Biogas Science 2018
TORINO, ITALY - SEPTEMBER 17-19

ECOMEMBRANE®
ENVIRONMENTAL TECHNOLOGY

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THE COMPANY

30 years experience

40 countries

700 references

FIELDS

gas

air

water

VALUES

- high quality materials
- fine manufacturing
- R&ID

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CUPOLA M3 HEAT SHIELD

PATENTED SYSTEM

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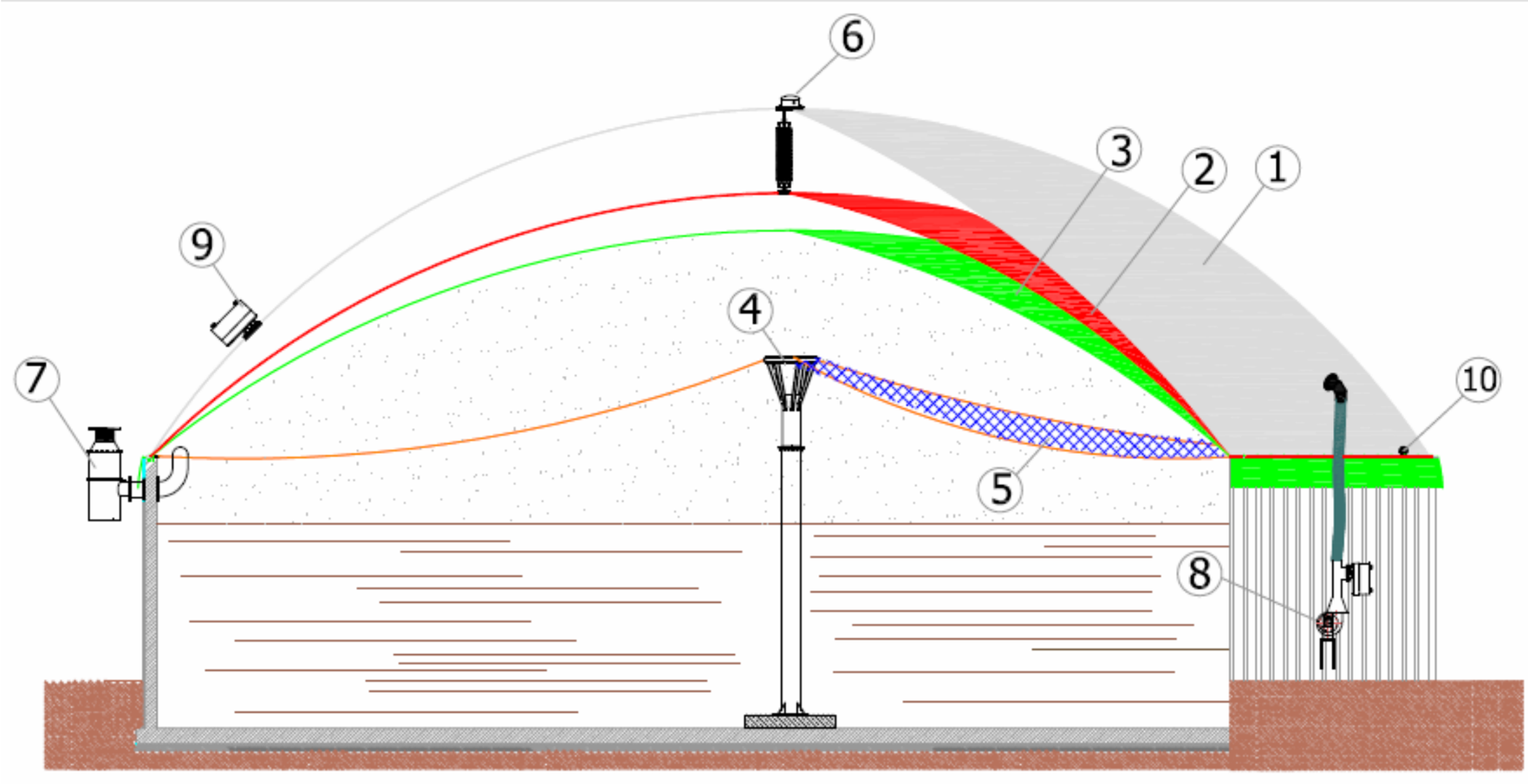
CUPOLA M3 HEAT SHIELD

THE SYSTEM



PRINCIPAL COMPONENTS

1 EXTERNAL DOUBLE-SIDED PVC COATED POLYESTER FIBRE FABRIC MEMBRANE

2 SPECIAL INSULATED INTERMEDIATE MEMBRANE

3 INTERNAL DOUBLE-SIDED PVC COATED POLYESTER FIBRE FABRIC MEMBRANE

4 CENTRAL COLUMN

5 NET AND BANDS SUPPORT SYSTEM

6 LEVEL MEASURER

7 SAFETY VALVE

8 AIR FAN WITH OVERPRESSURE VALVE

9 SAFETY OVERPRESSURE VALVE

10 ONE-WAY VALVE

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CUPOLA M3 HEAT SHIELD

WORKING LOGIC

A

CONDUCTION

In order to reduce heat transfer by physical contact, at first Ecomembrane introduced an intermediate layer in between the two standard membranes (air and gas), with conduction features to limit the heat transmission.

