
HOT Batch-
the Future of Batch
Preparation(?)

Zippe Industrieanlagen GmbH

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Economical and ecological framework

- Kyoto-Protocol: reduction of greenhouse-gas emissions in Germany until 2012 of 21% compared to 1990
- EU-directive: until 2020:- 20% (2050:-80%) CO2
- EU- emission trading system since 2005 (~15€/t CO2 sept.10)
- Long-term rising energy prices

⟹ General framework increases necessity of further energy savings

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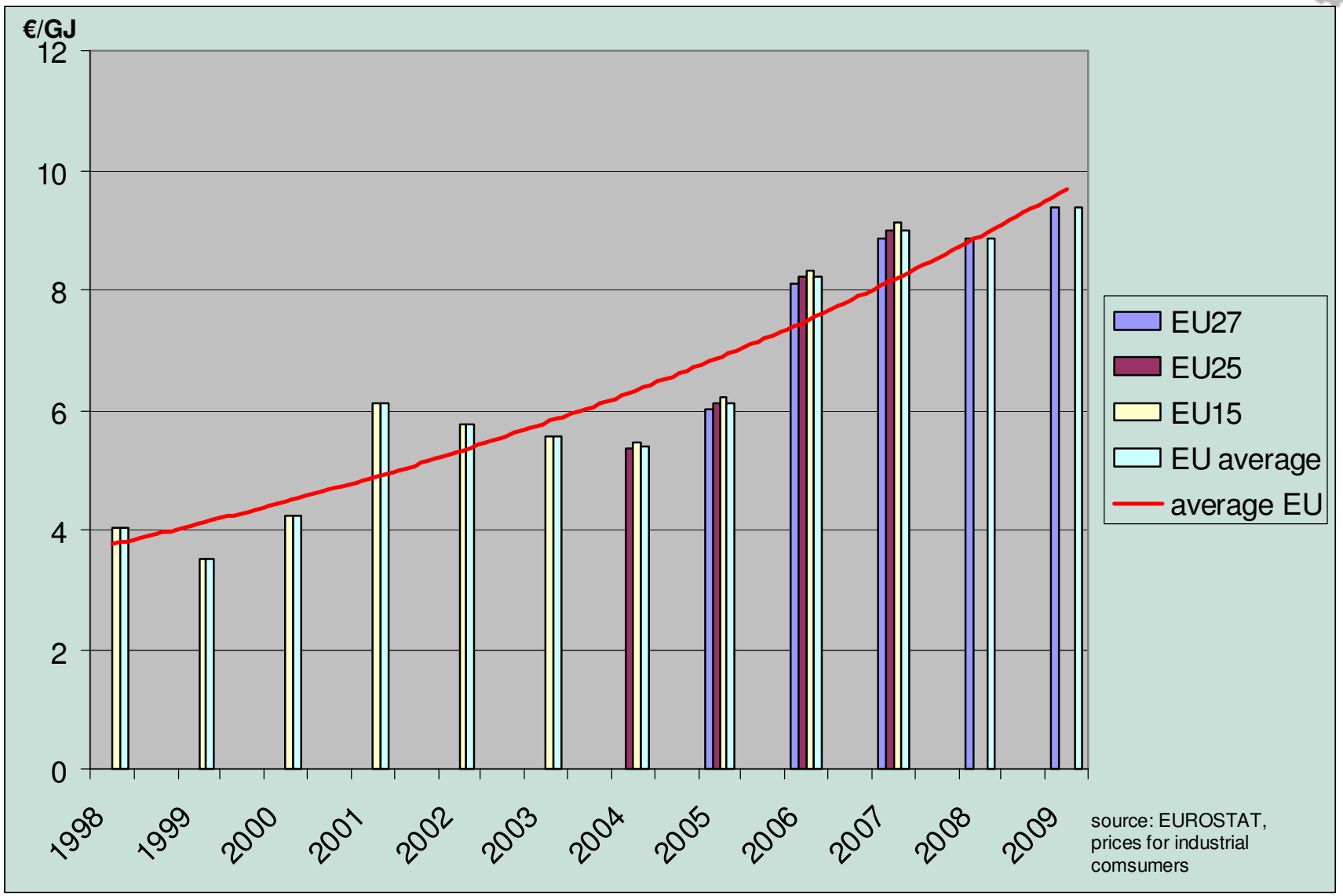
Development gas prices in the EU



