# TRINITY STAR

ECO ENERGY SOLUTIONS

## LEADING THE WORLD

## TO A GREENER TOMORROW

# INTRODUCTION

As we look at the growth over the years since our inception in 2010, we are extremely proud of what Trinity Star team has achieved, and even more excited about our outlook for an equally promising future. We have successfully transitioned from a local Dubai start-up to become a respected firm, garnering business from across the UAE and Middle East, while earning our clients' trust along the way.

It is satisfying to know that we are able to help our clients contribute to the sustainable and eco-friendly future and enable them to connect and operate their business more efficiently and economically. Customer satisfaction is the hallmark by which we measure our performance, and we hold ourselves, as do our clients, to the highest standards of quality.

In this continually evolving marketplace, our clients are more informed than ever about their solutions provider options.Even so, they continue to select TST as their partner of choice because of our experience, commitment to quality and community, and integrity.

When conveying TST successes, we always return back to three guiding principles-each of which has helped define who we are today

# COMPANY PROFILE

Based in Dubai, Trinity Star (TST) was founded in the year 2010, and incorporated in February 2011 with the vision of developing a greener and more sustainable environment for its clients and for the future generations to come. Dedicated to the cause of integrating advanced technology in the fields of energy, water, and waste; TST brings out products that define benchmarks.

