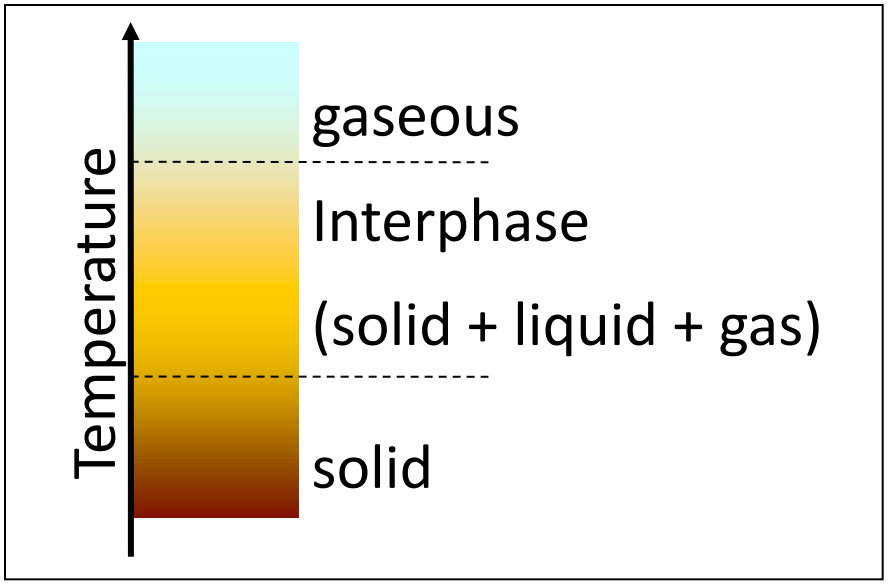
Examples of sustainable waste management

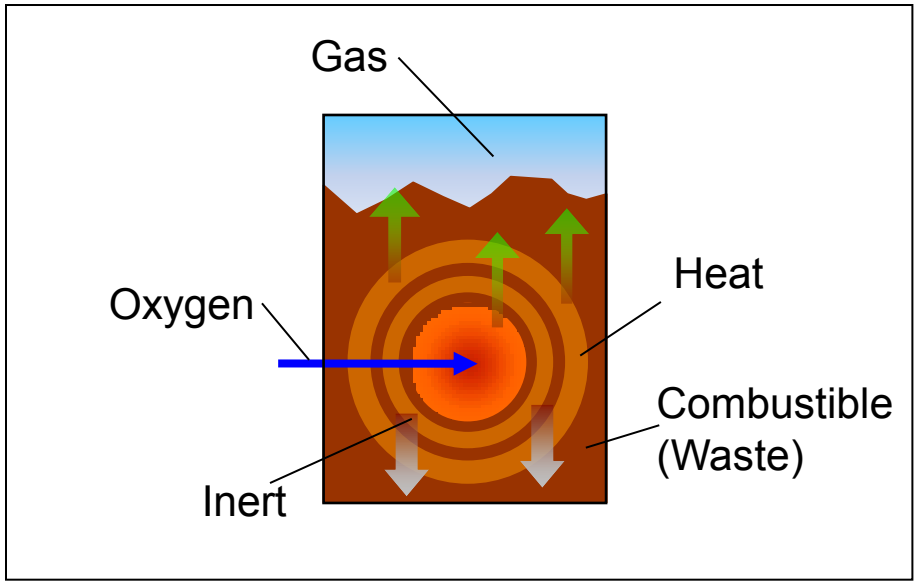
Mauro Zagaroli

Roma May 17th 2016

Technical Partner

High Temperature Gasification Principles





Combustible matters path

Reactor

100%

20 - 30%
Converted into energy

Solid residues
0%

To the use

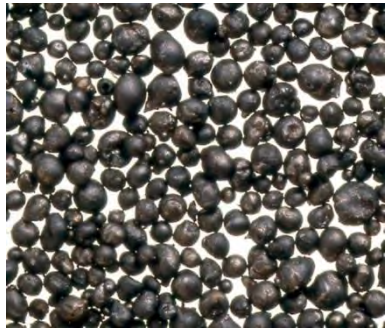
70 - 80%
Gas

0 %
Tars, oil, etc.