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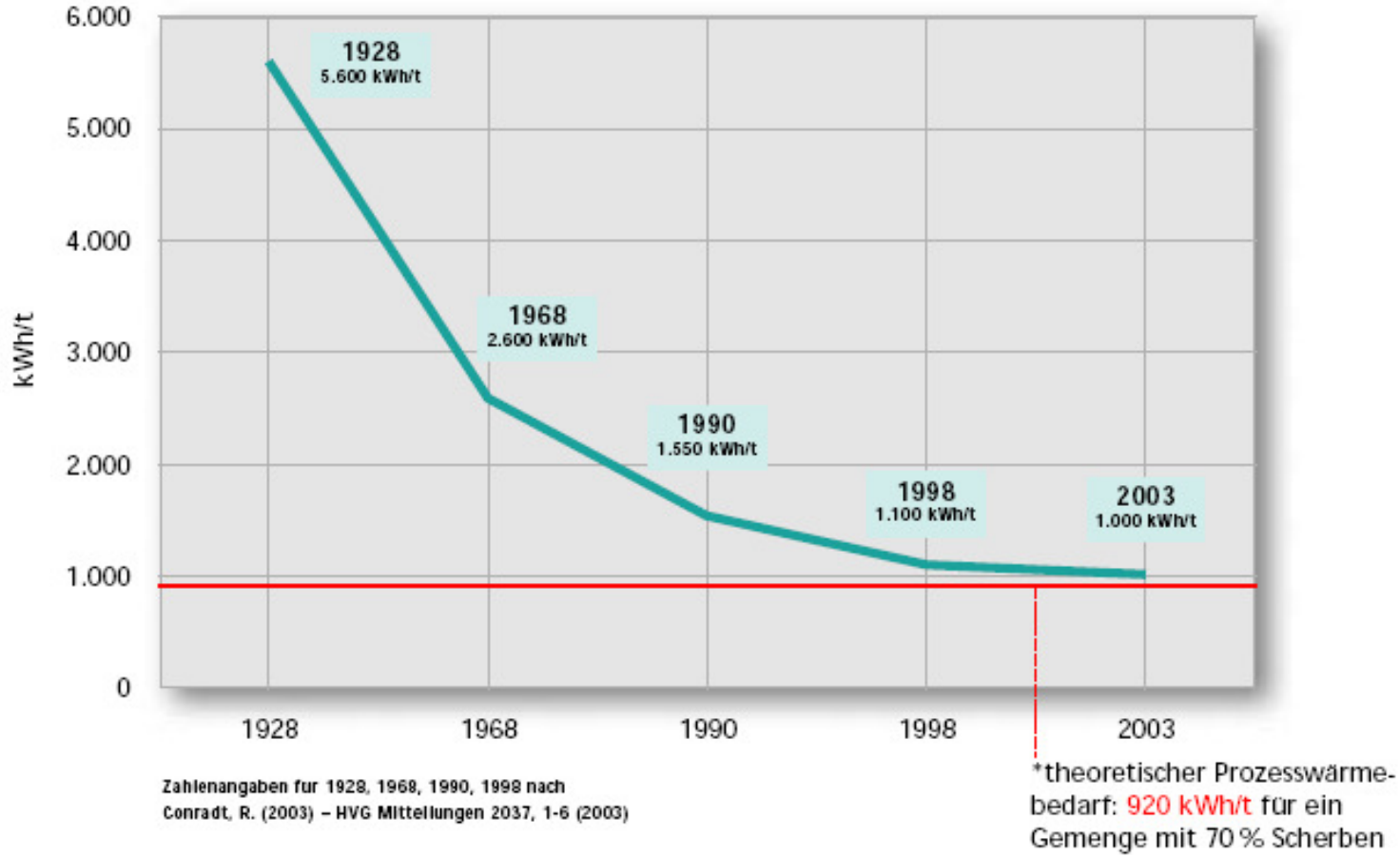
