

DRAFT AGENDA IEA TASK 36 SRF WORKSHOP
Workshop – Which future for the SRF market?



Production of SRF for co-combustion in coal fired Power Plants

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A fuel! Not 'something that burns'

The main characteristic of a fuel is to have a **sure technical specification** and well-defined characteristics to be eligible for a specific scope or process.

Is not particularly important that the fuel has a very high calorific value ,
but **must** have a calorific value constant in time

Must be uniform

Must be stable

Must guarantee a predictable production of ash and gaseous emissions

Must be storable and transportable

Should allow an adequate prediction of maintenance activities and costs associated



Must allow the operator of a power plant to use it with confidence and convenience



In order to be fed as fuel in co-firing with coal an SRF must have a constancy in characteristics at least equal to those of coal

How to get from this?

Clearly the production of a good SRF must be associated with the organization of a good separate collection of urban waste.

The waste allowed for the production of SRF are:

only waste not recoverable and recyclable as a material

and

only waste that can not pollute the SRF



TO SEPARATE COLLECTION

- paper and cardboard
- food waste
- plastic packaging
- aluminum packaging
- Glass
- Wood
- Tissues
- Metals
- Electronic devices
- ...

TO SEPARATE COLLECTION

- Plastics such as PVC, PTFE, should not be used for the production because their high chlorine content and halogens
- Polylamine packaging containing aluminum must be pre-separated
- Waste from electrical and electronic equipment must be pre-separated
- Metals must be carefully separated previously
- Must be excluded that they can enter treatment cells and batteries
- Should be excluded from waste medicinal products
- Must be excluded glass, ceramics
- woven ropes and nets are preferably to be excluded

Only residual waste for the production of SRF

How to get from this?

Clearly the production of a good SRF must be associated with the organization of a good separate collection of urban waste that allows to use for SRF production:

only waste not recoverable and recyclable as a material

and

only waste that can not pollute the SRF



**There is no good SRF
without a good separate
waste collection**

Ecoprogetto Venezia

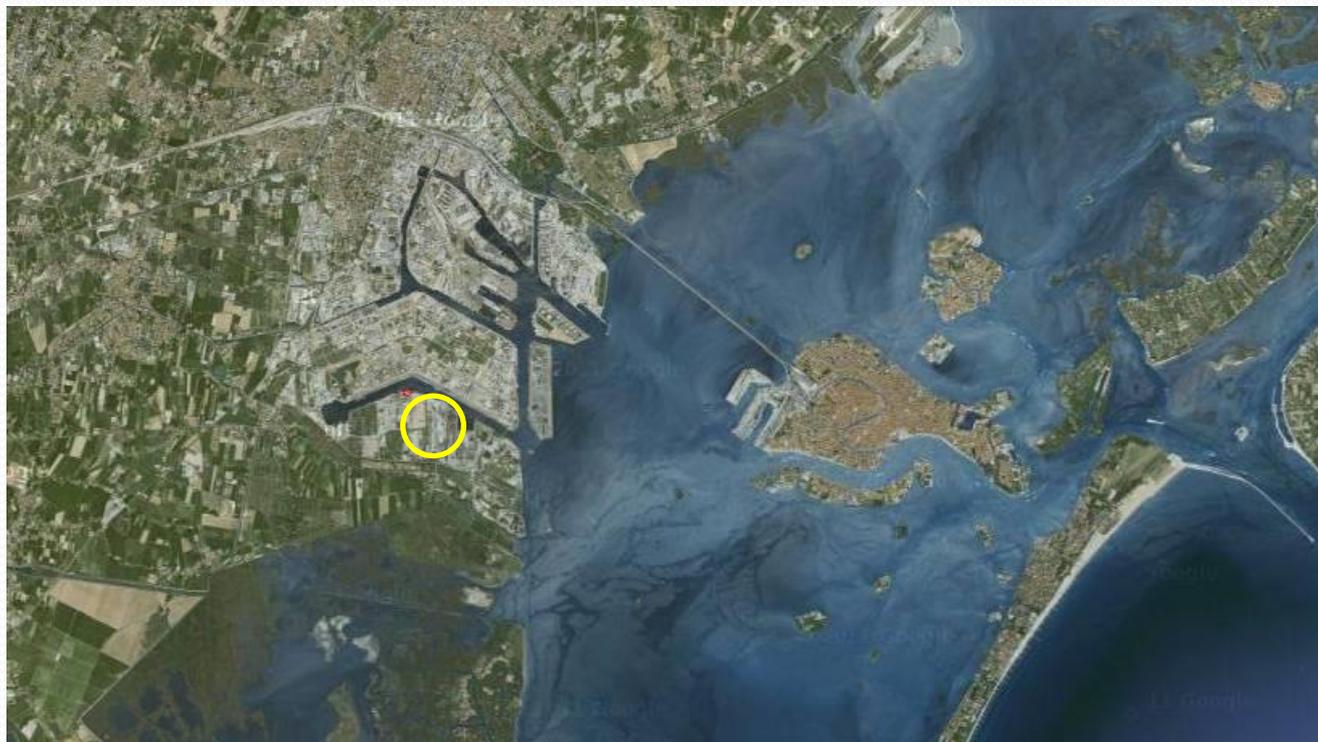
Is a public company controlled by VERITAS, which regulates the **treatment, reclamation and disposal cycle of waste in the Venice area**, making the served territory self-sufficient. Founded in 1998, its mission is to reclaim energy from the residual collected waste, with the objective of **minimizing the materials that end up in landfills**.

Every year:

250,000 tons of incoming municipal residual waste

200,000 tons of waste destined for RDF production, which becomes 100,000 tons of RDF after the processing losses

50,000 tons are treated in the incinerator closing in the year 2014



VERITAS



The **first multi-utility in the Veneto Region for inhabitants** receiving services in the environmental hygiene and integrated water cycle sectors and a reference point for 41 municipalities in Venice Province.

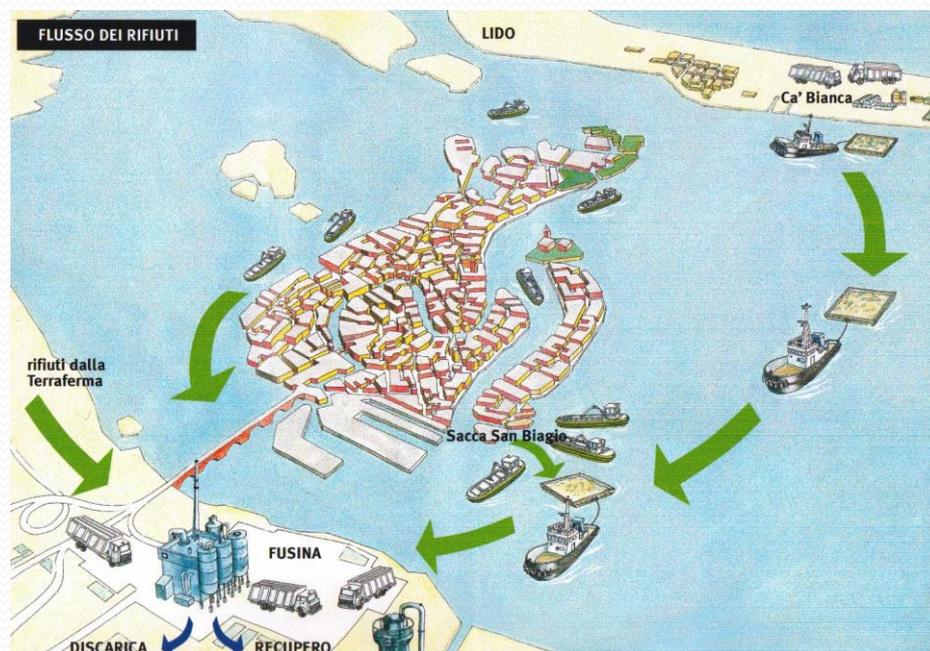
The plants at the Fusina hub are **part of a complex and organized regional system** that offers different solutions for both the treatment of recyclable fractions and for the disposal or reclamation of the remaining fraction.

