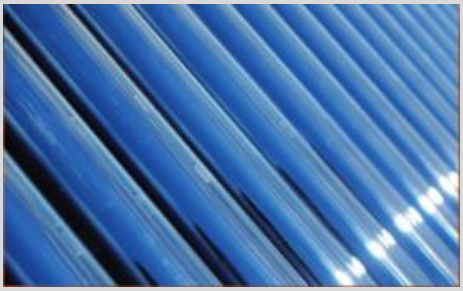
ECO THERMO FENGTECH (ETF)
NEXT GENERATION SOLAR THERMAL SYSTEMS

ETF- 300

ETF2- 300



ETF – 300

Vacuum tube collector on the ground or on the roof
to heat water for direct warm water use

ETF2 – 300

Vacuum tube collector on the ground or on the roof with integrated heat exchanger
to heat water for direct warm water use or for heating of buildings

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FENGTECH

Who is Feng Technologies (FENGTECH)

Fengtech was created in **2010** by Liqun Feng within the business incubator Laval Mayenne Technopole. It is an **innovative company developing solar thermal energy systems for professional use**. Its solar thermal power plants are very high performance, adapted to the climatic conditions of areas with little sunshine, such as those located in North-Western France.
Since its creation, the company has focused its research and development efforts on the solar thermal system approach with integrated capture, storage and use. Located in Laval, Pays de la Loire, West of France, his products are mainly sold in the North West of France from Lille to Brest (Brittany)

Vision :

- Innovation in solar heat systems for regions with a changing and cloudy climate.
- To reduce environmental impacts, meet the highest energy savings and provide profitability for the end user.

Fengtech systems

Fengtech systems are **low temperature** (water < 100°C) and very **low pressure** solar thermal systems. They aim to provide thermal energy for solar heating and solar cooling. Fengtech systems are systematically used for the following functions: heat capture, heat storage, overheating dissipation and frost management. Fengtech has 3 types of systems: solar home heating system, solar fence system and solar water heating system. These systems have been tested, in situ, in the North-West of France, and have proven to be cost effective and reliable.

Fengtech Innovation on solar thermal for agriculture : 2 main products

Eco-Thermal Fengtech ETF

A high performance solar hot water system with a new approach to capture, store and use in installations that require no pressure

- Main application : Veal farms for heating the water to feed the calves, cleaning, sterlisation or pasteurisation

Eco-Thermal Fengtech ETF2

A high performance solar hot water system with a new approach of capture, storage and use that requires pressure which includes a heat exchanger

- Main application : Heating farm buildings – pig or greenhouses

31 installations in the farms in North – Western France

- Mainly in veal farms and dairy farms
- 1 to heat a new Pig farm building
- 1 for a greenhouse

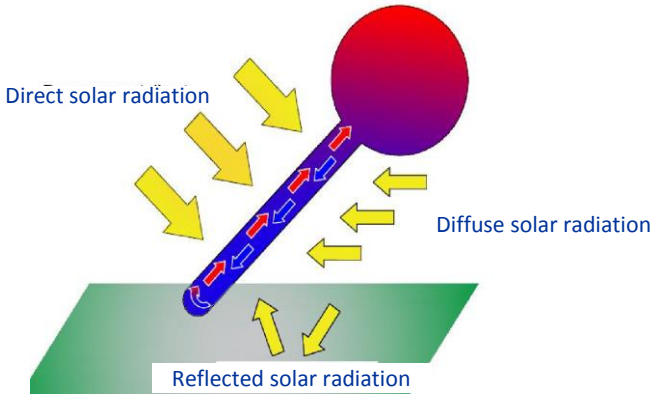
Fengtech patents

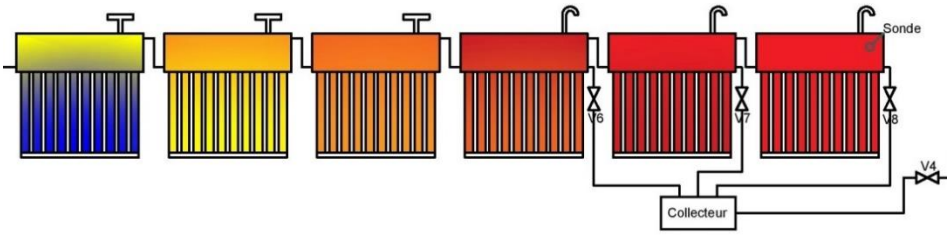
N°1: Solar fence with overheating regulation via an integrated curtain (Patent on system)
N°2: Solar fence with integrated aerothermal and geothermal energy (Patent on system)
N°3: Eco Thermo Fengtech (ETF) system (Patent on system)
N°4: Solar fence with integration of absorption and adsorption machine (Patent on system)
N°5: Future solar storage tank (Patent on product)
N°6: Future vacuum tube (Patent on product)