B

RADIATION

Radiant barriers are materials that reflect radiation, and therefore reduce the flow of heat from radiation sources.

C

CONVECTION

The transfer of energy between an object and its environment, due to fluid motion, is applicable to both the technologies mentioned in the membrane technology chapter.

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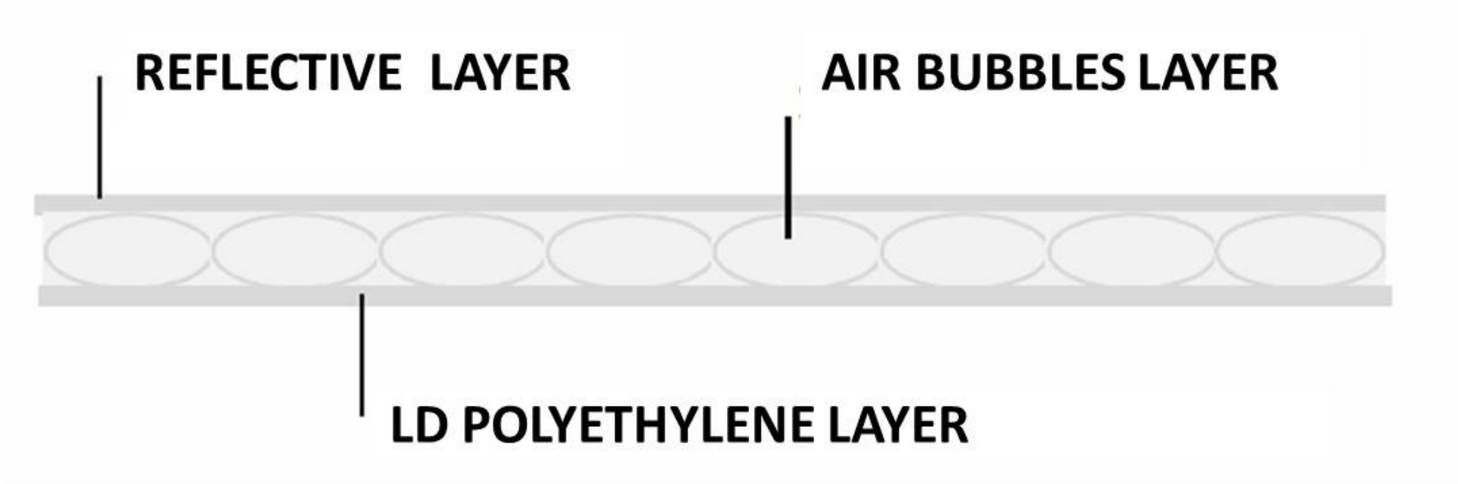
CUPOLA M3 HEAT SHIELD

THERMO-REFLECTIVE INSULATION MEMBRANE



COMPOSITION

Special insulated membrane is realized with an internal air bubbles layer and an external skin made with a reflective aluminum and LD polyethylene layer to increase the mechanical resistance.

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CUPOLA M3 HEAT SHIELD

MEMBRANE TECHNOLOGY

A

CONDUCTION

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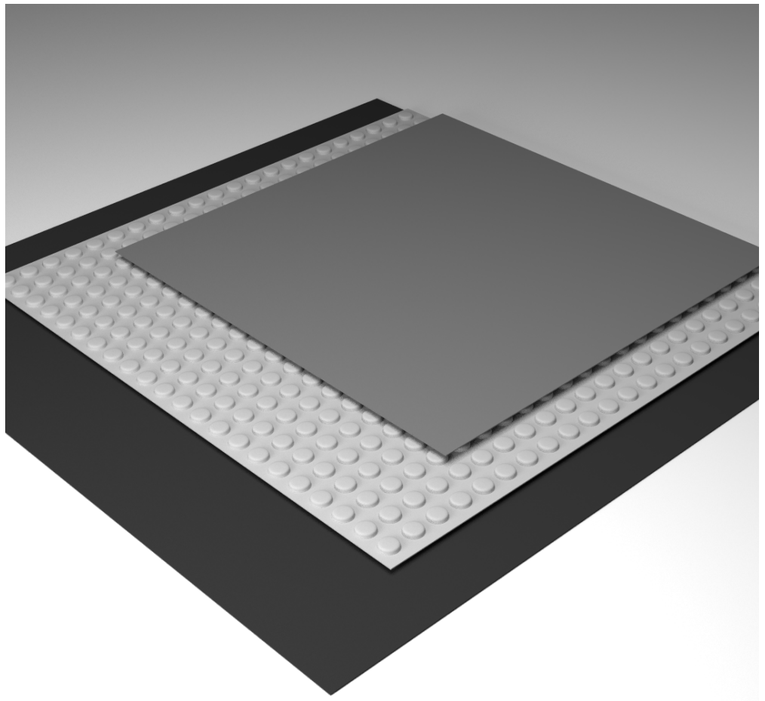

The special insulated intermediate membrane, made by a triple layered ultra-shielded material to separate the inner biogas chamber from the air chamber, acting as a protection against heat dissipation. This layer creates an open micro-gap between the two chambers, communicating with the outdoor environment, in order to avoid the presence of gas mixtures in the air chamber in case of biogas leaks

