



Solar Heat for Industrial Process towards Food and Agro Industries commitment in Renewables

DEMO-SITE SHOWCASES

Deliverable 9.3

WP9. Dissemination Training and Showcases

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DELIVERABLE FACTSHEET

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X	PU = Public
	PP = Restricted to other programme participants (including the EC)
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PARTNERS SHORT NAMES

CIRCE: FUNDACIÓN CIRCE CENTRO DE INVESTIGACIÓN DE RECURSOS Y CONSUMOS ENERGÉTICOS

RINA-C: RINA Consulting S.p.A.

CEA: Commissariat à l'énergie atomique et aux énergies alternatives

LINKS: from 2019 ISMB becomes LINKS FOUNDATION

SOLID: S.O.L.I.D. Gesellschaft für Solarinstallation und Design mbh

TVP: TVP Solar

ISG: Industrial Solar GmbH

BEST: former Bioenergy 2020+ GmbH

M&R: Martini & Rossi S.p.A.

RODA: Bodegas Roda S.A.


RAR: RAR – Refinarias de Açúcar Reunidas S.A.

LARNAUDIE: from 2019 JEAN LARNAUDIE substitutes ABC

EDF: Electricité de France

EUREC: EUREC EESV

SPANISH CO-OPS: Cooperativas Agroalimentarias de España, U. de Coop.

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PUBLISHABLE SUMMARY

This document describes the showcase rooms for each of the demo-sites developed in the SHIP2FAIR project.

As it is a deliverable of “Demonstrator” type, the content of the present deliverable provides a concise description – including the specific objectives of each site, the approach utilised, and the results – of each demo-site:

- Bodegas Roda
- Martini and Rossi
- Larnaudie

In collaboration with EUREC, each demo-site developed and printed communication materials to promote the project at their premises and provide more information to their teams and/or to visitors. Each site also has a filmed a video to present and describe the solar thermal installations. This deliverable will additionally include photos of the communication materials and/or presentations at each site.



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INTRODUCTION


The deliverable 9.3 is part of the Work Package 9: Dissemination, Training and Showcases. Its main objective is to define communication and dissemination activities to be carried out throughout (and after) the project.

Another specific objective is to organise a showcase at each demo-site for dissemination and training purposes. As a result, each demo-site has created a specific showcase room in order to provide information about the project demonstration activities and results to the public.

The establishment of permanent showcases at the demo-sites provides a powerful tool to raise interest – both from the industry stakeholders and the general public – in SHIP (solar heat for industrial process) projects and SHIP2FAIR results.

The showcase rooms are now available at each demo-site: Martini & Rossi (Italy), Bodegas Roda (Spain) and Larnaudie (France).

RAR demo-site was not finally build, and therefore there is no associated showroom available.

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1 DEMO-SITE 1 – Martini and Rossi

1.1 Overview

Martini & Rossi is the Italian company of the Bacardi Group. It has been located in Pessione of Chieri (TO) since 1863. The Pessione plant is the historical site where all the relevant products are produced: Martini vermouth, sparkling wines, liquors and starting from 31st of January 2017 also Bacardi Rum.

The plant controls the entire winemaking process from must and wine acceptance to the finished deliveries to the markets. The site also hosts an R&D department dedicated to wine-based products. With the start of rum production, Pessione became the largest operation centre (the definition of a Bacardi production hub) for the Bacardi Group.

To become more sustainable, the plant realized important investments to reduce the environmental footprint, thereby saving both electrical and thermal energies. A continuous improvement approach is constantly requested to the site from the Bacardi Group, which introduced the need to explore uses of renewable energies on site. Energy saving programs enable the plant to have lower energy costs, keeping it competitive versus the other production sites of the Group.

