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## Eastern Europe and Central Asian Countries on the Road to Climate and Ozone friendly RAC and Foam Sectors

***BELARUS – UNDP / GEF project "Initial Implementation of Accelerated HCFC Phase Out in the CEIT Region"***

***Demonstration project "Replacement of freon system in air conditioning for absorption unit"***

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- Absorption chiller, installed in company Santa Bremor, Brest , Belarus in 2016
- The company has significant needs for air conditioning of industrial premises, which requires refrigerating machines
- Previously, for these purposes, air conditioning plants with freon compressors were used.
- Consumption of freons in the company was up to 400 kg per year



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- ▶ An absorption chiller is a refrigerator that uses a heat source (e.g., solar energy, waste heat from factories, or district heating systems) to provide the energy needed to drive the cooling process.
- ▶ Absorbent bromide-lithium refrigerating machine is an industrial refrigeration system designed to select and remove excess heat and maintain the specified optimal temperature and thermal conditions of technological processes associated with increased thermal loads.

Absorbent - lithium bromide (LiBr)

The refrigerant - water



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## Disposal of heat at power supply complex №1 (absorption chiller)

- ▶ Installation of absorption chiller was also connected with economic benefits. In summer the current power supply complex is characterized by producing surplus heat. The company have a great need for cold (approximately 1,2 MW) to condition the production workshops in the warm season. Use of the absorption chiller allows disposing the produced surplus heat - converting waste-heat into cold. The produced cold water is used in the conditioning systems of two production workshops (the total area - 9200 m<sup>2</sup>) manufacturing delicacy salmon products and ice cream. Use of absorption cooling technology provides energy savings of 1 148 000kW\*h per year compared with the use of compressor plant. This amount of energy is sufficient to supply electricity to 640 private houses. Because of energy-saving the company reduces its CO<sub>2</sub> emissions to the atmosphere which in turn helps improve the environment.
- ▶ For two seasons (2016-2017) of absorption chiller operation Santa Bremor has managed to decrease the quantity of its CO<sub>2</sub> emissions to the environment by more than 707 tons due to decrease of the electrical power consumption in the amount of 1 750 000 kW\*h.

## Comparative performance of cooling systems



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	Absorption chiller	Installations with freon compressors
Refrigerant	Water	HCFC-22
<b>Operational costs</b>		
Electric capacity of the equipment, kW	20,70	447,7
Equipment operation with nominal capacity for the period from 15.04 to 15.09(153*16),hours	2 448	
Rated energy consumption (from 15.04 to 15.09), kW*h	165 000	1 095 970
Cost of electrical power, €/kW*h, at the price of power supplying institutions	0,0872	
Cost of electrical power consumed for conditioning, €	14 388	95 569
Saving due to the reduction of power consumption for conditioning, €	81 181	

## Absorption chillers: "for" and "against"

### Advantages:

- ▶ Minimal energy consumption, only for pumps and automation (absorption chiller with a cooling capacity of 1 MW consumes 4.9 kW of electricity, and a freon chiller - 250-300 kW)
- ▶ The minimum noise level
- ▶ Environmental safety. The coolant is ordinary water
- ▶ Utilize the heat energy of the discharged hot water, steam, flue gases or production processes
- ▶ Long service life (more than 20 years)
- ▶ Full automation. Fire and explosion safety

### Disadvantages:

- ▶ The higher price of equipment, approximately 2 times higher than the price of a conventional refrigerator
- ▶ Relatively low energy efficiency
- ▶ Significantly more weight than conventional refrigerator
- ▶ The need to use open coolers is a cooling tower, which increases the water consumption of the system



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## Results of the demonstration project

### "Replacement of freon system in air conditioning for absorption unit"

- ▶ The introduction of such innovative technologies at enterprises is an important step towards the development of environmentally friendly and energy-efficient equipment.
- ▶ Cooperation with the United Nations Development Program allowed the company Santa Bremor to create a demonstration platform for the promotion of such technologies in Belarus.
- ▶ To date, more than 40 absorption machines have been installed at various sites in the country, mainly industrial enterprises
- ▶ There is also an experience in the installation of absorption heat pumps
- ▶ The company Santa Bremor acquired the second similar absorption machine for air conditioning of other industrial premises

# Thank you for your attention!



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