ICaRE4Farms – a european project

The European project ICARE4FARMS funded by the Interreg ENO programme (North-West Europe), is composed of 9 partners from 5 different countries who will work together for 3 years to promote the use of solar thermal energy in North-West Europe, in the agricultural sector. During the project, 4 pilot sites will be equipped with FENGTECH systems in France, the United Kingdom, Belgium and the Netherlands Thanks to transnational cooperation, ICARE4FARMS will test new generation STE systems in 4 agricultural sectors requiring hot water for feeding livestock (calves), heating agricultural buildings (poultry, pigs) and greenhouses (horticulture).

Technical Description – ETF





Functioning

- The system can be installed on the ground or on a roof. It has a modular design to adapt to hot water needs and energy saving objectives.
- ETF has been entirly conceived to optimize heating of water even in regions with low direct solar radiations. Each element has been carefully selected to have the highest performance.
- The vacuum tubes contain a special coating to optimize the heating.
- The water enters the system at one end with a very slow inlet flow, to progessively heat the water while entering the system and keep the stratification in the tanks.
- The water heated in the tubes rises in the upper part of the tank using the thermosiphon principle, flows in to the next unit thanks to an elbow pipe that allows the hot water at the upper part of the tank to flow into the colder lower part of the next unit tank. The preheated water in a storage tank is pushed naturally from element to element to reach a higher and higher temperature.
- Hot water in the last elements is sent to the hot water buffer tank.
- Excess of heat is managed with safety valves on all the ETF units or redirected into the soil
- Winter frost is managed by heating ducts and pipe insulation.

Added value

Increased capture of solar radiations even on cloudy days

• Inclined position at 45° increases aperture from 4m² to 8m²

• White surface on the back captures more solar radiations as it reflected diffuse radiations into the tubes

High-performance vacuum tubes

- Act as an insulator in cold and windy weather, resistant to 25mm hailstones and overheating 240°C.
- Covered in the inside with a specialialy selected coating, increasing transformation of radiation to heat

Integrated water storage maximising heat efficiency

- 250 L Stainless steel tank for each unit specially designed to increase solar hot water stratification
- 30 vacuum tubes with water as heat carrying fluid

Re-use of excess thermal energy

- Excess heat in sunny days is dissipated and stored in the soil and will warm-up the cold water during next filling

Optimized heating process with modular conception

- Series tank for water pre-heating
- Parallel tanks for water heating and ready-to-use hot water supply.