The Fusina Centre is a reference model for Italy: it favours the **recovery of material and energy**, fully in line with the policies of the current standard.

At the gate of Ecoprogetto

In Ecoprogetto waste arrive from the land and from the lagoon

Contributions by land vehicles arrive either with the roadside collection trucks (5 to 20mc) and with large trucks (90mc)



Each transport is carefully checked:

is verified the origin and type of waste

the incoming waste is weighed with an automated system ,

the system is equipped with cameras that provide the recognition of license plates of vehicles,

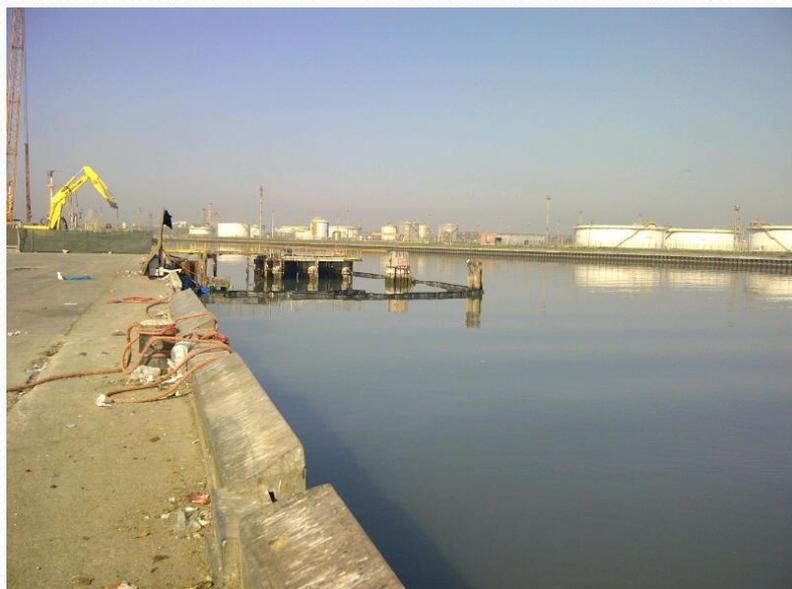
the system allows to produce computerized forms for the transport of waste (FIR)

The waste from Venice lagoon

The barge full of waste arrived at the dock



The quay of the barges



The unloading of the barge



The entrance to the treatment plant

The gates of the plant



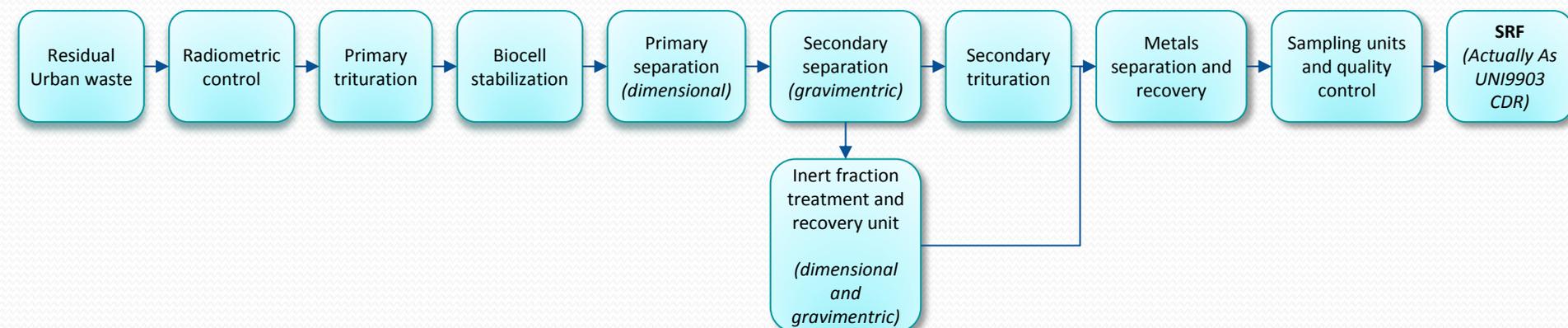
The interior of the input storage waste



It 's very important that the loading bucket is running an automatic and continuous process of mixing of waste in storage in order to avoid having a LIFO storage

The Ecoprogetto process model

The production process is a 'single flow' type



The key points are:

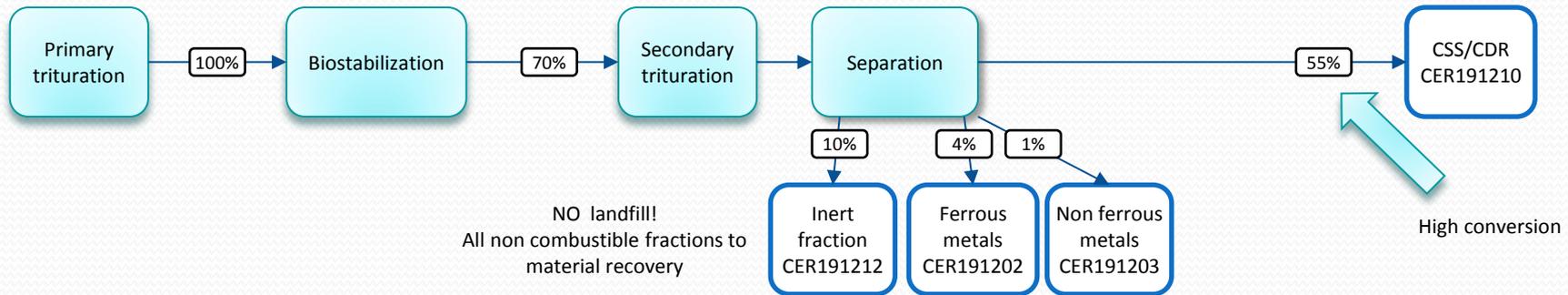
Biostabilization of total inputs

High efficiency selection of fuel fraction afforded by separation units operating in parallel on each size fraction

