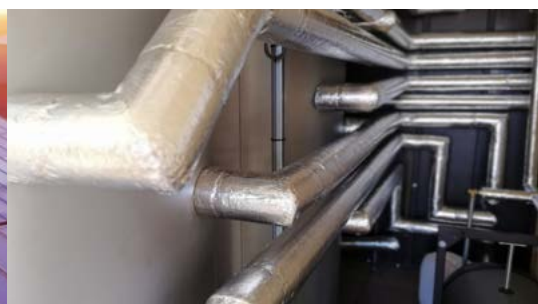


OPTICUBE

TURNKEY SOLAR HEAT SYSTEM





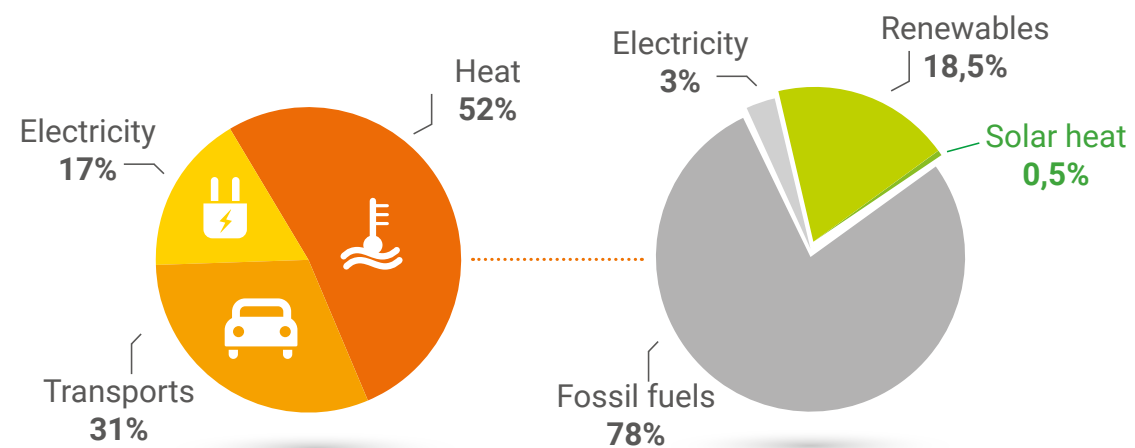
TURNKEY SOLAR THERMAL

Developed and designed by Sunoptimo, the Opticube is a «turn-key» solar system that removes the obstacles to the development of solar thermal technology. For each project, the technical complexity is integrated into a 10, 20 or 40 foot maritime container. The hydraulic part is entirely pre-assembled and tested in our workshop in Belgium, which speeds up the construction part. This system reduces the total cost by 40% compared to a traditional installation, while producing entirely green energy, and in some cases at a cost below €20 per MWh. A great way to save money while saving the planet!

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THE CHALLENGE



1

The need for heat

Heat is an absolute necessity throughout the world. It is so important that it accounts for more than half of the world's energy needs.

2

Fossil fuels

Most heat is produced using fossil fuels. These are harmful to the planet and increasingly expensive.



3

Use of renewables

As part of the energy transition, we need to substantially reduce our greenhouse gas emissions.



4

Solar heat: the noblest energy

Among those green energy options, solar thermal technology is, on paper, the most ideal:

- Free energy source (the sun)
- High efficiency (>85%)
- Proven technology
- High reliability (>30 years)
- No deforestation
- Preserved agricultural areas
- Self-consumption

5

And yet...

Despite the advantages of this technology, solar thermal energy accounts for only 0.5% of the heat requirement. The reasons are:

- Complexity (need for specialists)
- Long assembly time
- Cost of the system
- Building integration



OUR SOLUTION



Sunoptimo has designed a system that solves the constraints on the development of solar thermal technology worldwide. The technical complexities are bypassed thanks to this turn-key kit, making solar heat accessible to all, and reducing the assembly time on site.



