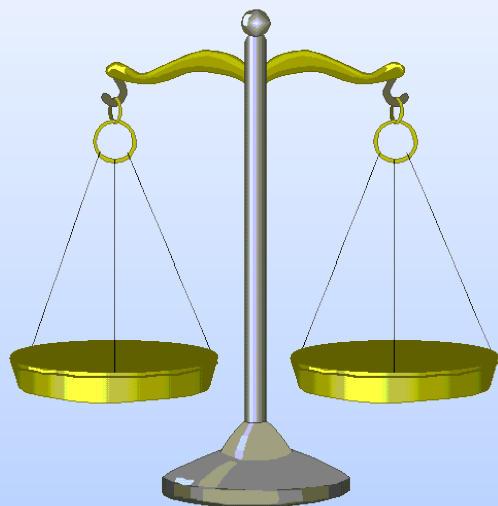


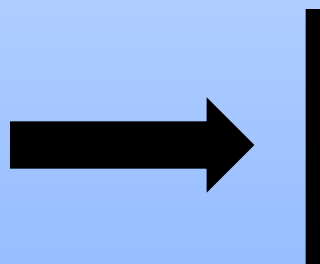
# Cimprogetti Kilns and Firing Systems operating results Environmental friendly solutions with **ALTERNATIVE-FUELS**

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# INTRODUCTION

**BALANCE  
ENVIRONMENTAL PROTECTION  
AND ECONOMIC GROWTH INTEREST**



**USE OF RENEWABLE FUELS AND  
REDUCTION OVERALL CO<sub>2</sub> EMISSIONS**

*... a form of progress towards  
Environment Protection and Economic Growth*

# CASE STUDY



# PROJECT MILESTONES

**From the oldest lime plant (1896)  
... a green-field lime plant**





# Cim-TD kiln 500 tpd dual fuel

the standard solid fossil fuel  
replaced with a wood based fuel



## THE CHARACTERISTICS

- high quality of lime produced;
- environment care;
- reduction of operating costs and investment costs through innovative design solutions;
- diversification of energy sources;
- use of renewable fuels with consequent advantages on the energy trade balance.

**Diversification of energy sources and use of renewable fuels is the great opportunity offered by Cimprogetti to Lime producers**





## THE RESEARCH

1. replace fossil fuels with renewable fuels in order to reduce operating costs;
2. reduce atmospheric emissions of greenhouse gases;
3. diversify energy sources, hence the energy suppliers.





**Confidential client**

Cim-TD kiln 350 tpd  
dual fuel

**Another  
successfully project  
with sawdust**



# PLANT CHARACTERISTICS



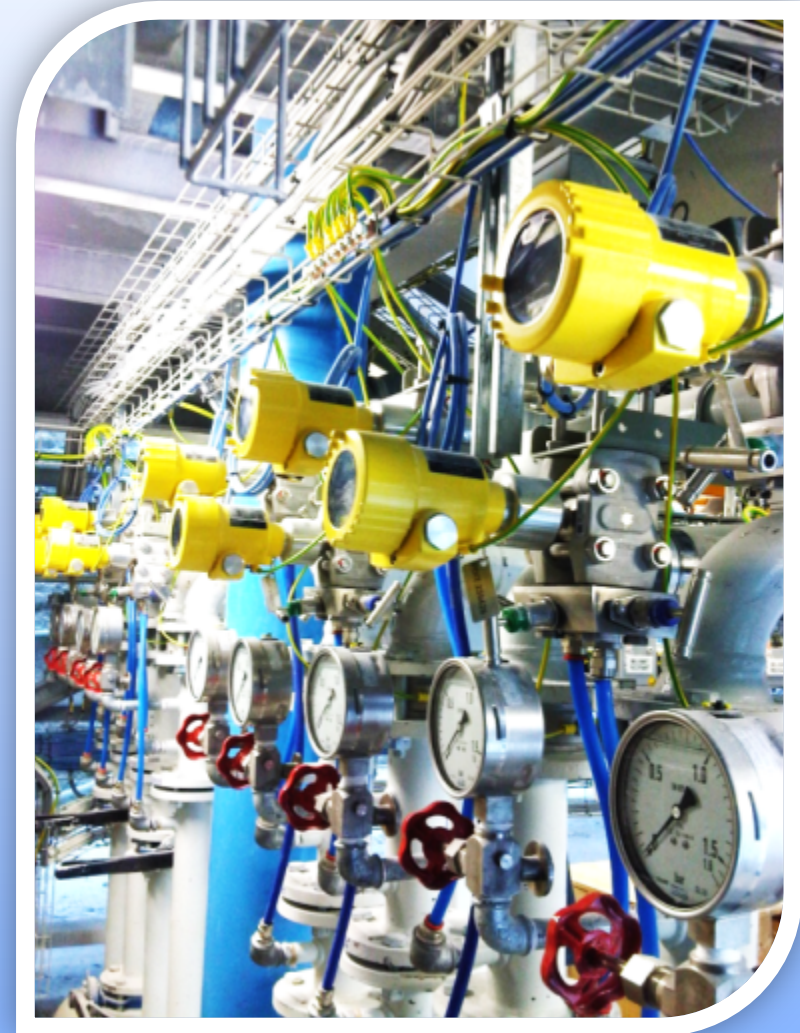
<b>CONSTRUCTION YEAR</b>		2012
<b>COMMISSIONING YEAR</b>		2013
<b>NOMINAL CAPACITY (TONS/DAY)</b>		350 tpd
<b>LIMESTONE SIZE</b>		30-60 mm 40-90 mm
<b>SPECIFIC HEAT CONSUMPTION</b>		840 Kcal/kg of lime (Saw Dust)
<b>AVERAGE RCO<sub>2</sub></b>		<2 % CO <sub>2</sub>
<b>REACTIVITY (T60 DIN)</b>		2 min.
<b>FUEL</b>	<b>TYPE</b>	Natural Gas or Saw Dust (2% H <sub>2</sub> O)