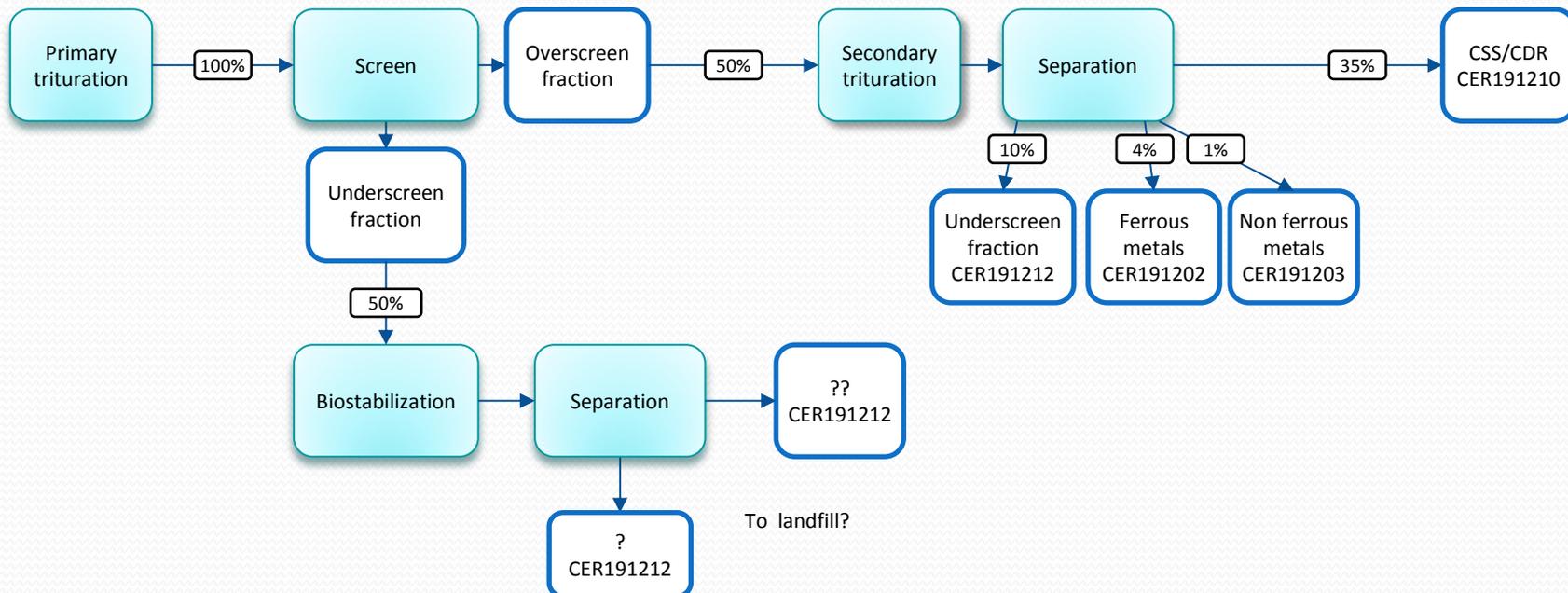
Production quality control secured by in-line automatic samplers

Comparison between process models

The Ecoprogetto process



The classic 'two paths' process

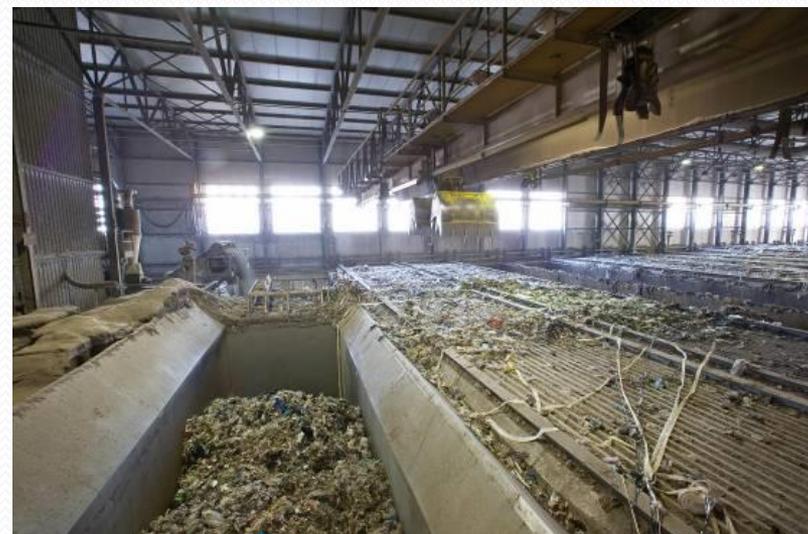


The biocell stabilization



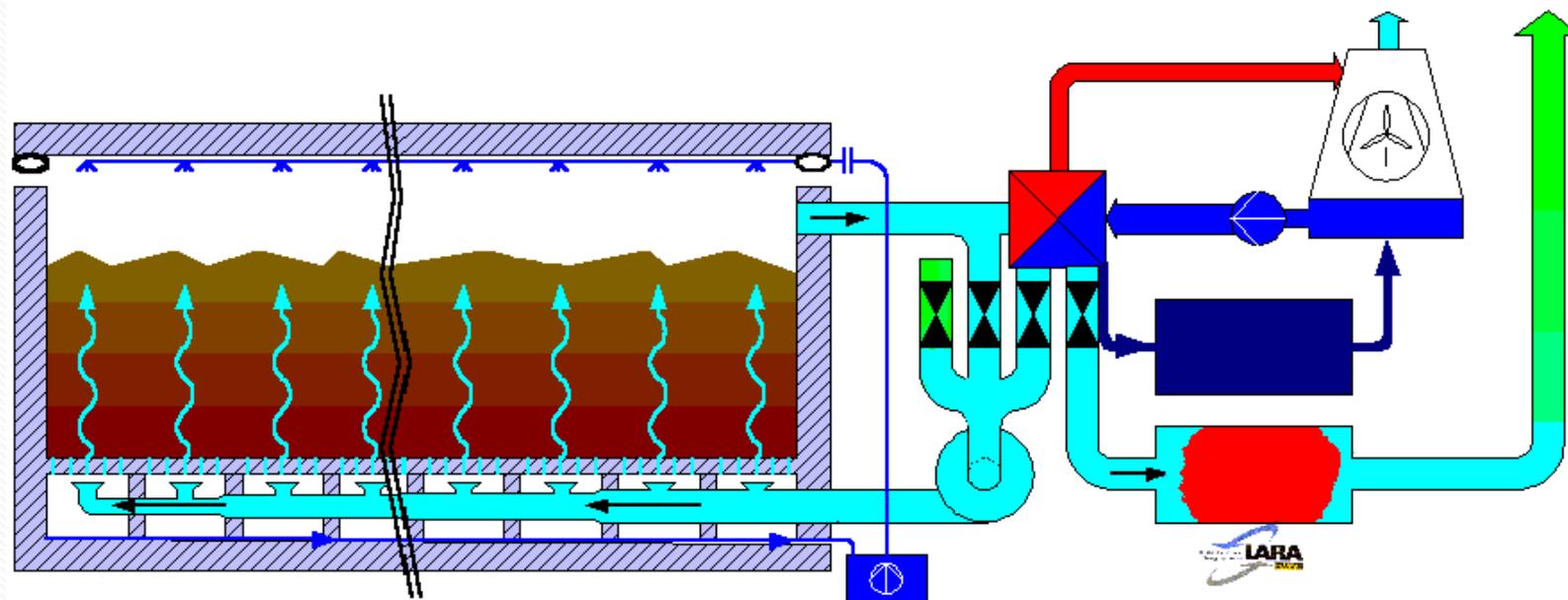
After the step of primary shredding an automatic loading bucket loads the waste in each biocell

The bio-cells can contain about 200 tons each



The biocell

The cycle of stabilization in biocell is an aerobic digestion process, is performed by loading the shredded material in appropriate cells with the bottom that allows the air insufflation and the simultaneous suction from above. The airflow then passes through the waste in treatment.

