



Simplified SHC predesign tool



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Project synopsis

Projet ANR HABISOL 2009 – Labellisation: DERBI, CAP ENERGIE

Start: january 2010, duration: 3 years

Budget total: 1 207 420 € Aide allouée: 560 122 €

Partners:

**TECSOL, PIMENT, CEA-INES, GDF SUEZ R&D, EDF R&D,
ENERPLAN**

Focus: existing and new buildings, all types – solar heating and cooling application with ab/adsorption

Aim: Systems reliability ; guarantee of performances

Public: scientific community, solar energy professional network, investors, etc....

1. General presentation of the tool (1/2)

Overview :

- solar **cooling, heating** and **DHW** installation
- solar combi+ and large scale system
- ab/adsorption systems with FPC/ETC collectors

Main goal of the tool :

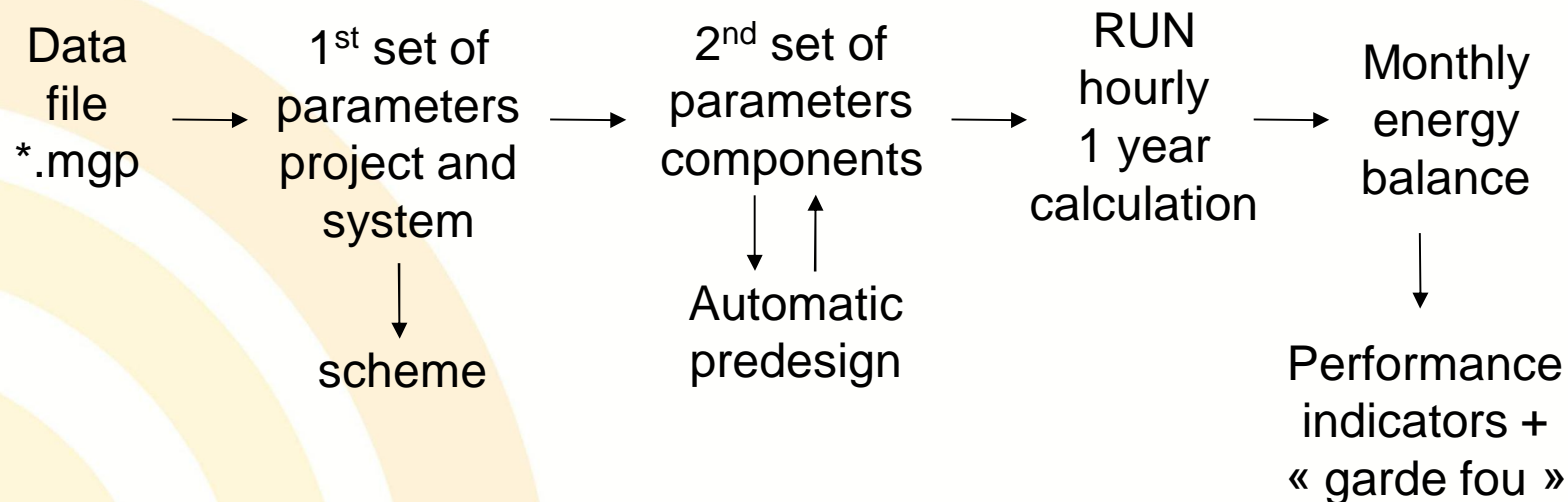
- design main components and predict system performances to carry on feasibility studies
- tool for designer and planner ==> no time consuming, simple, manual optimisation
- increase reliability ==> validation by comparison with existing installation monitoring data and with other calculation tool, online help, put boundaries, work on outputs
- compare predicted performances with monitored ones

1. General presentation of the tool (2/2)

Status :

- Developed by **CEA-INES** and **TECSOL**
- Excel beta version nearly ready, validation ongoing (RAFSOL, SOLERA, SOLACLIM, SONNENKRAFT, Trnsys TECSOL deck, DHW – GRS monitored installations by TECSOL, SOLO method for DHW)
- next year : VB development and user interface

Principle :



2. Detailed overview (1/4)

Data file (*.mgp) :

- specif format 8760 lines
- meteo data : G, Text, H% + Tw
- load data : Bcool, Bheat, Bdhw [kWh]

