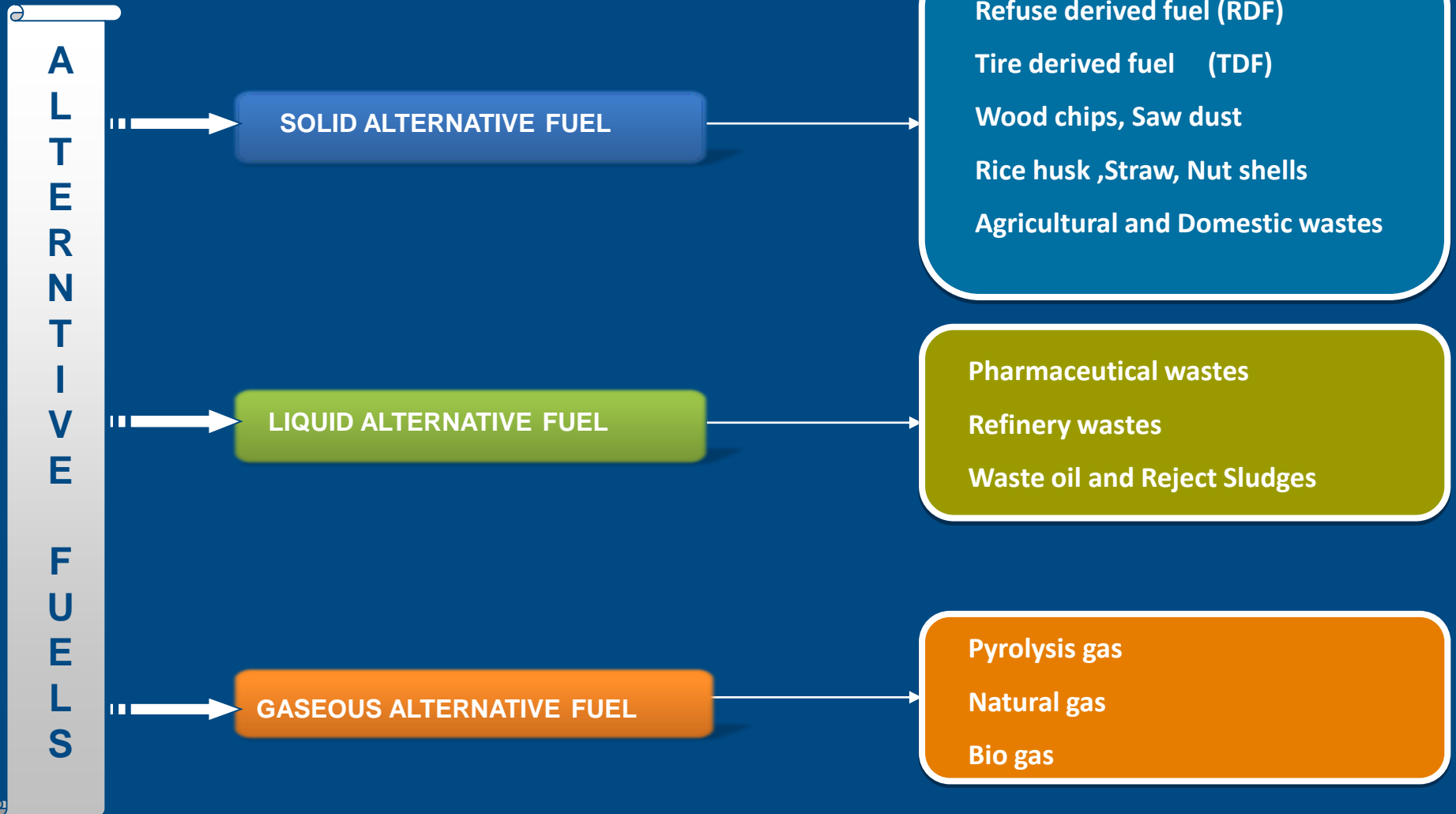
Alternative Fuels projects in India



Summary

- 
- A photograph of a volcanic crater filled with glowing orange and red molten lava, with a dark rock formation in the foreground on the left.
- **Convert fuel costs into earnings**
 - **Green house gas emissions can be reduced**
 - **Save natural resources and fossil fuels for future**
 - **Put waste to good use by turning it into energy**
 - **Achieve Zero fuel costs, if feasible negative also**
 - **Contribute in creating clean and green environment**

Alternative Fuels – Types



Alternative Fuels – Samples



Rice Husk



Wood chips



Shredded Tires



Cut Tires



RDF



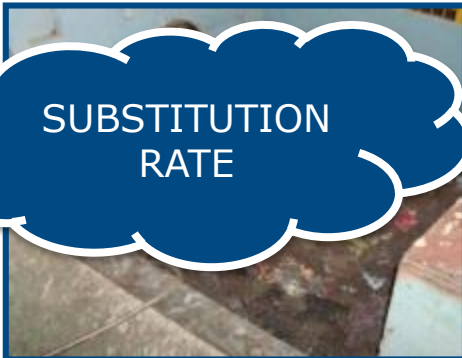
Expired Tablets



Hazardous Sludge – Pharma Rejects



Saw dust
One Source



Paint Sludge



Plastic chips



Rubber Cuts

Alternative Fuels – Samples



Rice Husk



Cut Tires

FLSmidth has solution!



