CelSian

EBM – engineering and operation tool to optimize furnace operation

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We are CelSian

- We are an engineering consultancy based in The Netherlands and USA
- We are fast, experienced & highly educated
- We are dedicated to glass and support all major manufacturers and suppliers

Four main propositions:

On-site Support

Process Optimization

Training Academy

R&D Cooperation

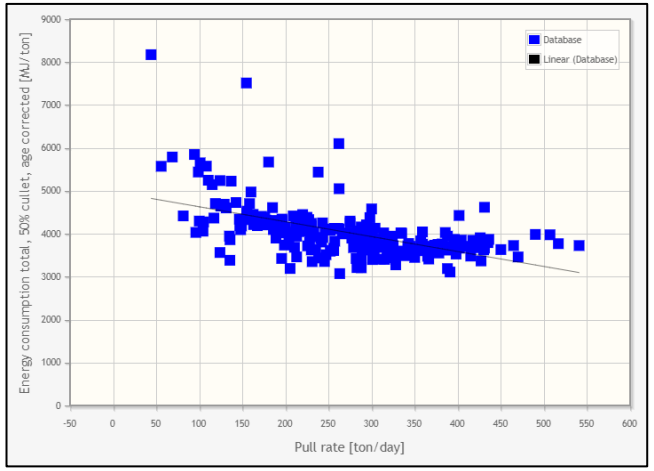
CelSian


RECORD
HIGH!

Furnace energy and CO_2 optimization

Stepwise approach:

- Evaluate furnaces in the energy benchmark database
- Full on-site energy and CO_2 audit
- Generation of energy balance, visualizing all energy flows
- **Energy Balance Modeling (EBM): determine best solutions**
- Detailed simulation on:
  - Energy use
  - Product quality
  - Furnace lifetime
  - Emissions



EBM is fast and easy to use

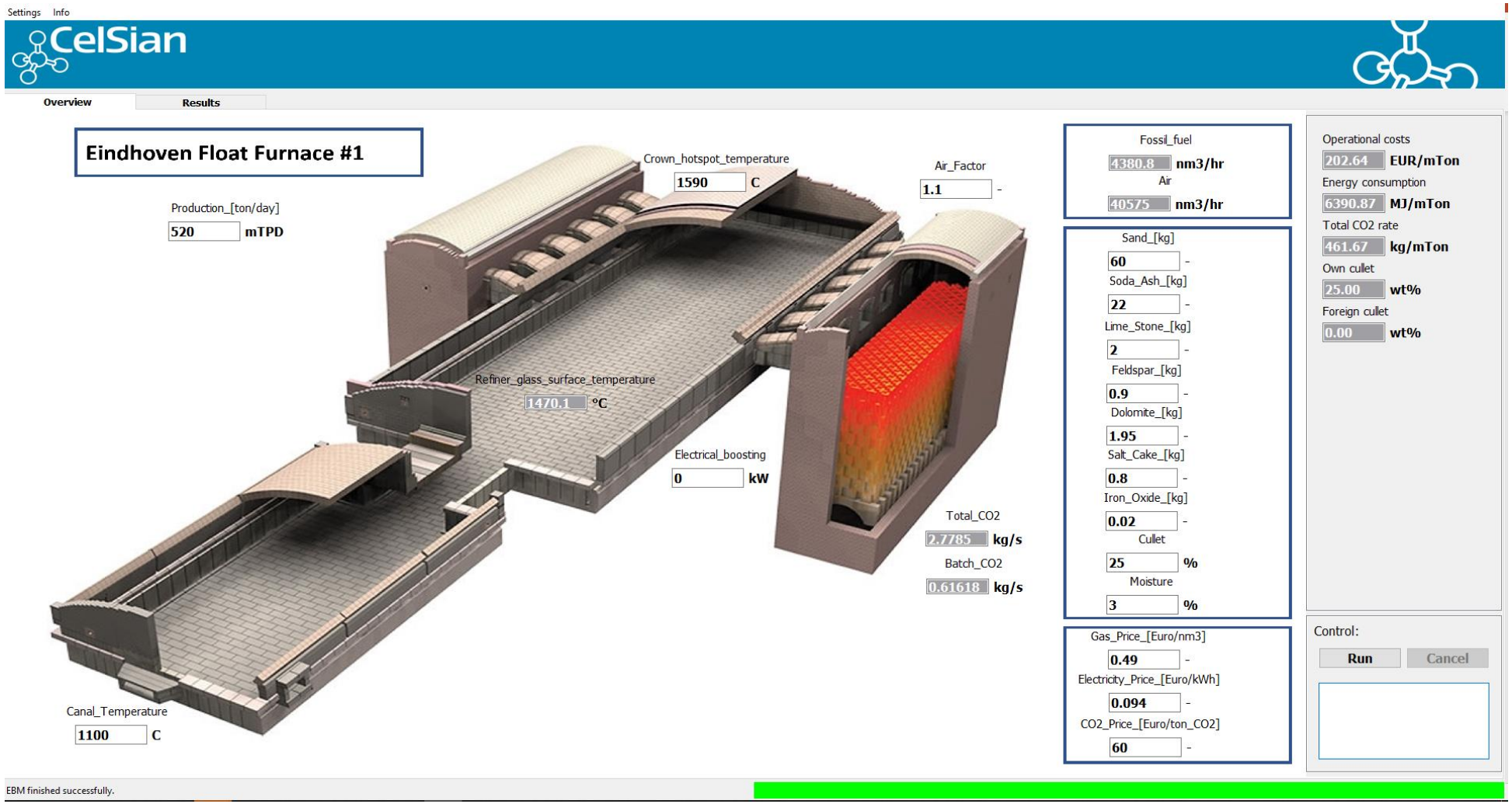
Route:

- Evaluate current energy usage (**digital twin**)
- Simulate the impact of different scenarios on energy/CO_2 use
- Identify key opportunities to reduce energy/CO_2 use
- Suggest process/design changes to optimize energy consumption
- Suggest preventive maintenance (air leakage, sealing)

Use as a soft sensor to identify strong and weak points

Use data as input for ROI calculations and justification for investment

Operation view: example for float glass



- One screen
- Fast simulations (~1 minute)
- Easy to understand
- Customer specific background
- Pre-selected parameters
- Changeable output units

Simulation results

Base data:

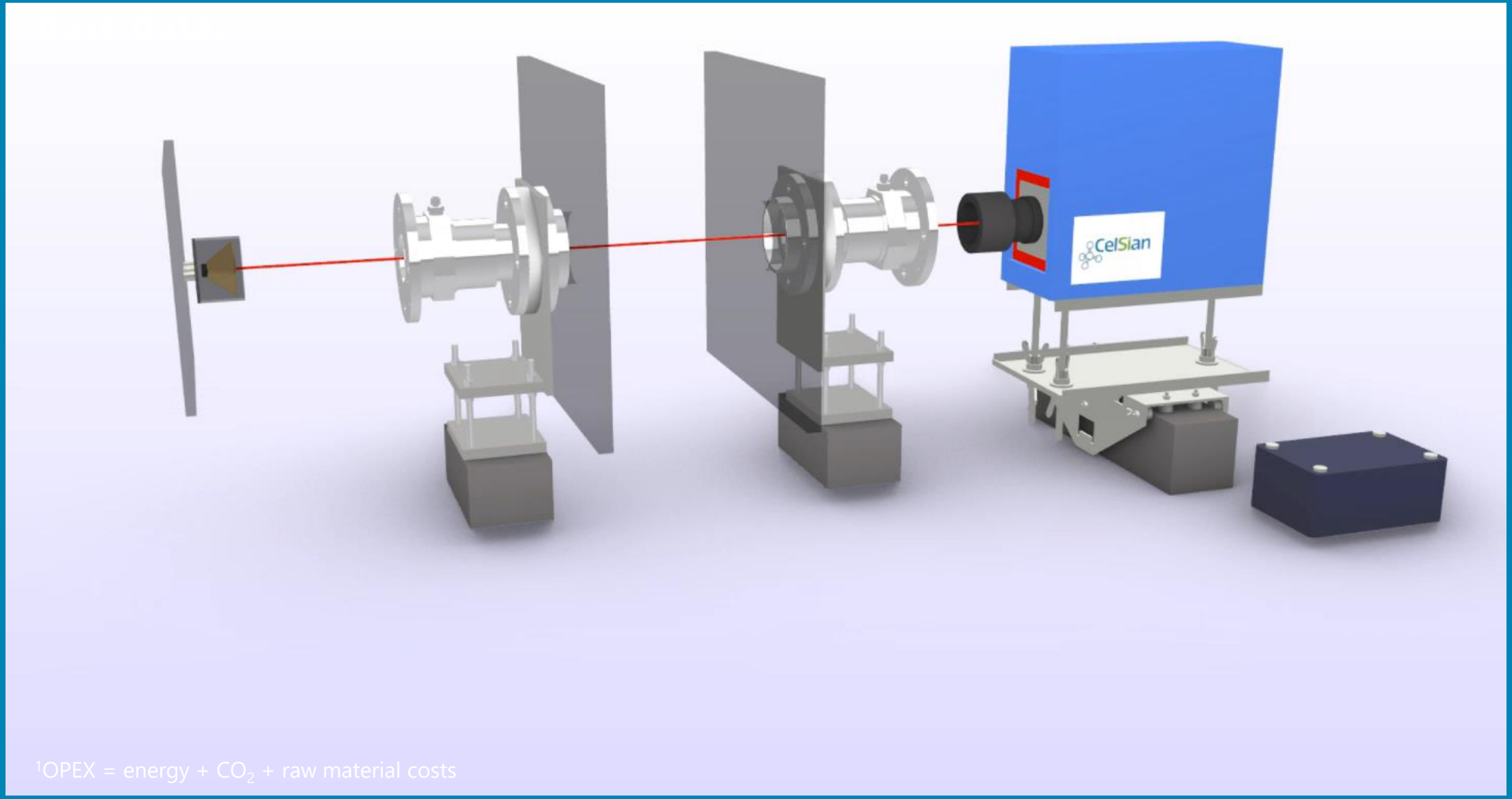
	Pull [TPD]	T_{crown} [°C]	Air Factor [-]	E_{boost} [kW]	Cullet [%]	Moisture [%]	Fe_2O_3 [wt-ppm]	$T_{surf\text{-}refiner}$ [°C]	E_{tot} [MW]
Base	520	1590	1.10	0	15	3	200	1471	39.3

	variation	Energy [MJ/ton]	OPEX[1] savings [kEUR/yr]	CO_2 savings [ton/yr]	$\Delta T_{surf\text{-}refiner}$ [°C]	E_{tot} [%]
Base	-	6529	-	-	-	100.0
Case 1	Air factor: 1.10 → 1.05	6427	364	1084	-0.1	98.4
Case 2a	E_{boost}: 0 → 2000 kW	6499	- 30	1380	-0.8	99.5
Case 2b	E_{boost}: 0 → 2000 kW T_{crown}: 1590 → 1585 °C		343	2490	-1.2	97.9
Case 3	Cullet: 15 → 25%	6391	1357[2]	4443	-0.9	97.9
Case 4	Moisture: 3 → 2%	6453	239	750	-0.5	98.8
Case 5	Fe_2O_3: 200 → 100 wt-ppm	6562	- 95	-353	-2.4	100.5
Case 6	Fe_2O_3: 200 → 500 wt-ppm	6445	235	903	+6.7	98.7

516 M KRW

[1]OPEX = energy + CO_2 + raw material costs; [2]assuming a cullet price of EUR 80/ton

CO – O_2 sensor



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Characteristics EBM

Process description:

- Shows the impact of a process change on KPI's defined by the customer
- Great insight into the furnace operation and impact on the cost of production
- Shows decarbonization options and reduction of production cost
- Fast assessment of the impact of energy reduction investments
- One 'language' across multiple furnaces

Software:

- Runs without a license on any modern laptop/computer
- The EBM executable needs to be validated only once by IT
- The EBM executable can read multiple pre-defined operator cases
- Very easy to use, limited (online) training
- Only a little calculation time (~1 minute)

Want to know more?

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