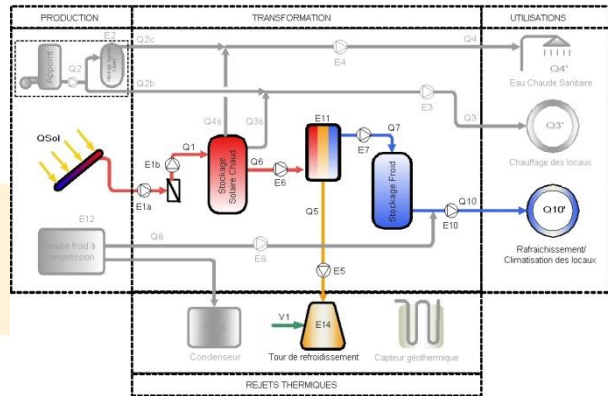
Intitulé de colonne	Unité	Nbr de décimale de la valeur	Intervalle de validité	Signification
TIME	-	0	[1 ; 8760]	Heure annuelle
MOIS	-	0	[1 ; 12]	Numéro du mois
JOUR	-	0	[1 ; 31]	Numéro du jour
HEURE	-	0	[1 ; 24]	Numéro de l'heure
Text	°C	1	[-99.9 ; 99.9]	Température extérieure moyenne horaire
Ens_g_hz	W/m ²	0	[0 ; 1200]	Ensoleillement global sur le plan horizontal moyen horaire
HR	%	0	[0 ; 100]	Humidité relative moyenne horaire
Tef	°C	1	[0.0 ; 100.0]	Température d'eau froide moyenne horaire
Bchauff	kWh	1	[0.0 ; 999 999.9]	Besoin horaire de chauffage
Bclim	kWh	1	[0.0 ; 999 999.9]	Besoin horaire de climatisation
Bece	kWh	1	[0.0 ; 999 999.9]	Besoins ECS utile

2. Detailed overview (2/4)

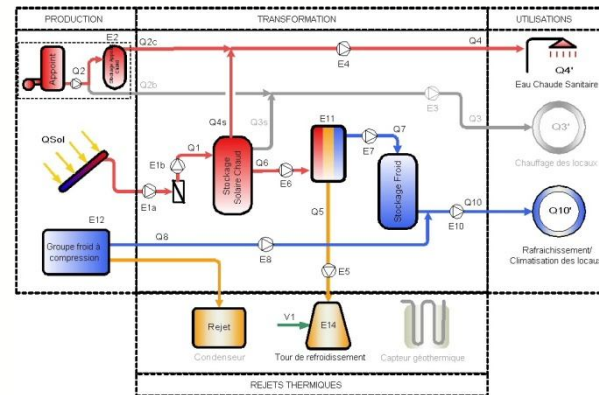
Configuration and scheme :

- use and priority selected by the user : cool, heat, DHW
- ➔ scheme automatically proposed

Ex : solar is used only for cooling



Ex : solar is used for cooling and DHW
There is a cold back-up



2. Detailed overview (3/4)

Components :

- ab/adsorption chiller : manufacturer database, automatic calculation for Pchiller
- collectors : manufacturer database, automatic calculation for Scollectors
- heat rejection : drycooler, drycooler+spray, open wet cooling tower, ground source heat rejection
- storage and buffer tank : hot and solar one, cold and chiller one – automatic calculation of the capacity + DHW supplementary capacity,
- back-up : hot back-up for heating possible, hot back-up for DHW mandatory, cold back-up for cooling possible

2. Detailed overview (4/4)

Calculation :

- hour per hour
- 1 hour = 1 operating mode (stop, cool, cool+dhw, heat, heat+dhw, dhw)
- energy calculation component / component
- electric consumption calculation

Monthly balance :

- all energies : Q1, Q3 (dhw), Q4 (heat), Q10 (cold)
- electrical and water consumption

Performance indicators (see L35) :

- COP, COPelec, etc.....
- « reference » / minimum / maximum performance indicators values
- Comparison and « best practice » advises