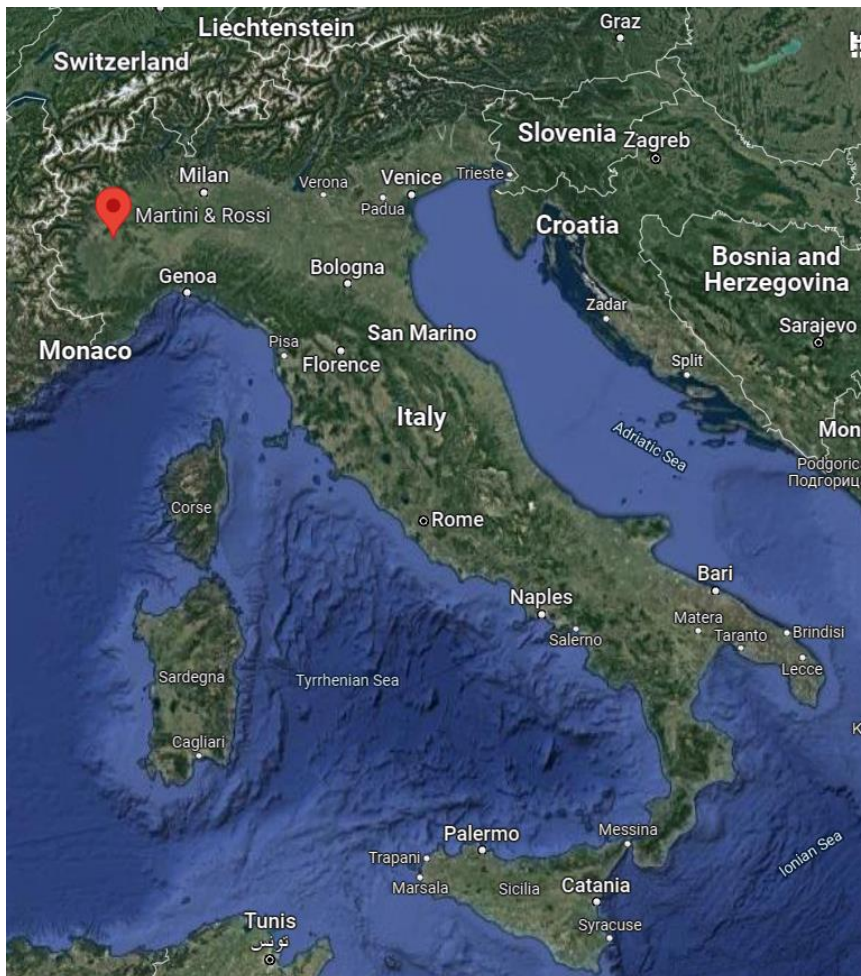



Image 1: Location of M&R facility

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1.2 Industrial process

The thermal energy necessities of Pessione for the industrial process (botanicals distillation and sparkling wine fermentation) require 5,542 MWh/year, sourced by “burning” 950k m³ of natural gas.

The entire thermal energy demand of the Pessione plant (hot water and steam) before the solar field installation was satisfied through 3 boilers capable to produce 12 MW (3 x 4 MW) in addition to a combined heat and power (CHP) plant producing hot water at 80°C and 0.7 ton/h of steam at 3.5 bar.

The objective of the SHIP2FAIR project was to cover as much of the thermal energy demand of the Pessione plant as possible using solar thermal collectors (PVT panels). Thanks to the participation in the SHIP2Fair project, it is possible to cover approximately 7% of the yearly thermal energy demand for production purposes.

1.3 Approach


The M&R installation covers a surface of about 1,073 m² of which 596 m² covered by 298 panels. They are designed to operate above 100°C in large-scale deployments. The panel’s shape is flat to allow for a more active surface, and they are characterized by a high degree of vacuum for minimized heat losses.

Two different operation modes were identified based on plant location data such as the monthly solar thermal energy production and M&R yearly energy demand for heating its processes.

In summer, the solar field works between a temperature range of 160°C to 177°C in order to produce 3.5 saturated steam through an indirect steam generator (see Image 2).



Image 2: Indirect steam generator

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In winter, the energy produced is used to heat the environment of the vermouth tank farm department (Tinaggio 92), located below the installation. While this operation mode is active, the system works between a temperature range of 60°C to 130 °C.

The Tinaggio 92 also hosts M&R dissemination activities; from there it is possible to see how to heat the environment starting from solar irradiance (see Image 3). As evidence of this, the new unit heaters connected to the solar field are shown.

