

## Unifamily-house



**Beneficiary:**

Unifamily-house  
Seville  
Spain

**Consultant:**

ROTARTICA  
FAGOR ELECTRODOMÉSTICOS  
IKERLAN

**Subject of Feasibility Study:**

Check of possibilities to install a Solar Combi+ System in a unifamily-house.

Deliverable D6.12\_SP3 (English)

EIE project SolarCombi+, Grant Agreement no. EIE/07/158/SI2.466793

## 1. Object:

The feasibility study shows the basic definition of a Solar Combi+ installation, for combined heating, cooling and DHW production for a unifamily house in Seville (Spain).

## 2. Building description:

The building is located in Seville in the south of Spain.



Figure 1 General geographical location

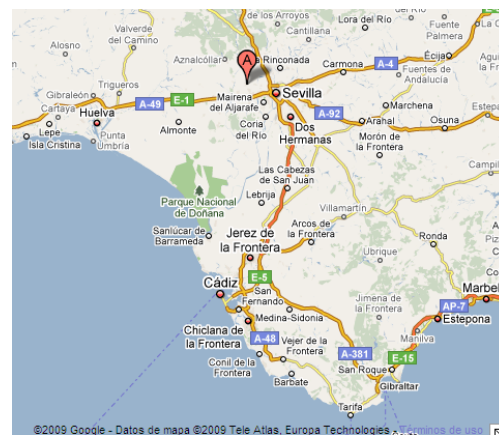


Figure 2 Geographical location (in detail)

## 3. Customer requirements and basic data:

The initial data has been given by the owner of the building. Main characteristics are resumed below:

- 2 floors building.
- Maximum occupancy profile: around 3-4 people.
- Total area: 150 m<sup>2</sup>
- Air-conditioned total area: 60 m<sup>2</sup>
- Average monthly occupancy: 50%
- Conventional energy used for heating and cooling: An auxiliary heater and a fire-place.

At least, climatic, water temperature and solar radiation data in Seville should be take into account, in order to analyze and define a Solar Combi + System.

Table 1: Average ambient temperature (°C)

	Ene	Feb	Mar	Abr	May	Jun	Jul	Ago	Sep	Oct	Nov	Dic
T°C	11	13	14	17	21	25	29	29	24	20	16	12

Table 2: Urban-Water average temperature (°C)

	Ene	Feb	Mar	Abr	May	Jun	Jul	Ago	Sep	Oct	Nov	Dic
°C	8	9	11	13	14	15	16	15	14	13	11	8

Table 3: Solar irradiation on horizontal (En Mj/m<sup>2</sup>/día)

	Ene	Feb	Mar	Abr	May	Jun	Jul	Ago	Sep	Oct	Nov	Dic
Rad.	7,3	10,9	14,4	19,2	22,4	24,3	24,9	23	17,9	12,3	8,8	6,9

#### 4. Installation definition:

So, the installation defined for this application has the main basic data:

- Solar Flat Plate collectors: 10 units. Total useful area: 25,9 m<sup>2</sup>.
- DHW storage: 150 l.
- Solar storage tank for heating and cooling: 800 l
- Absorption machine: 1 unit of Rotartica SOLAR 045, 4,5 kW cooling nominal capacity.

Taking into consideration the customer requirements and initial data, dynamic simulation give as a result an estimation of the heating, cooling and DHW requirements of the defined installation and are summarized as follows:

CONSUMPTION	kWh
DHW and Heating	3.480
Cooling	3.125

Table 4 DHW, heating and cooling consumption

#### 5. Installation description:

The installation described below is based on a SolarCombi + system, for heating, cooling and DHW production for a unifamily house in Seville. The air-conditioned area is over a 60 m<sup>2</sup>.

The basic characteristic of the installation, system and components definition and description are given below:

- Solar collectors system.
- Solar energy storage system.
- ROTÁRTICA absorption machine.
- Heat rejection system.
- Pumping system.
- Purge components.
- Expansion and security system.
- Auxiliary system.
- Hydraulic piping.
- Distribution system (circuits and components).
- Control and regulation system.