RDF



Expired Tablets



Hazardous Sludge – Pharma Rejects



Saw dust



Paint Sludge



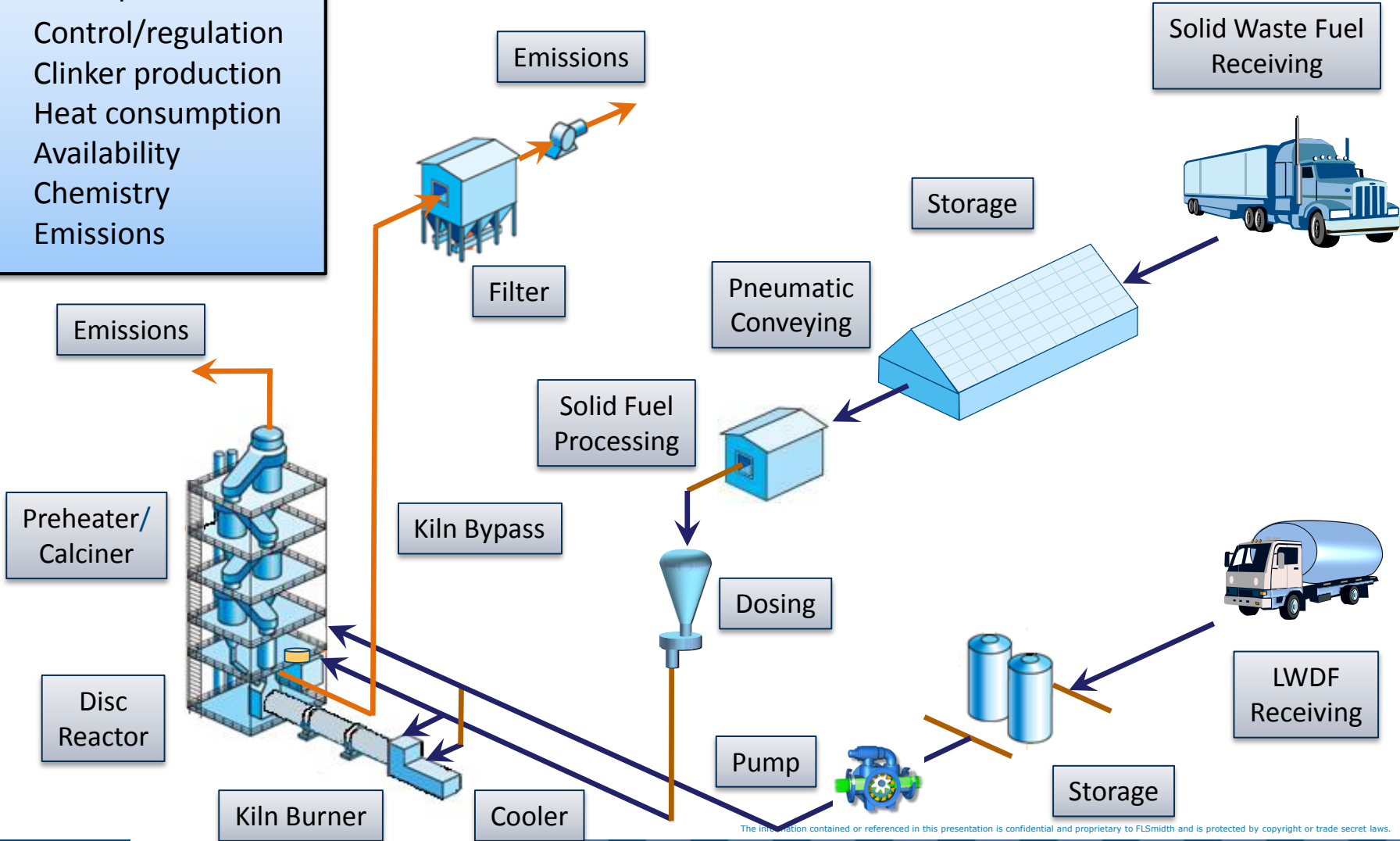
Plastic chips



Rubber Cuts

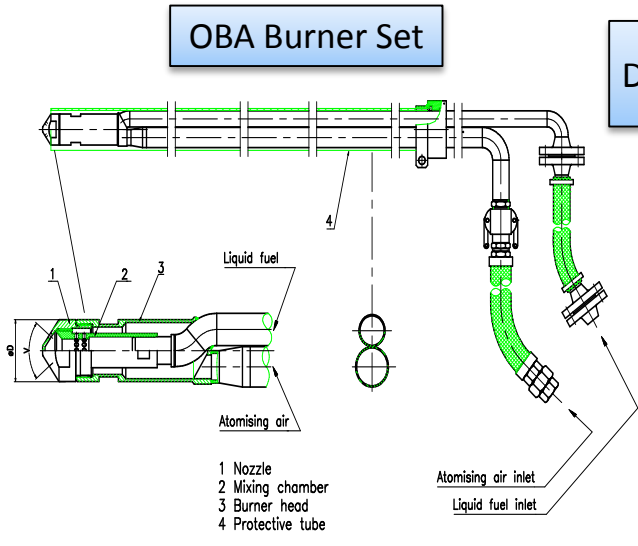
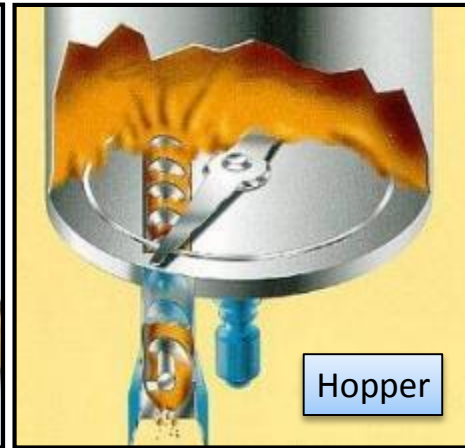
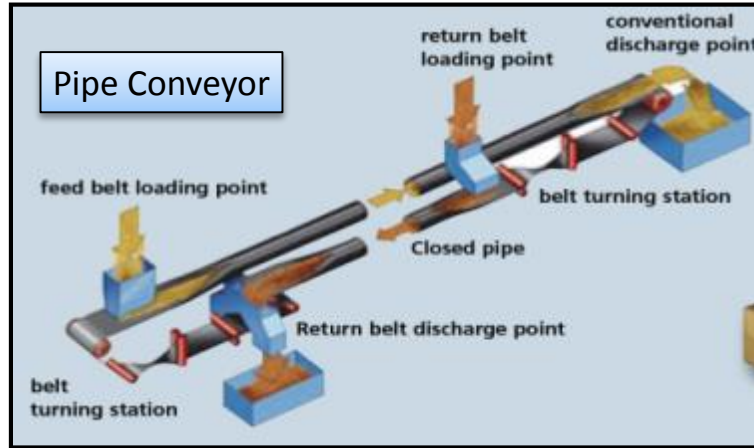
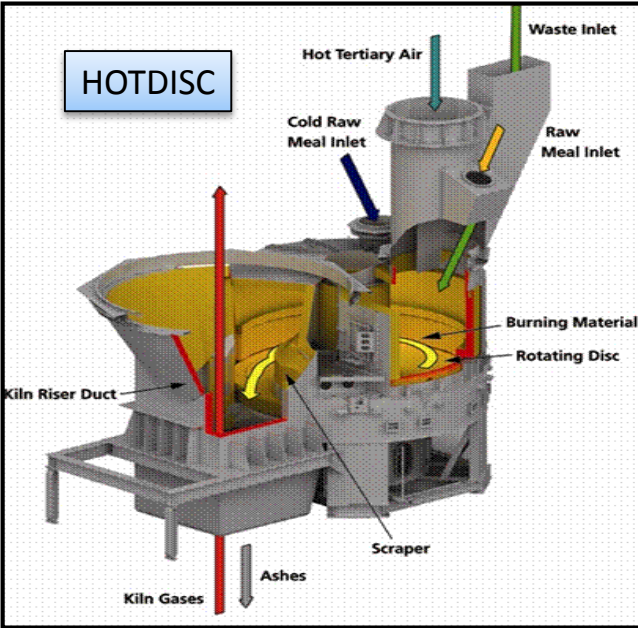
An integrated Alternative fuel solution

- Overall aspects:
- Control/regulation
 - Clinker production
 - Heat consumption
 - Availability
 - Chemistry
 - Emissions

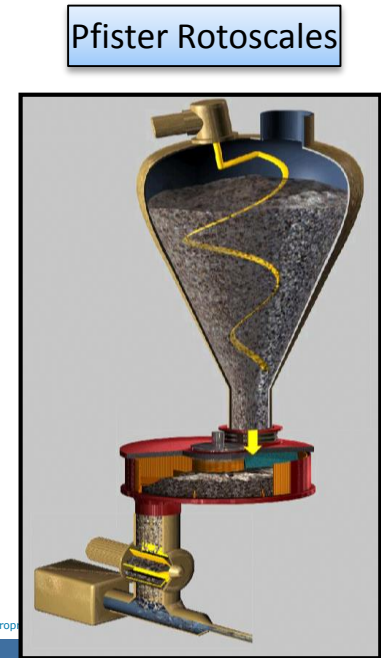
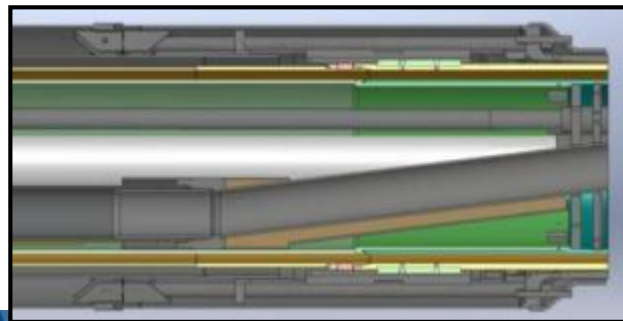
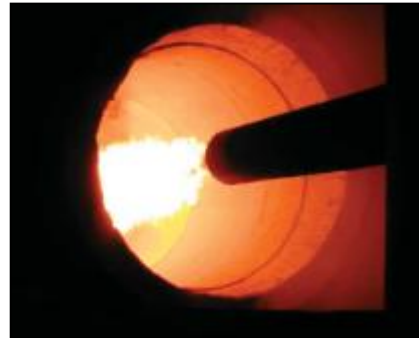


The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

FLSmidth Key products for Alternative fuels



DUOFLEX Burner



What is HOTDISC?

- ❑ The HOTDISC is a safe, simple and effective combustion device that maximize the substitution of fossil fuels by alternative fuels in a controlled and environmentally sound manner.
- ❑ Combustion of Alternative Fuels takes place in Oxygen rich atmosphere.
- ❑ Variable retention time based on the type of Alternative Fuel is possible to ensure complete combustion.
- ❑ Can accept lumpy materials – Whole truck tyre , apart from the small size materials.
- ❑ Calciner TSR of up to 60 % can be achieved.
- ❑ This is a proven system and Globally working very well, including India.