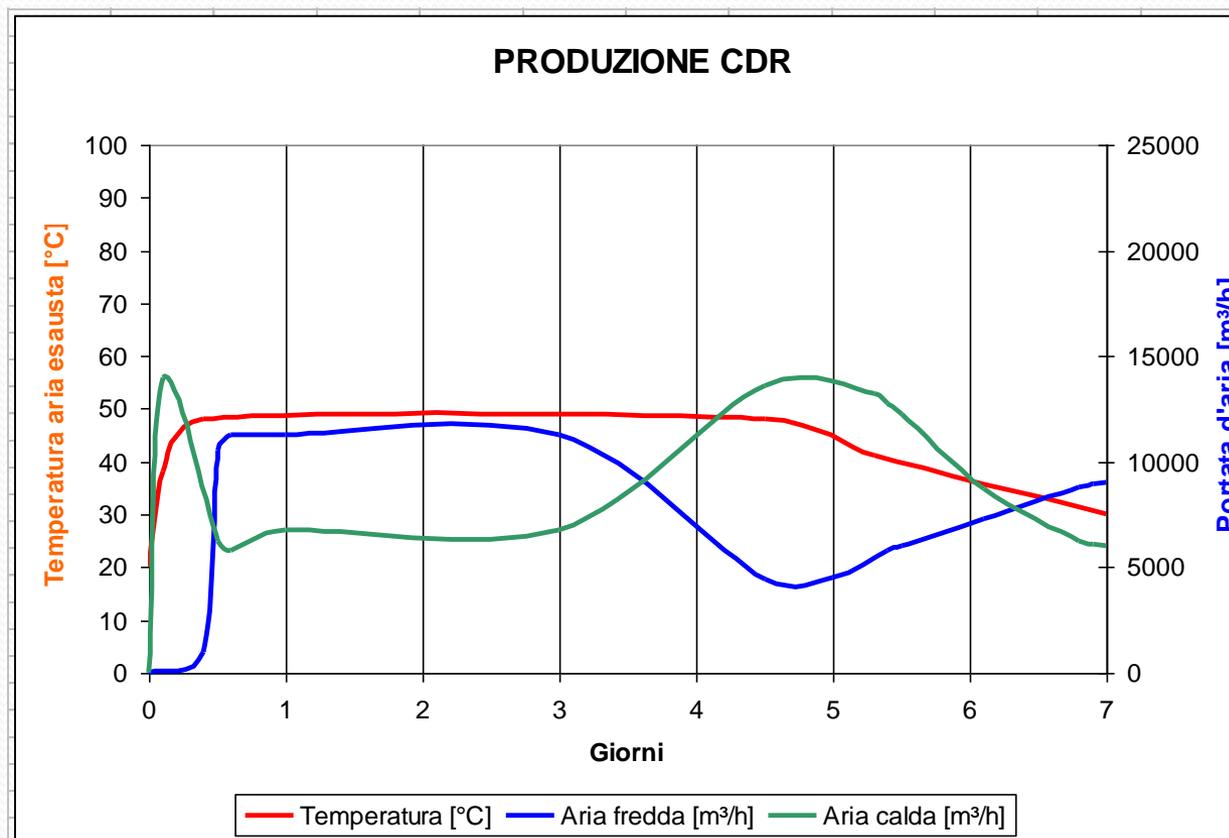


The heat generated by microbial decomposition of organic substances helps to evaporate water, which makes the material biologically stable.

This process reduces the mass of the waste more than 30% and increases the caloric value of about 35%.

The biocell stabilization

The temperatures which are reached only by exploiting the heat generated by the metabolic activity of the microbes are of more than 55 ° C. The treatment cycle (in batch) occurs in 7 days.



An automated control system shall control and regulate the process.

The biocell stabilization

The stabilization guarantees:

Dehumidification for biological pathway without the need to consume energy or fuels for the heating

Sanitation : as the stay at the temperature of 55 ° C provides to eliminate bacteria and pathogenic microorganisms

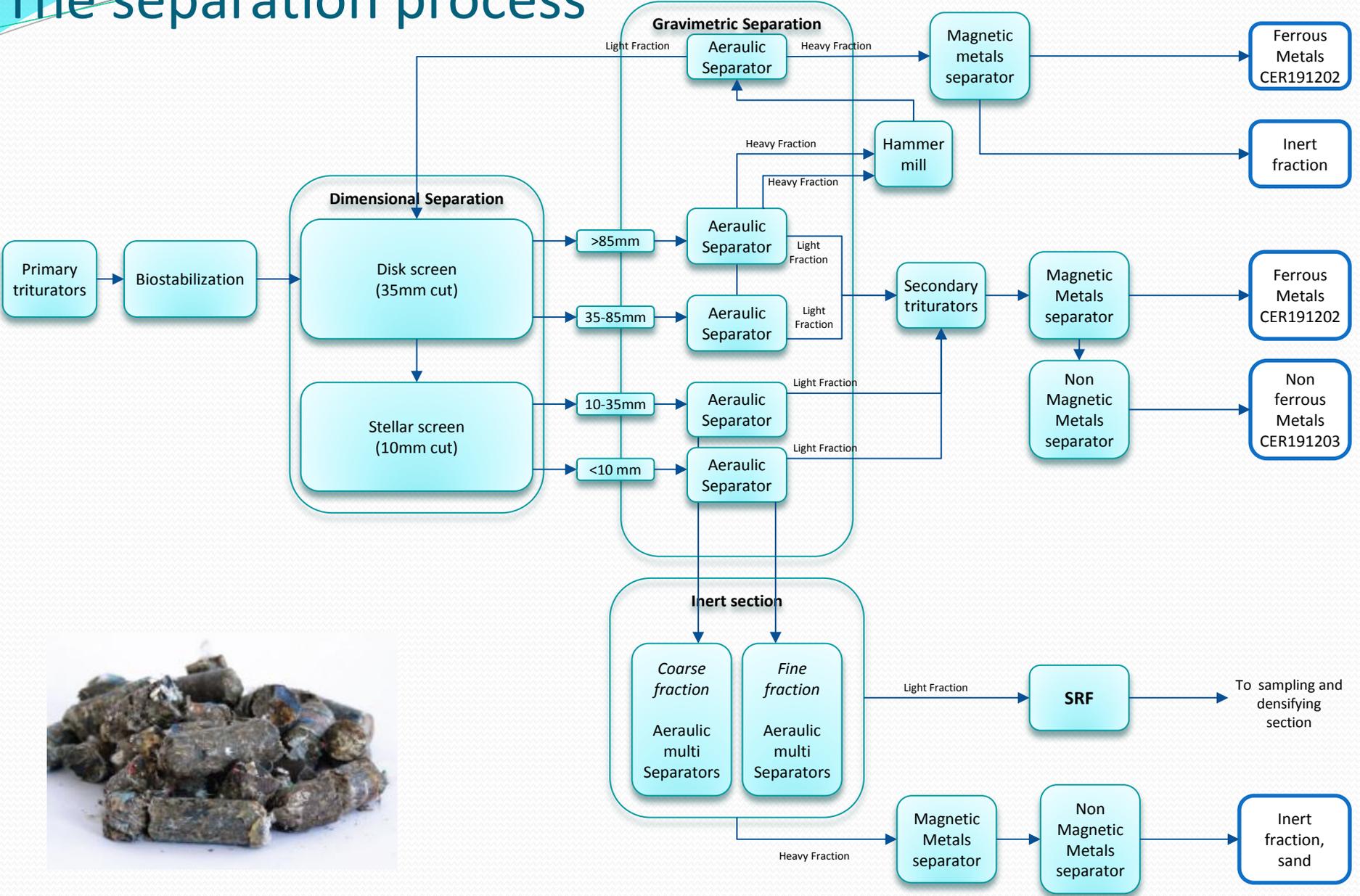
Stabilization of organic compounds: organic compounds are degraded , metabolized and partially extracted air