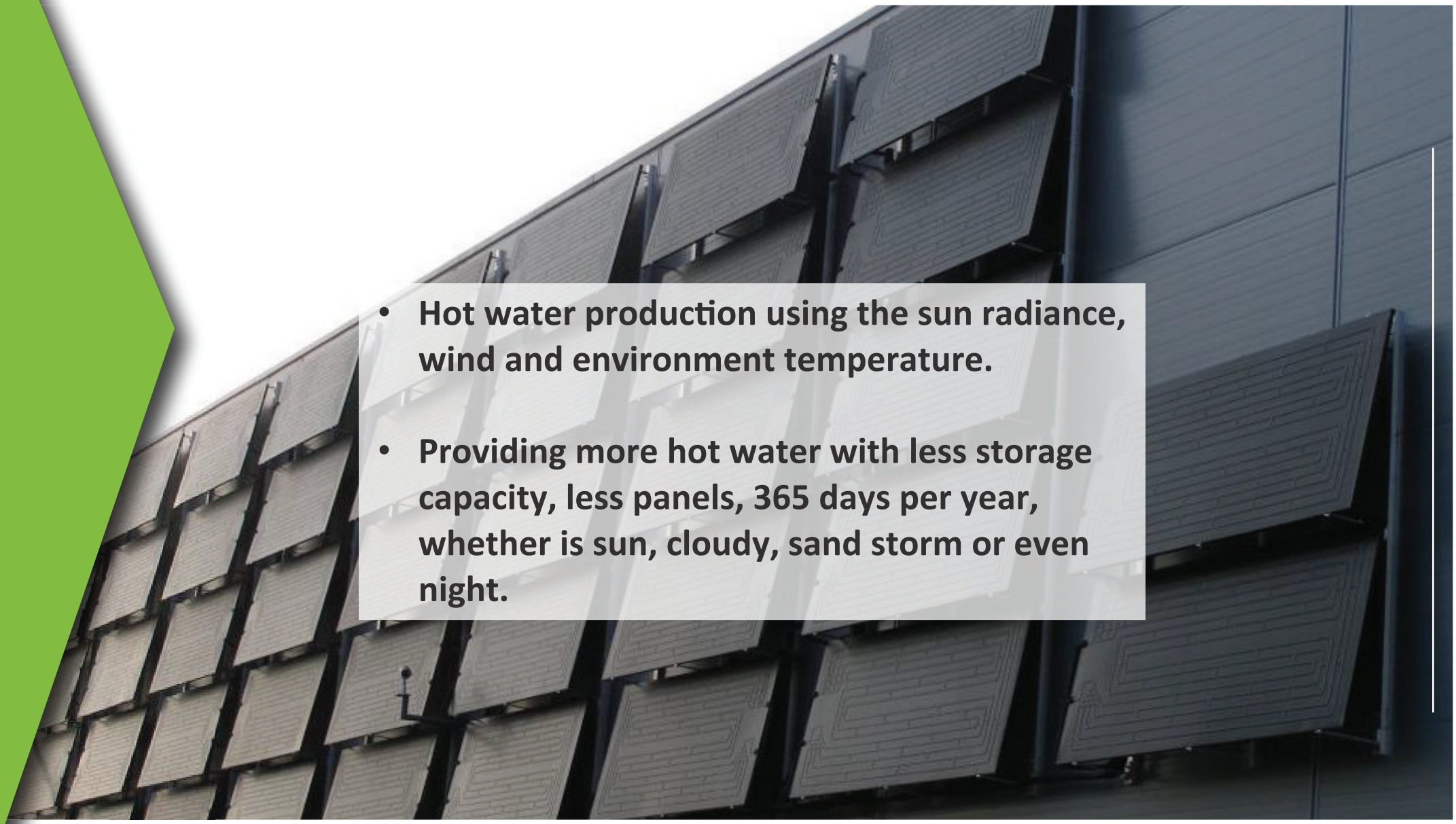
# VISION

Our main priority is to dynamically contribute to a sustainable, ecologically safe, and protected environment by providing eco-energy solutions. To TST, this means meeting the needs of society as a whole, whilst respecting and being concerned about the ability of the future generations to live in a better, safer and eco-friendly environment. The flexibility of our organization permits this change to be realized with ease and comfort, whereby providing a peoplefriendly atmosphere with enormous potential for meaning

# FUTURE SUSTAINABILITY OUR MISSION

Our mission is to conserve the unnecessarily wasted energy and provide our clients with safer, more reliable, more efficient, and environmentally friendly energy saving solutions and products thereby maximize savings on energy bills as well as being mindful of the needs of future generations.


Thermodynamic Solar Energy



- **Hot water production using the sun radiance, wind and environment temperature.**
- **Providing more hot water with less storage capacity, less panels, 365 days per year, whether is sun, cloudy, sand storm or even night.**

# Concept


DOMESTIC HOT WATER
CENTRAL HEATING
SWIMMING-POOL HEATING
Condenser
HOT
WATER
UP TO
55°C
Compressor
Expansion Valve

## Working Principle

The Thermodynamic Solar System joins two incomplete technologies, the Heat Pump and the Solar Thermal Collector. The Heat Pump is an efficient equipment but the heat produced from its renewable source depends on variations of the external temperature. The solar collector is the best heat source for heating in sunny days with high temperatures, but is totally ineffective when the sun is absent.

The Thermodynamic Solar Technology, using the thermodynamic heat pump principle complemented with an additional solar panel, surpasses the limitations of both incomplete technologies. This technology uses a refrigerant fluid (R134a or R407c) in a closed circuit.

The fluid enters the panel and suffers the action of the sun, rain, wind, outside temperature and other climate events. During this process, the fluid holds more heat than in a traditional solar thermal solution. After this process, a compressor sends the accumulated heat to a heat exchanger, transferring the heat into the water. The fluid cools down and the cycle repeats again.

As the fluid has a boiling temperature of approximately -15ºC, the system can work without sun, in the shade, indoors or even during night, producing hot water up to 60ºC, 24 hours a day, unlike the traditional solar thermal systems that can only produce hot water with direct sunlight exposure.

The system's consumption is only from the compressor that makes the fluid circulate, as there are no ventilators to help the evaporation or other cycles that lead to unnecessary energy consumption as in heat pumps.

## System Components

The Thermodynamic Solar System is comprised of the following components:

- Solar Panels – the solar evaporator to capture the environmental energy
- Heat Exchanger – Titanium gas-to-water heat exchanger
- Solar Block – holding the electronics, compressor, and additional internal components

Each of these components will be described in detail in the following sections.