HOTDISC

- A simple and integral waste burning device with a slow moving bottom disc table
- Built directly into the cement plant preheater
- Burns the greatest amount of solid waste than any other device on the market



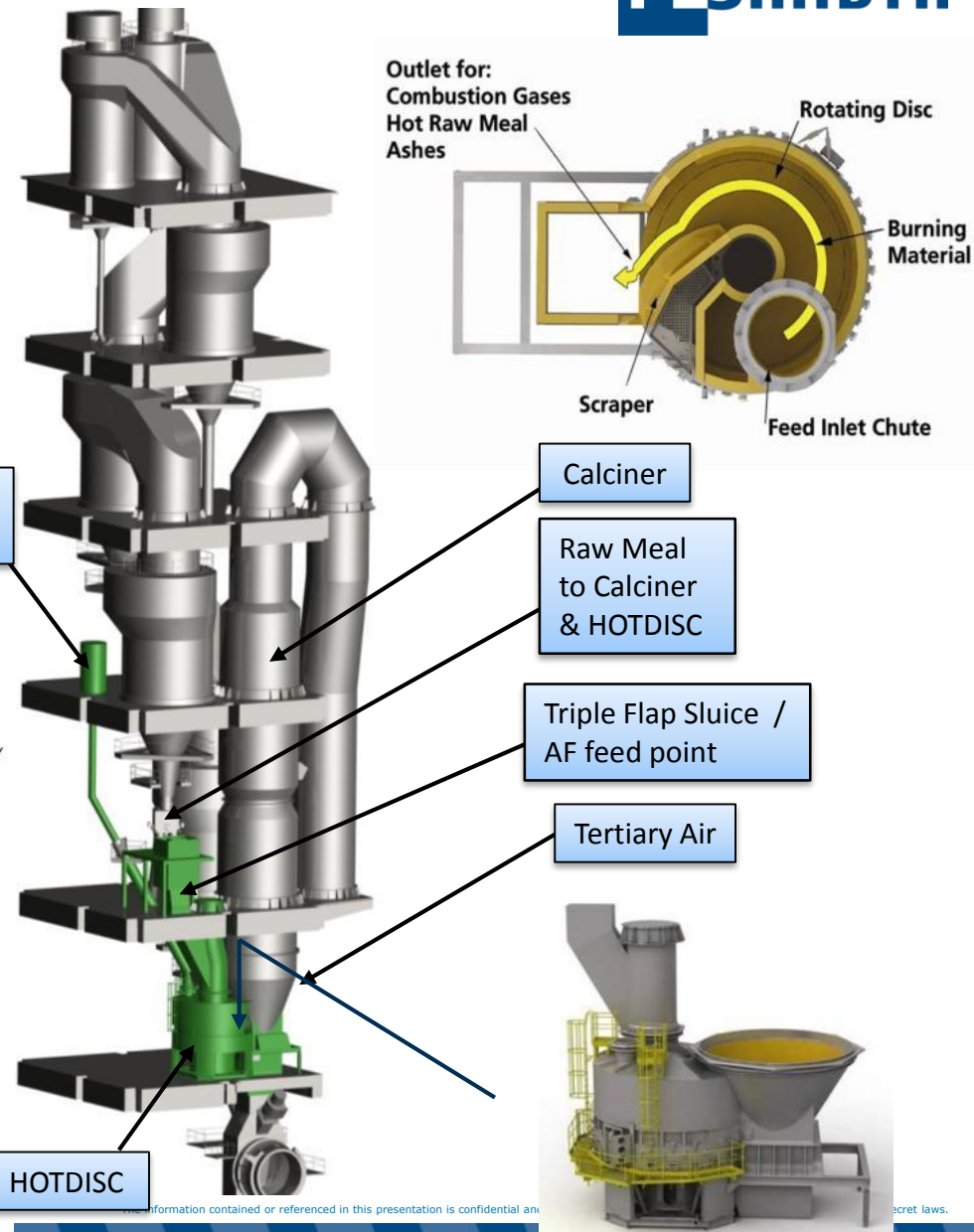
Back ground:

- AF feed to calciner?
- How to keep the alternative fuel in the calciner for a long time?
- Stationary, round combustion chamber with a rotating floor, i.e. the HOTDISC technology was born - 1999

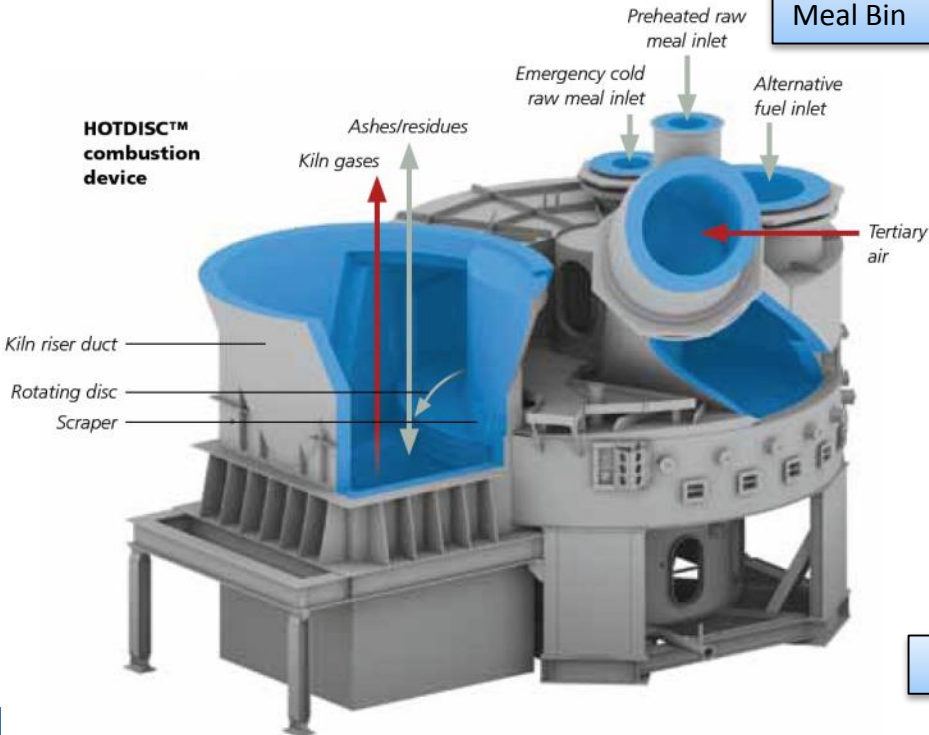
HOTDISC Technology

A HOTDISC Reactor:

- Burns solid waste, e.g. whole truck tires
- Co-feeding of different waste material
- Longer retention time
- Substitutes Calciner fuel
- Residues are incorporated in the clinker
- Emission control