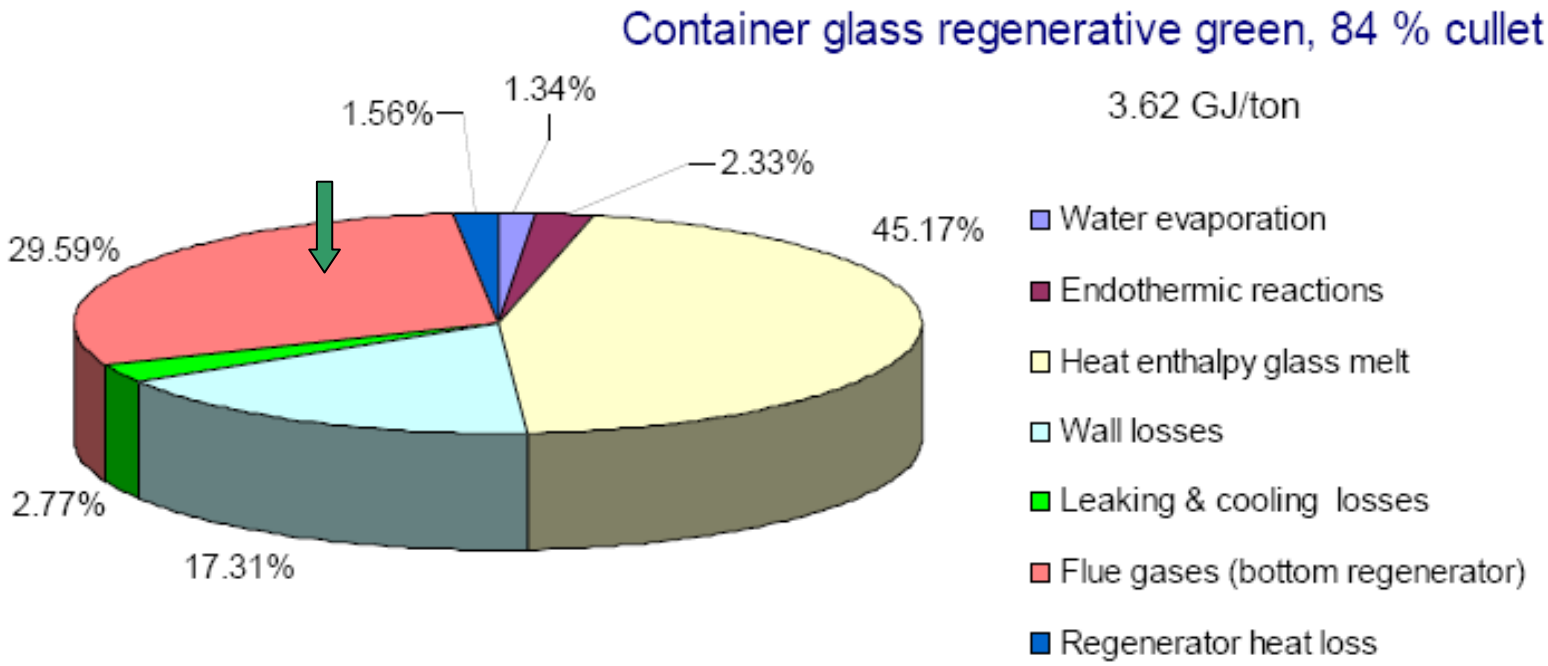
Development of specific energy consumption glass melting