Efficient Solution



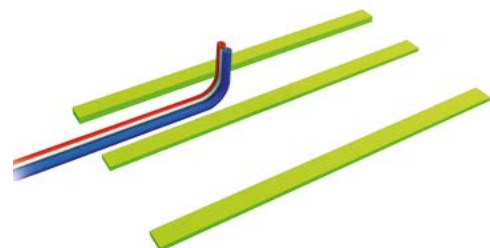
Seal of Excellence



Solar Keymark

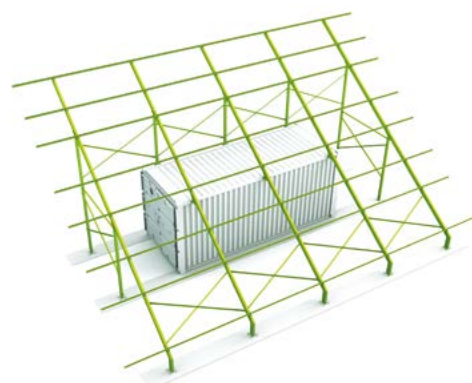


ASSEMBLY



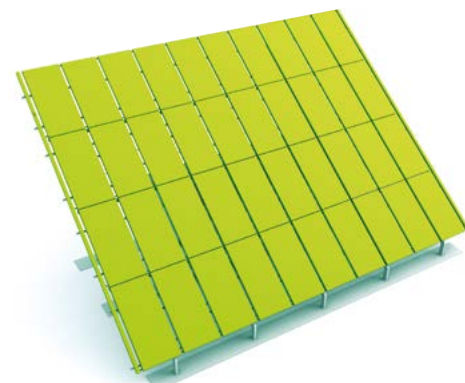
- 1 The underground cold water inlet and hot water outlet pipes are drawn from the customer's boiler room and will be connected to the container.

- 2 The container is placed on the concrete foundation that has already been laid. The pipes are connected via the container access hatch.

