Sorption Friends III

Taormina – 02.05.2023

HEIG-VD/IGT-LESBAT activities

Xavier Jobard & Alexis Duret

xavier.jobard@heig-vd.ch
+41 24 557 28 17
www.lesbat.ch
https://heig-vd.ch/rad/instituts/igt

alexis.duret@heig-vd.ch
+41 24 557 23 26

School of management and Engineering Vaud

3 Sites:

Yverdon-les-Bains (Cheseaux)

Yverdon-les-Bains (Y-Parc)

Yverdon-les-Bains (St-Roch)

13 Research Institutes

17 Millions (CHF) on R&D projects

60 Continuing education courses

67 Millions (CHF) of budget

700 Staff members (180 Professors or equivalent)

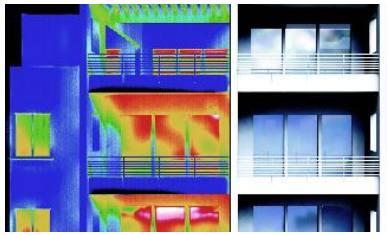
2’000 Students

Lab. of Solar Energetics and Building Physics

Member of the institute for thermal energy

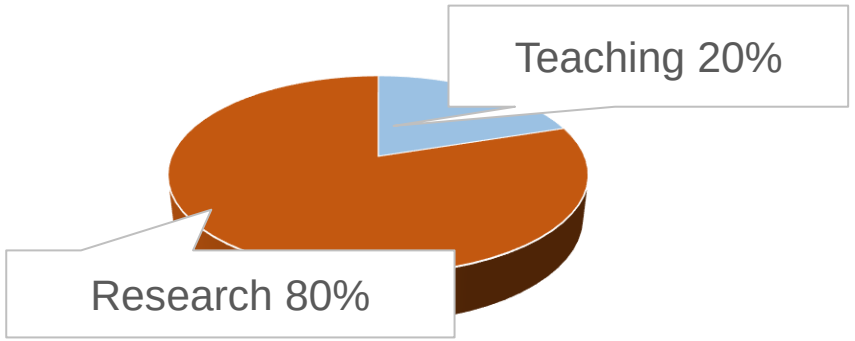






Key figures:

- 15 staff members
- More than 20 years of expertise
- Initial training: 700 hr/an (BSc, MSc)
- Continuing education: 180 hr/an
- Annual R&D turnover: ~1’000’000.- CHF



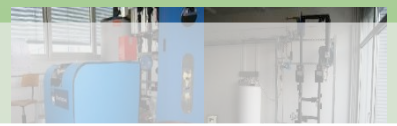
Lab. of Solar Energetics and Building Physics

Solar Thermal and storage

- Solar Heating and Cooling for Buildings
- Solar Heat in Industrial Processes and DH
- Thermal Energy Storage

Building energy Systems

- sorption technologies for cooling/heating
- Geothermal systems
- Multi-energy systems for neighborhoods



Buildings Physics

- Reuse of buildings construction materials
- Retrofit of historical or not buildings
- Building energy simulation & modelling

TRANSVERSAL COMPETENCES

Life Cycle Assessment (Simapro & Brightway)

Modeling and Dynamic Simulation (TRNSYS – IDA-ICE)

On-going Research projects

Optimisation of building energy systems for biuldings and neighbourhoods

OPTIM-EASE

SolHood

Dynamic LCA of electricity and other energy vectors (biogaz, etc.)

S-DSM

ACV énergies

Energy retrofit of buildings

OptiBat

TypoRENO

TDROP

Historeno

Energy efficiency and renewable heat for district heating and cooling networks

CharacSorb

DeCarbCH

SOLARCAD II

OPTICADSOL

Re-use of construction's materials in buildings

Reuse-LCA

MAT-Loop

REMCO

Lab. of Solar Energetics and Building Physics

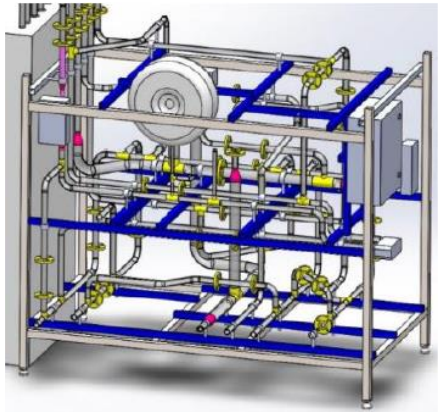
Experimental equipment

- 3 hydraulics loops
- Emulation of maximum 2 heat sources
- Emulation of 1 heat consumer and 1 cold consumer at the same time
- Increased stability with small buffer tanks

Test bench in cooling configuration			
Heat source	Heating rate	20	kW
	Storage capacity	300	l
	Volume flow rate	3000	l/h
Intermediate sink	Cooling rate	24	kW
	Volume flow rate	6000	l/h
Cold source	Heating rate	13	kW
	Volume flow rate	3000	l/h

Emulation of the DHN (33kW)

Substation prototype



Emulation of space heating loop (30kW)

HEIG VD | IGT Institut de Génie thermique

20 years of expertise in sorption technologies

LESBAT

Example of past projects :