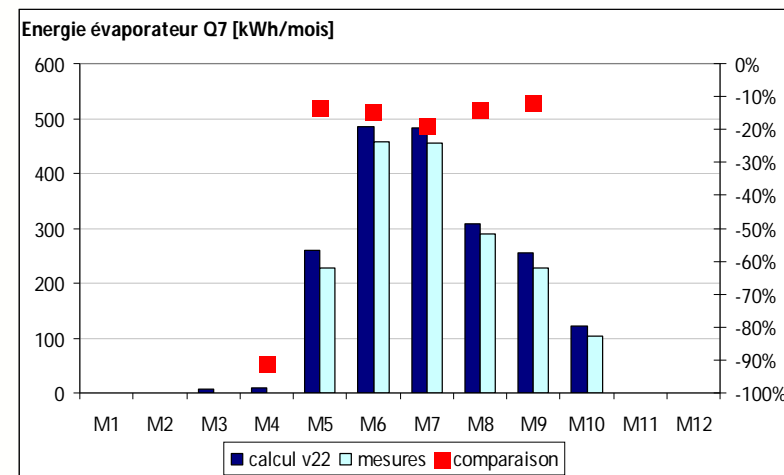
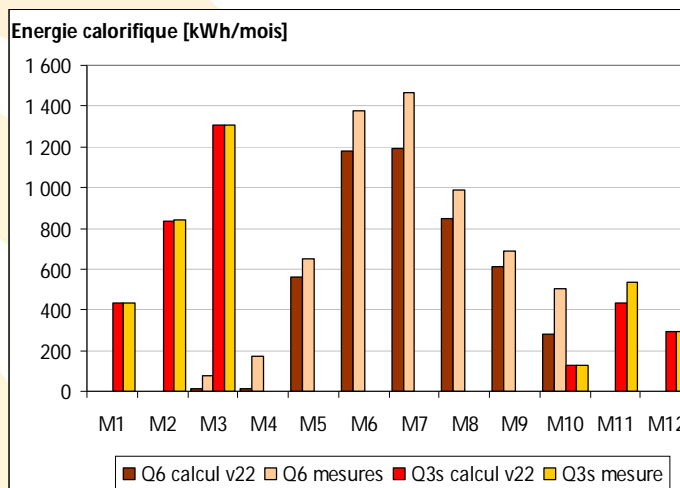
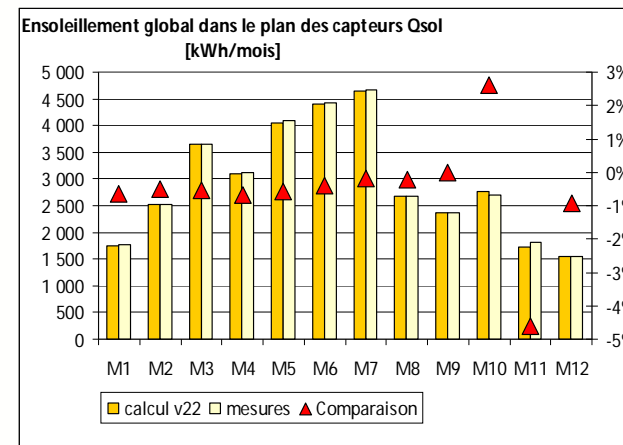
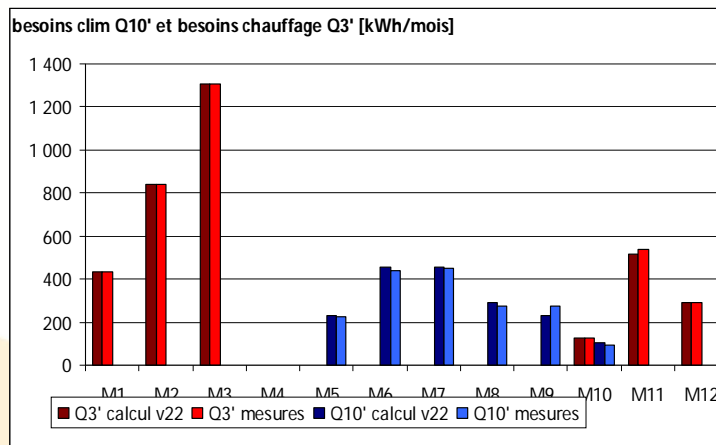
See « *Calculation of Performance Indicators for Solar Cooling, Heating and Domestic Hot Water Systems* » (ENGL)

3. Tool demo

Tool demo : Excel 2003

Validation :

- Has just started
- Results aren't too bad so far:



4. Deliverable

Public deliverable:

www.solaire-collectif.fr / FROID SOLAIRE /Megapics (FR)

publication F. Boudehenn SHC conference « *Calculation of Performance Indicators for Solar Cooling, Heating and Domestic Hot Water Systems* » (ENGL)

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