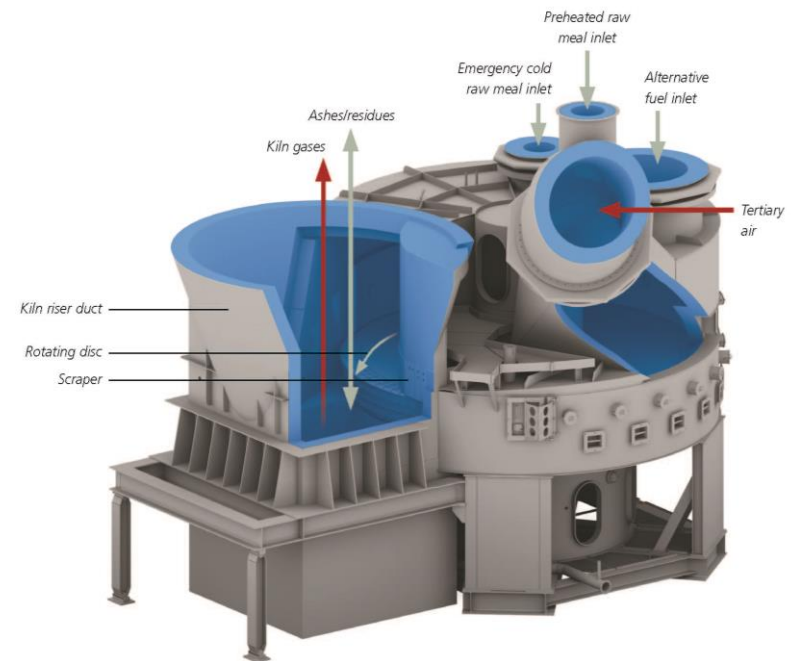


HOTDISC™ combustion device

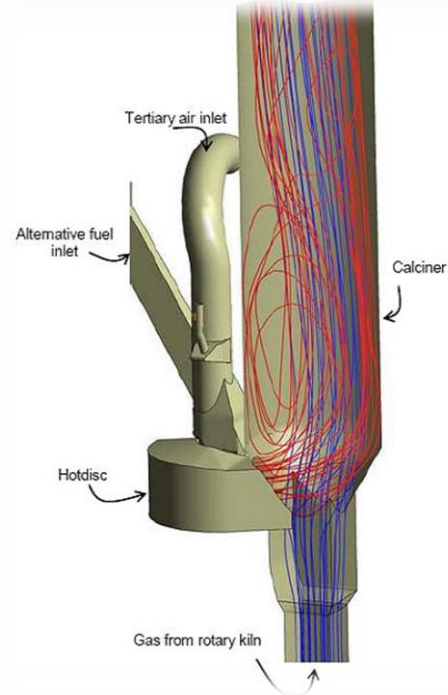
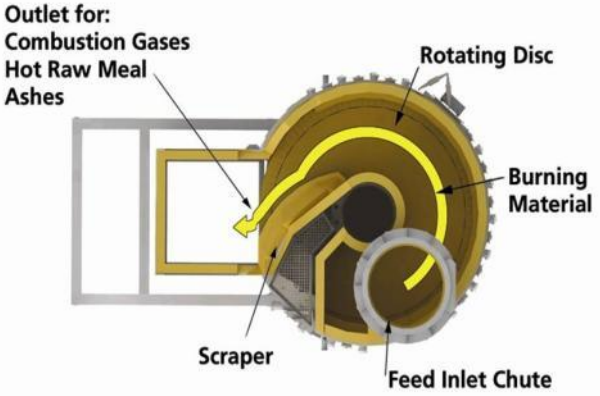
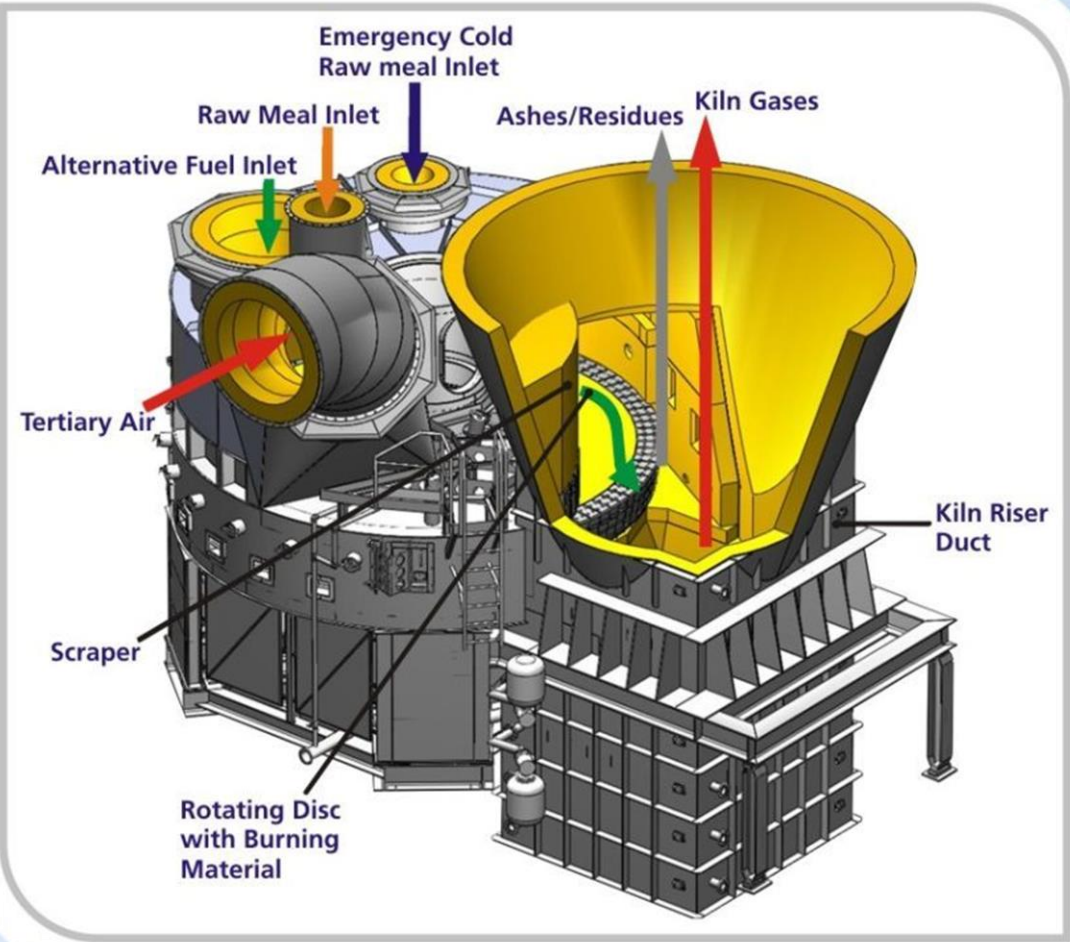


FLSmidth HOTDISC technology

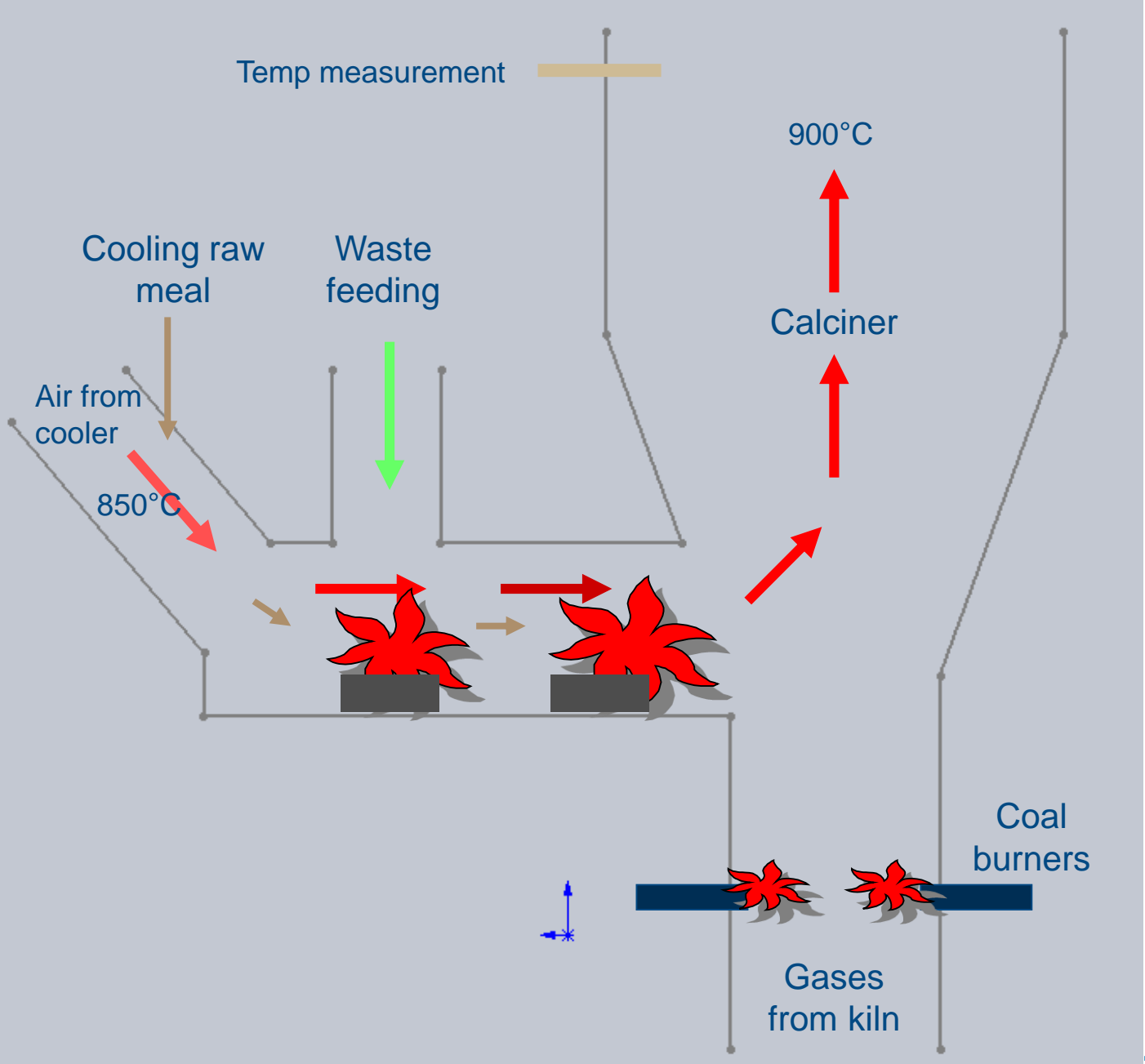
- Burns waste, size up to whole truck tires of 1.2 meters diameter
- Co-feeding of different waste materials, e.g. tyres, coarse MSW, wet oil sludge
- Adjustable retention time, 3-45 minutes
- Substitutes calciner fuel
- Residues are incorporated in the clinker
- Emission control
- Easy to operate
- Reliable, high run factor



