





SISECAM



LIFE16 CCM/BG/000059

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Şişecam Corporate Overview

- **\$2.6 BN** in Sales (50% international)
- Operations in **13 Countries**
- 21,000 Employees
- Sales to **150** Countries
- 28% of shares listed at BIST (SISE.IS), 72% by İşbank
- 4 Production Groups (11,500 TPD glass) - Flat / Container / Tableware / Chemicals
- Consumes 3.85%* of Turkey's NG and 0.7%* of Turkey's electricity
- < 1% of sales to R&D spending



Accredited Mobile Emission Laboratory TS EN ISO/IEC 17025:2000

*including plants outside Turkey



GLOBAL RANKING by Production '15 Europe World Flat 5 2 Container Δ Δ **Tableware** 3 2 **Chemicals** 10 Δ



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Şişecam Waste Heat Recovery Portfolio

- <u>Air-fuel</u>

- Organic Rankine Cycle (9 MW_{e,net})
- Steam Turbine (8 $MW_{e,net}$)
- Absorption Chillers (5 $MW_{th,cool}$)
- Waste Heat Boilers (18 MW_{th,heat})
 - Hot Water
 - Steam
- <u>Oxy-fuel</u>
 - Preheated Oxy-Fuel (1 MW_{th,preheat})

Total WHR less than 4% of global Şişecam energy consumption* and more than about 20% of global Şişecam waste heat*

	MW	kWh/ton glass*	% of Total
TOTAL thermal	24	51	59%
TOTAL electric, net	17	36	41%







The world leader in gases, technologies and services for Industry and Health



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Reducing energy prices*

Increasingly stringent environmental regulations

- EU BREF BAT: 0.5-0.8 kg/ton for oxy-fuel container glass furnaces

Probability of getting external funding for demonstration

- World first

Project Partners	Date	Project	Grant (Mio EUR)
Paşabahçe & Air Liquide	LIFE 2012	Eco-HeatOx	1,7	* 11ka *.
Paşabahçe & Air Liquide	LIFE 2016	CleanOx	1,24	* 400 *

EU's financial instrument supporting environmental and nature conservation projects.

Industrial gas supply synergy

- 2 Float- and 2 Tableware lines at same site in Bulgaria
- N₂ for tin bath, O₂ for melting and polishing (cryogenic)



*prior to 2012 (investment decision)



Technology

<u>Waste heat recovery from oxy-fuel tableware furnace flue gas via</u> <u>reactant (O₂ & NG) prehating</u>

- Reactant preheating temperatures (up to): 800°C O2, 500 °C NG

WORLD FIRST at TABLEWARE

WORLD FIRST!!!

CleanOx





Eco-HeatOx



Projects

	Project Name	1
LIFE Eco-HeatOx		LIFE CleanOx
2012-2016		2017-2021
	Project Coordinat	tor
PB Bulgaria		PB Bulgaria
	Project Partner	
Air Liquide		Air Liquide
7	Total Project Budg	get
4.3 Million EUR		2.8 Million EUR
	Grant	
1.7 Million EUR		1.24 Million EUR
	🌗 Paşabahçe	
>		



LIFE+ Info Board, Targovishte City Center







Project Objectives

LIFE	LIFE
Eco-HeatOx	CleanOx
9%	18%
23%	30%
12%	15%
90%	90%
	LIFE Eco-HeatOx 9% 23% 12% 90%



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Before / After Installation







Next Steps

- Signing partnership agreement → February
- Prototype installation & start-up → week of February 19
- First external monitoring visit → last week of April





Conclusion

World's first preheated oxy-fuel waste heat recovery demonstration

- up to 18% fuel savings targeted (~\$500-1000 K/yr depending on NG price)
- More than 90% NOx reduction possible (demonstrated by Ec0-HeatOx)
- Added value of gas- & glassmaker working together

Şişecam positioning in advance of increasingly stringent environmental regulations

- Potential NOx regulation change in Turkey in 2020+
- Şişecam's unique multi-segment production structure at same site

Şişecam continuing to invest in innovative technologies that bring value and reduce environmental footprint of glass manufacturing

- Leveraging external partnerships and in-house R&D capabilities
- Plans underway to further improve the performance and economic viability of the technology through LIFE CleanOx project





Thank you for your attention

Paşabahçe Bulgaria and Air Liquide thank EC LIFE+ program for funding this project.

For any questions, please contact <u>tgoruney@sisecam.com</u>

Visit us @ <u>www.ecoheatox.com</u> <u>www.pasabahce.com</u> <u>www.sisecam.com</u>