##### 5.1.- Basic configuration

The proposed configuration is show in the following figure:

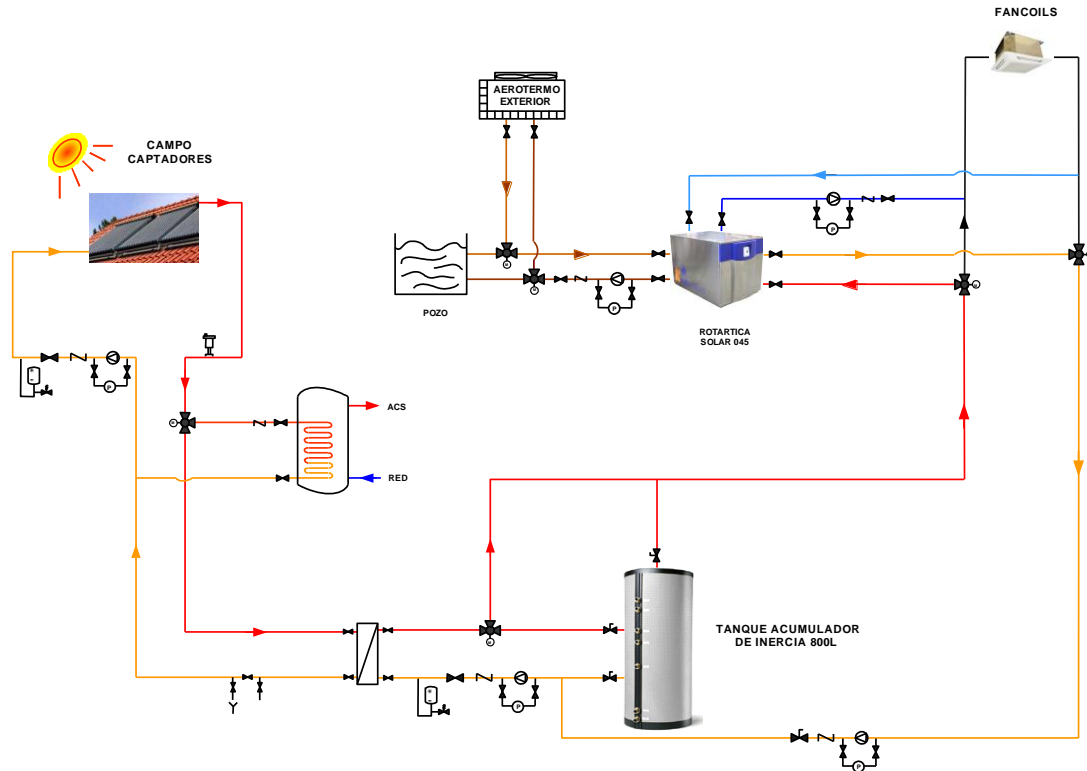


Figure 3: Installation configuration scheme

## 5.2.- Solar Collector

Solar collector system will be able to collect the solar energy and use the heat of the water for other purposes, such as heating, DHW and as a input energy for the absorption machine.

The solar collector field is around 25,9 m<sup>2</sup> area, with IMS flat plate collectors (ML-3.0 model).

## 5.3.- Solar Storage Tank

A solar storage tank is able to storage hot water from the solar collectors, so it will be possible to have hot water when the demand is not in accordance with the hot water generation.

A 800 I solar storage tank has been defined for heating and cooling applications, and its properties allows to work up to 110°C water temperature. An extra 150 I storage tank has been defined for DHW consumption purposes.

Solar storage tanks and other hydraulic and electric components will be placed on an auxiliary area.

