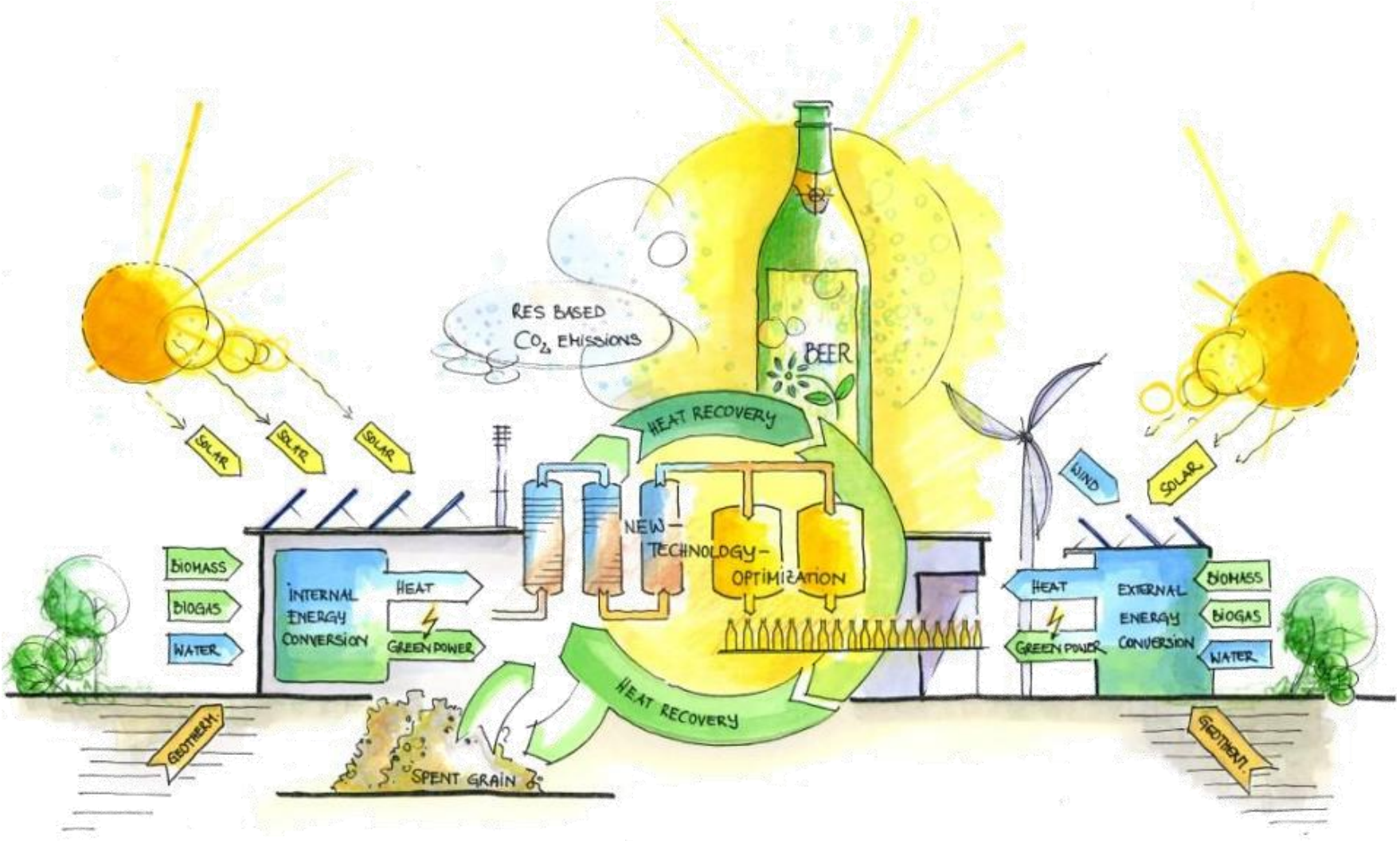
SHIP Egypt

Overview &
Best Practice Examples

Wolfgang Glatzl & Josef Buchinger

AEE INTEC & ConPlusUltra

Project SolarBrew



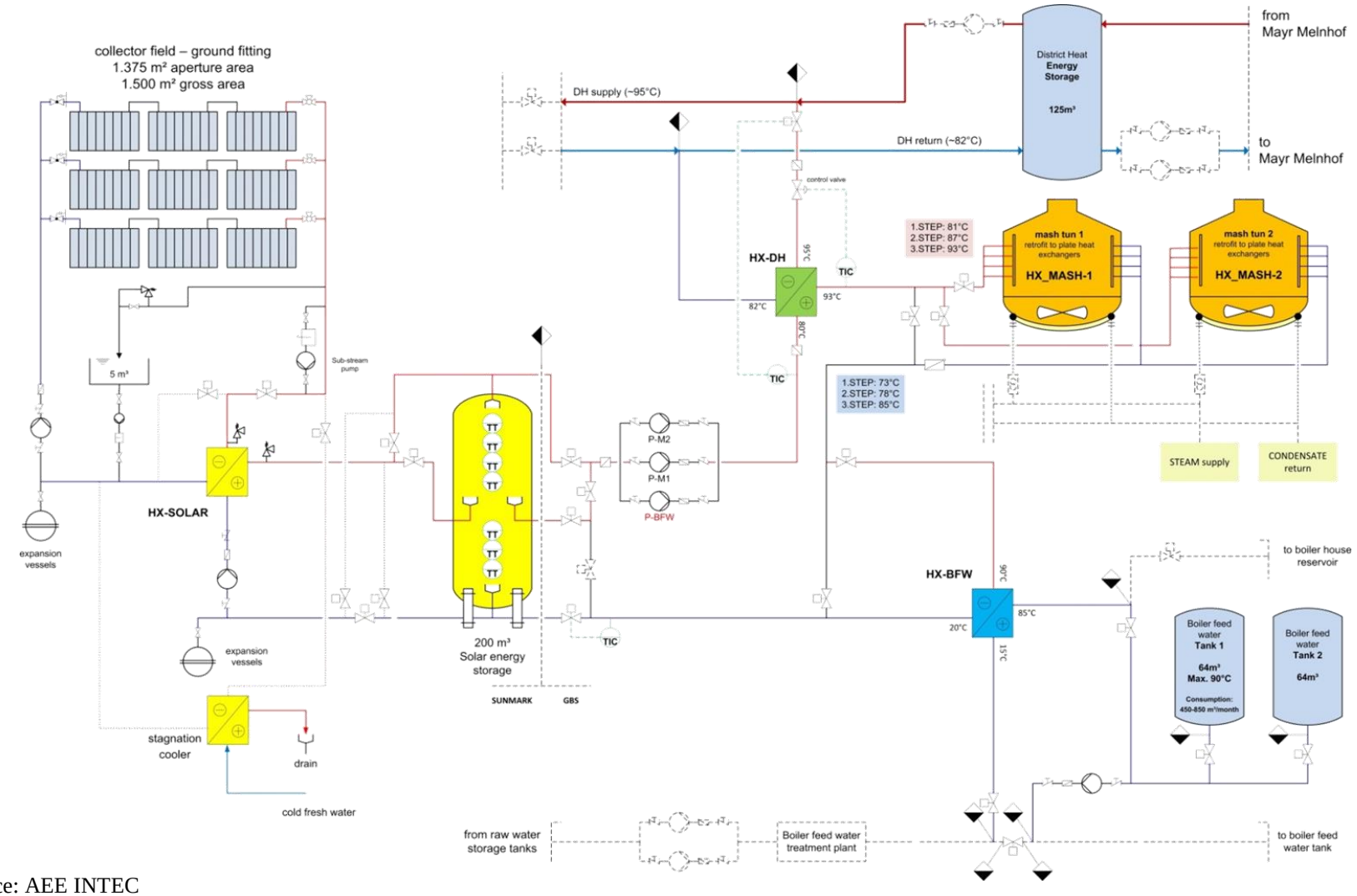
Source: AEE INTEC

Project SolarBrew

- **Solar Brew: Solar Brewing the Future**
  - ⇨ EU FP7 (2012 – 2015)
  - ⇨ Projekt Nr. 295660

- **Project Pool**
  - ⇨ AEE INTEC (Coordination)
  - ⇨ HEINEKEN Supply Chain B.V.
  - ⇨ GEA Brewery Systems GmbH
    - **Partner plant engineering**
  - ⇨ Sunmark A/S
    - **Partner solar thermal**