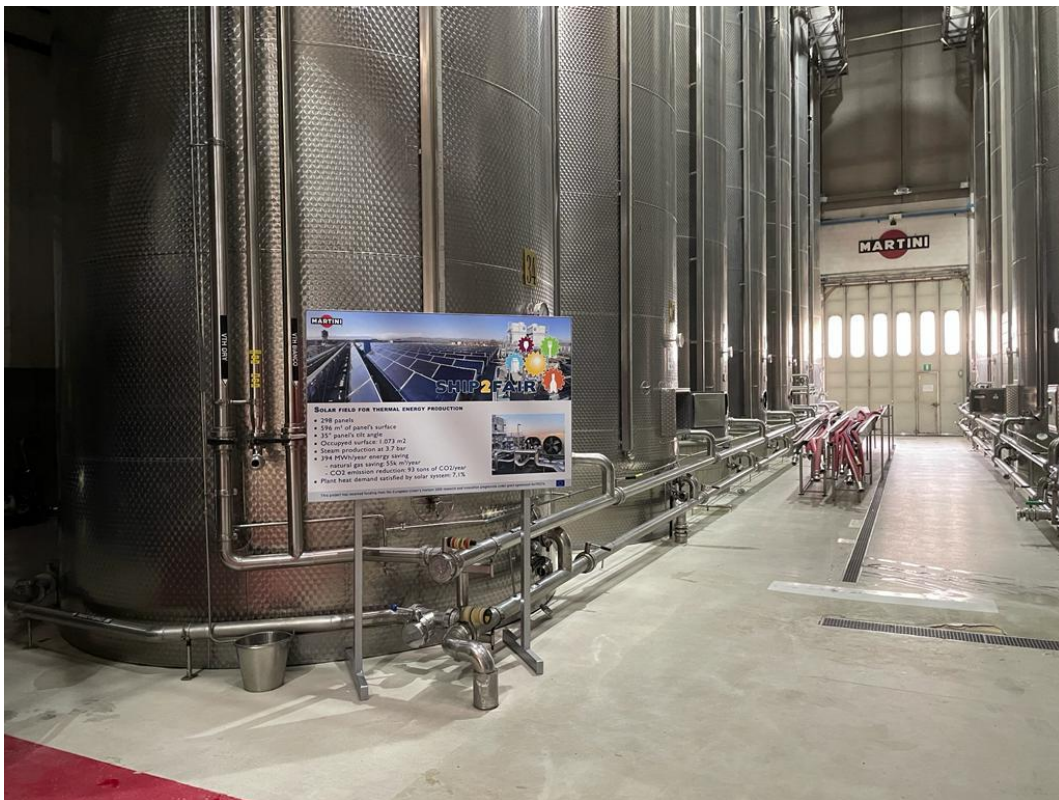



Image 3: Tinaggio 92

1.4 Results

The system is made up of 298 panels grouped in 20 strings of 10 panels each (except from one with 8 panels). In each string the panels are series-connected, and each string is connected with two main pipes through which it is driven to/from thermal block.

In the thermal block the main components of the system are installed:

1. The dry cooler is responsible for dissipating the excess of energy in case the temperature exceeds the upper operative limit. It also plays a key role in safety.
2. The heat exchanger: During the summer mode, the flow is driven to the heat exchanger for transferring the energy to the circuit 2 which feeds the indirect steam generator for producing steam.

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- Valves, sensors, pumps and expansion vessels: All these equipment play a key role in automation, allowing the flow to be driven properly in the right way, on the basis of the current system condition.



Image 4: Thermal Block



Image 5: M&R Solar Field

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With the help of a video maker, Martini & Rossi prepared and created a video to promote the project internally as well as during visits with external contacts. The video is available on YouTube [here](#) and on the SHIP2FAIR [website](#).



Image 6: M&R video on the SHIP2FAIR project

Information on the energy scenario, industrial process and installations is also displayed [on the SHIP2FAIR website](#) (see pictures below).

in
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Demo 1 - Martini

Process: Distillation bottle warming and sanification (steam production at 3 bar and 135°C)

Site: Pessione/Torino


Country: Italy

Longitude: E 7° 50' 16 "


Latitude: N 44° 58' 5 "

DNI: 1319 kWh/m2

Space opportunities: the site has availability of 1,000 m2 of rooftop



WWW.MARTINI.COM

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Description of the energy scenario

Heat demand: The thermal demand is quite constant during the whole year, while the variation of fuel consumption is caused by weather conditions.

The process works fully operative 16 hours per day during the working days and it is at base load (mostly for anti-icing purpose particularly in winter) during Saturdays and Sundays.

Description of the industrial process and current control

The M&R demo site is an industrial facility where all the products of company are produced: Martini, Sparkling Wines and Liquors and starting from 31st of January 2017 also Bacardi Rum. The plant owns the entire process from must and wine acceptance to the finished goods deliveries to the markets.

More in detail, the processes identified as suitable for the use of heat produced through solar thermal technologies are distillation, bottles warming, sanitification and space heating of production departments.

Currently, heat is produced in form of steam at 7 bar and 140°C, which is subsequently used either directly or sent to heat exchangers for the production of hot water at 55°C. Out of the distillation and bottling processes heat demand, 8% is for 1-bottling process, 7% for 2-bottling process and 12% for distillation. For the production of steam, natural gas is used as fuel.

Control: The CHP is old and it has a proprietary system for monitoring and control. The boilers have all Siemens PLC, as well as WinCC as SCADA system. At process level, there are regulations loops on temperature and pressure.