Working Principle

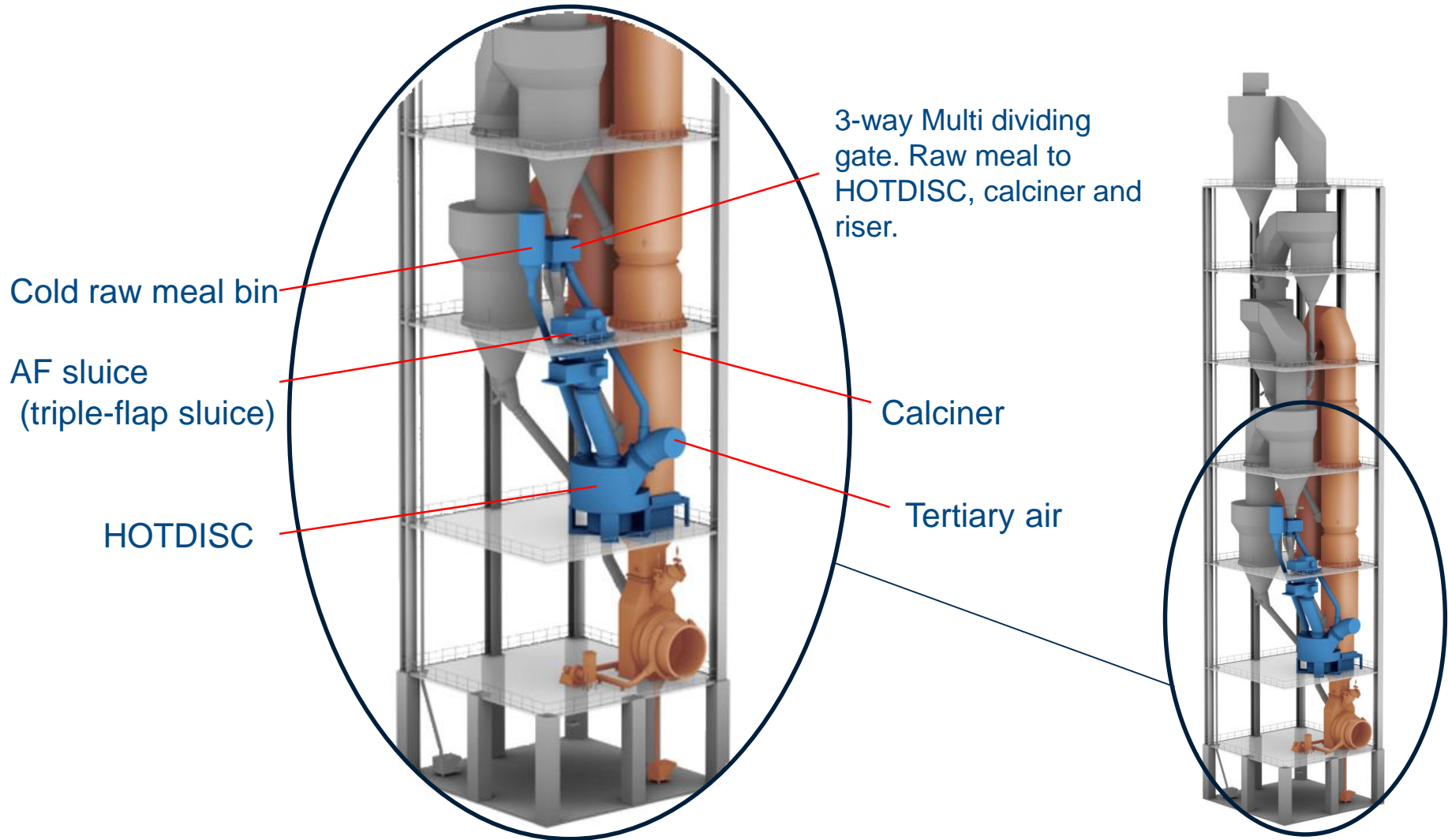


The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.



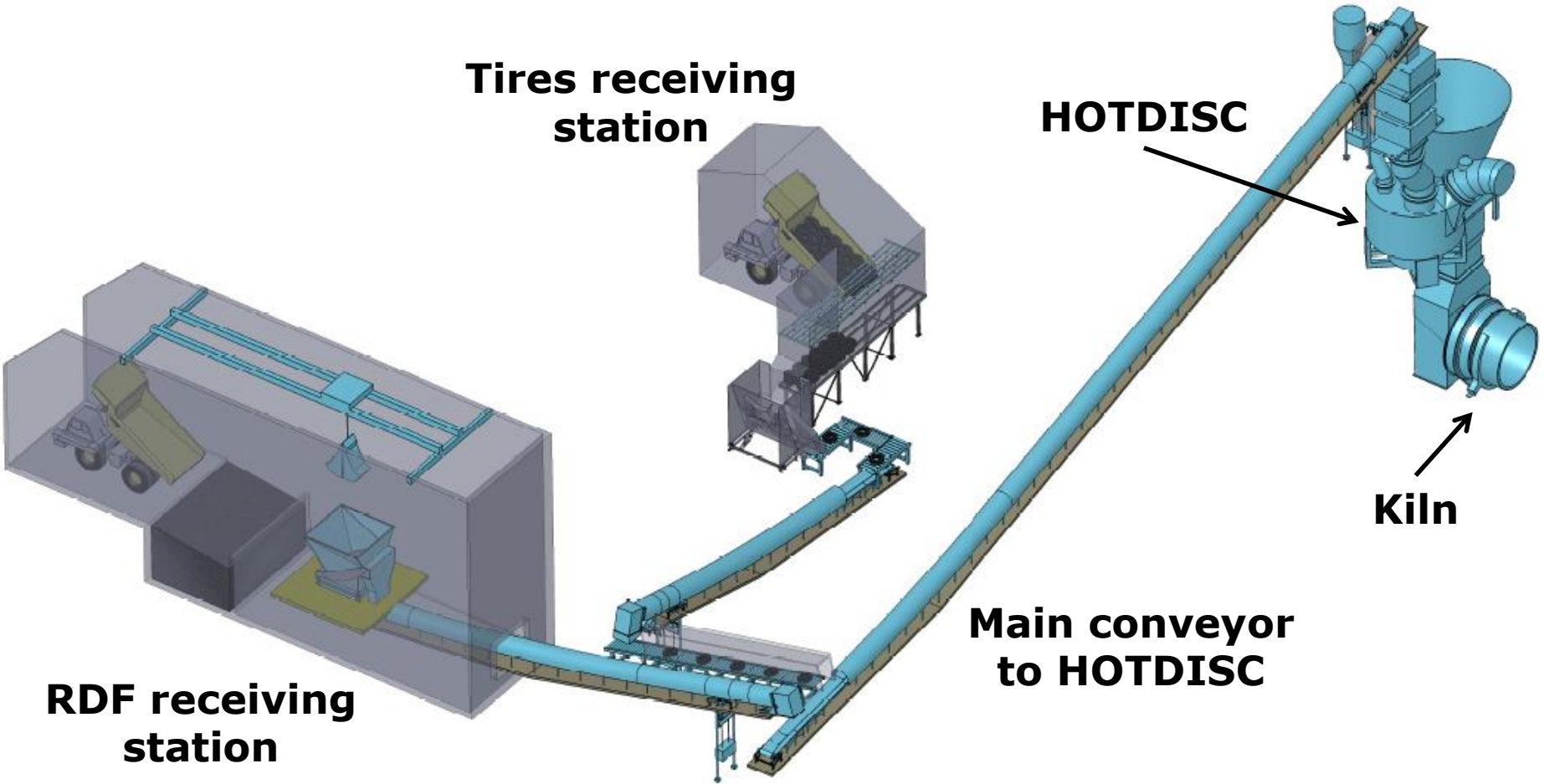
rietary to FLSmidth and is protected by copyright or trade secret laws.