Inert
≈ 10% in mass
≈ 1% in volume

Metals
≈ 1% in mass
≈ 0,15% in volume

Casting



Sintered tile

Interlocking paving blocks

Wide variety of building blocks

Back-filling material

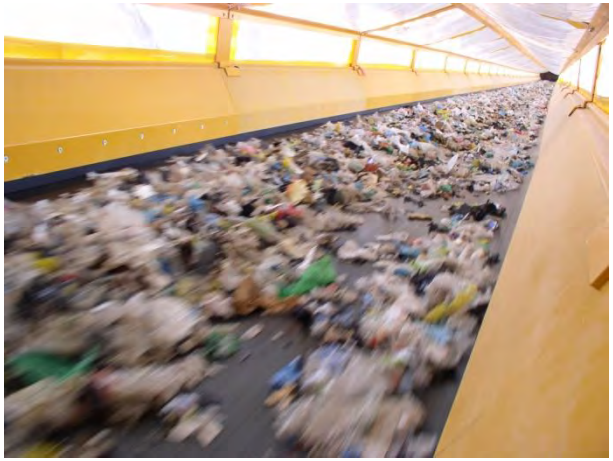
Raw materials for cement

Rock wool

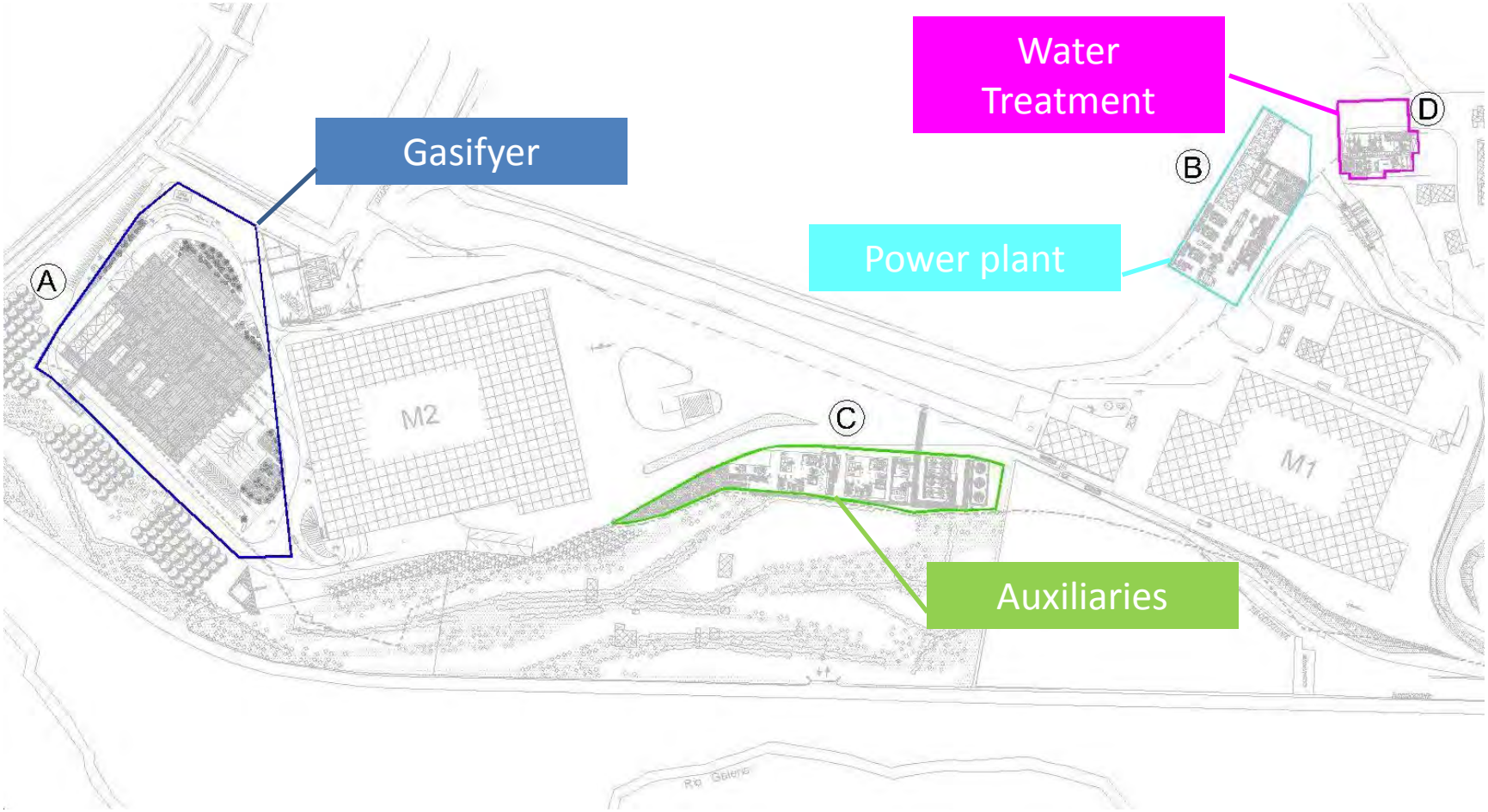
Application Field

- Contaminated Soil
- Sludge
- MSW
- RDF
- ASR (Car Fluff)
- Hospital Waste
- Other