Ship project to be implemented

- › Ultrahigh Vacuum FPC -direct steam generation system
- › Heat Transfer Fluid: Saturated Steam
- › Net Aperture Area: 584 m²
- › Gross Area: 596 m²
- › Peak power: 327 kW
- › Gross heat production per year: 349 MWhth
- › Yearly global efficiency: 44%
- › CO₂ savings: 85 tCO₂
- › Heating cost: 3,75 c€/kWh
- › Expected payback: 10-11 years
- › Solar fraction: 5% average, 33.5% in August


Pictures



Indirect Steam Generator



Solar field

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2 DEMO-SITE 2 – Bodegas Roda

2.1 Overview

The RODA Winery demo-site is located by the Ebro River, in a balcony of the station district of Haro (La Rioja, Spain), on a centenary cellar. RODA’s main activities are winemaking and wine selling. The company manufactures and markets four brands: SELA, RODA, RODA I, CIRSION. These brands are marketed and available nationally in Spain and also internationally.



Image 7: Location of Bodegas Roda facilities

2.2 Industrial process

Before developing the SHIP2FAIR project in RODA, cooling demand was covered by chilled water produced at 7°C and variable pressure depending on the machine involved. A secondary system was also present. In addition, heating was produced in the form of water at 45°C and pressure of 1.5 bar. The system was monitored through a Siemens automaton monitoring system.

The selected processes were responsible for a high percentage of the total energy consumption of the factory. In particular, heating needs were covered using liquefied petroleum gas (LPG) as a fuel and were considered to be constant at monthly and daily scale during the heating period, i.e. from October to March. The total demand for cooling was covered by an electric chiller.


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Image 8: Evolution of the solar field installations

2.3 Approach

RODA has a solar installation consisting of 70 m² of vacuum tubes; solar thermal collectors, model Vitosol 200 TM SPEA, 3m² of 3.26 m² of opening area. It is a high-performance vacuum tube solar panel with ThermProtect. The capacity of the solar field is 50 kW.

RODA is a solar installation with centralized storage of 4000 litres, in two tanks that receive solar heat through an external plate exchanger. The heat from these tanks is used to partially replace the energy

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input by conventional sources. To improve the performance of the above-mentioned cold-generating absorption machine, a 1,000-litre tank is used.

PRODUCCIÓN SOLAR

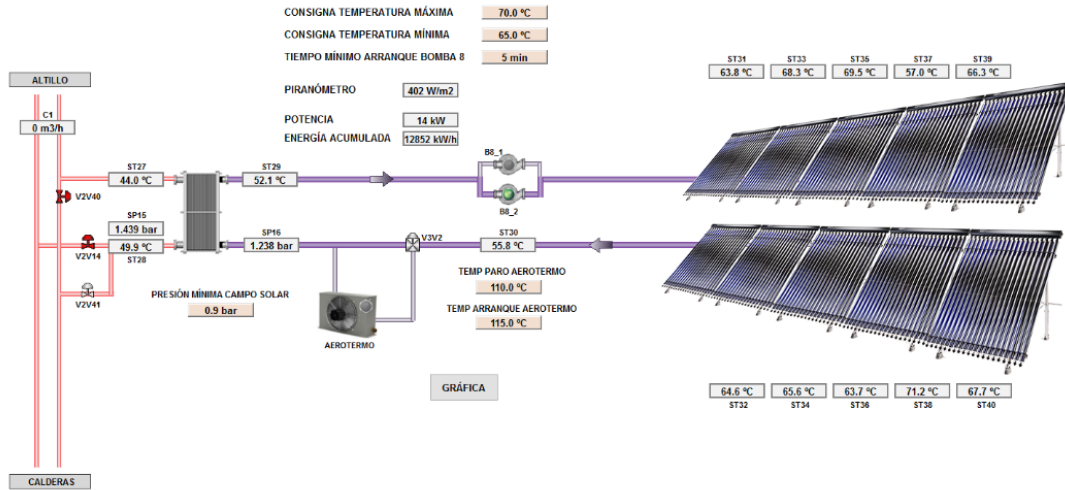



Image 9: Solar installation design

The solar design has been integrated with the conventional one so that maximum use of both the solar and conventional systems is guaranteed.



