



SANITSER

25 Settembre 2014 - Tecnargilla

Project: LIFE12 ENV/IT/001095

SANITSER

SANITaryware production: use of waste glass
for Saving Energy and Resources



Life+ Projects : technological innovation as industrial development opportunity

MINERALI



INDUSTRIALI



VICENTINI

IPEC



SETEC



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**Projects Co-financed
By the European Union
LIFE+ Programme**

2006 – 2013

**Minerali industriali S.r.l.
and sister companies**



**MEIGLASS - LIFE06 ENV/IT/332
NOVEDI - LIFE07 ENV/IT/361
VALIRE – LIFE08 ENV/IT/00421
SASIES - LIFE10 ENV/IT/346
UNIZEO - LIFE10 ENV/IT/347
FRELP - LIFE12 ENV/IT/000904
SANITSER - LIFE12 ENV/IT/001095**





JOANNEUM
 Period: 2006-2009
 Coordinator: SASIL S.p.A
 Partner: JOANNEUM RESEARCH

MINIMISING ENVIRONMENT IMPACT GLASS LANDFILLED ACHIEVEMENT SAVING SUPPLY
MEI GLASS



PRIMARY RECOVERY UNITS

PLASTIC 2,5 % 25.000 ton
METALS 2,5 % 25.000 ton

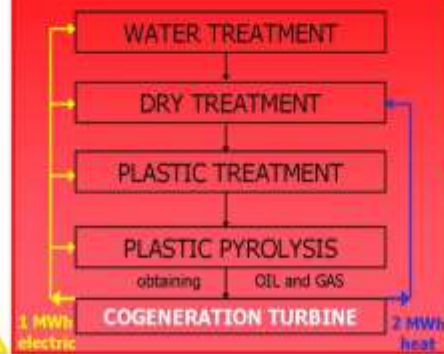
RESEARCH

RESEARCH & DEVELOPMENT

INNOVATIVE TECHNOLOGY FOR TREATMENT AND THE USE OF ALL COMPONENTS PRESENT IN WASTE

PRODUCTION

SASIL PRODUCTION PLANT



160.000 tons/year **GLASSWARE** equal to 400million of bottles
 25.000 tons/year **CERAMICS** equal to 1 million of m²
 10.000 tons/year **BRICKS** equal to 1.000 "100mq" housing

ENVIRONMENT

- **DECLINING CO₂ EMISSIONS**
to around 54.000 ton/year as a result of LOWER ENERGY REQUIRED for melting recycled glass instead of raw materials → equal to the emissions of 33.000 cars for 1 year to 15.000 km/year
- **REDUCTION OF THE USE OF RAW MATERIAL**
replaced by recovered glass and therefore LOWER MINING → equal to some 10.000 m² of quarry area covered by about 1.000 forest trees
- **IMPROVING ENERGY EFFICIENCY**
through the full recovery of heat and electricity by the COGENERATION turbine → equal to the annual consumption of 10.000 housing

... and all that, until 2005, went to landfill!

Sasil S.p.A. – reg. Dosso – 13862 Brusnengo – BI – tel 015-985261 – fax 015-985980 – www.sasil-life.com





Provincia di Biella

NOVEDI Project NO Vetro in DIscarica



From **GLASS** destined to landfill



through the production of an **INNOVATIVE** material



to the realization of a **ECO-SUSTAINABLE** building



FOAM GLASS



START PRODUCTS

(currently delivered to landfill)

Mosaic glass, artistic glass,
glass from TV screens, Lamps, Textile Fiber
glass, Solar and photovoltaic panels



FINAL PRODUCT

FOAM GLASS

- Low Density
- High mechanical strength
- High resistance to fire
- Low thermal transmissivity



END USED

Production of lightweight concrete
with high insulating power for the
construction of environmentally
sustainable buildings