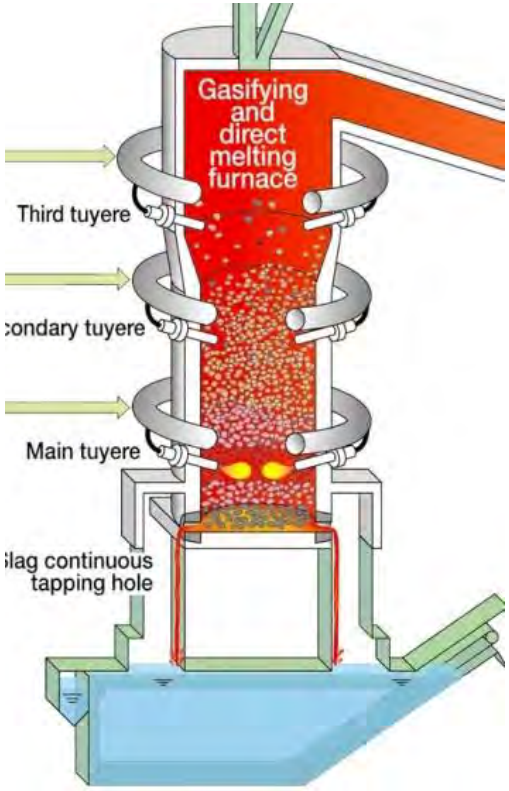
Malagrotta - MBT e Gassification



Malagrotta Compound

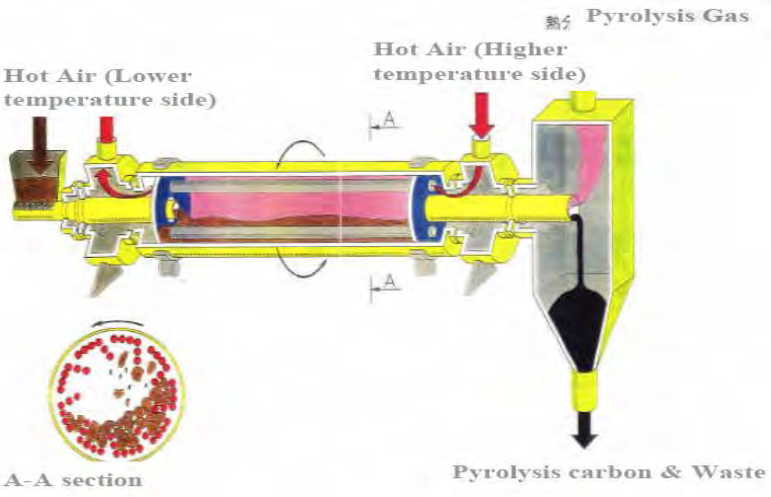


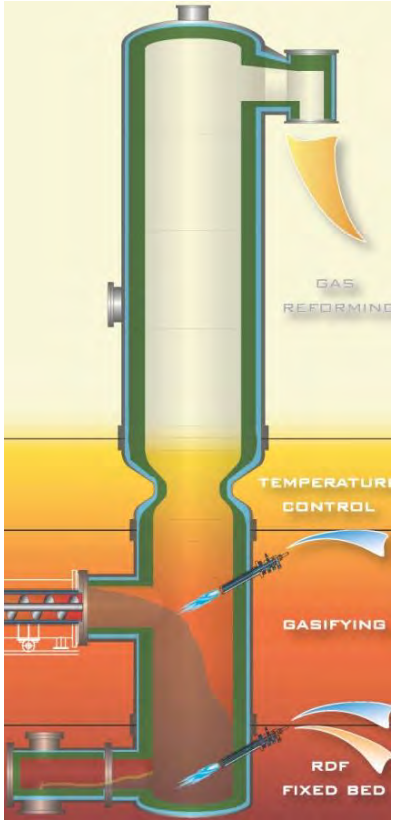
Market Available Technologies



"Shaft"
(Enriched Air Reactor)
51 Facilities

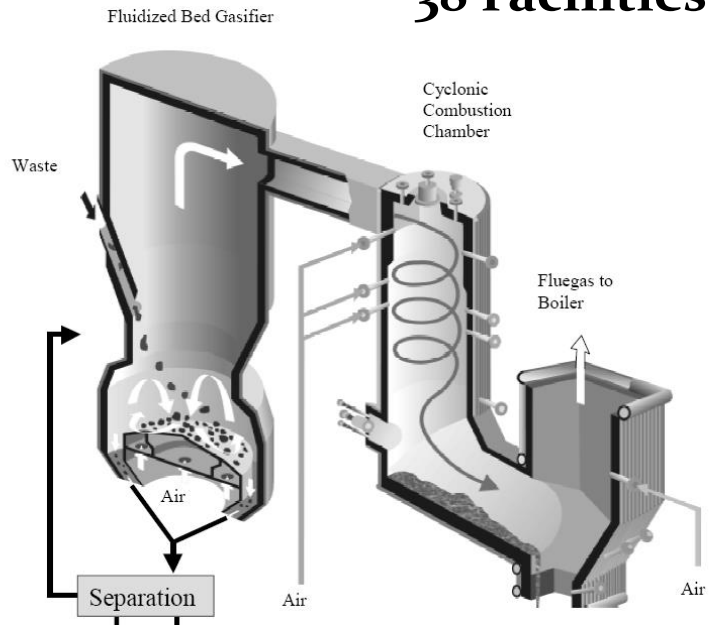
Rotary Kiln
(Pyrolysis+ Gasification)
15 Facilities