Image 10: Solar field

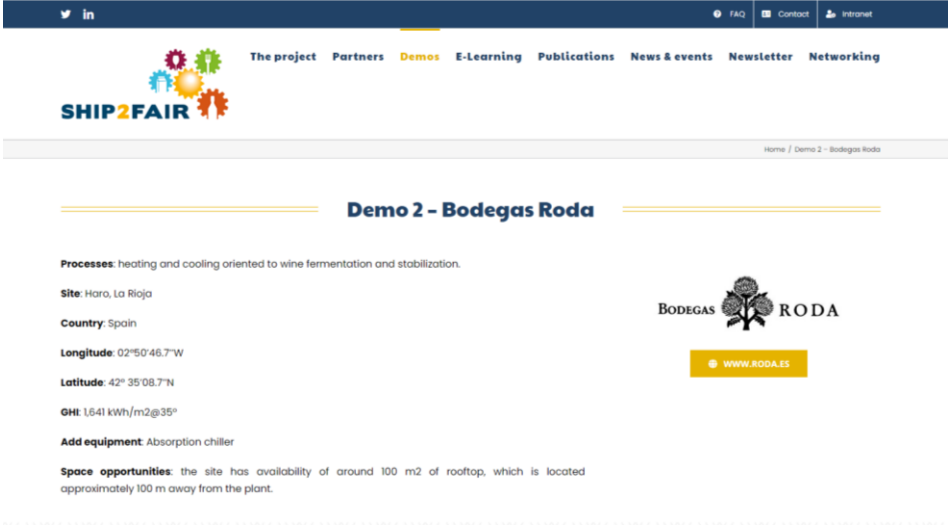
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A video is available online on the SHIP2FAIR website and [on YouTube](#) to show the installations and use at Bodegas Roda.



Image 11: RODA YouTube video

Information on the energy scenario, industrial process and installations is also displayed [on the SHIP2FAIR website](#) (see pictures below).



SHIP2FAIR

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Home / Demo 2 - Bodegas Roda

Demo 2 - Bodegas Roda

Processes: heating and cooling oriented to wine fermentation and stabilization.

Site: Haro, La Rioja

Country: Spain

Longitude: 02°50'46.7"W

Latitude: 42° 35'08.7"N


GH: 1.641 kWh/m2@35°

Add equipment: Absorption chiller

Space opportunities: the site has availability of around 100 m2 of rooftop, which is located approximately 100 m away from the plant.

BODEGAS RODA

WWW.RODA.ES

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Description of the energy scenario

Cooling consumptions of the plant are distributed among the different activities as shown in Figure. It can be noticed that a constant temperature of about 12° or even lower is required almost all year round.



Monthly demand %	may	jun	jul	aug	sep	oct	nov	dec
		20%	20%	20%	20%	20%	20%	40%
	Cooling					Heating		

consumption: (1) Malolactic fermentation it is necessary to heat the process with a radiant soil is a glass warehouse of 1.000 m2 at a temperature of 21°C, from the ground up to a height of 1.8 m. (2) Stabilization process consists in cooling the same area house at a temperature of 15°C. The total annual heat consumption is 190.000 kWh (150.000 kWh for cooling + 40.000 kWh for heating).

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Description of the industrial process and current control

The RODA Wineries demo site is placed beside the Ebro river, in a balcony of the station district of Haro (La Rioja, Spain), on a centenary cellar. RODA's main activities are winemaking and wine selling. The company manufactures and markets four brands: SELA, RODA, RODA I, CIRSION. From a commercial point of view, RODA markets its products in both national and international markets.

Currently, cooling demand is covered by chilled water produced at 7°C and variable pressure depending on the machine involved. Also a secondary system is present. In addition, heating is produced in form of water at 45°C and pressure of 1.5 bar. The system is monitored through a Siemens automation monitoring system.

The selected processes are responsible of a high percentage of the total energy consumption of the factory. In particular, heating needs are covered using LPG as a fuel and are considered to be constant at monthly and daily scale during the heating period, i.e. from October to March. On the other hand, regarding cooling, the total demand is currently covered by an electric chiller.

Control: The control in the plant is manual and add in an excel file for its analysis. Each day the figures of relative humidity and temperature are measured,





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Ship project to be implemented

- > Evacuated Tubes + Absorption chiller + Adsorption dehumidifier
- > Heat Transfer Fluid: Water for secondary demand loop
- > Net Aperture Area: 70 m2
- > Gross Area: 110 m2
- > Peak power: 50 kW
- > Gross heat production per year: 49 MWhth
- > Yearly global efficiency: 54%
- > CO2 savings: 11.44 tCO2
- > Heating cost: 5 c€/kWh
- > Payback: 6-7 year

Pictures



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Roda also printed communication materials to provide more details on the project in the showcase room (see Images 11-14 below).



Image 11: Roda showcase room



Image 12: Roda showcase room



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Image 13: Roda communication materials




Image 14: Roda communication materials

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2.4 Results

With SHIP2FAIR, RODA contributes to mitigating the effects of climate change using renewable energies, specifically using solar-thermal energy to reduce CO2 emissions. Ideally, it would therefore be a more competitive company by reducing its energy bill, increasing efficiency and improving its image as a sustainable winery.