Potentials (furnace design, regenerators, isolation, cullet ratio) largely depleted

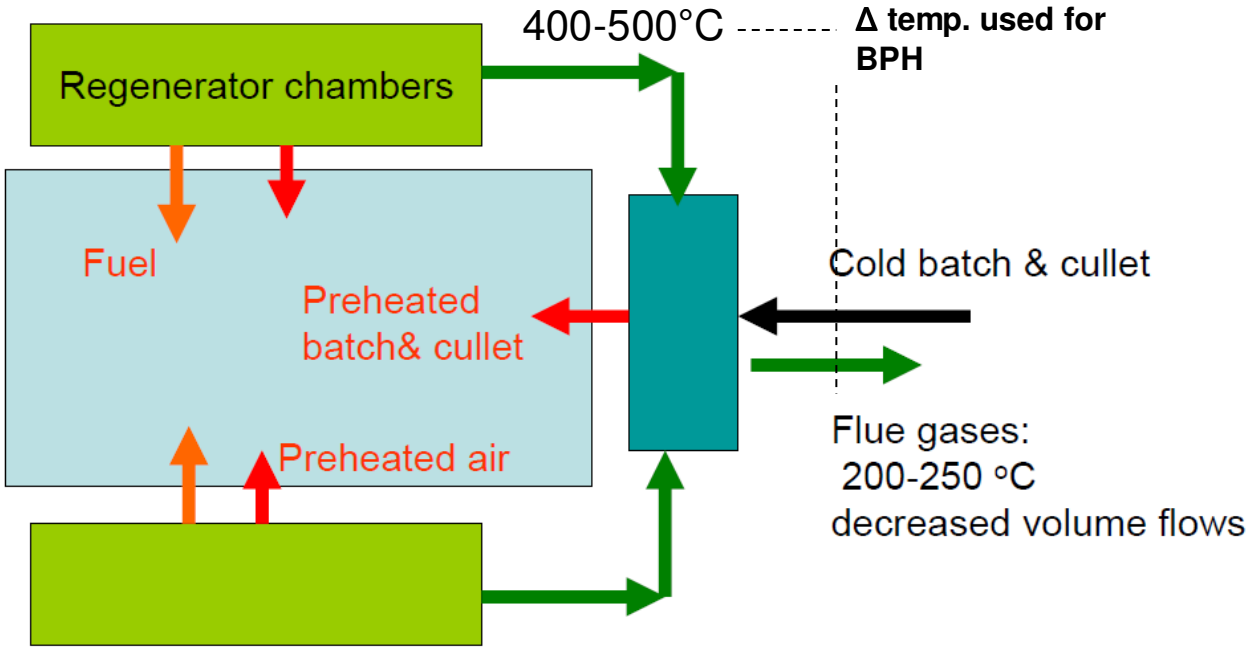
➡ **search for other starting points**

Energy Balance Container Glass Furnace



Reference taken from Prof. Ruud Beerkens, „Best Practice Study Container Glass“

Batch preheating



Batch preheating → Fuel consumption decreases → Flue gas volume decreases
less flue gas heat losses:
- lower temperature
- lower volume flow

Batch Preheating

starting-point with huge potential: appr. 30% of the melting energy are „lost through the chimney“*

Advantages

- **Savings energy (fossile, electric)**
- **Reduction fuel-related emissions (CO_2, NOx, evt. SOx)**
- **Savings of emission certificates / regulation adherence**
- **Increase of capacity**
- **min. specific energy consumption achieved by utilizing higher capacity (optimal balance)**

* Ruud Beerkens Best Practice Study 2008, Container Glass Furnace, 84% cullet, 3.62 GJ/ton; TNO. 1.October 2008 NCNG-Senter Novem-TNO workshop

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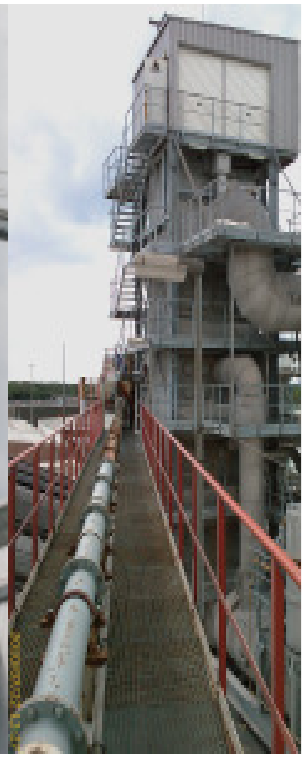
Batch Preheating Technology-Container Glass

St. Prex 300tpd

Bad Münder 320tpd



Dongen 340tpd (1996)

Dongen 360tpd (2010)

Dongen 400tpd (2011)

Typical capacities for these preheaters are up to 400tpd, cullet ratios 40-85%

REFERENCES

>> Batch and Cullet Preheater <<

Germany

DBW Deutsche Basaltsteinwolle GmbH, Bovenden (Basalt) 1984
Ardagh Glass Bad Münder (Batch and Cullet) 1992

The Netherlands

Ardagh Glass Dongen I (Batch & Cullet) 1996
Ardagh Glass Dongen II (Batch & Cullet) 2010
Ardagh Glass Dongen III (Batch & Cullet) 2011

Switzerland

Vetropack S.A., St.-Prex (Cullet) 1989

South Europe

40 ton/d ABP installation in 2010&2011

1989

St.-Prex, 300 to/d

Recu-furnace
w. 100 % Cullet

1992

Bad Münder, 320 to/d (Cullet/Batch)

U-flame furnace, 65-85 % cullet

1996

Dongen, 360 t/d (cullet/batch)