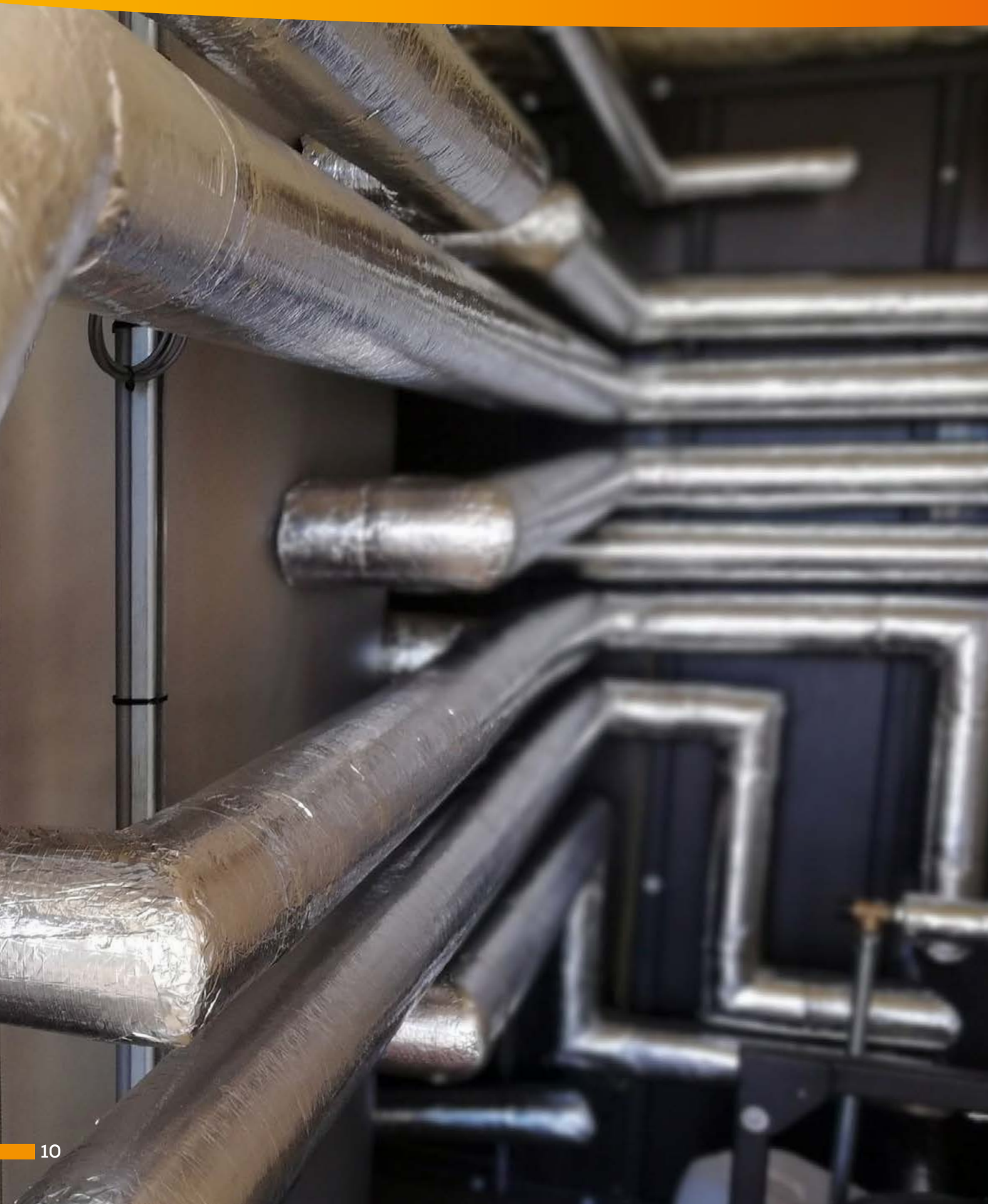


- 3 Once assembled, the steel structure waits for the solar field to be deployed.

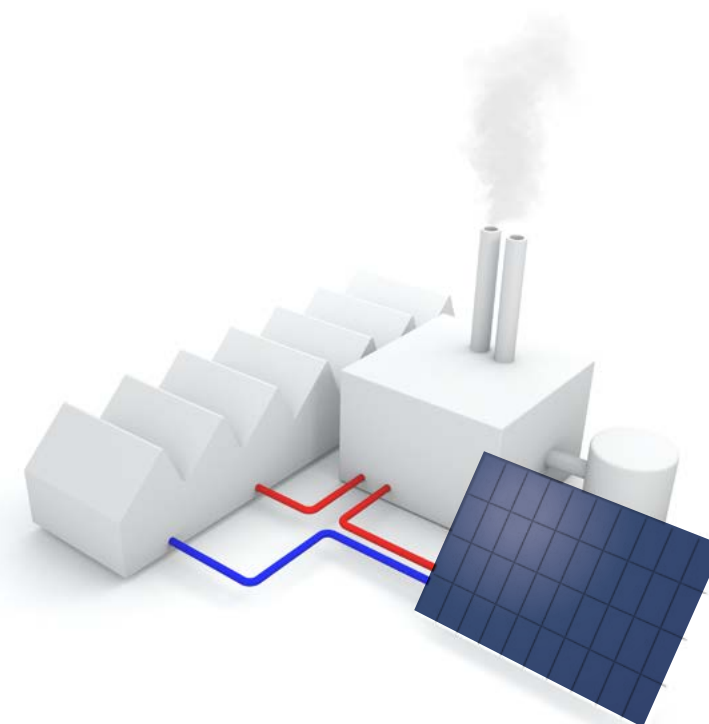
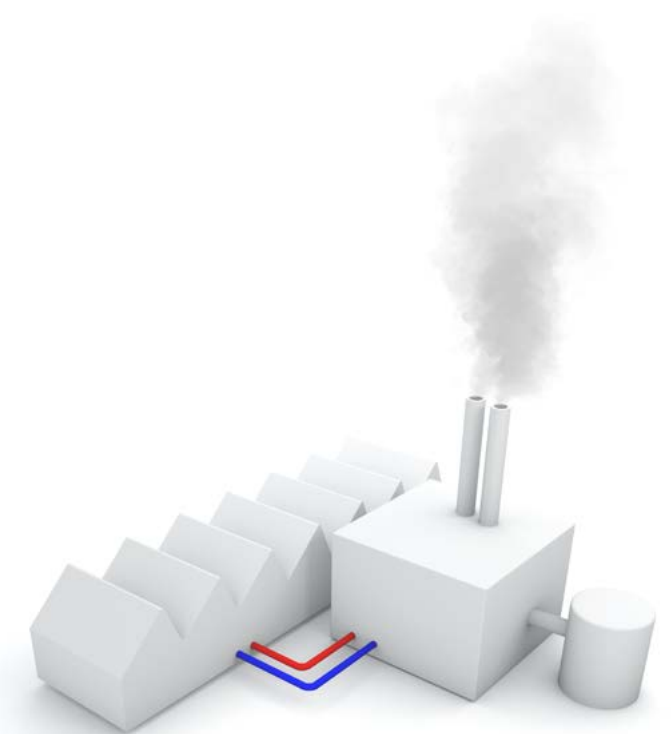
- 4 The deployment of the collector field is done starting with the bottom line. After the installation, the final connections are made.