Inline calciner system with a HOTDISC



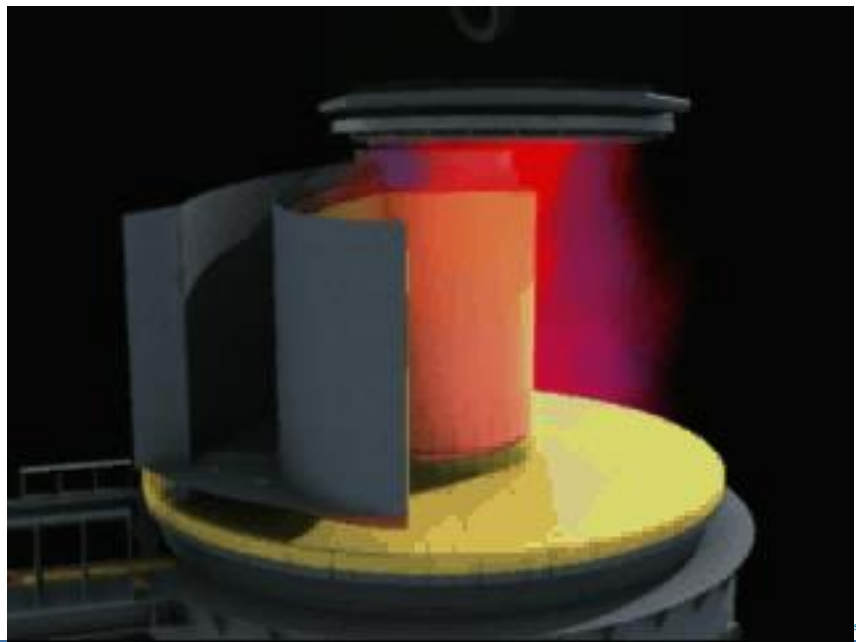
The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

Typical feed installation for a HOTDISC in a cement plant



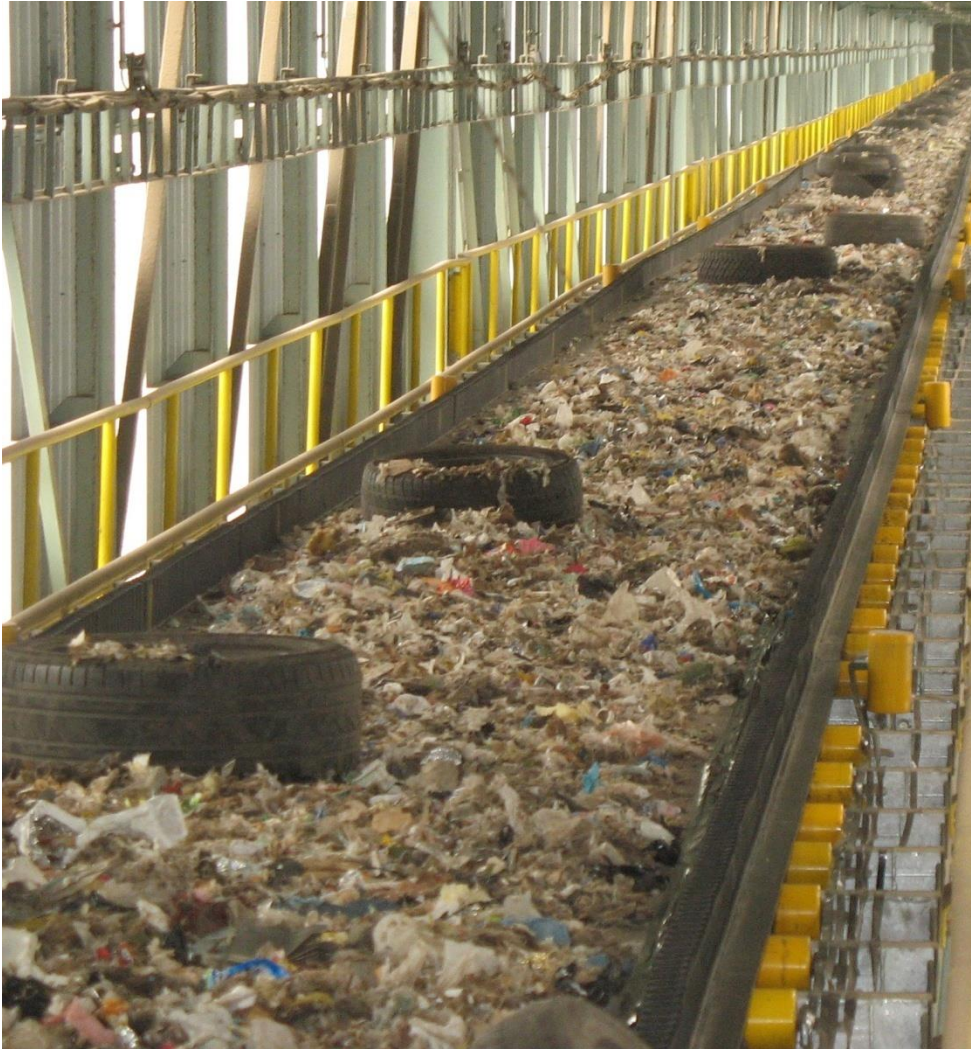
The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

Automatic tire extraction and dosing system to the HOTDISC



secret laws.

Multi-fuel feeding to the HOTDISC



The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

HOTDISC references



- Norway
- Slovakia
- Canada
- Brazil
- Slovenia
- Mexico
- Turkey
- India
- USA

The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

FLSmidth HOTDISC references



Plant	Prod.	Hotdisc size	Status	Waste capacity
Heidelberg Kjøpsvik, Norway	1700 t/d	ø6.0m x 2.5h	Start-up Feb02	2-3 t/h whole tires 2 t/h RDF
Holcim Rohoznik, Slovakia	3500 t/d	ø6.3mx3.15h	Start-up Feb05	4 t/h whole tires, 15 t/h RDF.
Ciment Quebec, Canada	3250 t/d	ø6.3mx4.0h	Start-up Sep05	4.5-5 t/h tires; 3.2-3.6 cut truck tires; 2 t/h RDF
Votorantim Salto de Pirapora, Brazil	4200 t/d	ø5.0mx2.5h	Start-up Feb06	3 t/h truck and car tires
Salonit Anhovo, Slovenia	3500 t/d	ø6.3mx2.5h	Start-up 2009	6 t/h whole tires
La Cruz Azul Hidalgo, Mexico	4000 t/d	ø6.3m x 4.0h	Start-up Oct11	6 t/h truck tires; 6 t/h RDF
CIMSA Eskisehir, Turkey	1800 t/d	ø6.3m x 2.0h	Start-up Feb12	4 t/h car tires; 6 t/h RDF
Vasavadatta Cements, India	4800 t/d	ø6.3m x 3.15h	Start-up Sep12	3.5 t/h whole tires
Ash Grove Cement, Midlothian, USA	2360 t/d	ø8.0m x 3.15h	Scheduled Q2-2014	7.0 t/h whole car tires, or 4.6 t/h whole truck tires

The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

“Kiln upgrade with HOTDISC Reactor”

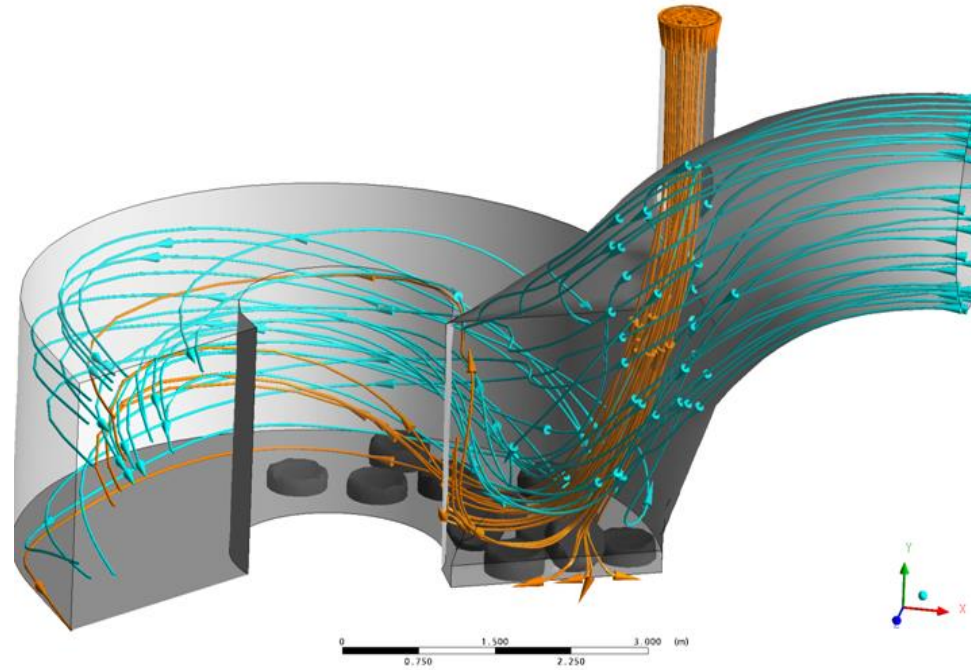
Major Scope

Commissioned in June 2009

- Upgraded to 3500 tpd ILC (from SP kiln)
- New preheater tower With new calciner forseen for 100% alternative fuel
- HOTDISC installed (6.3 m)

HOTDISC mkIII:

- Flow pattern in combustion chamber improved
- Separate inlets for tertiary air and alternative fuels
- Meal distribution improved
- Simpler design for cost optimisation



HOLCIM, Rohozonik, Slovakia

2004, HOTDISC Reactor – 6.3 x 3.15

- 3500 TPD with FLS ILC
- Whole tyres & RDF
- % TSR at calciner -- Guaranteed : 50%
Achieved : 80 %