U-flame furnace

65-85 % Cullet

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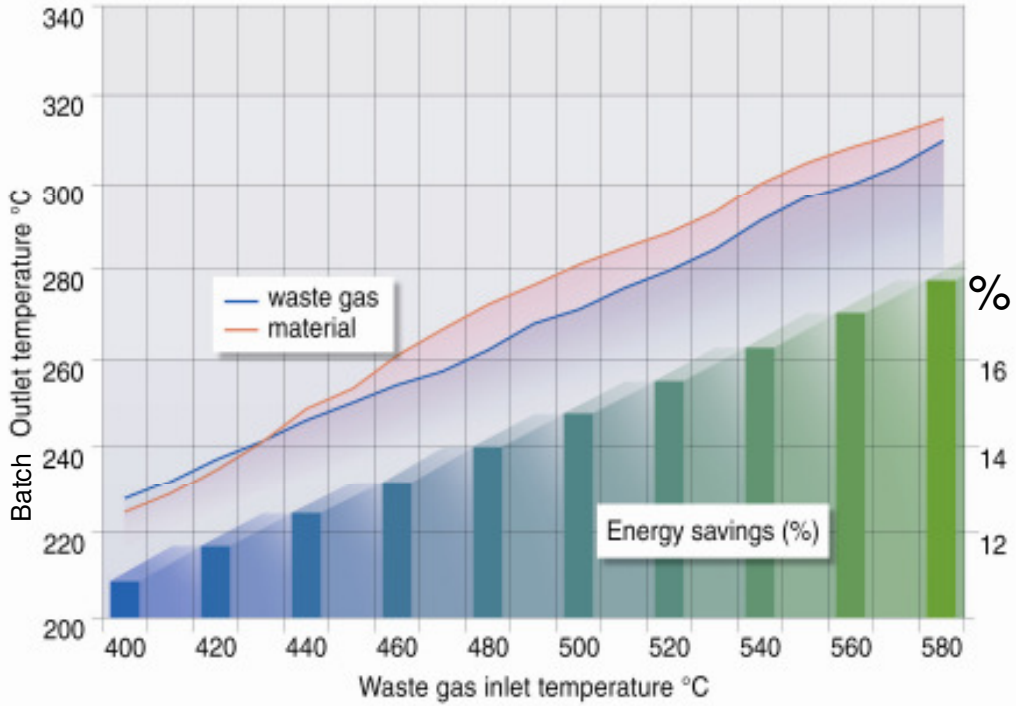
Energy savings

assumption.: U-flame furnace 300to/d, 80% cullet;

480 C° waste gas entry



Waste gas inlet:	480 °C
Waste gas outlet:	270 °C
Batch input:	15 °C
Batch outlet:	280 °C
Batch throughput:	15.5 to/h
Cullet ratio:	80 %
Saving of natural gas:	7.8 %
Saving of electrical energy:	62.2 %
Total energy savings:	14 %
Saving of energy costs:	27 %
Saving of natural gas:	4.390.000 m³/year