After an analysis of the data obtained in 2021 and 2022, RODA has calculated that, with the solar thermal installation, it produces 60 MWh/year, which means a saving of about 4500 l of propane gas and a CO2 emissions reduction of 13 Tons per year. The amount of energy covered by the solar field is 14%. It is complex to infer stable economic data, since these years have been greatly influenced by fluctuating activity during the COVID-19 crisis and by the war in Ukraine and subsequent instability of fossil fuel prices.

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3 DEMO-SITE 3 - Larnaudie

3.1 Overview


Larnaudie is located in Castelnau d’Auzan, in Gers, a Southwest department of France. It is specialized in manufacturing fresh products (foie gras, duck breast, duck slivers, legs to cook...) and prepared products (tinned and semi-cooked foie gras, confits, cassoulets...). Our products are a reference in the duck industry.

The factory has 225 employees, 15 000 square meters dedicated to production and 120 partners breeders and feeders.

The slaughter capacity is 3 million ducks and Larnaudie is the fourth largest slaughterhouse in the fattened duck industry, representing 10% of the market. The factory includes all the production processes to create the aforementioned duck products.



Image 15: Larnaudie location

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3.2 Industrial process

Each year the company consumes about 350 tonnes of gas for the boiler. SHIP2FAIR has enabled Larnaudie to implement a system that can reduce its consumption by 15%. Solar panels collect the solar energy and transform it into thermal energy, then with the help of a heat exchanger, this thermal energy heats the boiler.

This solar energy system will reduce the consumption of fossil fuels and reduce the carbon footprint.

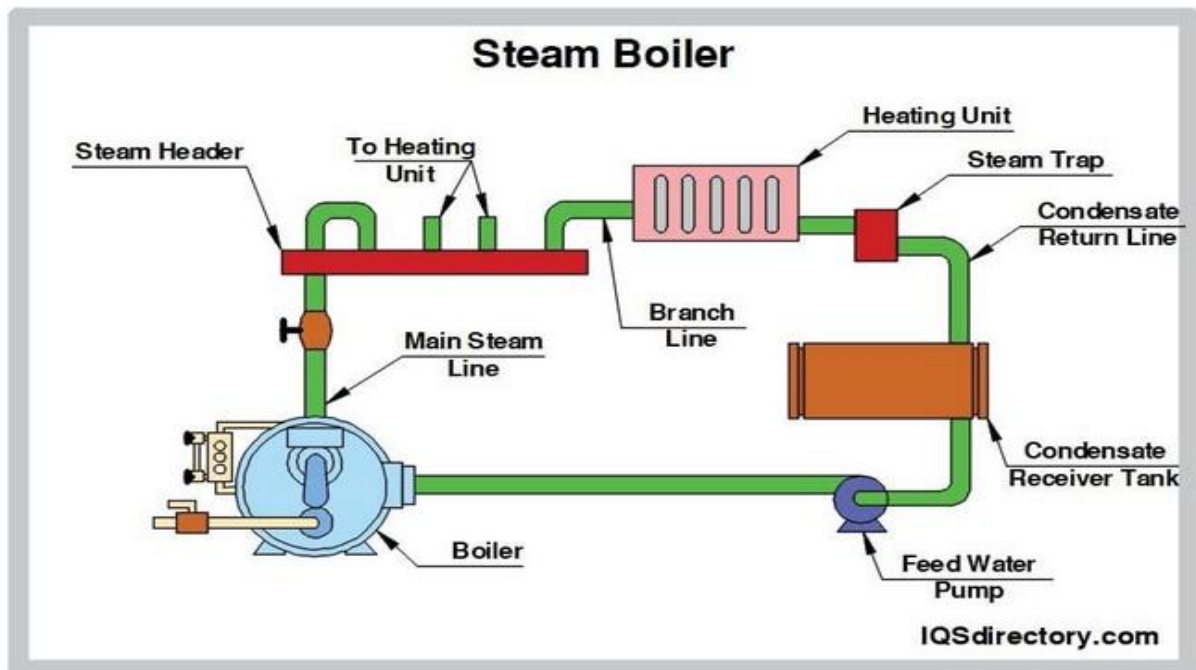



Image 16: Steam boiler system

As explained in the picture above, the boiler burns fuel to heat water and produces steam. The heat exchanger creates steam for outside usage and has a combustion chamber and water container. The boiler is used to provide heat for several processes (cooking, slaughterhouse).