Product moisture stable and equal to 10-15 % max

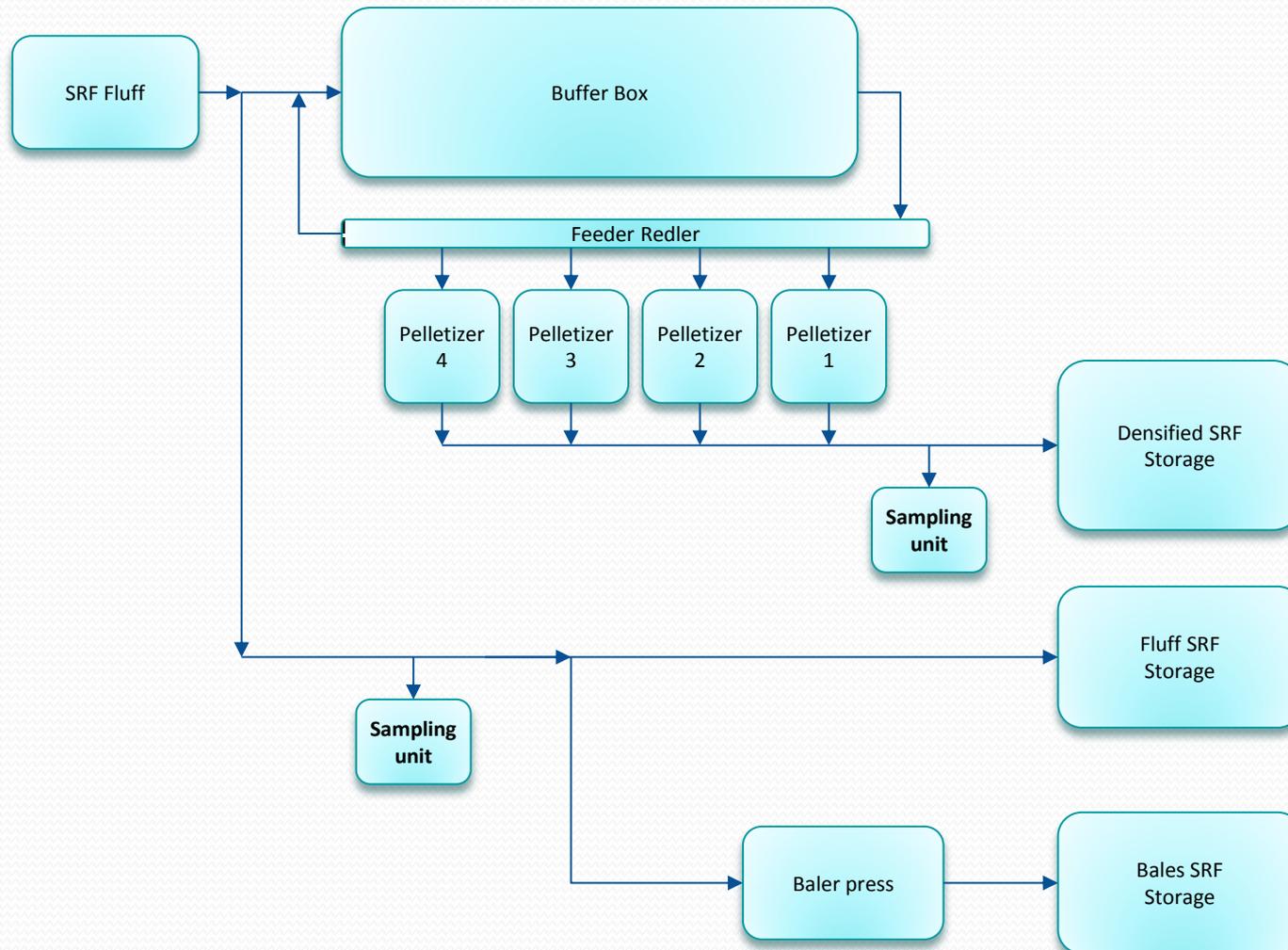
Mass reduction of 30% by weight

Increased calorific value of 35% (from 9.500 to about 13.500 kJ/kg before refining processes)

The separation process



Sampling and densifying unit



The pellettisation unit



The pelletizer machines exert a strong pressure on the material and they do extruding through a die (conic holes diameter from 16 mm to 14 mm).