## 5.4.- ROTARTICA absorption machine

ROTARTICA SOLAR 045 absorption machine will be placed also in the auxiliary area and basically the basic technical characteristic of the machine are given below:

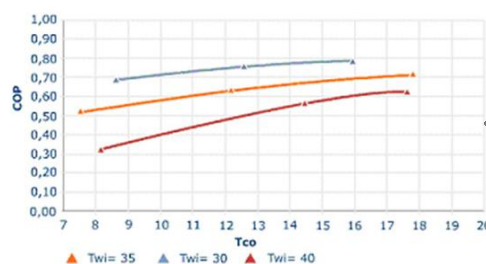


Figure 4: Rotartica COP

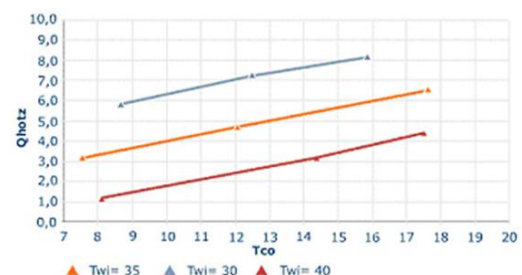


Figure 5: Rotartica Cooling capacity

PERFORMANCE SPECIFICATIONS	
Cooling nominal	4.5 kW
COP	0.7
Solar circuit T <sup>a</sup>	90° C

Table 5: Performance Specifications

Nominal performance of the absorption machine is also schematically represented in the figure 6.

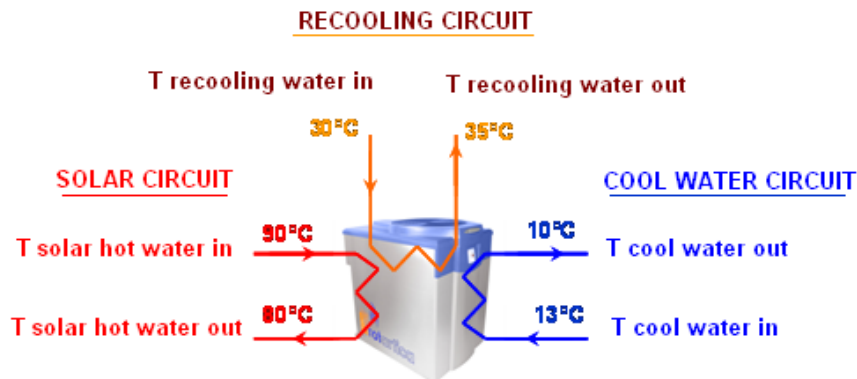


Figure 6: Esquema básico de funcionamiento de la máquina de absorción Rotartica

It is important to take into consideration Rotartica machine nominal design parameter, such as flow-rates and pressure drops in the three circuits, in the definition of the components of the system.

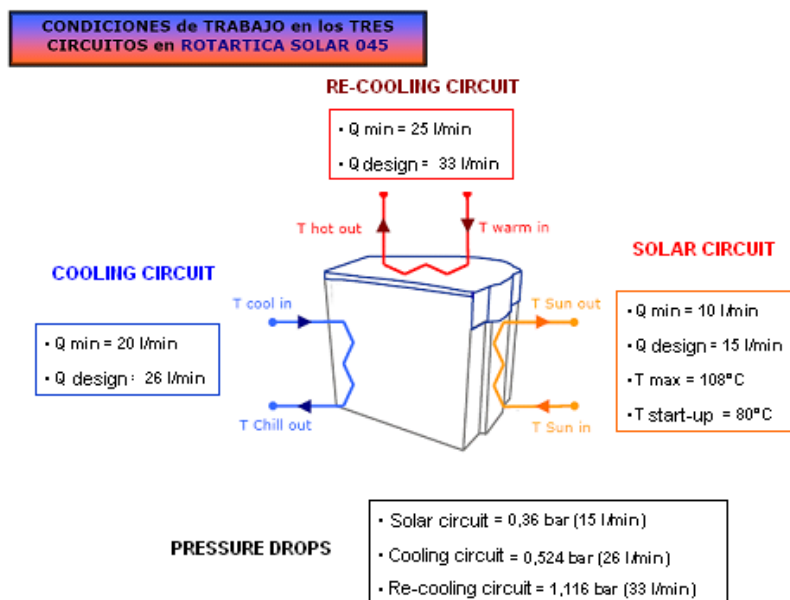


Figure 7: Performance nominal conditions for Rotartica 045 absorption chiller

### 5.5.- Heat Rejection system

Absorption machine heat rejection system will be against a well and also with a dry air cooler. Other components, such as pumps, filters heat exchanger and others, will be located in the pumping auxiliary area.