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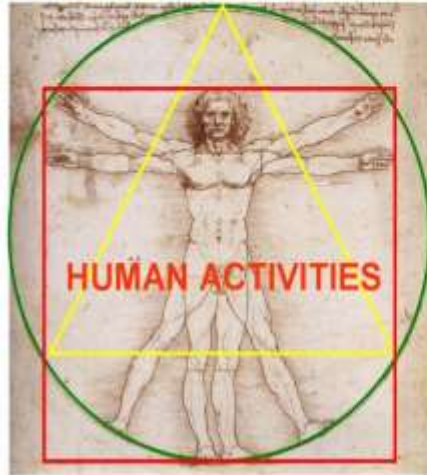


VALIRE Project

Valorisation of incineration residues



RESEARCH PRODUCTION ENVIRONMENT



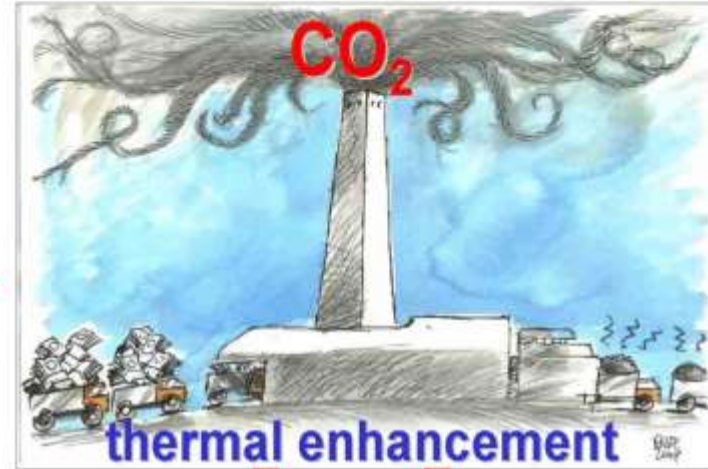
ELECTRIC ENERGY

0,5 kWh/day/person

0,4 kg/day/person

URBAN WASTE

1 kWh/day/person



SLAG

40 grams/day/person

ASHES

10 grams/day/person



ENHANCED TREATMENT

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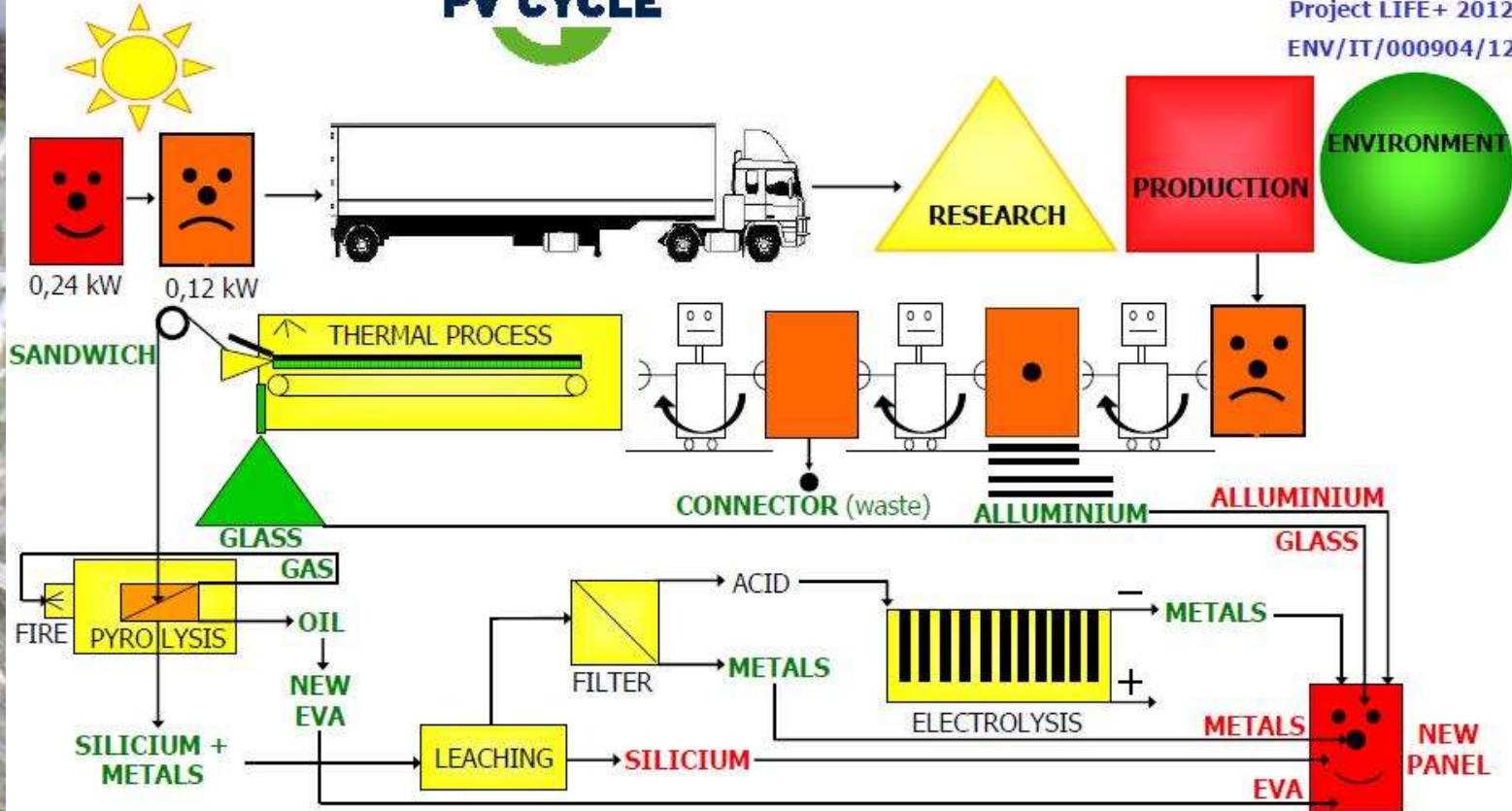


FRELP Project

Full Recovery End of Life Photovoltaic



Project LIFE+ 2012
ENV/IT/000904/12





Project LIFE10 ENV/IT/347 «UNIZEO»

« Urea-based nitrogenous fertilizers coated with zeolite: reducing drastically pollution due to nitrogen »

Coordinating beneficiary:

Minerali Industriali S.r.l.

Associated beneficiary:

Medilabor di Odore Dott. Carlo

Main objectives and expected results :

- Functioning pilot plant with a production capacity of **1000 ton** per year;
- Granules of urea-based fertilizer coated with Zeolite tested in agricultural lots and one golf course in **total 2500 Ha**;
- **Reduction of needed urea in the tested farmland with 30-40%**
- **Drastic reduction of nitrates** in groundwater and aquifers and **nitrogen** (ammonia) in air;
- **45%-50% of reduction of loss of nitrogen in atmosphere and leaching**;
- **Crop yield in the test lots increase** with respect to that produced with the normal chemical fertilizers;
- Increased knowledge and awareness amongst target group of growers on water and air pollution by nitrates and the advantage of the new product.





Reduction of the waste currently destined for landfill



Landscape protection



Reduction of CO₂ emission and energy consumption

Project: LIFE10 ENV/IT/346 « SASIES »
'Sludges from agglomerated stones industry for environmental sustainability (acronym SASIES)'

Objectives and expected results:

- Proven possibility of recycling the entire amount of sludges that come from the processing of siliceous and carbonate agglomerated stones, reducing waste going to landfill, which is currently **345,000 tons at a European level**;
- Saving more than **75% CO₂ emissions** in the processing and disposal of waste;
- Effective recycling of stone sludges from agglomerated stones production, reducing the need to dig raw materials. Reduction of the current costs for waste disposal.



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santamargherita
THE ORIGINAL ITALIAN SURFACE

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M
INDUSTRIALI



Sanitaryware production: use of waste glass for saving energy and resources

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Coordinating beneficiary: Minerali Industriali S.r.l.