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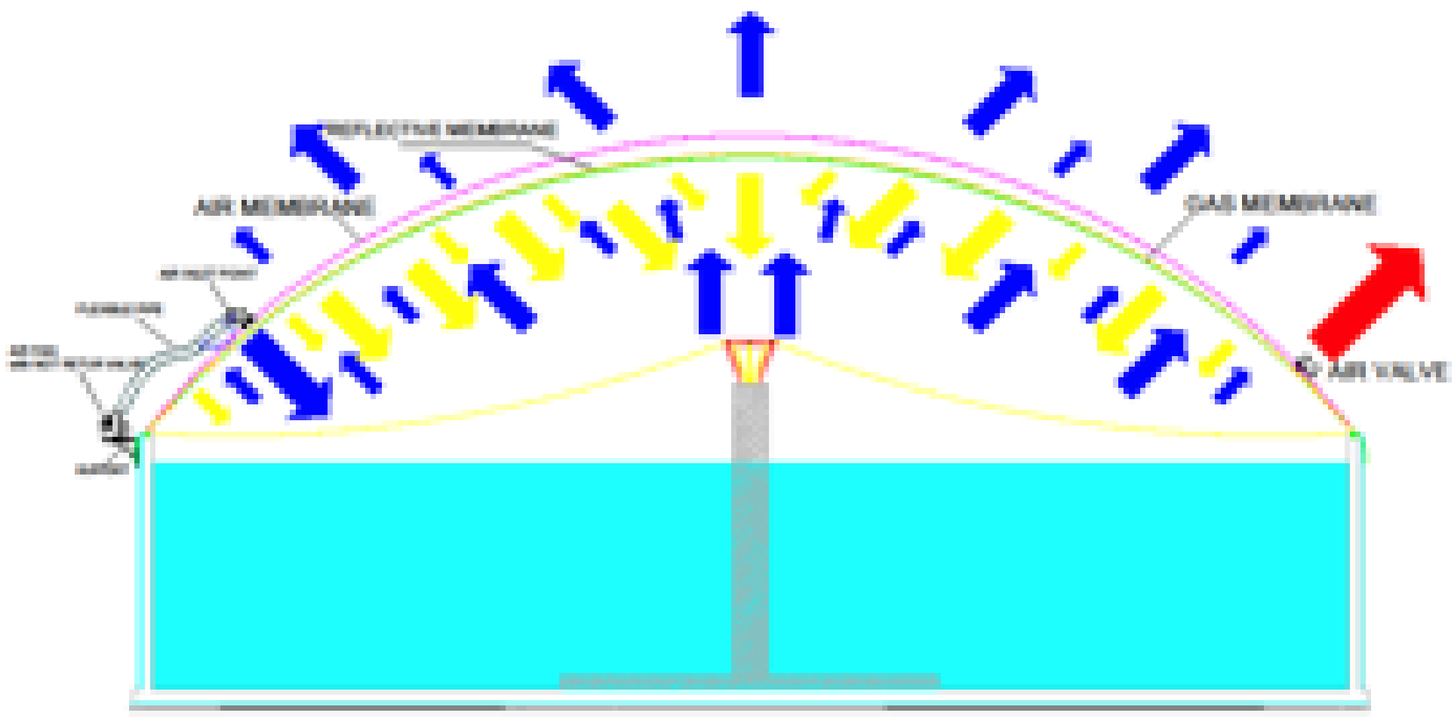
CUPOLA M3 HEAT SHIELD

MEMBRANE'S INTERACTION

B

RADIATION

Radiant barriers are materials that reflect radiation, and therefore reduce the flow of heat from radiation sources.



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CUPOLA M3 HEAT SHIELD

SYSTEM / MEMBRANES INTERACTION

C

CONVECTION

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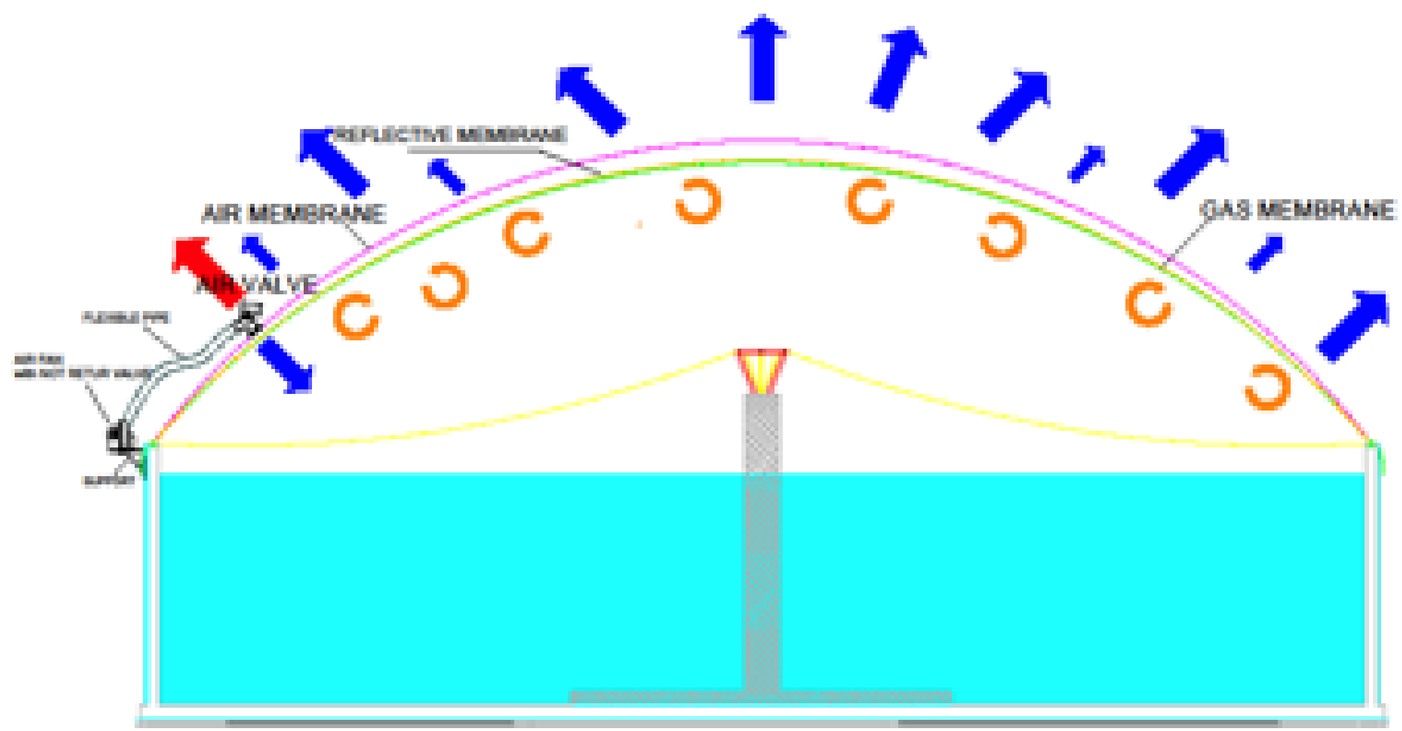