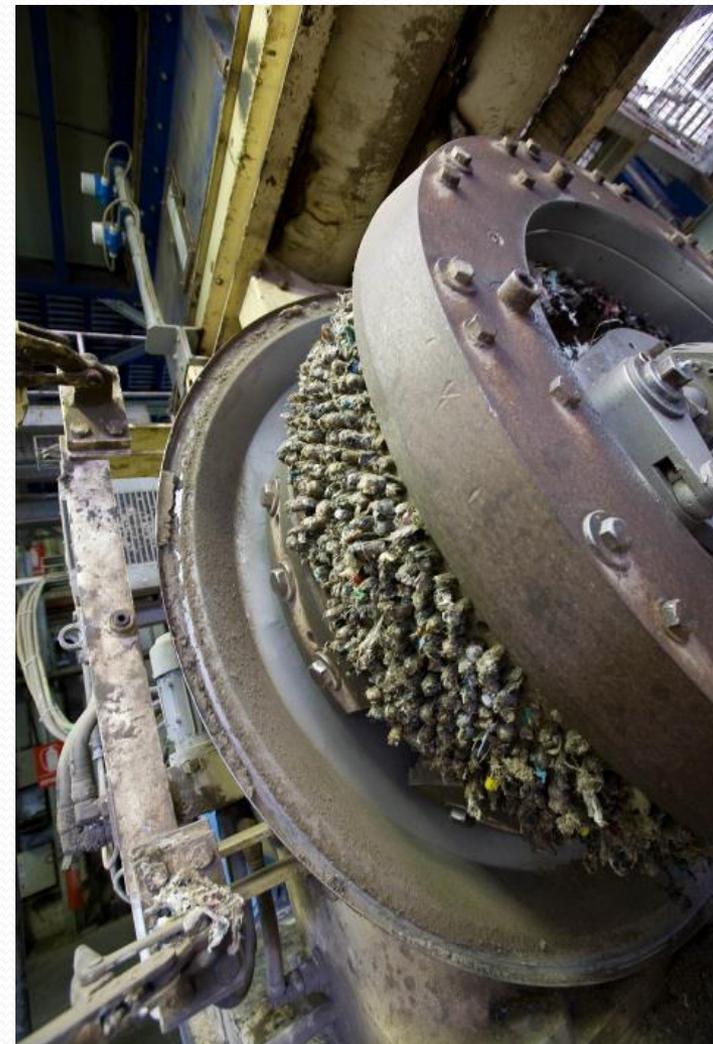
The SRF 'fluff' enters with a specific weight of about 150 kg / m^3 and exits densified as SRF 'briquette' to a specific weight of about 350 kg / m^3 .



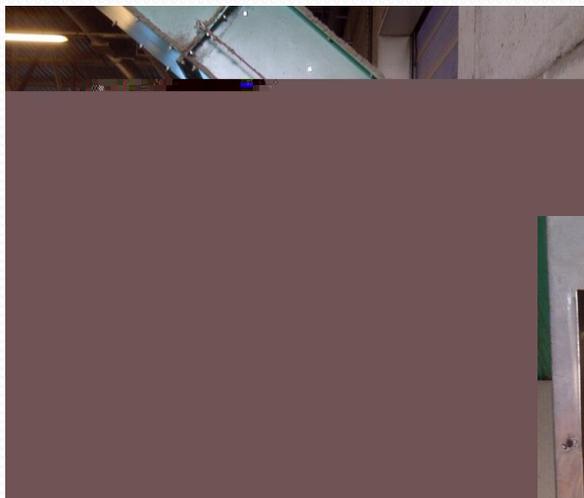
The pellettisation also allows to further reduce the moisture of the SRF.

This allows a longer shelf life (estimated at around about 2/3 months before the onset of normal phenomena of recovery of bacterial activity and self-heating) and easier portability.

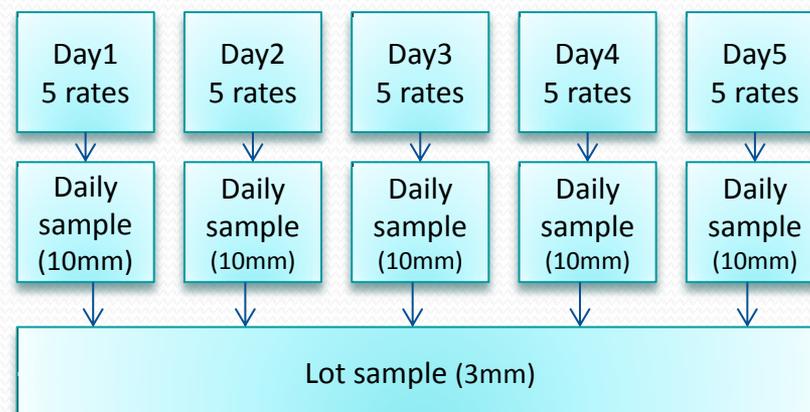
With this density it is possible to arrive at full load (30 tons) trucks with 90 cubic meters



The sampling units



Autosampler with weighing of the individual rates



Shredder for sample preparation

Storage and transport

The storage is done in special bays capable of holding the entire production of the week

The transport of SRF is made with special trucks equipped with automatic loading and unloading system (walking floor)

The trucks are loaded with wheel loaders equipped with pressurized cabins and with high-efficiency filtration systems to protect the operator from the presence of dust

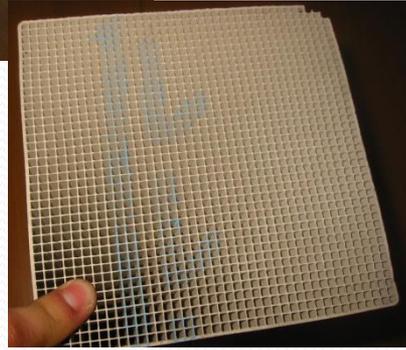
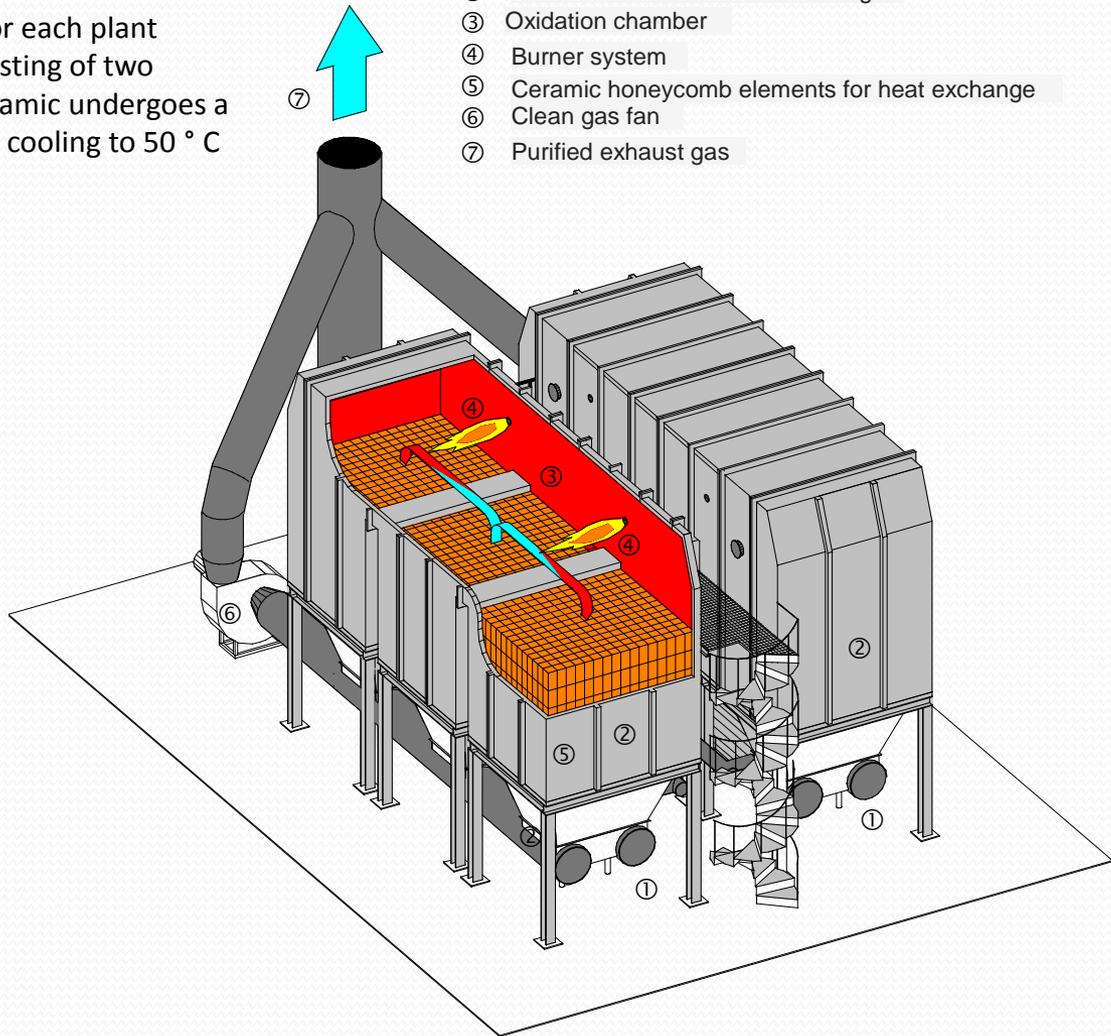