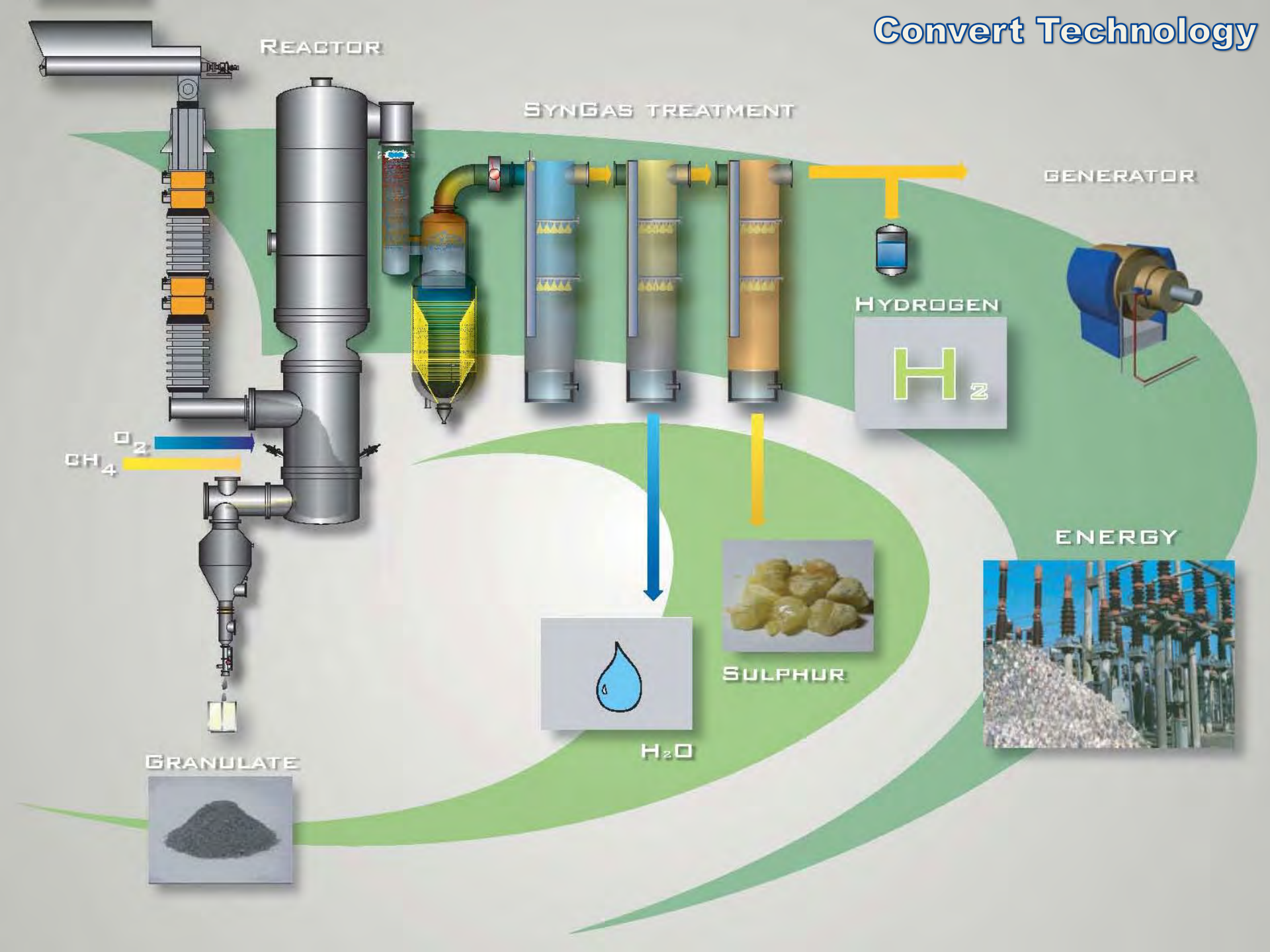


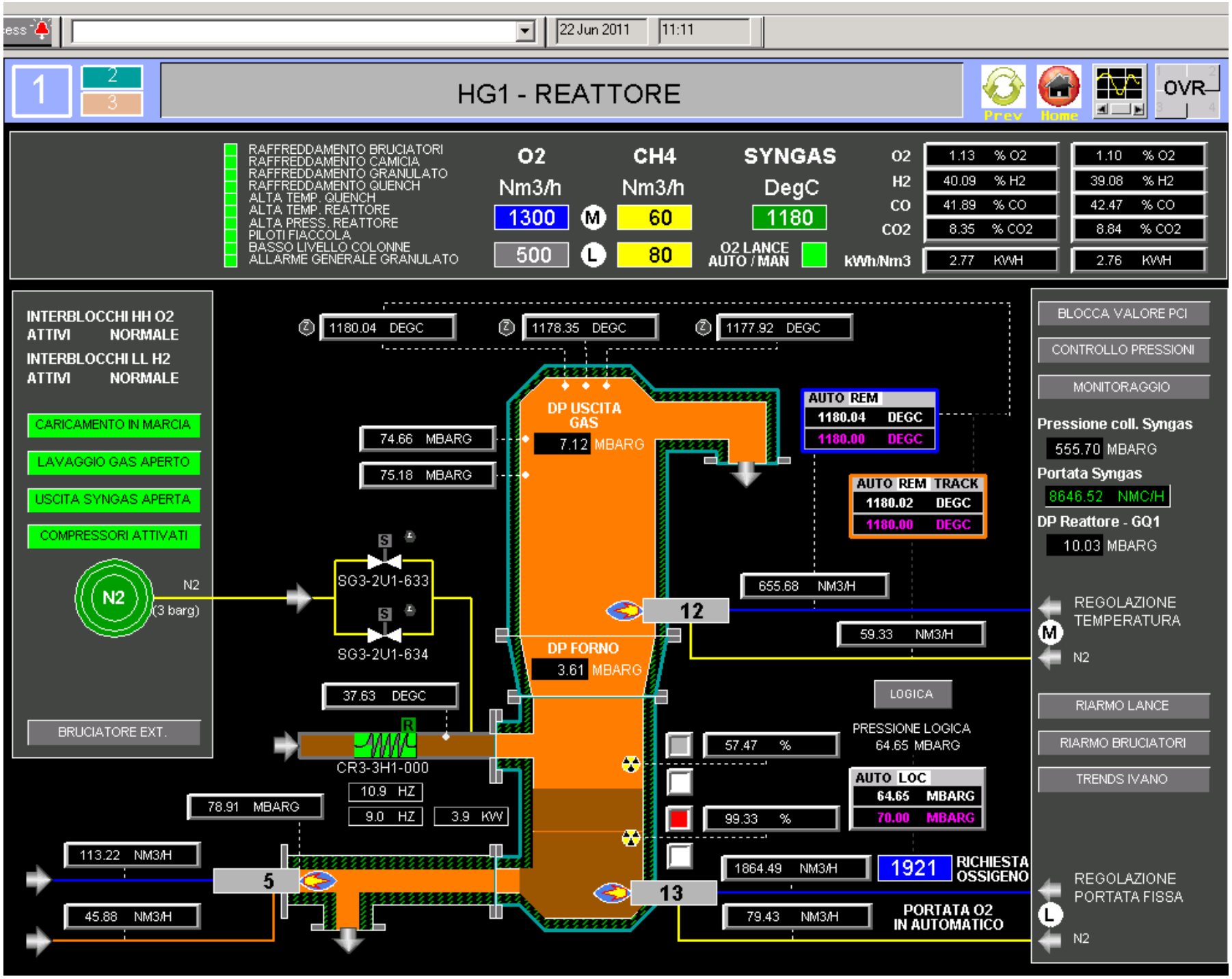
"Convert"
(Pure Oxygen Reactor)
8 Facilities