## OTHER REFERENCES

**2011**

Carmeuse S.A. (Moha, Belgium)  
Fuel conversion of a  
competitor PFR kiln,  
420 tpd, lignite/saw dust fired





## OTHER REFERENCES

**2013**

Carmeuse Holding S.R.L. (Deva, Romania)  
Fuel conversion on a competitor PFR kiln,  
250 tpd, lignite/saw dust fired



# PLANT OPERATION

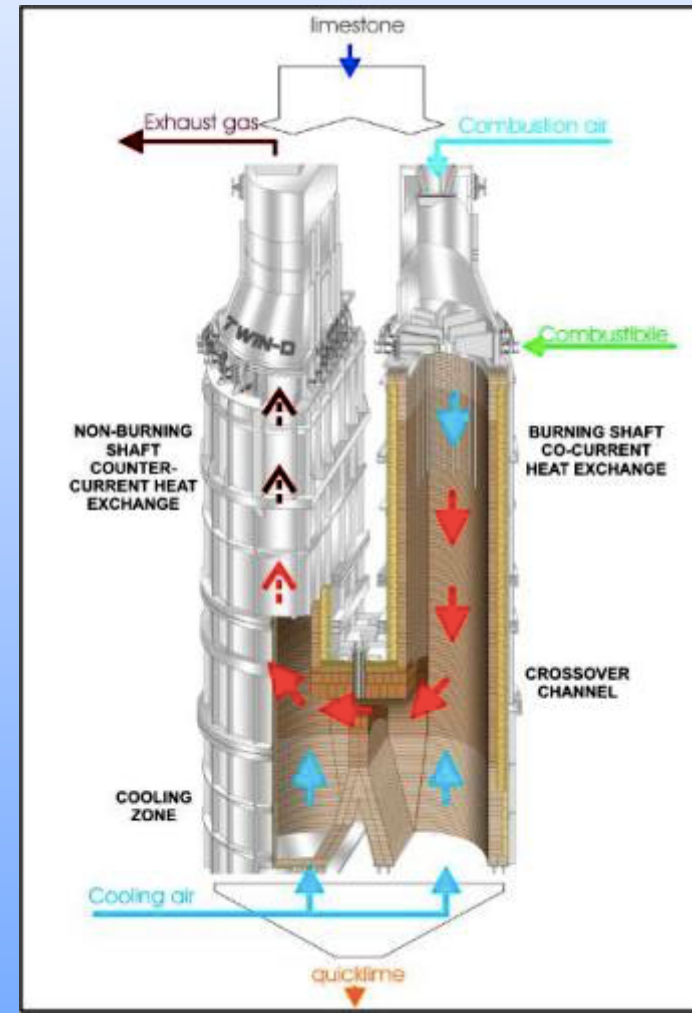
## TECHNOLOGY “Parallel Flow Regenerative”

Regenerative heat recovery in two shafts, which are alternatively under combustion and preheating

## PROCESS

Chemical reaction of decarbonation of the limestone alternately in one of the two connected shafts of the kiln

The regenerative preheating process has very low fuel consumption and allows a total control over heat exchange, resulting in optimal product uniformity.