Solar Fridge (2001-2010)

- Development of a autonomous solar fridge
- Deployment of a working prototype in western Africa

ceas Centre Ecologique Albert Schweitzer
Ecouter - Innover - Partager
SOLAREF www.solaref.com

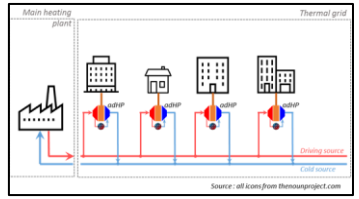
Monitoring of a solar cooling plant in Geneva (2008-2010)

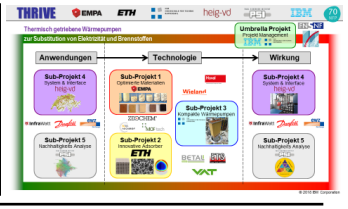
- Performance validation of the system (absorption chiller)
- Formulation of optimization measures

Project THRIVE (2014-2018)

- Valorization of waste heat with adsorption heat pumps
- Experimental characterization of adsorption heat pumps and simulations

70 NRP Energy Turnaround National Research Programme





PACs-CAD project (2017-2021)

- Deployment potential of sorption heat pumps in district heating
- Development and validation of a TRNSYS model of a substation integrating a sorption heat pump.

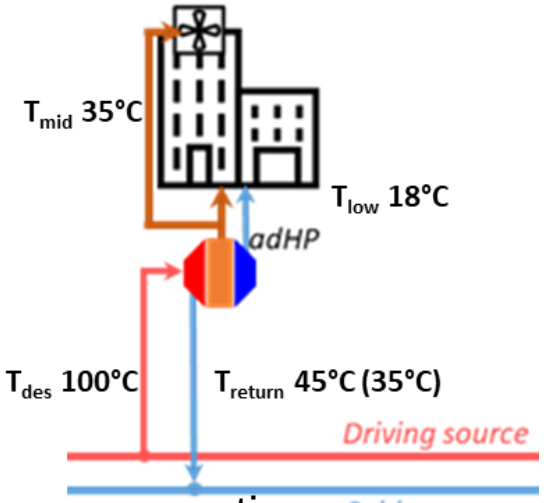
Interreg France - Suisse

Hes·so Haute Ecole Spécialisée de Suisse occidentale

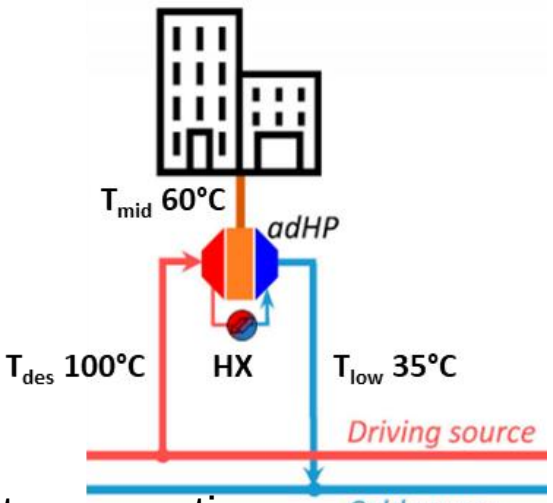
On-going project : CharacSorb

District heating networks suffers from :

- Low efficiency caused by high operating temperatures, especially high return temperatures that lead to extra cost
- Low utilization of the DHN in summertime (only domestic hot water is used in the buildings) which leads to inefficient operation conditions and long amortization time.