Fluidized Bed
38 Facilities

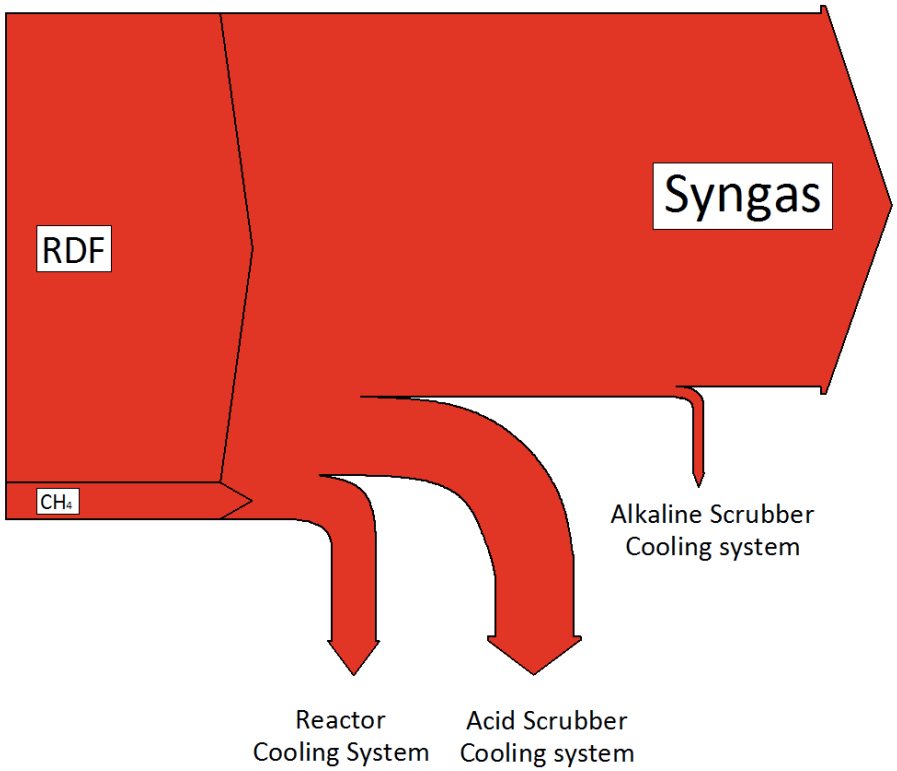


Convert Technology




22 Jun 2011
11:11
1
2
3
HG1 - REATTORE
Prev
Home
OVR
RAFFREDDAMENTO BRUCIATORI
RAFFREDDAMENTO CAMICIA
RAFFREDDAMENTO GRANULATO
RAFFREDDAMENTO QUENCH
ALTA TEMP. QUENCH
ALTA TEMP. REATTORE
ALTA PRESS. REATTORE
PILOTI FIACCOLA
BASSO LIVELLO COLONNE
ALLARME GENERALE GRANULATO
O2
Nm3/h
1300
M
500
L
CH4
Nm3/h
60
80
SYNGAS
DegC
1180
O2 LANCE AUTO / MAN
O2 1.13 % O2
H2 40.09 % H2
CO 41.89 % CO
CO2 8.35 % CO2
kWh/Nm3 2.77 KWH
1.10 % O2
39.08 % H2
42.47 % CO
8.84 % CO2
2.76 KWH
INTERBLOCCHI HH O2
ATTIVI NORMALE
INTERBLOCCHI LL H2
ATTIVI NORMALE
CARICAMENTO IN MARCIA
LAVAGGIO GAS APERTO
USCITA SYNGAS APERTA
COMPRESSORI ATTIVATI
N2
N2
(3 barg)
BRUCIATORE EXT.
1180.04 DEGC
1178.35 DEGC
1177.92 DEGC
DP USCITA GAS
7.12 MBARG
74.66 MBARG
75.18 MBARG
AUTO REM
1180.04 DEGC
1180.00 DEGC
AUTO REM TRACK
1180.02 DEGC
1180.00 DEGC
655.68 NM3/H
59.33 NM3/H
12
SG3-2U1-633
SG3-2U1-634
DP FORNO
3.61 MBARG
37.63 DEGC
CR3-3H1-000
10.9 HZ
9.0 HZ
3.9 KW
78.91 MBARG
LOGICA
PRESSIONE LOGICA
64.65 MBARG
57.47 %
99.33 %
AUTO LOC
64.65 MBARG
70.00 MBARG
113.22 NM3/H
45.88 NM3/H
5
1864.49 NM3/H
1921
RICHIESTA OSSIGENO
13
79.43 NM3/H
PORTATA O2 IN AUTOMATICO
BLOCCA VALORE PCI
CONTROLLO PRESSIONI
MONITORAGGIO
Pressione coll. Syngas
555.70 MBARG
Portata Syngas
8646.52 NMC/H
DP Reattore - GQ1
10.03 MBARG
REGOLAZIONE TEMPERATURA
M
N2
RIARMO LANCE
RIARMO BRUCIATORI
TRENDS IVANO
REGOLAZIONE PORTATA FISSA
L
N2