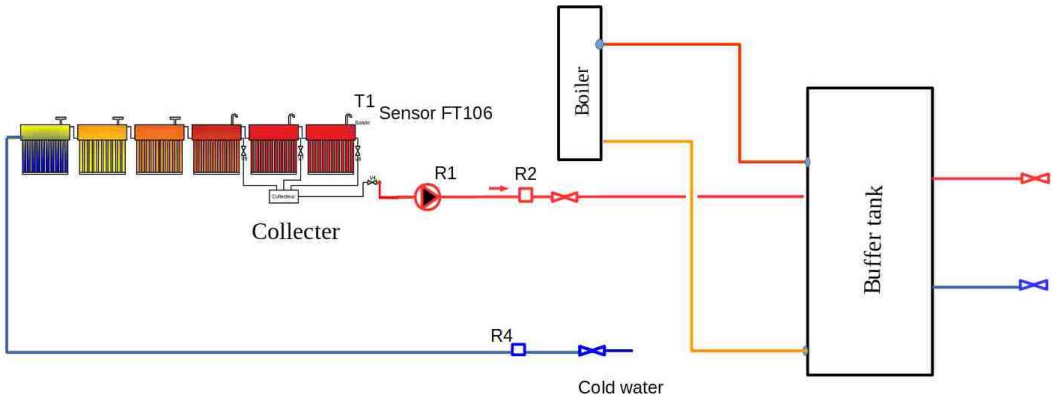
Easy maintenance

- Cleaning of white surface
- Tubes easy to replace

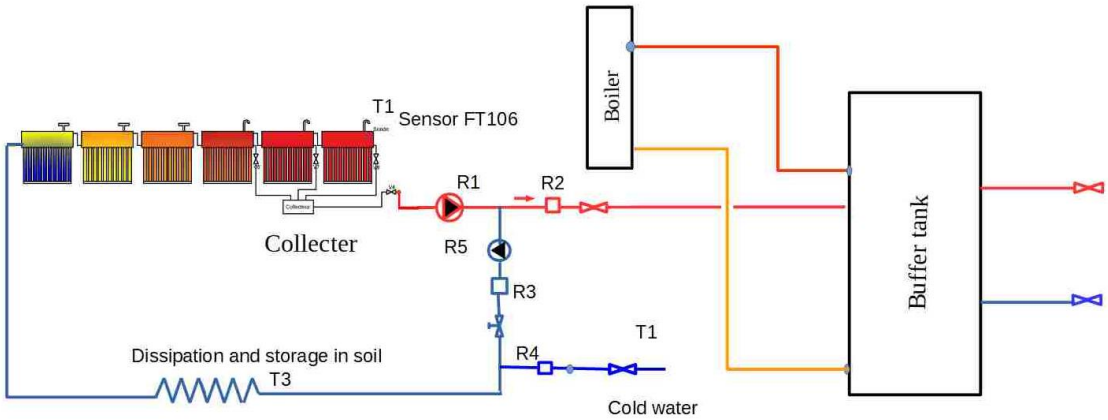
ETF – Detailled Technical Description

Application :
ETF is a thermal solar energy system without pressure, mainly for direct water use that does not require pressure, for instance to feed the calves (If pressure is needed than ETF 2 units should be used).

Solar Thermal Energy for hot water without pressure



Solar Thermal Energy for hot water without pressure with storage in the soil



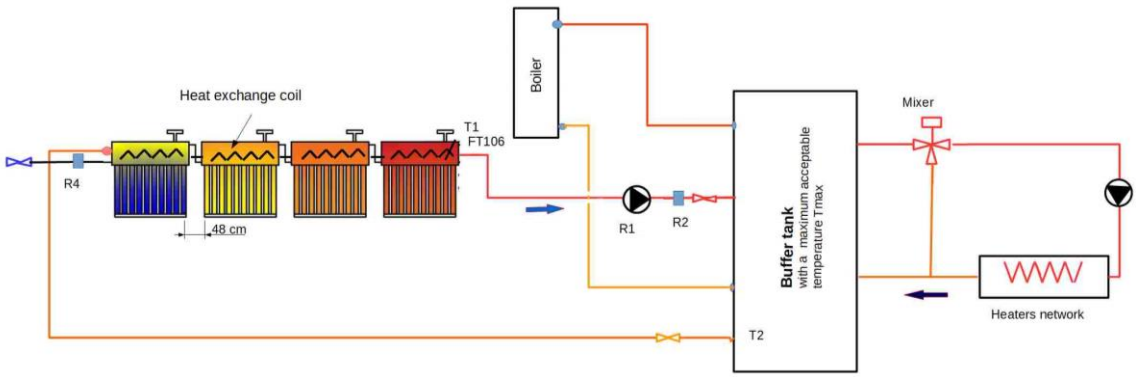
Scope of Supply (solar hot water production)

FENGTECH	1.1 ETF unit including : 1.2 Water Tank in stainless steel 304, 30 vacuums tubes, support and assembly nut and screw in 304 1.3 Insulated tank's connection pipe between tanks type « L » in 304 1.4 Protection sheet between tanks in 304 with 2 collars 1.5 Tank protection valve Pressure and Temperature 1.6 Regulator FT106 with one electro valve EV0 and a hot water level and temperature sensor and heating sleeve 1.7 Installer's technical assistance for first installation
Installer	2.1 Piping from ETF system to buffer tank and some small pieces like valves, elbows. 2.2 Pump R1 , electro valve R2 and its controller with solar hot water requirement from the buffer tank 2.3 Pump R5, electro valve R3 and its controller with solar hot water dissipation requirement 2.4 Device for electricity protection, a release on earth 2.5 Assembly and installations 2.6 Commissioning (2.7) Installation of instrumentations : calorimeter, flowmeter, temperature sensors, irradiance meter and data transmission
Foundation and concrete (installer or slab supplier)	3.1 Trench 3.2 Installation of the piping in the trenches underground before the concrete slap realization. 3.3 Concrete slab. 3.4 White sheet and its fixing on the concrete or white painting on the slab