## TYPICAL FUEL PROPERTIES

Fuel		Saw dust	Pet coke	Coal (Typical)
<b>LHV</b>	kcal/kg (dry)	<b>3,750</b>	8,100	6,750
<b>V o l a t i l e matter</b>	%	<b>&lt;60</b>	8-12	6-30
<b>Fineness</b> ( <i>res.</i> <i>90μm</i> )	%	<b>30</b>	<10	15
<b>Moisture</b>	%	<b>&lt;5</b>	< 1	<1.5
<b>Ash</b>	%	<b>&lt;3</b>	<1	<15

## PROPERTIES OF GAS AT CHIMNEY @11% of O<sub>2</sub> dry

		After performance test
Dust	mg/Nm <sup>3</sup>	10
O <sub>2</sub>	% dry	9-10
NO <sub>x</sub>	mg/Nm <sup>3</sup> @11%O <sub>2</sub> dry	< 500
SO <sub>x</sub>	mg/Nm <sup>3</sup> @11%O <sub>2</sub> dry	< 200
CO	mg/Nm <sup>3</sup> @11%O <sub>2</sub> dry	< 500
CO <sub>2</sub> (*)	% dry	20-22

## CO<sub>2</sub> EMISSIONS PRODUCED BY THE KILN

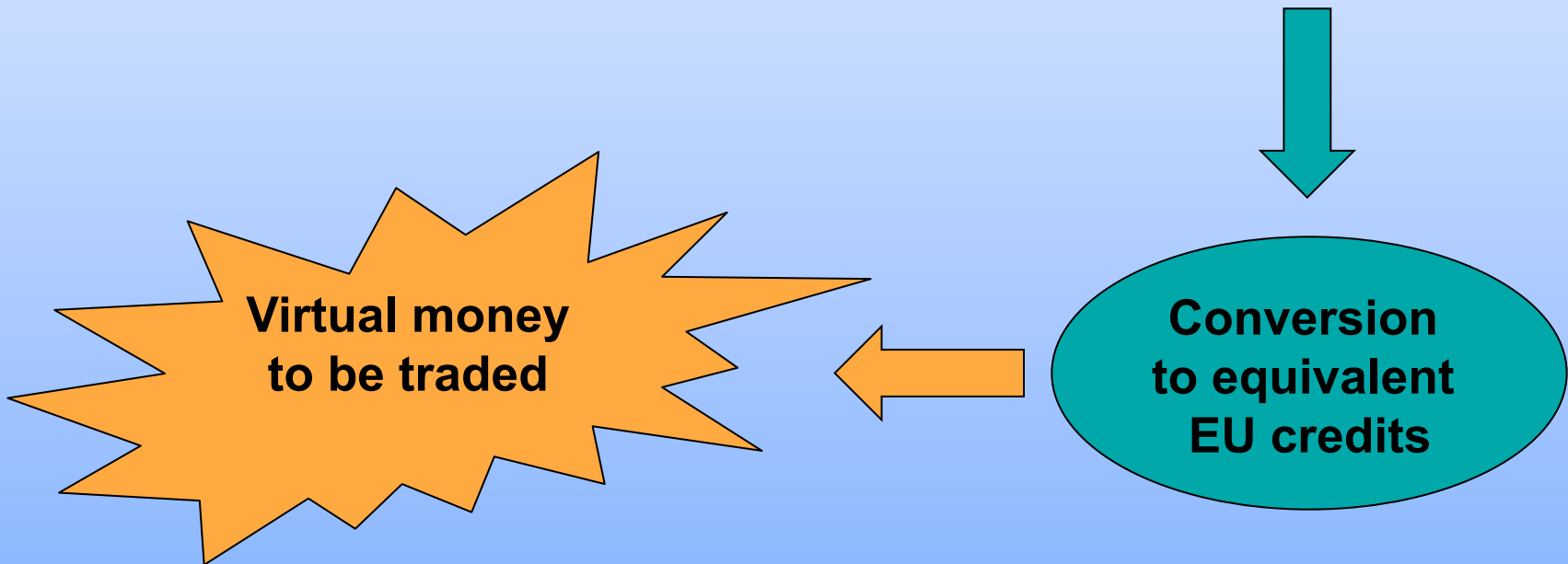
Fuel		Petroleum-coke	Coal	Saw dust
<b>Production</b>	tpd	500	500	<b>500</b>
<b>CO<sub>2</sub> from limestone calcinations (2% Res. CO<sub>2</sub>)</b>	Kg/h	15,062	15,062	<b>15,062</b>
<b>CO<sub>2</sub> from fuel (hour)</b>	Kg/h	6,878	7,104	<b>0 - see*</b>
<b>CO<sub>2</sub> from fuel (daily)</b>	t/day	165	170.5	<b>0 - see*</b>
<b>CO<sub>2</sub> from fuel (330 day/year)</b>	t/year	54,450	56,265	<b>0 –see*</b>