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CUPOLA M3 HEAT SHIELD

ADVANTAGE POINTS

A

HIGH PASSIVE SAFETY AGAINST EXPLOSION DANGER

B

REDUCING HEAT TRANSFER

C

BETTER PRESSURE CONTROL

D

LONGER LIFETIME FOR THE GAS CHAMBER MEMBRANE

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CUPOLA M3 HEAT SHIELD (HSs)

EVALUATION OF THE EFFECTIVENESS OF THE GASOMETRIC COVERAGE SYSTEM IN REDUCING HEAT LOSSES FROM THE ANAEROBIC DIGESTERS

- The gasometric coverage “HSs” is compared with a traditional system (reference) under identical experimental conditions
- Trials currently in progress at the Biogas plant Cooperativa Speranza (Candiolo, TO)
- Experimental activity performed in collaboration with DISAFA, University of Turin, Italy

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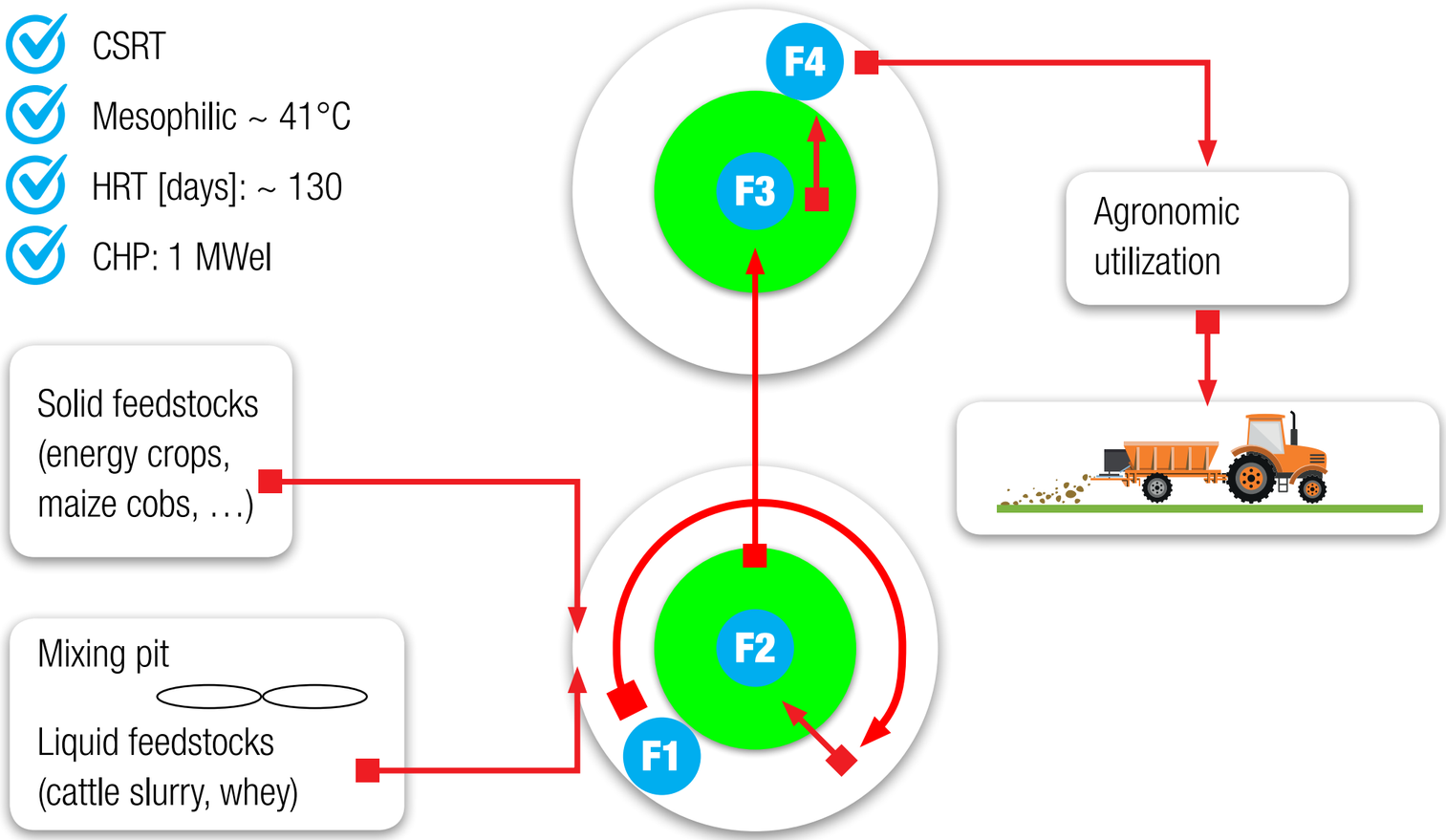
THE BIOGAS PLANT AT THE COOPERATIVA SPERANZA (CANDIOLO, TO)