Associated beneficiaries: G.E.M.I.C.A. S.r.l.
Life Cycle Engineering
SE.TE.C. S.r.l.

Main objective:

Improving the environmental impact of the sanitaryware production process replacing natural raw materials (up to 40-50%) with glass cullet from urban waste disposal and other recycled materials in the ceramic blends formulation.



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EARLIER STUDIES

Use of processed glass cullet waste in ceramic is supported by the following reasons:

- Chemical compatibility of soda lime glass and vitreous sanitaryware ceramics, since both are characterized by Na_2O and CaO , acting as main fluxes [M. Dondi, T. Manfredini et al, 1995];
- Abundance of glass phase (50-65%) in the output products [M. Dondi et al., 1999; G. Baldi et al., 2001]: soda lime glass is already a glass phase and contributes both to obtain the dominant amorphous phase in vitreous sanitaryware ceramics and to change the sintering process shifting it to lower temperatures-shorter times than the traditional one;
- Flexibility of VSW-making process, which renders it possible to mix glass with other raw materials without modifying significantly the manufacturing cycle [G. Baldi et al., 2001; A. Moreno et al., 2000; A. Brusa et al., 1999]



2009: Minerali Industriali and the Earth Science Department of the University of Milan started a collaboration to study the introduction of glass cullet in partial replacement of Na-feldspar (traditional flux agent) for sanitary-ware ceramic production.





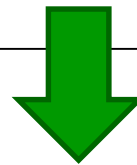
EARLIER STUDIES

This study has considered three main aspects:

- 1 - how SLG affects the sanitary-ware ceramic transformations at high temperature, in terms of mullite nucleation and growth, to mark the effects of activation energy reduction and to pose the basis for a successive determination of optimal firing time and temperature;
- 2 - how far SLG influences the technological properties of the final product, as a function of time and temperature;
- 3 - how SLG-bearing slips, properly adjusted to warrant processability, transform upon firing, in terms of final phases.

Problems to overcome:

- **Eventual changes in rheology of the slips;**
- **Pyro-plasticity effects on large ceramic bodies;**
- **Effects of thermal gradient upon firing on large and complex shape bodies having SLG;**
- **Glaze reformulation to match the new thermal cycles.**



2012: SANITSER PROJECT





Main actions:

- Definition of new formulations for slips bearing SLG and of production processes using the modified firing time-temperature cycles at lower temperature;
- Glaze composition revision in the light of new firing time - temperature cycles;
- Determination of environmental impact parameters (Life Cycle Assessment).

Expected results:

SAVED PRIMARY RESOURCES: 40-50%

SAVED ENERGY: 16-18%





RAW MATERIALS INVOLVED IN TESTING

Re-use of recycled products and production waste for ceramic industry



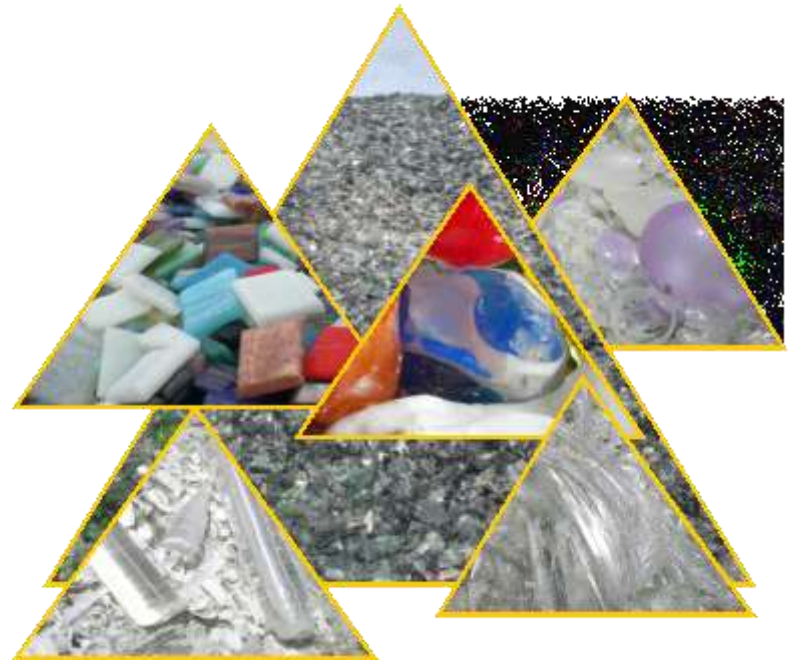
GLASS CULLET WASTE FROM URBAN WASTE DISPOSAL: 100% RECYCLED POST CONSUMER

As defined on section 7.8.1.1 c, UNI EN ISO 14021

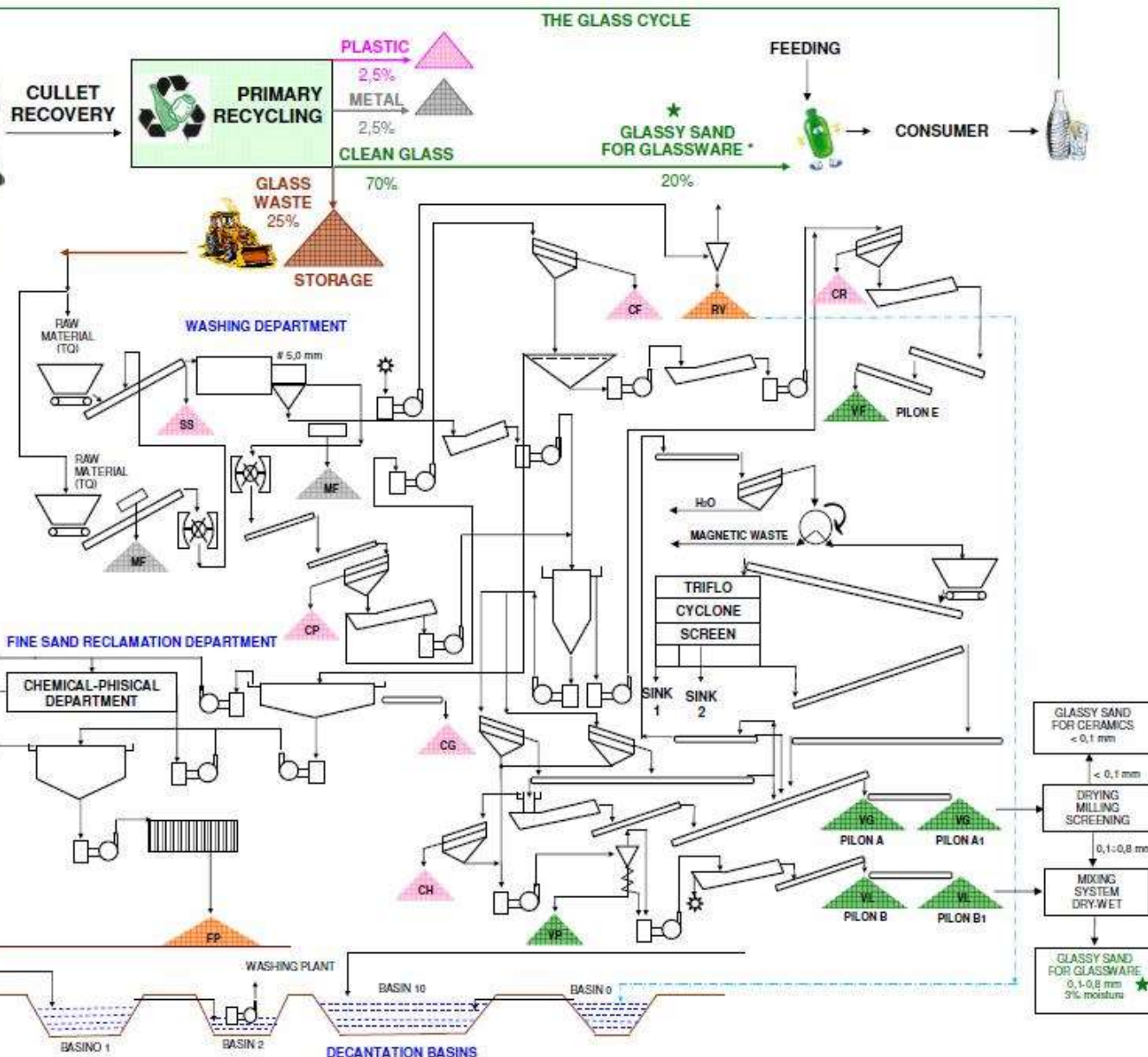


SPECIAL GLASSES FOR GLAZE (tv monitor, lamp, neon, boric glass): 100% RECYCLED PRE and POST CONSUMER

As defined on section 7.8.1.1 c, UNI EN ISO 14021



Vetro GS - 100% Riciclato "post consumer" - Schema di processo



	TYPE MATERIAL	%	t/h	kg/h	t/year (s. 000 h)
TQ	RAW MATERIAL	100	40		200.000
SS	UP SCREEN WASTE (glass + ceramic - recycle)	3,0	1,2	1200	6.000
MF	FERROUS MATERIAL	0,25	0,10	100	500
CP	CORK - PAPER - PLASTIC - ALUMINIUM - GLASS	2,5	1,0	1000	5.000
CF	FINE PAPER and GLASS	0,25	0,10	100	500
CG	FLOATING PAPER	0,15	0,06	60	300
CR	REWUM PAPER + GLASS	0,15	0,06	60	300
CH	HYDROVETRO PAPER + GLASS	0,15	0,06	60	300
VG	COARSE GLASS	50	20		100.000
VM	MILLED GLASS		/		
VF	FINE GLASS	4	1,6		8.000
VP	SPIRAL HEAVY GLASS	1,25	0,5		2.500
VL	LIGHT GLASS	35	14		70.000
FP	FILTERPRESSED MATERIAL	2,5	1,0	1.000	5.000
RV	VARIDUS RECOVERY	0,8	0,30	320	1.600
	TOTAL	100	40	3.900	200.000



RAW MATERIALS INVOLVED IN TESTING

Re-use of recycled products and production waste for ceramic industry



CERAMIC PITCHER: 100% RECYCLED PRE CONSUMER
As defined on section 7.8.1.1 c, UNI EN ISO 14021



Ceramic pitcher BVC – vitreous china