INTEGRATION



The fluid to be heated (usually water) arrives cold in the boiler room and leaves hot after it has consumed a fuel. In many cases, this fuel is fossil fuel, which implies significant greenhouse gas emissions.



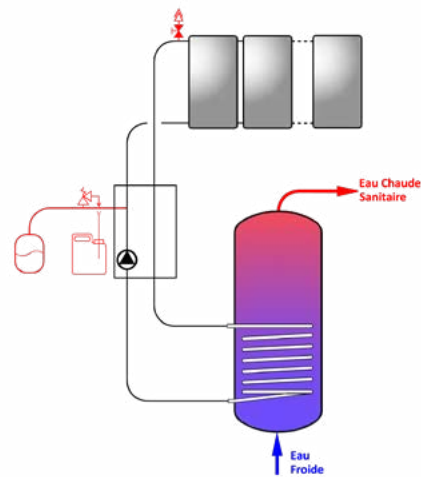
Thanks to the bypass to the solar station, the boiler room receives water that is either fully heated or preheated by the Opticube. The boiler room will then either not need to consume any fuel or will consume much less.

| SIZING

The solar water heater

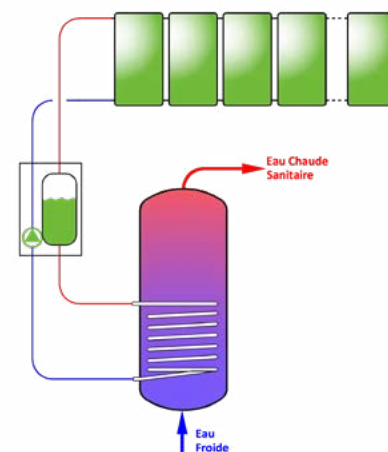
The sun's rays heat the absorber of the solar collectors. The heat is transferred to a heat transfer fluid via the coil which is welded to the absorber. Thanks to the pump, the fluid transfers the heat from the solar collectors to the water tanks. This solar-heated water is then fed into the hot water distribution network.

A solar water heater works on one of two principles:



Pressurised system

When the pump is switched off, the liquid remains in the collectors. If overheated, it deteriorates and vaporises over time. In addition to high maintenance, this risk of overheating limits the design to 40% solar fraction.



Sunoptimo Drainback

When the pump is switched off, the air replaces the liquid in the collectors. It cannot deteriorate. There is no limit to the size of the system. This principle offers passive protection of the system, and therefore low maintenance.

The drainback is the starting point for **Optimum Sizing**. The more collectors that are installed, the more of the heat requirement is covered, and the lower the cost of the backup energy.

The ideal number of collectors to be installed is calculated to achieve an economic optimum.