- CSRT
- Mesophilic ~ 41°C
- HRT [days]: ~ 130
- CHP: 1 MWel



- **Two identical** cylinder-shaped anaerobic **digesters**, each formed by two chambers, concentrically arranged
- Useful volume: ~5800 m3 each
- Mixing systems:
  - F1, F4 —> 1 long axis, 2 paddles (1 vertical, 1 horizontal)
  - F2, F3 —> same mixing system

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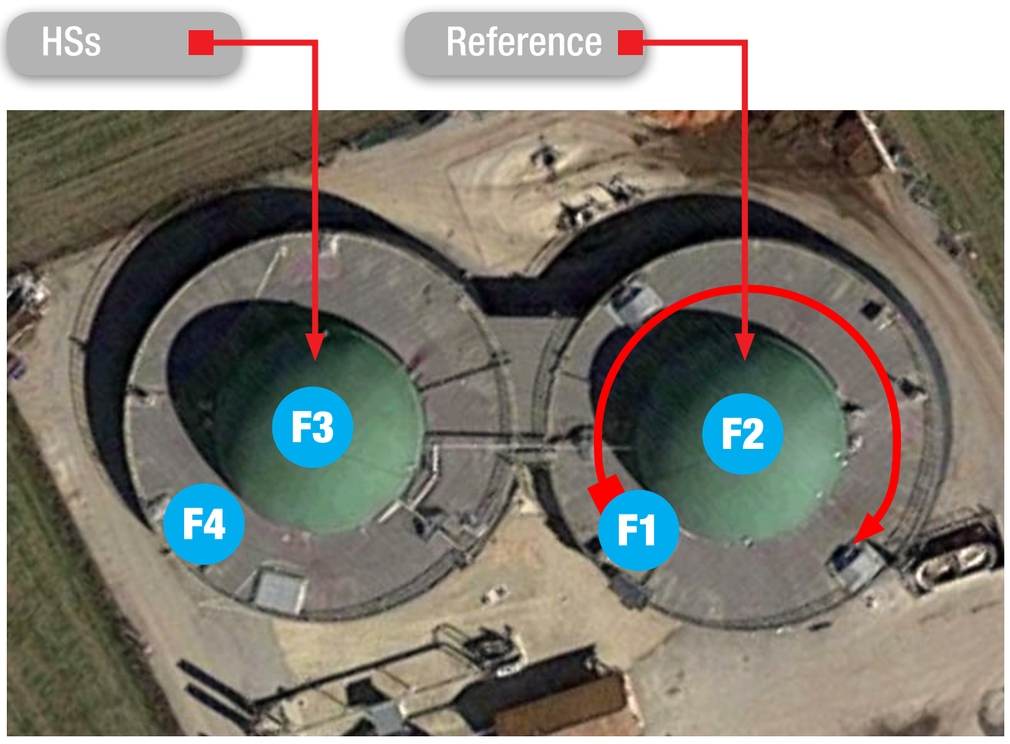
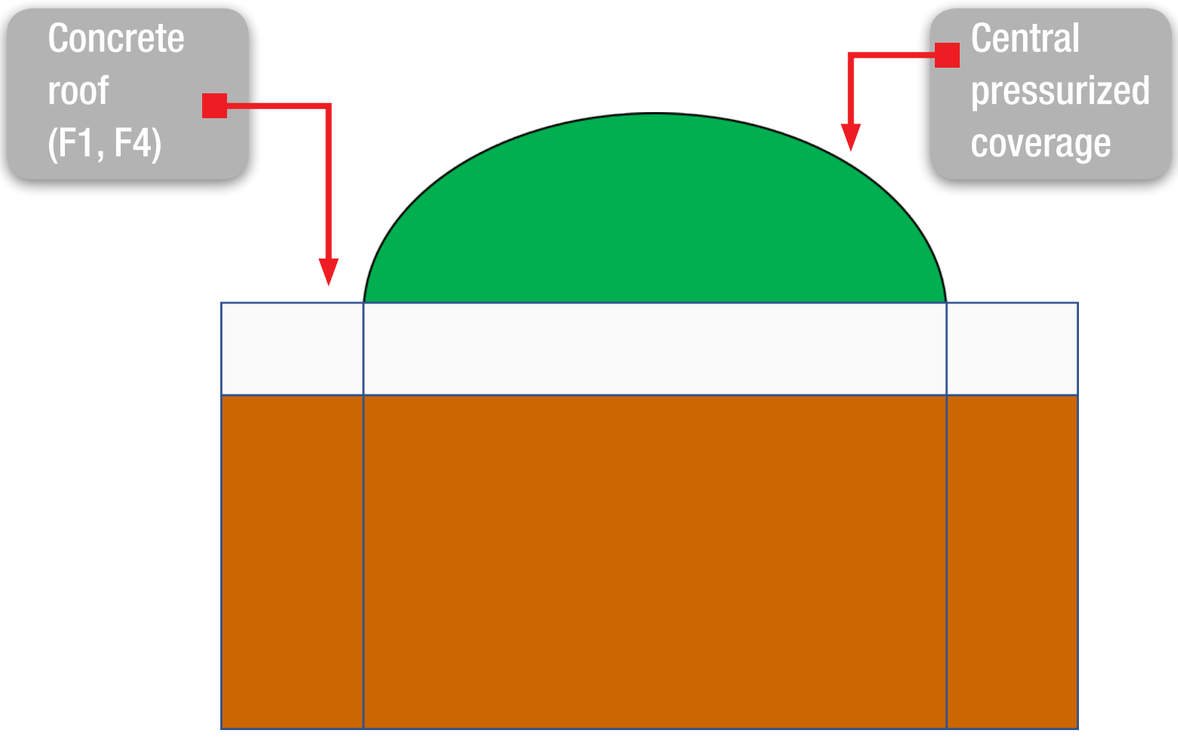
THE BIOGAS PLANT AT THE COOPERATIVA SPERANZA (CANDIOLO, TO)