Ceramic pitcher BFC – Fire clay

Minerali Industriali Group has facilities to recycle the ceramic pitcher throughout Italy, Europe and Latin America.

The ceramic pitcher is regularly recovered, crushed and ground, to be reused alone or in mixture, as a component of the ceramic blends.





RAW MATERIALS INVOLVED IN TESTING

Re-use of recycled products and production waste for ceramic industry



F60PB: 100% RECYCLED PRE CONSUMER
As defined on section 7.8.1.1 c, UNI EN ISO 14021

Na/K - feldspar resulting from the recovery and treatment of the ornamental stone "wastes", obtained from the historical white granite quarries Montorfano and pink granite Baveno, in the north of Lake Maggiore. In 1992 (renovated in 2012) the Mining Concessions for the exploitation of feldspar and associated minerals are issued by the Mining District of Turin, with **mining projects aimed exclusively at the recovery of the landfills material.**

The result is an innovative project that converts something considered a mining waste into a raw material, creating a benefit to the environment avoiding the opening of new mines.





RAW MATERIALS INVOLVED IN TESTING

Re-use of recycled products and production waste for ceramic industry

**Glass cullet +
Ceramic pitcher +
F60PB**



**HARD MATERIAL COMPONENT
H.M.C.**

**Realization of a dedicated line for the integrated
treatment of glass cullet + ceramic pitcher + granit**





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Thank you