High thermal efficiency of running systems

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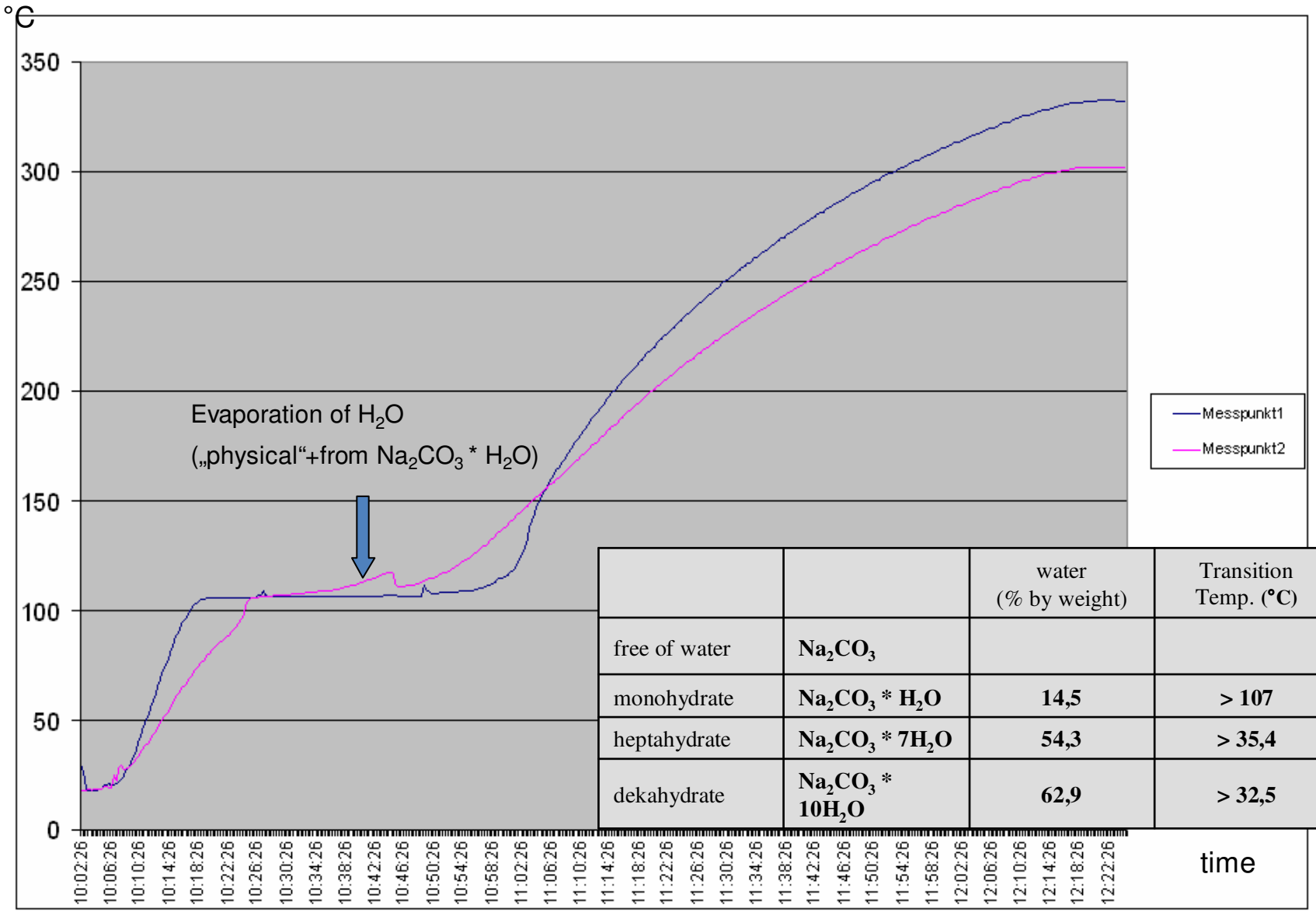
Batch Behavior under effect of heat



		water (% by weight)	Transition Temp. (°C)
free of water	Na_2CO_3		
monohydrate	$Na_2CO_3 * H_2O$	**14,5**	**> 107**
heptahydrate	$Na_2CO_3 * 7H_2O$	**54,3**	**> 35,4**
dekahydrate	$Na_2CO_3 * 10H_2O$	**62,9**	**> 32,5**

Soda builds up hydrate phases

also to consider…

Dry cullet preferred by preheater

Preheating system installed in 2010

- installed 2010
- retrofit
- direct system
- furnace type: regenerative U-flame, 1 doghouse
- throughput: appr. 350 tons
- flue gas inlet temp.: ~450°C
- flue gas outlet temp.: ~220-230°C
- weight ~320mt incl. batch & steelwork
- cullet percentage: 75-90%