GASOMETRIC COVERAGE SYSTEMS





- F2 cover = Ø 22 h gas 6 m
  biogas volume:1250 m3
- F3 cover = Ø 22 h gas 6 m
  biogas volume:1250 m3

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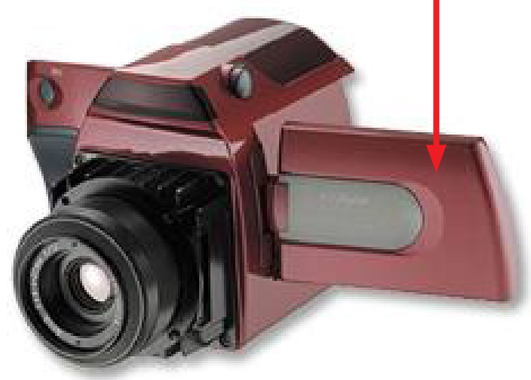
MATERIALS AND METHODS

ASSESSED PARAMETERS

Environmental parameters:

- aver. air Temperature (Te, °C)
- aver. air relative humidity (RU, %)
- aver. wind speed (WS, m s-1)

ther mal imaging camera (AVIO mod. TVS-500)



The temperature (Ts, °C) of selected surface areas of the covers

wireless heat flux meters (ThermoZig) according to ISO 9869

Estimation of Heat loss through the digester covers (Q, W m-2)

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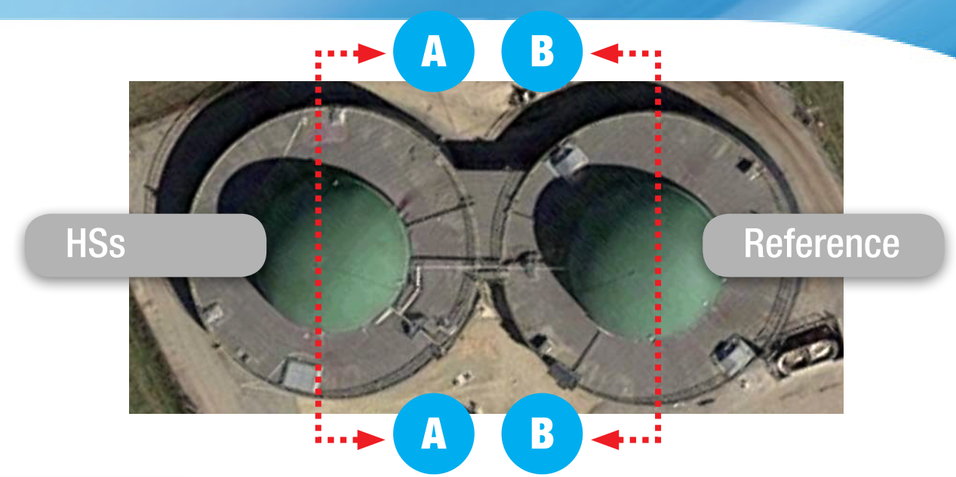
THERMAL IMAGE AND HEAT LOSS OF THE GASOMETRIC COVERAGE SYSTEMS