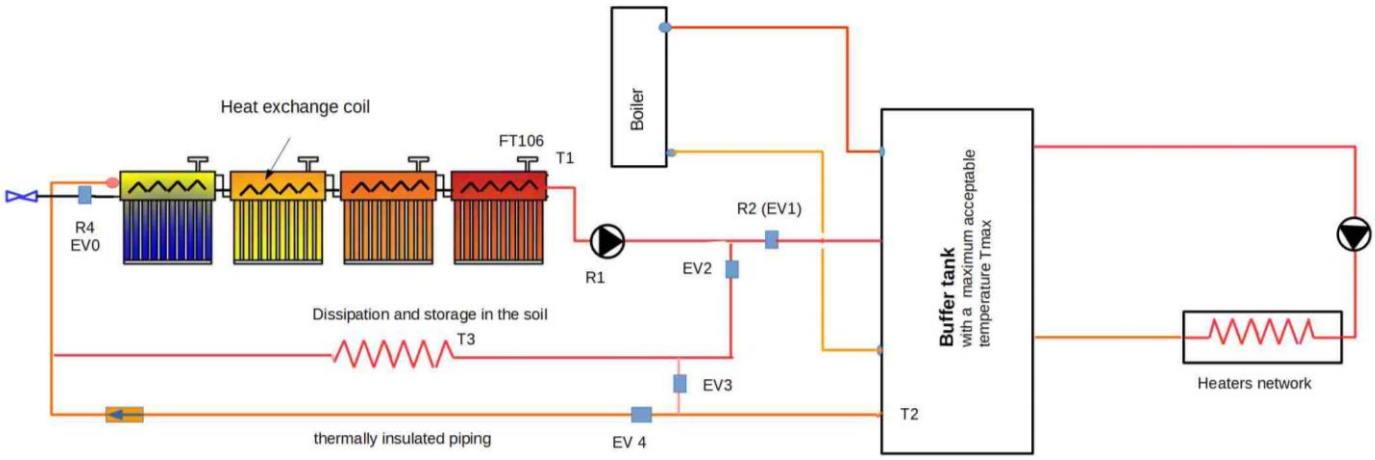
ETF2 – Detailled Technical Description

Application :
ETF2 is a thermal solar energy system with pressure, mainly when hot water is needed for heating, for instance heating a pig farm or a greenhouse

Solar Thermal Energy for heating with pressure



Solar Thermal Energy for heating with pressure with storage in the soil



Scope of Supply (solar heating production for heating system)

FENGTECH	1.1 ETF2 unit including : 1.2 Water Tank in stainless steel 304, 30 vacuums tubes, inside heat exchanger (15m serpentine), support and assembly nut and screw in 304 1.3 Insulated tank's connection pipe between tanks type « L » and serpentine connection in 304 1.4 Protection sheet between tanks in 304 with 2 collars in 304 1.5 Tank protection valve Pressure and Temperature 1.6 Regulator FT106 with one electro valve EV0 and a hot water level and temperature sensor and heating sleeve 1.7 Installer's technical assistance for first installation
Installer	2.1 Piping from ETF system to buffer tank and some small pieces like valves, elbows.. 2.2 Pump R1 , electro valve EV1, EV2 EV3, EV4 and its controller with solar heating requirement from the buffer tank 2.3 Pump R1, electro valve EV1, EV2, EV3 and its controller with solar hot water dissipation requirement 2.4 Device for electricity protection, a release on earth 2.5 Assembly and installations 2.6 Commissioning (2.7) Installation of instrumentations : calorimeter, flowmeter, temperature sensors, irradiance meter data transmission
Foundation and concrete (installer or slab supplier)	3.1 Trench 3.2 Installation the piping in the trenches underground before the concrete slap realization. 3.3 Concrete slap. 3.4 White sheet and its fixing on the concrete or white painting on the slab

Technical Information

ETF units for ICaRE4Farms Project			
Type of Unit		ETF-300	ETF 2-300
Number of tubes		30	30
Type of Tubes		Vacuum	Vacuum
Heat transfer fluid		Water	Water
Dimensions of vacuum tubes			
Length of tube	mm	1800	180
Length of tube in contact with solar radiations	mm	1700	170
Diameter	mm	58	58
Aperture surface	m^2	4	4
Distance between collectors	mm	~350	~350
Dimensions of system			
Width	mm	2425	2425
Height	mm	1750	1750
Depth	mm	1470	1470
Surface on the ground	m^2	3.56	3.56
Energy saving per year per m^2 (*)	kWh/m^2	800 ~ 1100	800 ~1100
Maximum power	kW	2,5	2,5
Weight			
Empty Unit	kg	100	120
Filled with water	kg	400	420
Liquid content of tank above the unit	L	250	250
Liquid content of tubes	L	60	60
Pressure	bar	0	6
Maximum stationary temperature	°C	100	100
Connection entry / exit of tank	mm	25	25
Tank Insulation – polyurethane	mm	60	60
Interior and exterior of tank		Stainless steel 304	Stainless steel 304
Integrated heat exchanger (serpentine)		-	Stainless steel 304
Diameter	mm		25
Length	m		15
Surface	m^2		1,18

Note:

- (*) It is the yearly energy saving observed on the veal farms in North West of France (see page 7)
- Fengtech suggests to use multilayer tube for solar hot water pipe to buffer tank
- Fengtech suggests to use PEX tube for geothermal storage