Ciment – Qubec, Canada

2004, HOTDISC Reactor – 6.3 x 4.0

- Pre-heater up gradation with HOTDISC & ILC
- Tire Derived Fuel, Shredded fuel mix
- % TSR at calciner : 70 % - 90%
- % TSR Overall : 50 % - 60%

Votorantim Salto de Pirapora, Brazil

2005, HOTDISC Reactor – 5.0 x 2.5

- Fuels Used : Whole tyres car/truck

Norcem A/S, Kjopsvik, Norway

2002, HOTDISC Reactor – 6.0 x 2.5

- Fuels Used : Cut tyres, impregnated paper waste

Alternative Fuels projects in India

HOTDISC™ Solution for burning RDF, Tire Chips & Tires

Vasavadatta Cements, India

Feed Rate of Shredded Tyres – 3.5 tones/hour
 Feed Rate of RDF – 10 tones/hour

HOTDISC™
 Combustion device



Alternative fuel usage data from June 13 to November 13

Tyre Chips
 Municipal Waste
 other Waste
 Rubber Chips
 Plastic Waste



Shredded Tyres
 200 x 300 mm



Whole Truck Tyres
 1200 mm wide

TOTAL AF CONSUMED	-	1139.28 MT
--------------------------	----------	-------------------

**Vasavadatta Cements have consumed more than 2000 tonnes of tyre derived fuel since the date of commissioning of HOTDISC combustion device



The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.





The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

Key Benefits at Vasavadatta Cements



- ❑ TSR ~30% (based on the availability)
- ❑ Reduction in coal firing ~ 7 TPH
- ❑ Reduction in Iron Content in the raw mix ~ 0.4 %
- ❑ Reduction in CO ~ 19 %
- ❑ PAT benefits
- ❑ CDM benefits

Key features of HOTDISC



- Simplicity & ease of operation
- Efficient combustion
- High temperature combustion
- Lumpy waste derived fuels firing
- Multiple waste stream firing
- Environmental benefits
- Reduced operational costs
- No impact of kiln availability

Fuels tested in HOTDISC



- ✓ Refused Derived Fuel (produced from municipal garbage), loose or compacted
- ✓ Old tires (whole, shredded or cut into pieces)
- ✓ Coarse shredded RDF/MSW
- ✓ Impregnated coarse wood waste
- ✓ Lime-stabilized Oil sludge(from tanker cleansing)
- ✓ Bagged oil rags
- ✓ Paint residues
- ✓ Cut sandals
- ✓ And many more..

HOTDISC Summary

Requirements:

- Long retention time for solid waste
- Co-feeding of different waste material
- One common waste feeding point
- High fuel substitution rate
- Emission control

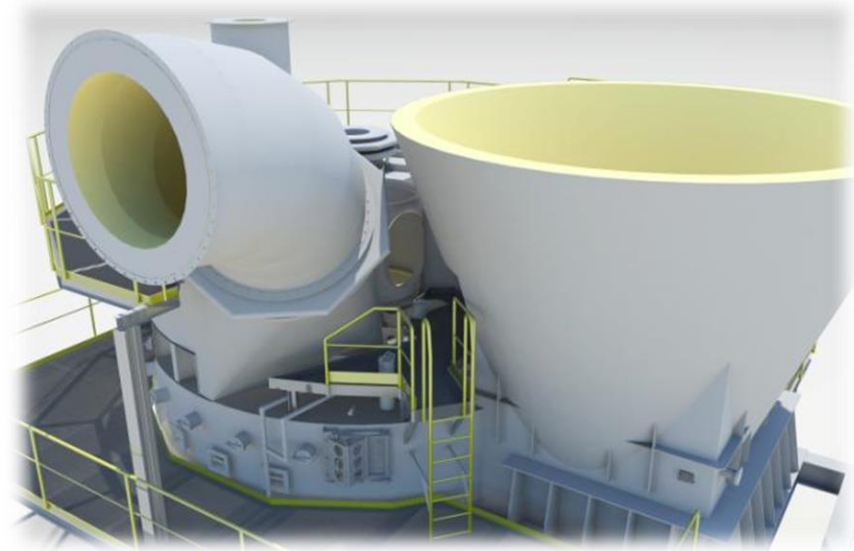
Solution:

HOTDISC Reactor + Calciner

Economics:

HOTDISC installation will be profitable due to:

- Reduced amount of fossil fuel to calciner
- Pre-processing of fuels not required



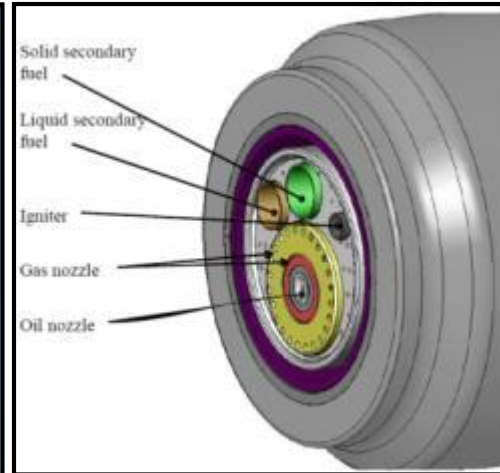
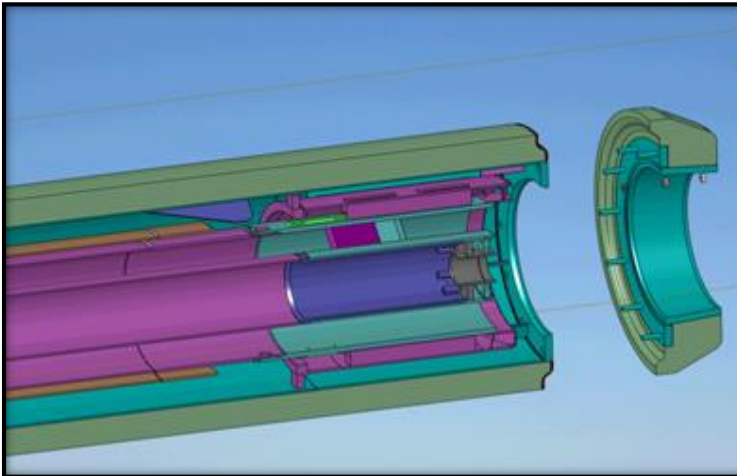
HOTDISC: The most safe and effective solution for waste elimination