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3.3 Approach


1. Solar field

The solar field is the sub-assembly consisting of the TVP solar thermal panels and the 3-pipe piping system (flow, return and reverse return) responsible for heat generation and the circulation of the Heat Transfer Fluid (HTF). The panels capture solar radiation during daylight hours and transfer this energy to the HTF (water and 30% glycol), increasing its temperature with the objective of reaching a specific set point. The heat transfer fluid circulates within the pipes of the panels and its circulation within each individual string that makes up the system via the supply line (cold HTF) and return line (hot HTF).

2. Thermal block (dry cooler zone + technical room)

The thermal block is composed of all the components and equipment that enable the management of the energy produced by the solar thermal system. It is composed, as can be seen from the P&ID (piping and instrumentation diagram) attached to the operations manual, of a variety of equipment:

- Main solar pump (P-001): This component has the fundamental task of ensuring the circulation of the HTF within the closed hydraulic circuit. It is managed via inverter via the programmable logic controller (PLC) installed on board the TVP electrical panel. This component guarantees the TVP software will manage the different operating modes indicated in the operating manual with variable flow rate.
- Sensors: The TVP system principally uses 3 main types of sensors (temperature, pressure and pyranometer). By reading the different parameters involved, the TVP control software is able to automatically manage all the operational phases described in the manual. Specifically, the pyranometer, installed on board the weather station, allows the TVP system to punctually identify the amount of irradiation on the system and, with this information, to better manage the P-001 pump even in the presence of passing clouds. The temperature sensors, as well as the pressure sensors, apart from the purpose of analysing performance data, allow the system to operate automatically. Other sensors present are the flowmeter, which allows the correct HTF instantaneous flow rate value to be read, and the level sensor inside the tank, which allows the system to use the specific auto-refill function for operation in the event of any type of failure (leaks, etc.).

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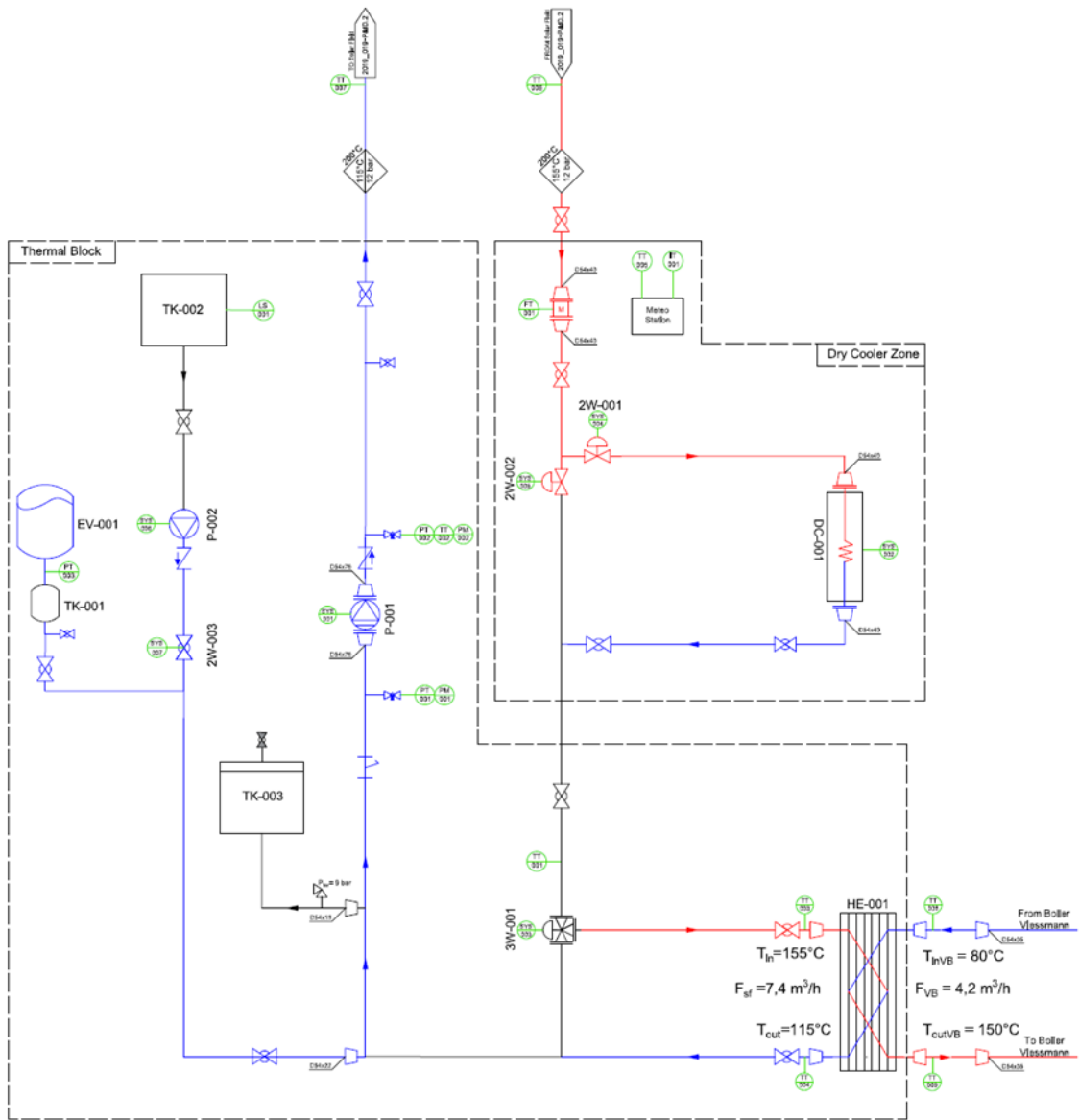