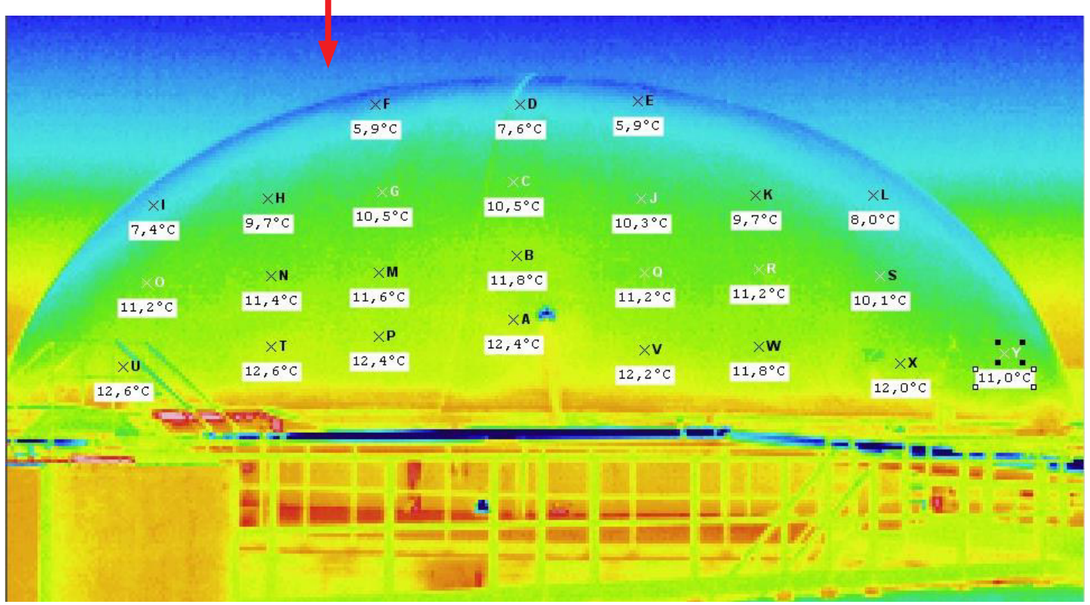
Date: 04/09/2018

Aver. T_e = 14°C Aver. UR = 89% Aver. W_s = ~ 0 m s^{-1}

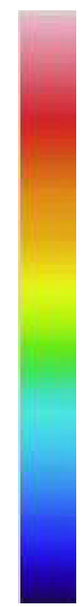


A-A: HSs

Heat loss (Q) = 22.1 W m^{-2}



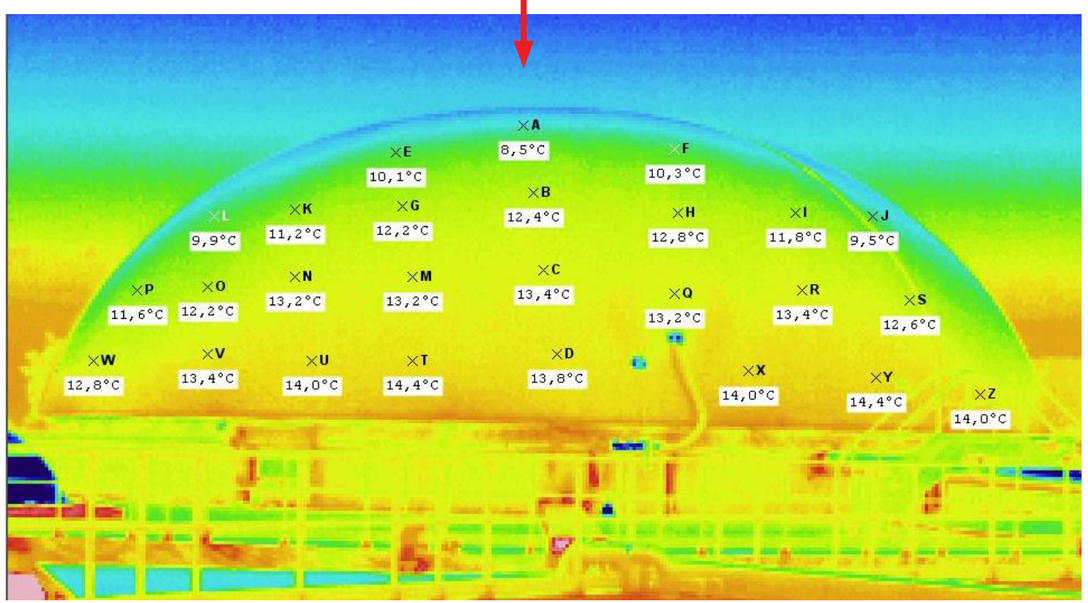
25°C



0.0°C

B-B: Reference

Heat loss (Q) = 38.0 W m^{-2}