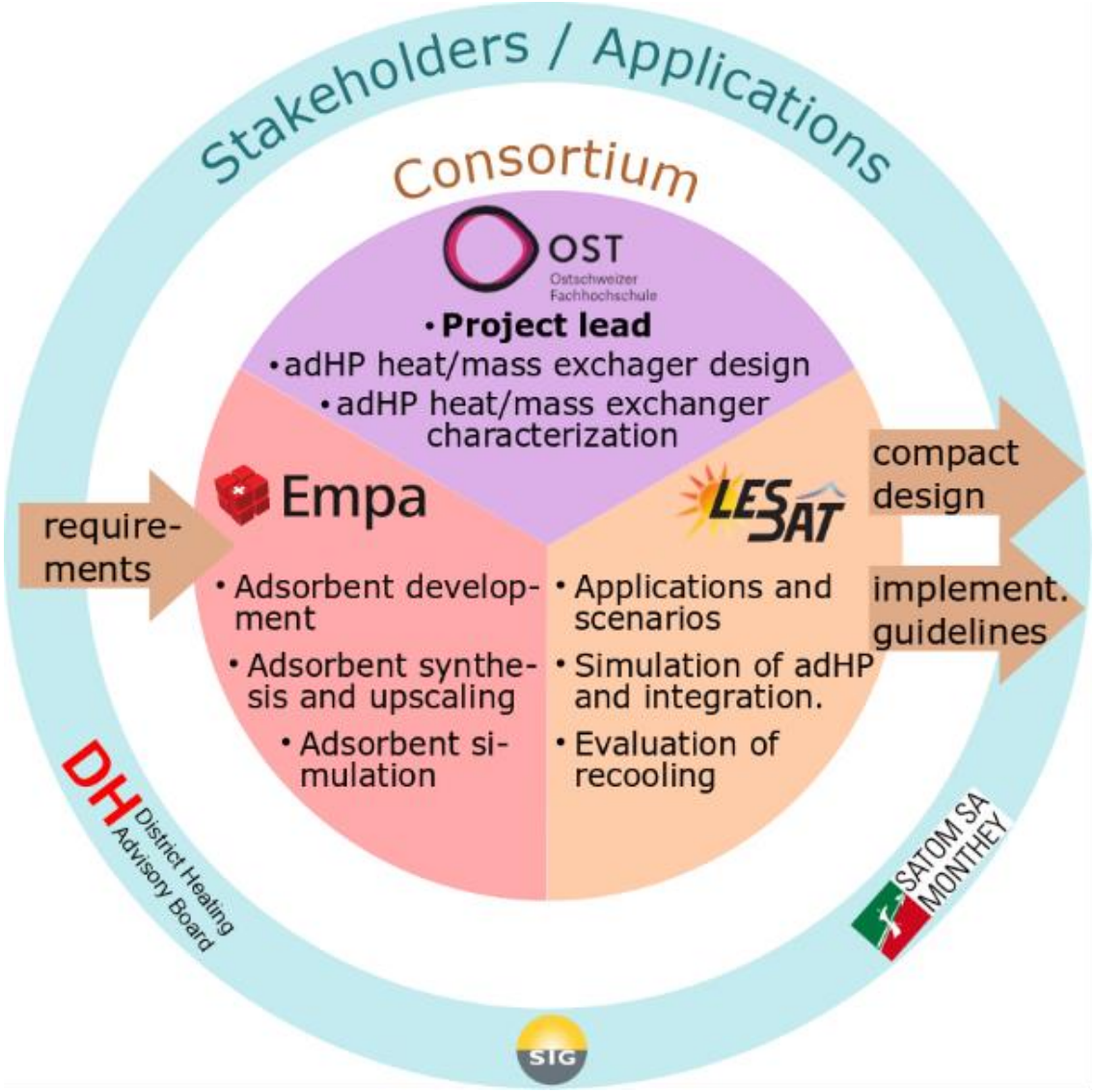


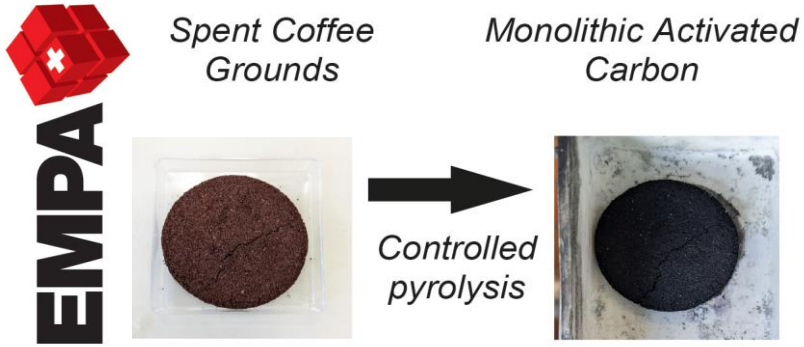
Summer operation



Winter operation

On-going project : CharacSorb





List of LESBAT main contributions:

1. **Interface** between industry & research
2. Provide **inputs/constraints** to develop new sorbent materials (EMPA) & sorption bed (OST-SPF)
3. Calibrate a **numerical model** against experimental data
4. **Performances evaluation** of new sorbents and sorption bed configuration for new applications
5. **Formulation of guidelines** for implementing sorption technologies in DH

HEIG VD | IGT
Institut de Génie thermique

LESBAT interest for AdHP

Skills & assets:

1. Operationnal test bench for various sorption heat pump and chiller applications
2. Silica gel adsoprtion chiller : Fahrenheit ecoo 10 ~13 kW @ 85°C/27°C/15°C
3. Modular district heating substation intergrating an adHPs
4. Mainteners of TRNSYS Type 860*
   - model is validated
   - calibrated with a commercial heat pump

*Dalibard, A., 2017. Advanced control strategies of solar driven adsorption chillers, 1. Auflage. ed, Forschungsberichte des Deutschen Kälte- und Klimatechnischen Vereins e.V. DKV e.V., Deutscher Kälte- und Klimatechnischer Verein, Hannover.

LESBAT interest for AdHP

Interests of LESBAT in future sorption HP development:

1. Application for renewable cooling
   → a lot of interest from DH operators (waste incineration, …)
   → small system are not competitive
2. Strategies to avoid high investment in recooler (DHW preheating, heat source for HP..!!??)
3. Heat adapter concept for DH extension (interconnexion between a high temperature grid and low temperature grid)
4. Heat transformers for medium/low temperature waste heat valorization:
   → Valorization of air and lake water heat in combination with electric HP

HE IG VD | IGT

Institut de Génie thermique

Merci pour votre attention…

… des questions!!

Remerciements à l'OFEN pour le soutien financier du projet CharcoSorb