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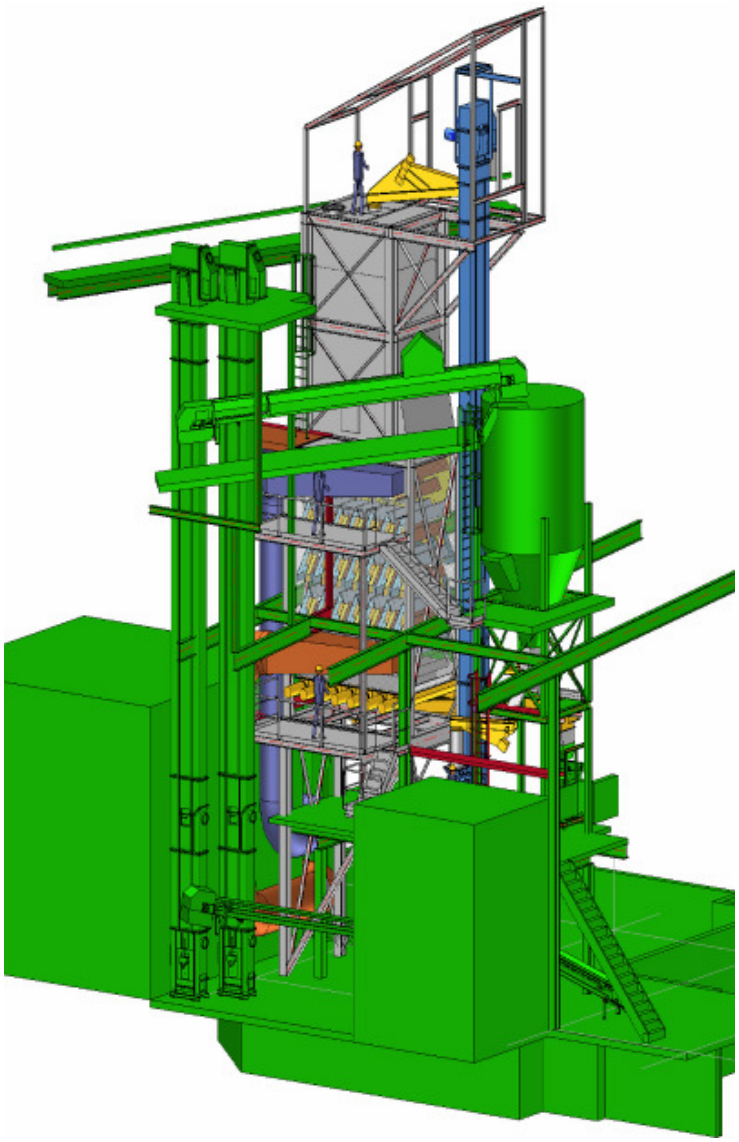
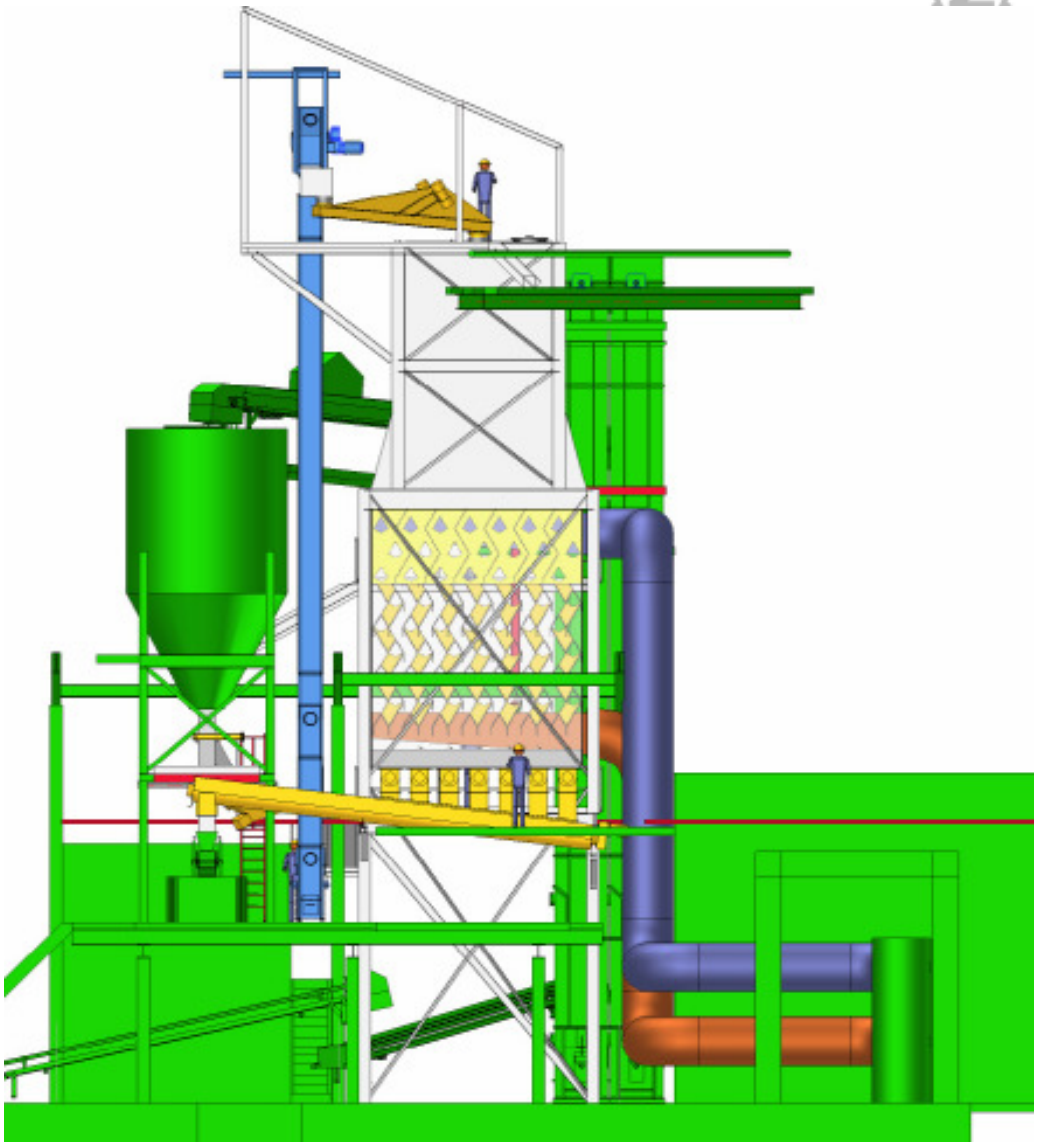
Preheating system installed in 2010