## Thermodynamical Solar Panel

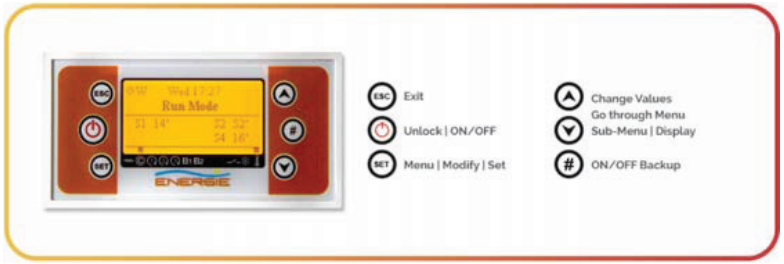
- Made in anodized aluminium with a flexible coating
- Lightweight (8kg) –70% less than a solar thermal panel
- Easy to transport and install
- Dimensions: 2m x 0.8m
- No Glass, rubbers, or fragile materials
- No overheating problem
- No sandstorm problem
- High resistance to salty environments
- High resistance to humidity
- Can be installed from 10º to 90º (landscape mode)
- Flexible installation, adapting to the space and architecture
- No need to clean
- The efficiency doesn't reduce over time or with dirt or sand accumulation
- 25 years estimated life expectancy
- SolarKeymark certification

## Solar Block

This component of the Thermodynamic Solar System has a low consumption compressor (last generation scroll, which allows the circulation of the fluid through all the system), a high efficiency heat exchanger that transfers the heat to the water, an expansion component (electronic expansion valve) that allows the fluid to return to the solar thermodynamic panels to capture heat once again, and an electronic controller to manage all the system (described below in further detail).

Electronic Controller – main features

- Temperature data by probe
- Programming (daily/weekly/etc.)
- Time and date information
- Easy to control
- Easy customization
- System tests
- 4 temperature probes
- Chrono-thermometer
- 6 Languages



## Main Advantages comparing with Solar Thermal

- No Overheating
- No Corrosion
- No Panel Cleaning Required
- Less Space
- Less Maintenance
- Less Consumption
- Higher Life Span


Top Standards
UL
CE
MCS
DIN
Geprüft
DCL
DUBAI MUNICIPALITY
DUBAI CENTRAL LABORATORY
PRODUCT
CONFORMITY
BS EN 12975 - 1
Certificate No. CL17020475

# Solutions

## ECO

Probably the most developed solar water heater in the world

Available with capacities of 200 to 450 litres

Versions with one or two solar panels, with or without supplementary coil.

Cylinder available in enamelled or stainless steel.

## ECO XL

Hotels, hospitals, schools, sports halls, industry with

Domestic Economy

MINIMUM OF CO2 EMISSIONS

(KYOTO PROTOCOL)

HOT WATER UP TO 60ºC 24 H, 365 DAYS A YEAR


## THERMODYNAMIC SOLAR BLOCK

Most advanced scroll compressor in the market

Optimized soundproofing

Electronic expansion valve

Versatile electronic controller with intuitive handling

Excellent quality heat exchangers

MAXIMUM EFFICIENCY

# Case Studies

1. **Villa 5 Bedrooms –** Eco Nomic 200L
**DHW needed daily:** 500 L
**Location:** Dubai
**Comparing with:** Solar Thermal Panels
**Context:** grassroots

Our Technology need less storage capacity to reach the DHW needed daily

| Solutions | Monthly Consumption | Monthly Cost | Storage Capacity |
|---|---|---|---|
| Thermodynamic | 72 KWh | 32 AED | 200L |
| Solar Thermal | 135 KWh | 59 AED | 350L |