100 m²



Fossil fuels
50%
Solar fraction

150 m²



Fossil fuels
70%
Solar fraction

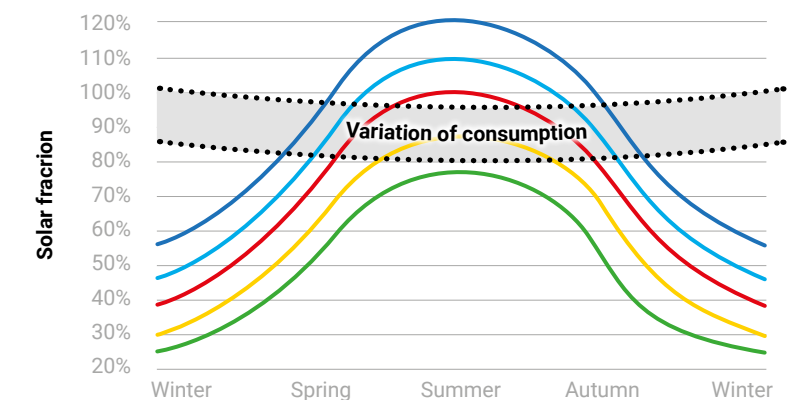
200 m²



Fossil fuels
80%
Solar fraction

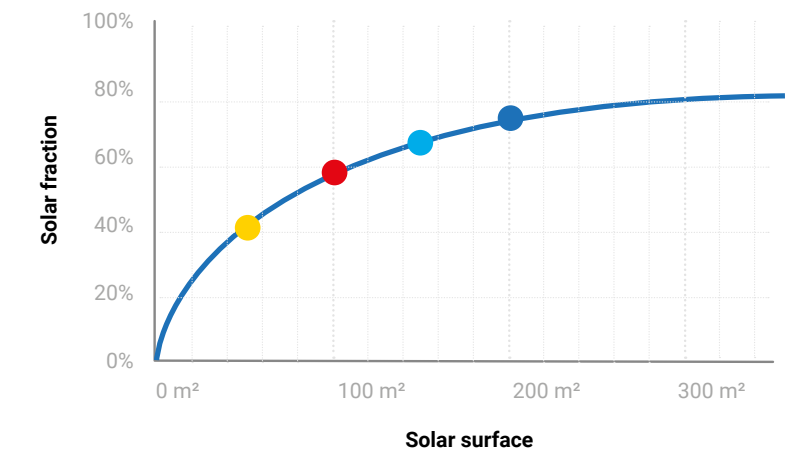
The drainback prevents overheating. Therefore, more collectors can be placed to cover a larger part of the heat requirement.

The pressurised installation that would reach 100% of the needs at the best time of the year (red line) could be degraded, unlike a drainback installation (blue lines).



The Optimum Sizing is calculated on the basis of different data. The yellow dot represents the solar fraction at the best time of the year by a pressurised system.

This is much lower than the performance offered by a Sunoptimo installation (blue dots).