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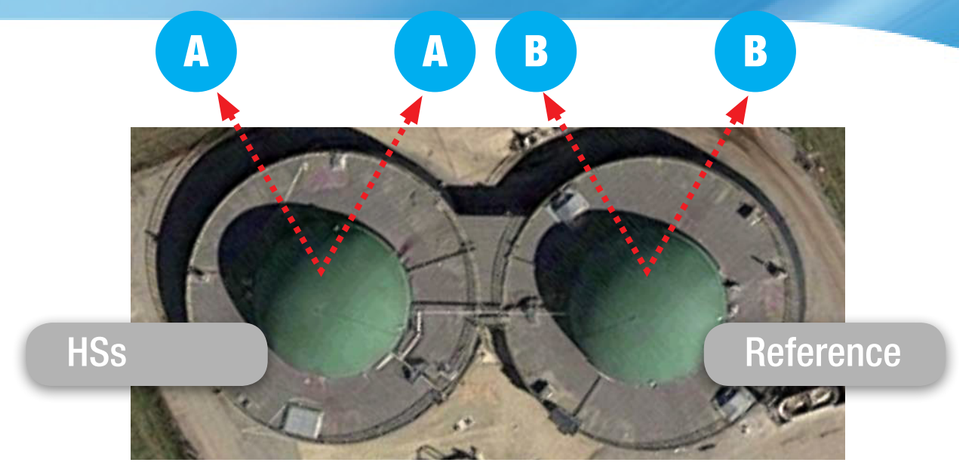
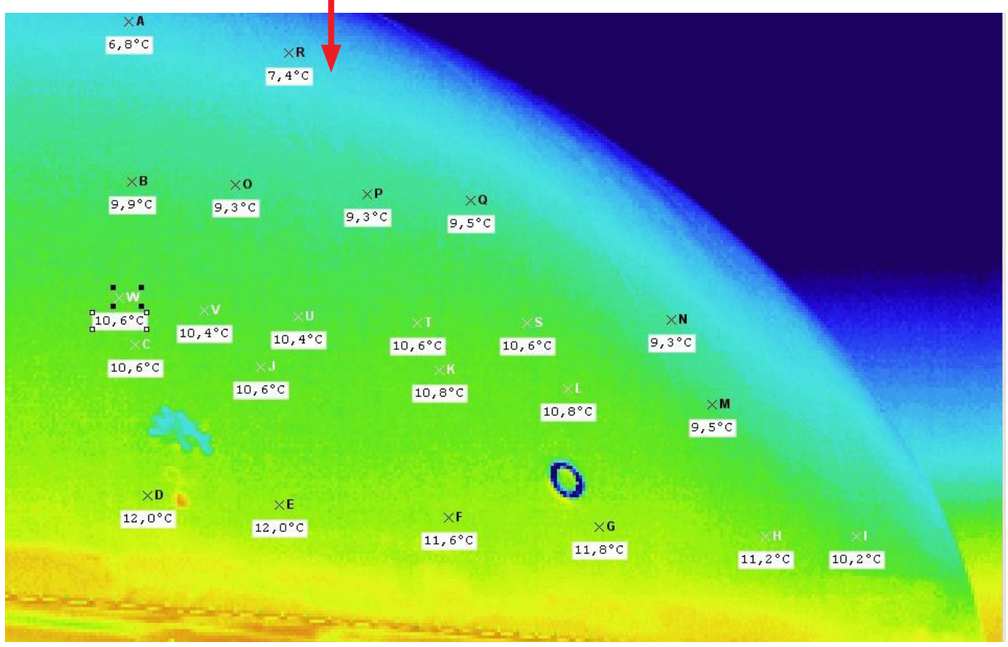
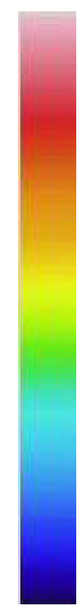


A-A: HSs

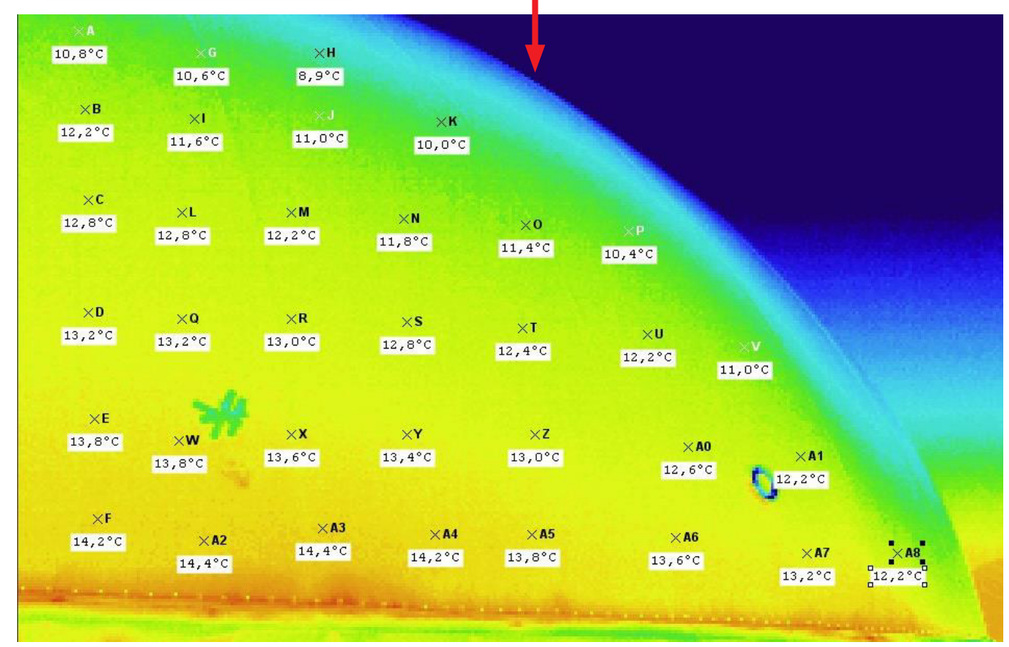
Heat loss (Q) = 18.0 W m^{-2}





B-B: Reference

Heat loss (Q) = 39.3 W m^{-2}



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