# Case Studies

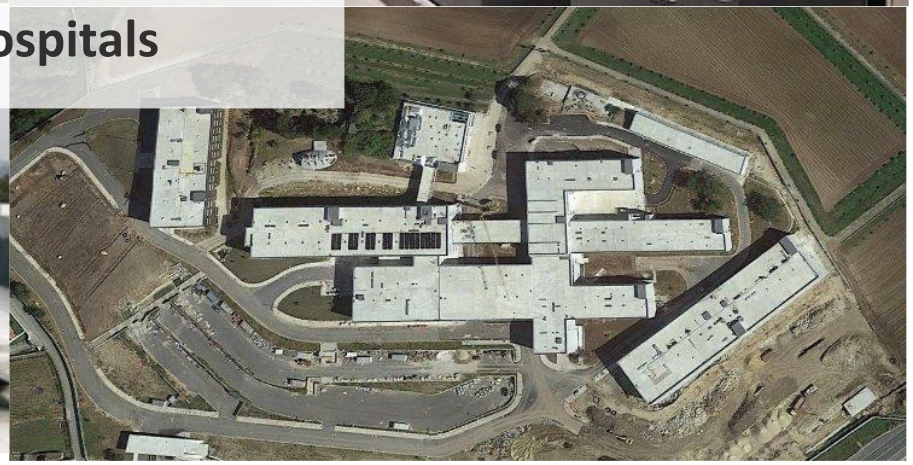
**2.** **4 stars Hotel –** 3 x Eco XL 6000L
**DHW needed daily:** 45,000 L
**Location :** Abu Dhabi
**Comparing with:** Gas Boilers
**Context:** Retrofit

Gas boilers need less storage as they have a high heating power

| Solutions | Yearly Consumption | Yearly Cost | Storage Capacity |
|---|---|---|---|
| Thermodynamic | 98,550 KWh | 19,710 AED | 18,000L |
| Gas Boilers | 34,490 m3 | 238,000 AED | 10,000L |

# References

## Solutions for DHW in Hospitals



# References

# References


## Solutions for DHW in Industry

# References


## Solutions for DHW in UAE

## References - Institutions

Masdar
A MUBADALA COMPANY
مصدر
إحدى شركات مبادلة

Radisson BLU

بلدية دبي
DUBAI MUNICIPALITY

Jumeirah

THE SUSTAINABLE CITY
A PROJECT BY DIAMOND DEVELOPERS

مستشفى دانة الإمارات
Danat Al Emarat Hospital
WOMEN & CHILDREN النساء والأطفال

ALDAR

amt

# THERMODYNAMIC SOLAR BLOCK

Most advanced scroll compressor in the market
Optimized soundproofing
Electronic expansion valve
Versatile electronic controller with intuitive handling
Excellent quality heat exchangers

**MAXIMUM EFFICIENCY**

# Requirements for sizing DHW Large Volumes

Solar Blocks Requirements

## Hotel

How many stars?
Number of rooms
Average occupancy
How many Restaurants, Spa, Gym, Laundry?
Yearly or monthly energy consumption costs for existing heating solution

## Gym

Average number of users per day
Showers with standard faucet or timer faucet?
Consumption peaks (number of users during a certain amount of hours)
Yearly or monthly energy consumption costs for existing heating solution

## Laundry

Kilograms of cloths washed per day
Working hours
Yearly or monthly energy consumption costs for existing heating solution

## Restaurant

Number of meals served at lunch and dinner
Working hours
Yearly or monthly energy consumption costs for existing heating solution

## Buildings

Maximum occupancy of the building
Average occupancy of the building
Does it have recirculation?
Yearly or monthly energy consumption costs for existing heating solution

## Hospital

Number of beds
Average consumption per person per day
Yearly or monthly energy consumption costs for existing heating solution

## Requirements for sizing Private Indoor Swimming Pools

Width
Length
Average Depth
Required water temperature (standard = 28ºC)
Air temperature (standard = plus 2ºC than the water temperature)
Air Humidity (standard = 65%)
Yearly or monthly energy consumption costs for existing heating solution

## Requirements for sizing Private Outdoor Swimming Pools

Width
Length
Average Depth
Required water temperature (standard = 26ºC)
Does it have a thermal blanket? If yes, how many hours will be in use?
Location of the Swimming Pool
Is it on a windy area or on an area protected from the dominant winds?
The following averages for each month when it will be in use (if possible):

- Air temperature [ºC]
- Relative Humidity [%]
- Wind Speed [m/s]

Yearly or monthly energy consumption costs for existing heating solution

**WWW.TSTENERGYSAVER.COM**

TRINITY STAR
ECO ENERGY SOLUTIONS

**Trinity Star Eco Energy Solutions**
**T +9714 3306778**
**P.O. Box 31981, Dubai - UAE**
***info@tstenergysaver.com***