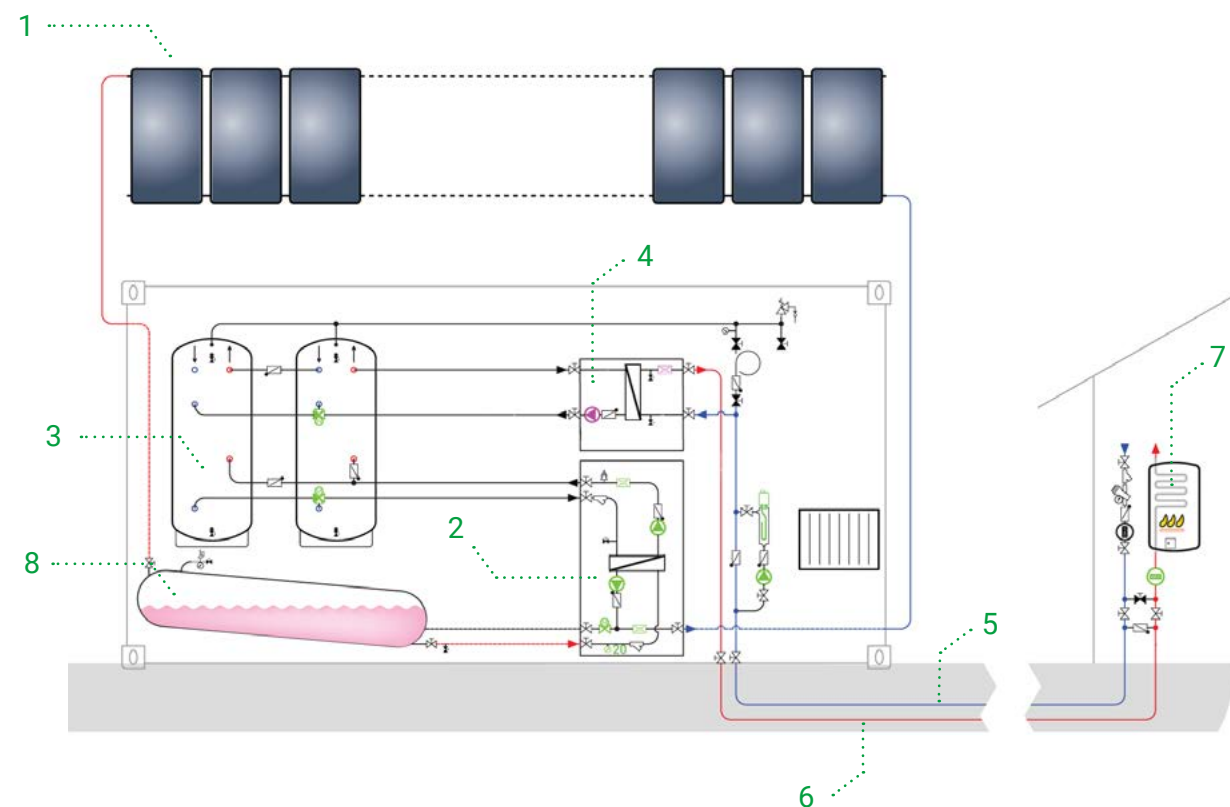
| SIZING

Functioning of an Opticube

The Opticube supplies solar heat thanks to several separate hydraulic loops. First, the solar loop transfers the heat from the fluid in the collectors to the storage tanks via an Optiflow station.

The storage tanks are then able to deliver their heat to the customer's cold water supply, which arrives in the Opticube and leaves after being heated or preheated by an Optiaqua station.

When the system is shut down, the fluid flows back down into the drainback tank and is thus preserved.



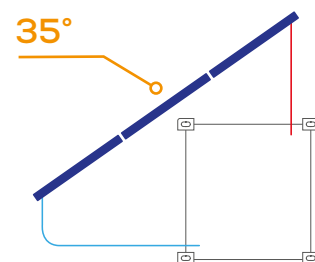
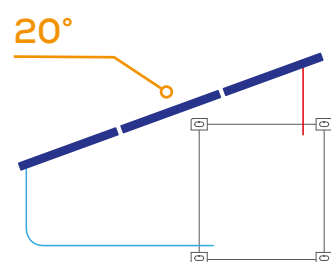
- | | | |
|-----------------------|---------------------|--------------------------|
| 1 Solar collectors | 4 Optiaqua DHW unit | 7 Customer's boiler room |
| 2 Optiflow solar unit | 5 Cold water supply | 8 Drainback tank |
| 3 Solar tanks | 6 Hot water return | |



FULL RANGE

The right Opticube for the right project

A clear advantage of this system is its modularity. The Opticube is available in several versions, allowing it to be easily integrated into any project, bypassing any constraints.



Up to 1.000 m²

Each project requires more or less solar collectors depending on the user's needs.

The solar field consists of a minimum of 12 collectors (30 m²), and a maximum of 120 collectors (300 m²) per Opticube. Of course, it is possible to multiply the Opticube containers in order to extend the solar field up to 1,000 m².

The collectors can be arranged in 3 or 4 rows, or in a sunshade in order to conserve a maximum of ground space (in the case of a parking for example).

OPTIONS



Antifreeze

In addition to the reinforced insulation of the container, an electric convector is activated in case of freezing risk. A recirculation pump (coupled with an electric resistance) is activated to ensure that the pipes are frost-free.



Hydraulic backup

The final dead water tank is maintained at temperature by means of an immersed coil. The back-up energy source can be a gas, oil, wood, pellet boiler or even a heat pump. The water is preheated by the solar system and if there is a shortage of energy, the boiler is switched on.