Typical Layout

Preheating system installed in 2011

- Installation 2011
- Furnace pull 400 t/day
- Retrofit (direct System)
- 4x3x19m
- End fired furnace (incl. Electric boosting)
- 85% cullet
- Flue gas inlet temp. 370°C
- Flue gas outlet temp. 210°C

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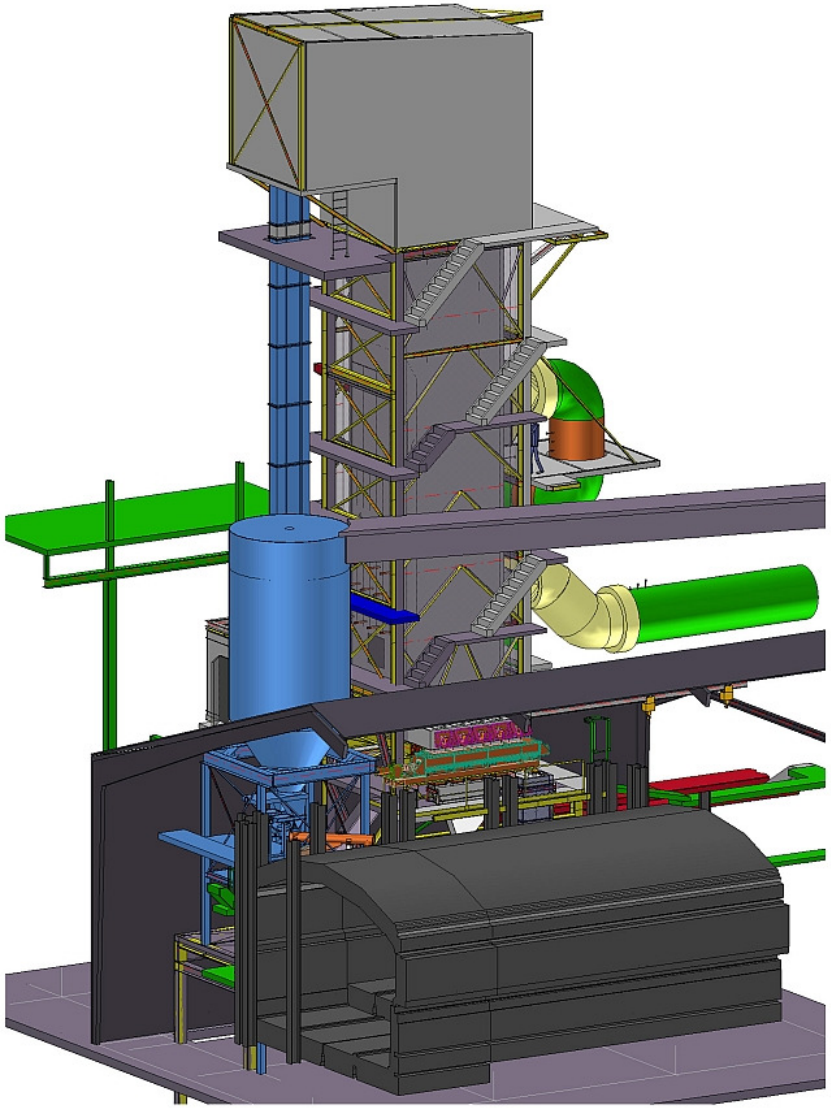
Preheating system installed in 2011



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Resumé

- Batch Preheating represents a remarkable energy-, CO_2- and cost saving-potential
- High gap between exhaust gas temperature and needed temperature for flue gas treatment beneficial for BPH
- Typical capacities are between 250 and 400 tons/day, cullet ratios between 40 and 80%
- Installations so far at locations with high energy prices
- Installations so far only in container glass and at regen./recup. furnaces
- Filtering system needed
- For many applications, especially in container glass, the technology is reliable and economical

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