Emissions control and air treatment plants

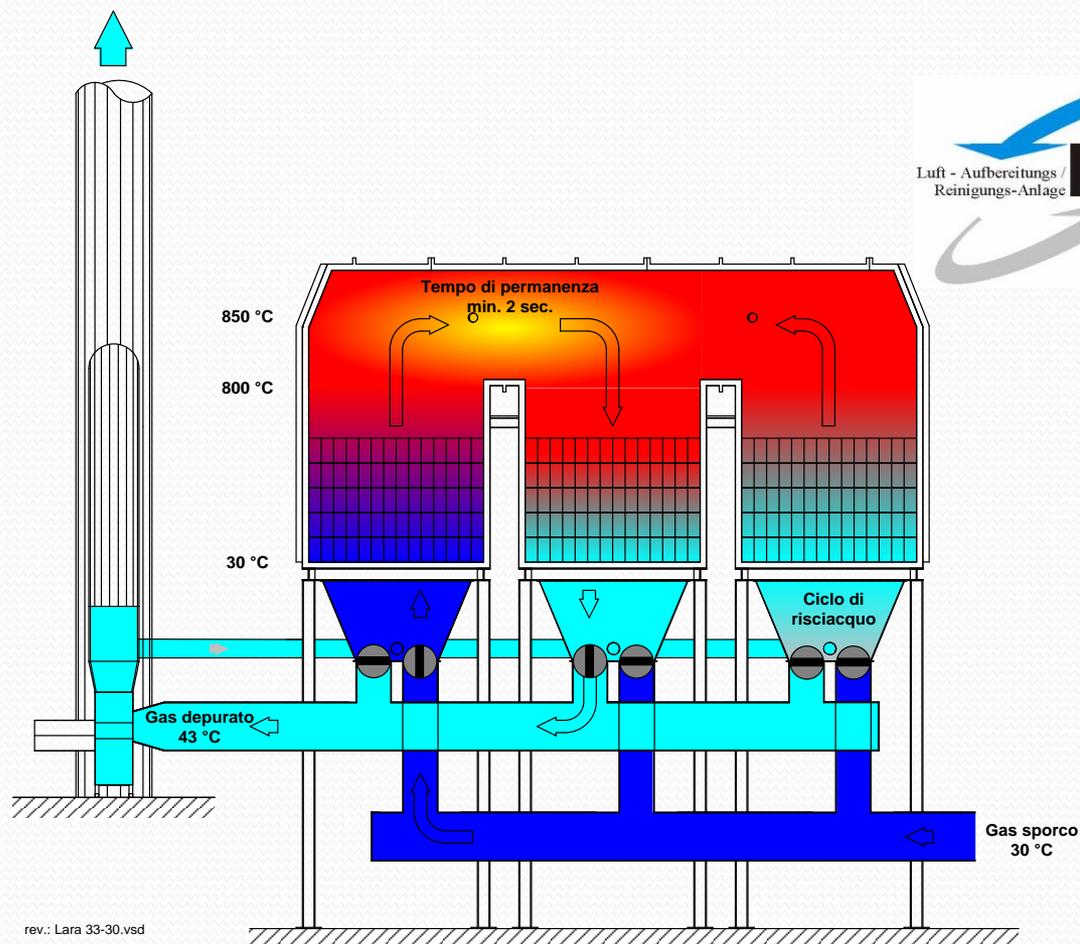
The process of bio-stabilization needs a proper control of the air to avoid problems for odor emissions.

In Ecoprogetto we use thermal oxidation systems for each plant consist of recuperative thermal oxidizers each consisting of two parallel units. The air passing through the bricks ceramic undergoes a faster oxidation at 850 ° C (for 2 seconds) and a fast cooling to 50 ° C (for 1 second).

- ① Inlet valves for air distribution
- ② Steel shell with fibroceramic lining
- ③ Oxidation chamber
- ④ Burner system
- ⑤ Ceramic honeycomb elements for heat exchange
- ⑥ Clean gas fan
- ⑦ Purified exhaust gas



Emissions control and air treatment plants



The system (called LARA) provides effective odor control. Each oxidizer can treat approximately 100.000 cubic meters / hr of air from the biocells system of each plant.

The system is extremely compact and allows to treat a volume of air with an efficiency that, for a system with scrubber + biofilters, would require an area of about 700 square meters.



The actual authorized standard (old UNI9903)

Ecoprogetto is still authorized for the production of RDF UNI9903

PARAMETRI DI RIFERIMENTO	VALORI PREVISTI DAL D.M. 5/2/98	IMPIANTO DI PRODUZIONE CDR DI FUSINA (VE)
P.C.I.	min 15.000 KJ/kg	17900 KJ/kg
UMIDITÀ	max 25%	10,1
CLORO	max 0,9%	0,48
ZOLFO	max 0,6%	0,21
CENERI	max 24%	17,5 %
PB (composti volatili)	max 200 mg/kg	Pb volatile=96 mg/kg
CR	max 100 mg/kg	34,9 mg/kg
CU (composti solubili)	max 300 mg/kg	composti solubili=53,9 mg/kg
MN	max 400 mg/kg	116 mg/kg
NI	max 40 mg/kg	15 mg/kg
AS	max 9 mg/kg	2,8 mg/kg
CD+HG	max 7 mg/kg	<2,6 mg/kg
TRAMMOLLIMENTO	solo indicazione	>1160 °C