Electric backup

Two immersed electric resistors keep a dead water tank at temperature. The water is preheated by the solar system and, if there is a shortage of energy, the electric heaters are switched on. In this case, the customer's boiler is not needed.



Hydroelectric backup

This option is a combination of the electric and hydraulic backup options.



3 collectors rows



4 collectors rows



Sunshade version

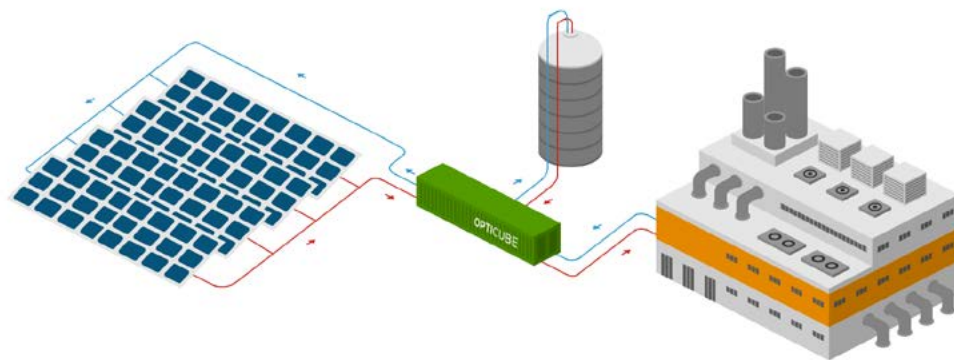


Wooden cladding option

OPTICUBE FIELD

A SECOND APPROACH TO THE OPTICUBE

In order to meet the demands for more than 1,000 m², Sunoptimo has developed the Opticube concept on a second axis, called **Opticube Field**: a containerised solar heating system adapted to the largest solar thermal fields, from 1,000 to 30,000 m² of collectors.



Expertise

The Opticube Field is the perfect embodiment of Sunoptimo's expertise and technical mastery. These two concepts form the basis of our range of containerised solar heating systems.

Manufacturing

Rather than spending hours on site, we pre-assemble each Opticube Field in our workshop in Belgium. All functions are tested before delivery.

Integration

The workshop tests we carry out make it easy to commission the Opticube Field. This concept, combined with the proven reliability of solar thermal, means that the integration of this technology into heating processes is straightforward.

Before, during and after.

We follow each project from conception to completion.

Designing | Our in-house design office studies the project, models it in 3D and defines the size of the system.

Testing | Each component is tested in our workshop during the production phase.

Commissioning | Performance tests are carried out and technical documentation is published

Monitoring | We provide data and operating reports after commissioning and throughout the life of the system.



APPLICATIONS



Industries

Proofing, washing, food processing, bottling...

In Merville (Northern France), an industrial company specialising in tank washing has installed 4 Opticube systems (1,270 m²). Since 2018, this company has been using the sun to produce a part of the hot water needed for its process.



District heating

A large-scale heating system to supply a city or district.

For the Ettenheim heating network (Germany), Sunoptimo has designed the Opticube Field boiler room which, coupled with a 1,661 m² collector field, has been producing solar heat since 2020.



Communities and others

Rest homes, residences, hotels...

Since 2015, hot water for a centre for autistic people in Saint-Georges sur Meuse (Belgium) is produced by this 75 m² Opticube.



Agriculture

Livestock, greenhouses, farms...

In the Lot department, a calf farmer has chosen solar thermal energy to produce his hot water. Since 2017, this 60 m² Opticube, assembled in one day, has been supplying heat to his farm.



INVESTMENT: 2 SOLUTIONS

CAPEX

- ✓ Equity investment
- ✓ You own the system (independence)
- ✓ You benefit from 100% of the savings

0€: Third-party investment

- ✓ Savings from day one
- ✓ No equity investment: the system costs you 0€
- ✓ Presence of a third party investor



| REFERENCES



All our references can be
found on our website:
www.sunoptimo.com



www.sunoptimo.com

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