DUOFLEX Burner

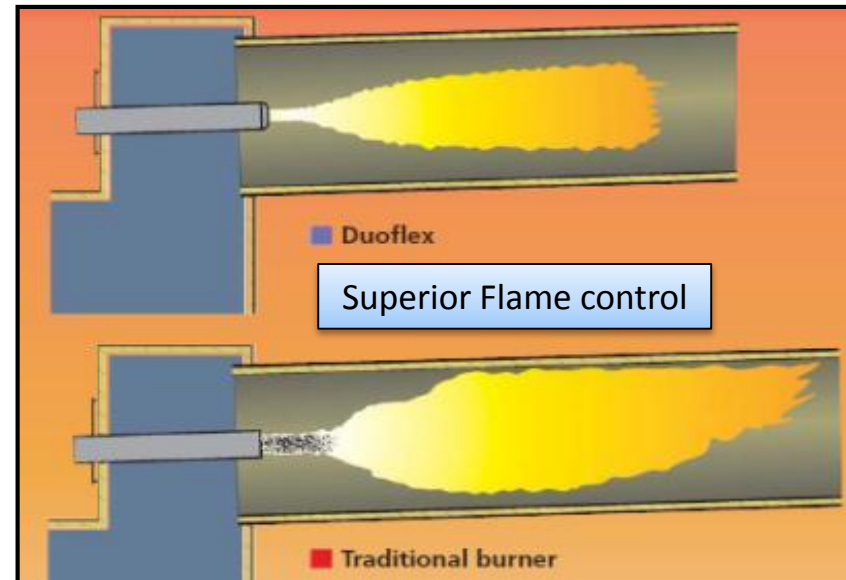
Replaceable Nozzle Tip

DUOFLEX with Wood chips



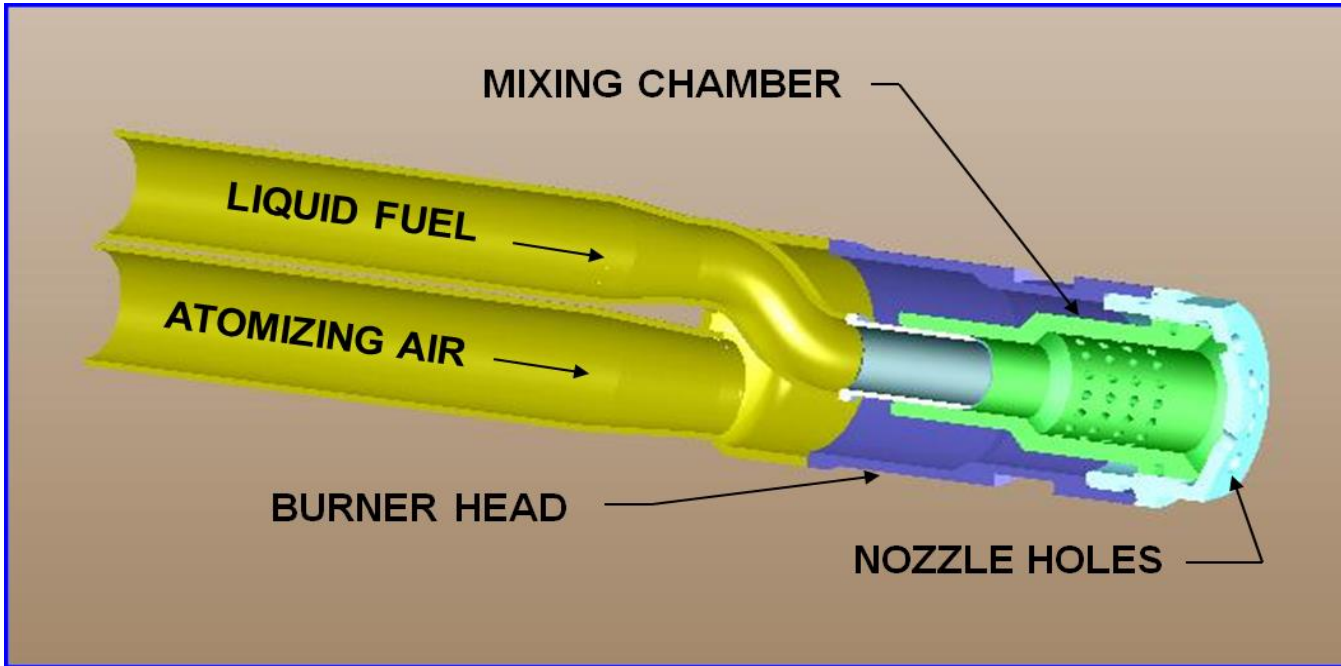
FLSmidth DUOFLEX Burner

- Better control on flame length and shape
- Adjustable air nozzle, axial / radial air ratio & degree of swirl
- Relatively longer refractory life
- Improvement in clinker quality
- Best suited for firing alternative fuels
- Replaceable nozzle tips



The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

Oil Burner – Air Atomized (OBA)



- Simultaneous firing of two different liquid fuels
- Atomization of liquid wastes
- Simple, robust design, no moving parts
- Will accept fluids with solid particles up to 5 mm
- Can be supplied for chemically aggressive fluids
- Handle highly viscous & corrosive liquids

Live Bottom Hopper

FLSmidth KOCH Hopper

Consists of:

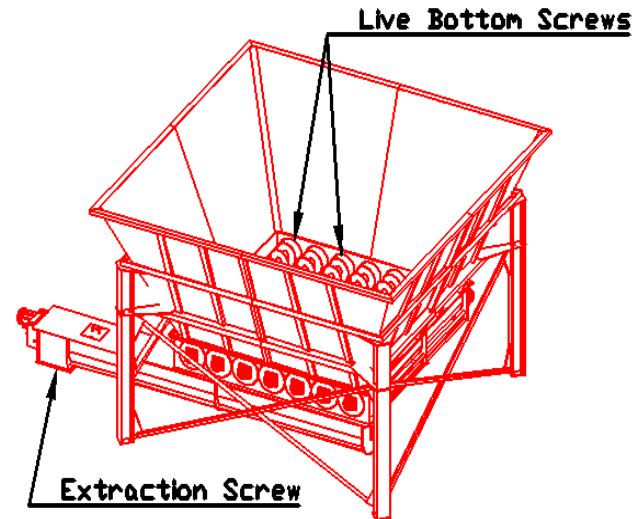
- Hopper Unit
- Activated Screw Bottom Unit
- Extraction Screw Unit

Suitable for:

- Front end Loaders
- Truck Tipplers

Features:

- Robust & Fuel flexible design
- Parallel Screws prevent Bridging
- Perpendicular Screw for extraction
- Volumetric dosing
- Load Cells



The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

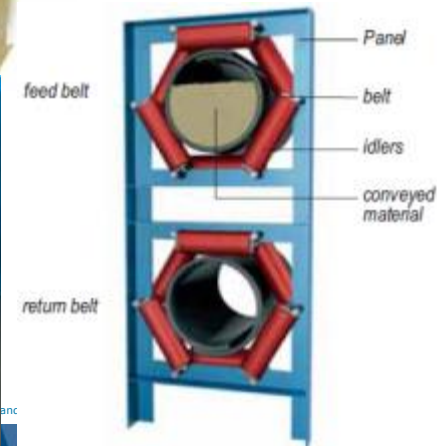
Pipe Conveyor

HIGHLIGHTS:

- Dust & Spillage free transportation
- Closed conveying – no impact on atmospheric moisture
- Low power consumption
- High availability and low investment cost
- Perfect protection for both material & environment



Cross section



Pfister Rotor Weigh Feeders

HIGHLIGHTS:

- Stable fuel dosing
- Fuel Flexibility
- Outstanding reliability
- Compact, Robust, closed dosing
- Optional explosion-proof design
- Fuel homogenization in the pre-bin



THE FLSMIDTH COMPANY OR ITS SUPPLIERS OR ITS PRODUCTS ARE CONFIDENTIAL AND PROPRIETARY TO FLSMIDTH AND IS PROTECTED BY COPYRIGHT OR TRADE SECRET LAWS.

SALONIT ANHOVO

HOTDISC Reactor

- Upgrade with HOTDISC
- HDR 63 – 250
- Latest generation HOTDISC
- Calciner foreseen for 100% fuel substitution



MOLINS

AF Storage & Pneumatic Feeding

- Fuel flexible
- RDF & Sewage sludge
- Closed conveying



SPENNER CEMENT

Calciner Upgrade

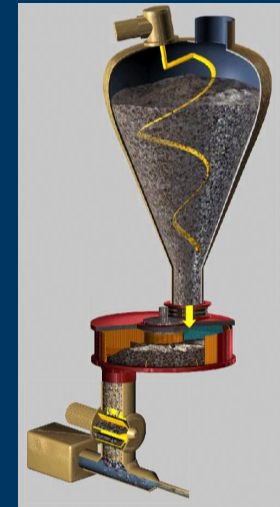
- Pipe Conveyor
- Pfister feeders
- Rapid implementation
- 100 % fuel substitution



HEIDELBERG

Kiln firing with AF

- Storage & Feeding
- Pfister feeders



HOTDISC Reactor

Vasavadatta Cements

- BK Birla Group
- AF feeding system
- First in India
- 30% Calciner Fuel substitution



Extraction & Feeding – Biomass

JK Cements, Mangrol

- Existing Hopper – mass flow problems
- Screw Bottom bunker – Live Bottom Extraction
- Best suited for Biomass – rice husk, mustard husk
- Better Availability & Handling capacity

Pipe Conveyor

Ultratech Cements

- Aditya Birla Group
- First Pipe Conveyor for AF application in India
- 30 % Calciner Fuel Substitution



KOCH Bunker

ACC WADI,

- HOLCIM Group
- Starter Kit
- 50% Calciner fuel substitution.



Alternative Fuels projects in India

Feeding system for Saw dust & Tire Chips

Ultratech – Narmada Cement Limited
Feed Rate of Saw dust &
Tire Chips: 2 – 10 tph



**Now in
Operation!**



← Saw Dust
<5mm (2D)





The information contained or referenced in this presentation is confidential and proprietary to FLSmidth and is protected by copyright or trade secret laws.

Alternative Fuels projects in India

Liquid waste firing system



Typical Tank farm area showing unloading system, storage tanks, transfer pump station, nitrogen generator kit & Liquid transfer pipe lines

System Highlights:

- Kiln firing system
- OBA Burner & MF Station
- Liquid solvents from Pharma industries
- Special design pump skids
- Nozzle eductors for continuous agitation of liquid fuel in storage tanks

“One Source – Value addition while Fuel Substitution”

- Alternative Fuels gives cement producers a great potential for reducing conventional fuel costs
- Use of Alternative Fuels are cheap and attractive
- Optimum solutions to be designed that can be integrated easily with the existing system
- Consistency & Reliability – for both alternative fuels & the feeding system
- Customized solutions available for alternative fuel requirements
- Better to have a preferred partner while substituting with Alternative fuels

Let us contribute towards a clean and green environment.



Thank You!