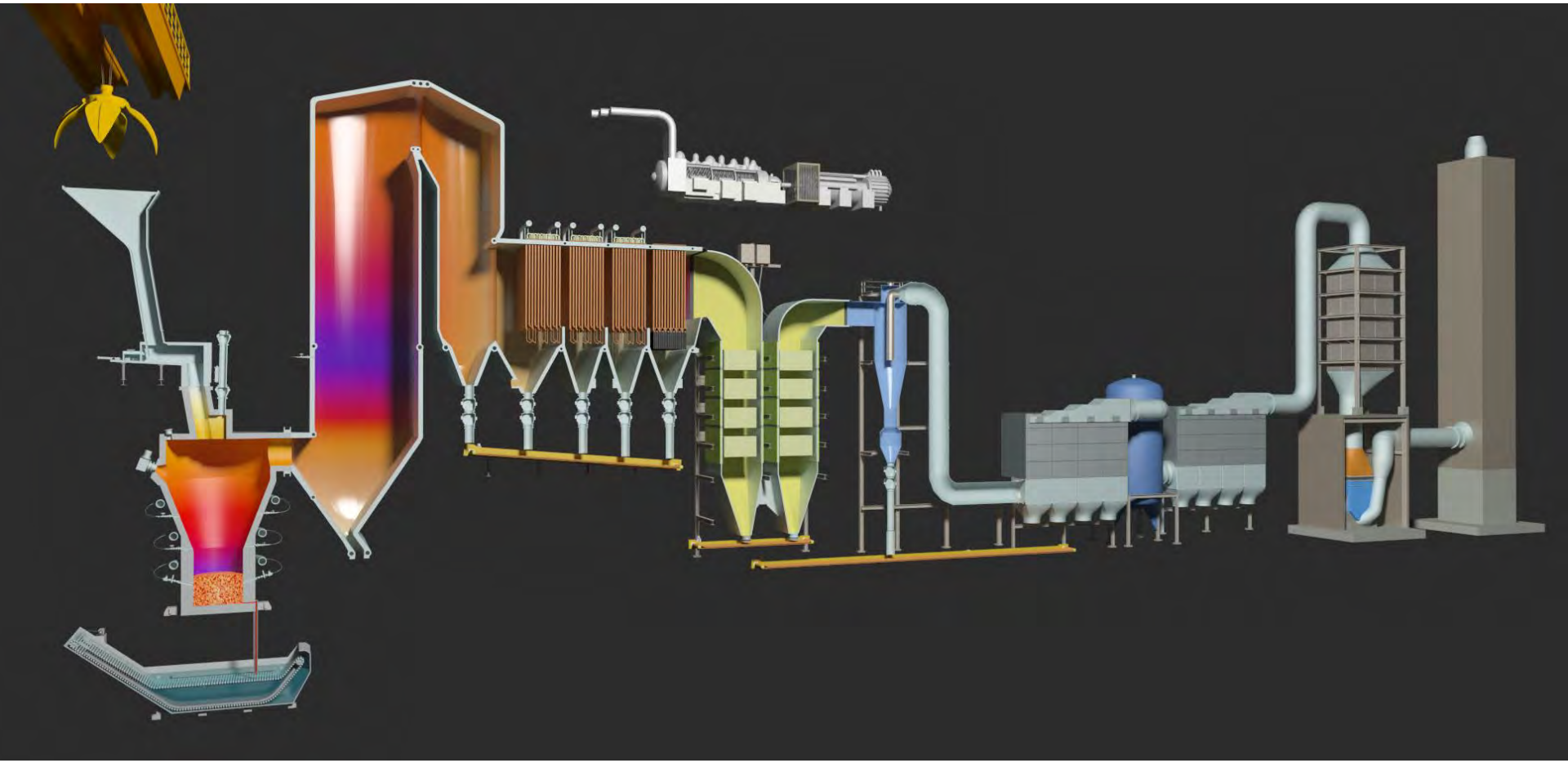
Efficiency and Syngas



Efficiency 75-80%

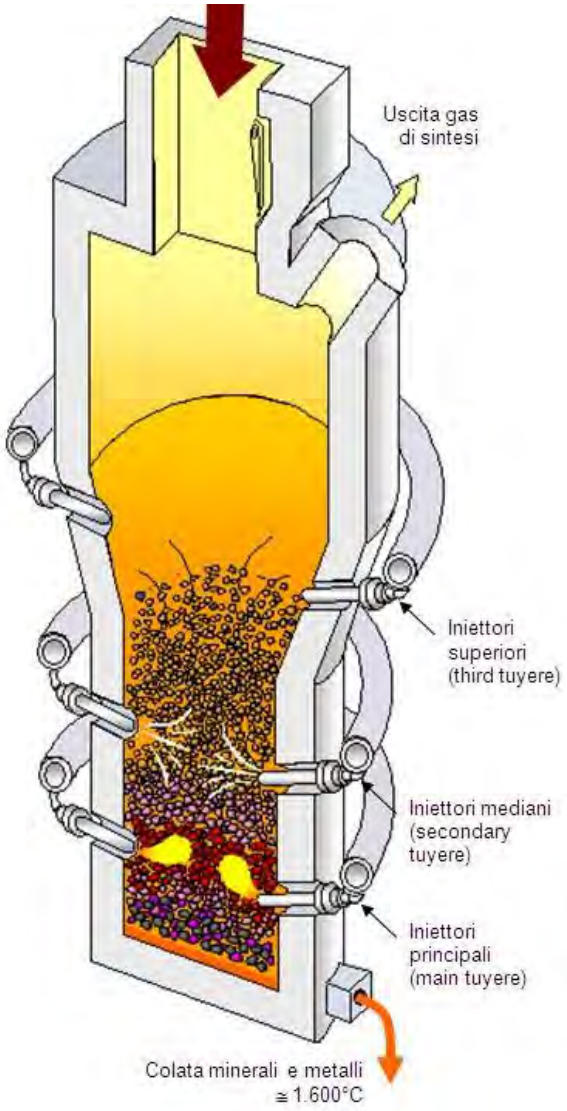
Waste input	kg/h	8.000
Waste Composition	-	-
Wood	% weight	3
Paper	% weight	34
Plastic	% weight	36
Textile	% weight	8
Organic fraction	% weight	10
Inert fraction	% weight	9
Elemental Composition	-	-
C	% weight	38,13
H	% weight	5,25
O	% weight	18,44
H2O	% weight	21,02
Ashes	% weight	17,16
LHV	MJ/kg	16,04
Oxygen input	Nm3/h	2.340
Syngas Output	Nm3/h	11.086
H2	% vol	41,7
CO	% vol	42,3
H2O	% vol	4,7
CO2	% vol	11,3
LHV Syngas	MJ/Nm3	9,77

Shaft Technology



Hourly Throughput	12.83	t/h
Daily Throughput	308	t/d
Availability	7.800	h/y
Yearly Throughput	100.000	t/y

Thermal Power from Waste	57	MW_t
Total Thermal Power	62,6	MW_t
Electrical Power	≅ 17	MW_e
Self consumption	≅ 4	MW_e



Waste/CSS Inlet

Syngas Outlet

Section 3
Stabilizing Zone
> 850 °C

Section 2
Gasifying Zone
600 – 800 °C

Section 1
Melting zone
> 1’600 °C

Casting Outlet

Temperature	850	°C
Flow	35.500	Nm^3/h
Composition		
CO	21,1	% vol
CO_2	5,9	% vol
H_2	18,2	% vol
H_2O	15,1	% vol
CH_4	0,0	% vol
N_2	39,6	% vol
H_2S	206	ppm
COS	8	ppm
HCl	276	ppm
Syngas LHV	4.685	kJ/Nm^3