UNI9903 CDR

1 lot = mean of 5 week subplot

Comparison with EN15359 standard

LINEA CDR 2 (CSS)													
Parametri	U.M.	classe 1	classe 2	classe 3	classe 4	classe 5	Misura statistica	Risultati su 10 test settimanali	classe 1	classe 2	classe 3	classe 4	classe 5
		UNI 15359						sett. 12-21	DM 22.02.2013 all.1 tab.1				
PCI	MJ/Kg	25	20	15	10	3	media	21,81	≥ 25	≥ 20	≥ 15	≥ 10	≥ 3
Cloro totale	% ss	0,2	0,6	1,0	1,5	3,0	media	1,00	≤ 0,2	≤ 0,6	≤ 1,0	≤ 1,5	≤ 3
Mercurio	mg/MJ	0,02	0,03	0,08	0,15	0,5	mediana	0,03	≤ 0,02	≤ 0,03	≤ 0,08	≤ 0,15	≤ 0,50
Cromo	mg/kg ss	500 mediana su 10 lotti					mediana	100	100				
Manganese	mg/kg ss	600 mediana su 10 lotti					mediana	170	250				
Arsenico	mg/kg ss	15 mediana su 10 lotti					mediana	1,0	5				
Nichel	mg/kg ss	200 mediana su 10 lotti					mediana	22	30				
Piombo	mg/kg ss	600 mediana su 10 lotti					mediana	155	240				
Rame	mg/kg ss	2000 mediana su 10 lotti					mediana	780	500				
Cadmio	mg/kg ss	10 mediana su 10 lotti					mediana	2,5	4				
Antimonio	mg/kg ss	150 mediana su 10 lotti					mediana	68,8	50				
Cobalto	mg/kg ss	20 mediana su 10 lotti					mediana	4,6	18				
Tallio	mg/kg ss	10 mediana su 10 lotti					mediana	1,0	5				
Vanadio	mg/kg ss	150 mediana su 10 lotti					mediana	4,2	10				
Somma metalli	mg/kg ss						mediana	1.553	xxx				
Umidità	%						media	6,1	accordi tra produttore e utilizzatore				
Ceneri	% ss						media	14,6	accordi tra produttore e utilizzatore				

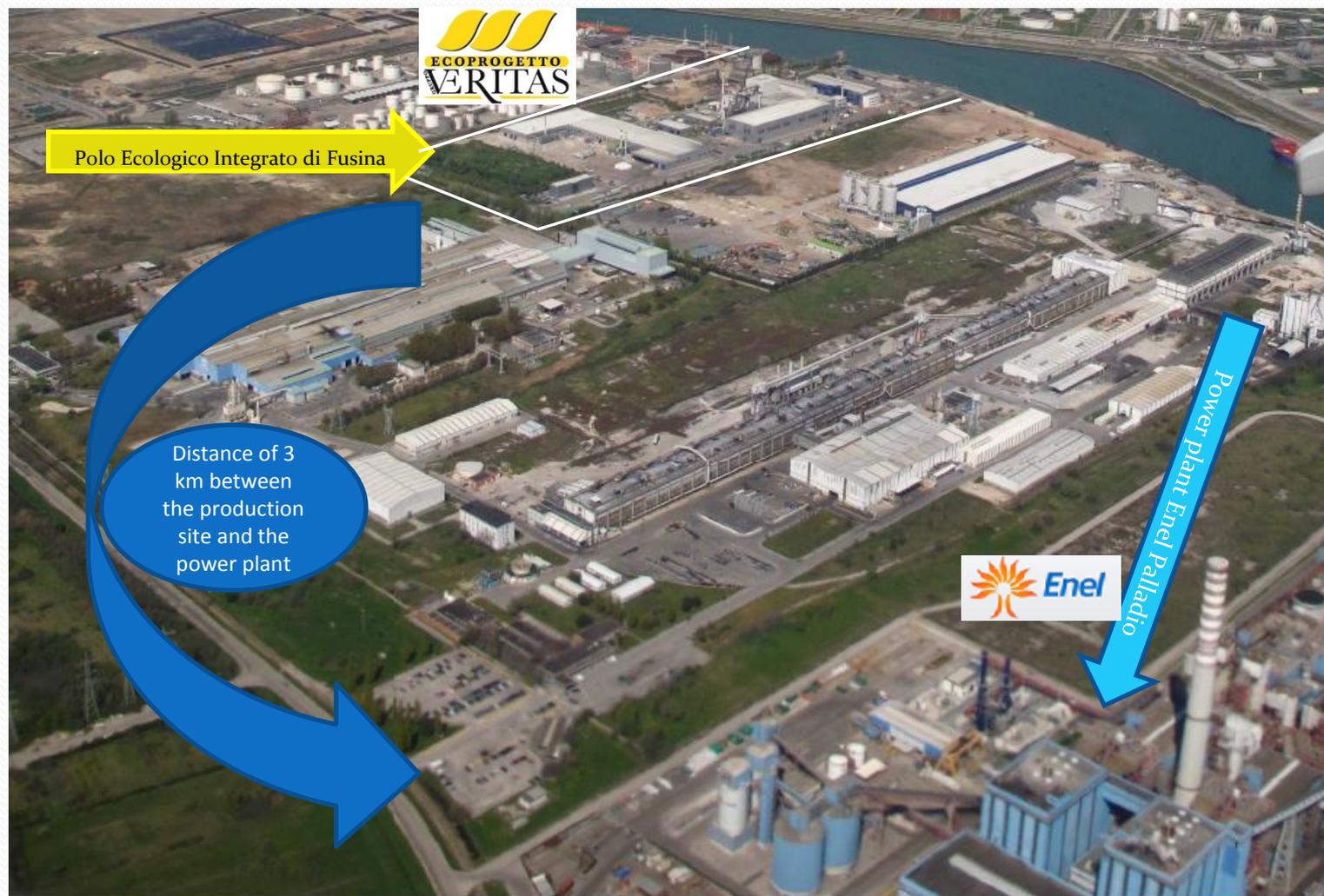
Work in progress!
We have planned some improvements on fine selection systems

UNI 15359

1 lot for Ecoprogetto = 1 week production

The power plant

The short distance between SRF production plant and power plant is very important



The power plant

The main destination of the SRF is the **co-combustion with carbon** at ENEL's nearby thermoelectric plant.

After a pluriannual research, the SRF is currently used in 2 sections of the plant, with 320 MW of power each.

The site has a small plant for the receiving, shredding, and transfer of the SRF by pneumatic transport.

Is very important that the SRF can be shredding up (dried and non sticky) to pulverize to 3mm



The SRF that can be used by ENEL's Palladio facility is about **5% of the carbon that powers it.**

Currently about **70,000 tons of SRF** are sent to the ENEL facility each year, but this is expected to increase to 100-105,000 tons/year.

Some power plant index

Power plant Index of E.E. production : **1.7 MWh/ton SRF**

It takes 2 tons of SRF to generate electricity to power a home users for a year

For every ton of SRF used in co-firing is avoided the production of **500 kg of CO₂**



Thank you for your attention.

For more information please visit

www.ecoprogettovenetia.it

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Site manager Ecoprogetto Venezia Srl



*Milano,
20 November 2012*