Image 17: Thermal block

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Image 18: Evolution of the solar field installations


A video is available online on the [SHIP2FAIR website](#) and [on YouTube](#) to show the installations.



Image 19: Larnaudie video

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Information on the energy scenario, industrial process and installations is also displayed [on the SHIP2FAIR website](#) (see pictures below).



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Demo 4 - LARNAUDIE

Process: Meat transformation

Site: Castelnau d'Auzan


Country: France

Longitude: 0°05'11" E

Latitude: 43°56'57" N

GHI: 1285 kWh/m² @35°

Space opportunities: There are 3,000 m² of free area within the factory area.



WWW.LARNAUDIE.COM

Description of the energy scenario

There are two main generation equipment:


- A boiler that generates steam at 8 bars and 170°C and is regulated by pressure. It is fed with demineralized water at 84° (condensate return).
- A second heater (hydrogas) that generates hot water at 65°C in 40m³ tanks.

Even if they have not a separate energy meter, the main part of the needs (80%-90%) are estimated to be related to the steam generation. The second heater is used for sanitary hot water production and duck scalding process. The butane consumption is around 37 MWh per working day, supposing around 800MWh per month. The consumption remains quite constant.

Description of the industrial process and current control

The stage of cooking, sterilizing and pasteurizing in the process of candying raw duck meat needs an accurate control of temperature, relative humidity and precise timing. A PLC control, regulate and record every process cycle to meet quality requirements.

Within SHIP2FAIR, a heat exchanger between the demineralized water tank and the boiler to preheat the water up to 140°C will be added in order to integrate the solar heat. In order to optimize the utilization of solar heat, an additional thermal storage tank will be installed. Other potential use of the solar heating could be for the 65°C water generation.



› Foie gras and duck meat production

Ship project to be implemented

<ul style="list-style-type: none"> › Ultra-high vacuum FTP › Heat Transfer Fluid: Water › Net Aperture Area: 1568 m² › Gross Area: 1600 m² › Peak power: 925 kW 	<ul style="list-style-type: none"> › Gross heat production per year: 1085 MWhth › Yearly global efficiency: 50.7% › CO2 savings: 226 tCO2eq › Heating cost: 3.25 c€/kWh › Expected payback: 10-11 year
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Pictures







Image 20: Larnaudie on the SHIP2FAIR website

	Document:	D9.3 SHIP2FAIR demo-site showcases	
	Author:	EUREC	Version: 3
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EUREC and Larnaudie prepared communication materials to present the project and key results of the demo-site (see Images 21 and 22 below).



Image 21: Larnaudie showcase room



SOLAR FIELD FOR THERMAL ENERGY PRODUCTION

- 260 panels
- 3700 m² of panels surface
- 300 kW peak power
- Boiler preheating up to 150C
- 257 MWh annual production
- 31'518 m³/year fuel savings
- 63 tn/year CO2 savings
- 2.7% heat demand satisfied by the solar system





 This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 792276.


Image 22: Larnaudie communication materials

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3.4 Results

With SHIP2FAIR, Larnaudie can reduce its fossil fuel use and can use thermal energy for the boiler. The PVT system also creates a more stable and secure source of energy for the facility.

Larnaudie calculated that the solar thermal installation could produce 300 kWh/year, which means a saving of about 31518 m³ of butane gas, leading to a reduction of CO₂ emission of 63 Tons per year. The solar fraction (amount of energy covered by the solar field) is 14%.

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5 Conclusions

SHIP2FAIR results are now available on three demo-sites in Spain, Italy and France. The showcase room and communication materials available at each demo-site will provide information to external contacts and visitors.

The roll-ups and panels will be used on-site to show the main results of the project whereas the video will explain in greater depth the installations and functionalities. All materials will help to promote the project to a wider audience and give a positive example of how the industry can be decarbonized.