\* Using renewable energy from wood biomass (sawdust):  
 Amount CO<sub>2</sub> emissions during burning = Amount of CO<sub>2</sub> absorbed by trees during their growth

EMISSION INTO THE ENVIRONMENT = 0

## CO<sub>2</sub> EMISSIONS SAVING

Fuel		Saw dust
CO <sub>2</sub> emission year reduction	t/year	54.000-56.000





# FUEL SELECTION... THE DRIVING FORCE

Caseous



Liquid



Solid



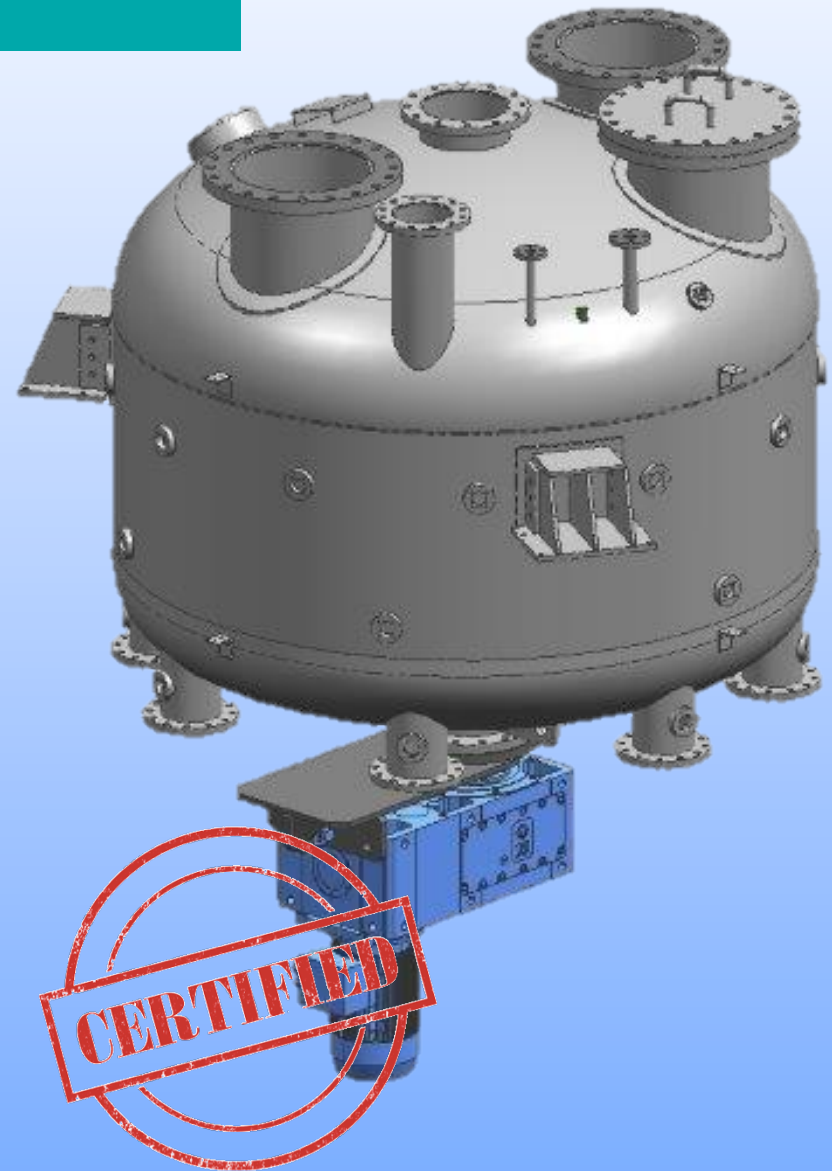
In lime industry fuel represents about 40% to 50 % of the total production cost.



# CIM-FIRESOLID COMBUSTION SYSTEM

Cimprogetti combustion system is currently successfully tested worldwide.

- Outstanding repeatability on the fuel feeding time for several cycles (this is a guaranteed value from Cimprogetti)
- Possibility to use several different RENEWABLE FUELS in addition to Saw Dust



# CONCLUSIONS

## ADVANTAGES OF ALTERNATIVES FUELS FOR TSR KILNS:

- 1.fossil fuel substitution with renewable fuel;
2. reduction of GHG emission;
- 3.reduction of operation costs due to use of cheaper fuels;
- 4.special credits can be achieved by national or local governments for use of biomass as fuel;
- 5.co-firing of sawdust & RDF (thermal recovery from selected waste material);
- 6.use of raw gas (SYNGAS) for lime production (large possibility of use of waste material without pre-selection);
- 7.thermal recovery of waste material (burning) reduce proportionally the need to landfill it, with evident environmental improvement

Thank you for your attention

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