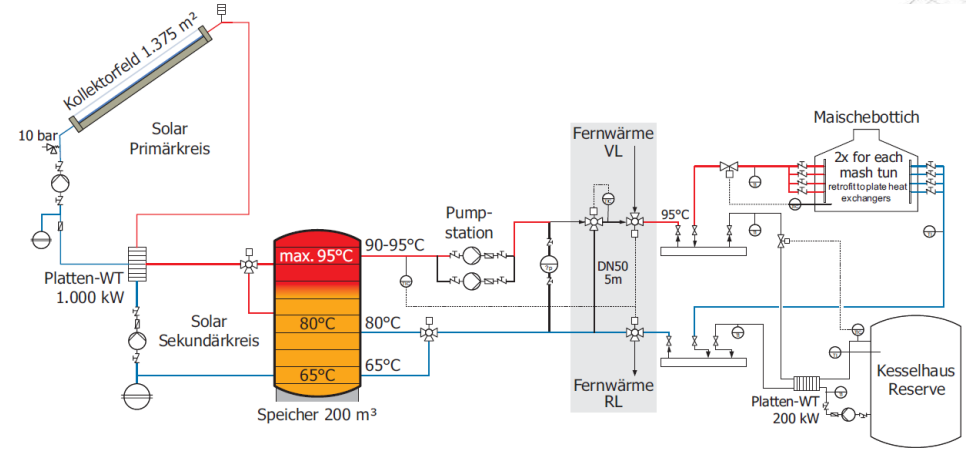
Case study 1 - Göss Brewery - Austria

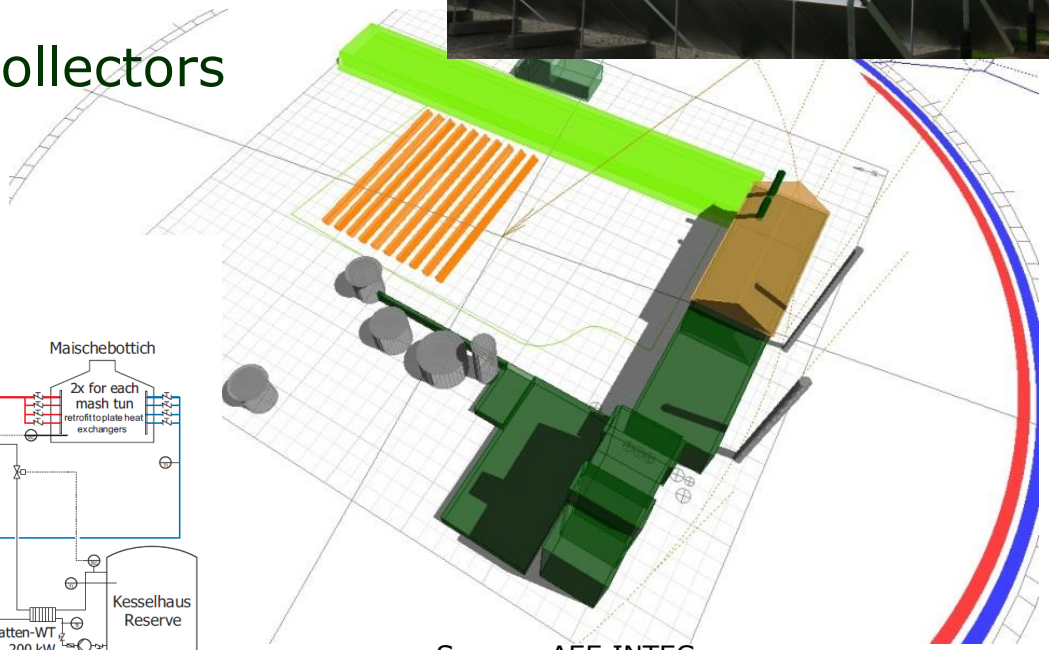


Source: AEE INTEC

Case study 1 – Göss Brewery

- **Brewery FP7 project „SolarBrew“**
- **AEE INTEC, Sunmark, GEA**
- **Integration in mashing (50–75°C)**
- **System in operation since 2013**
  - ⇨ 1.375 m² flate plate collectors





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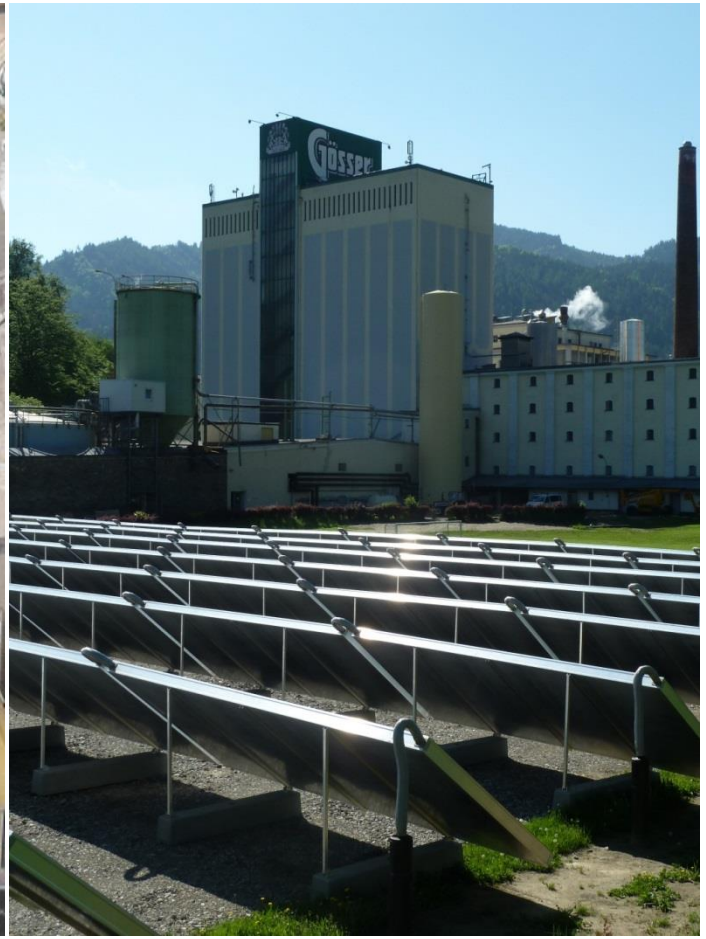
Case study 1 – Göss Brewery



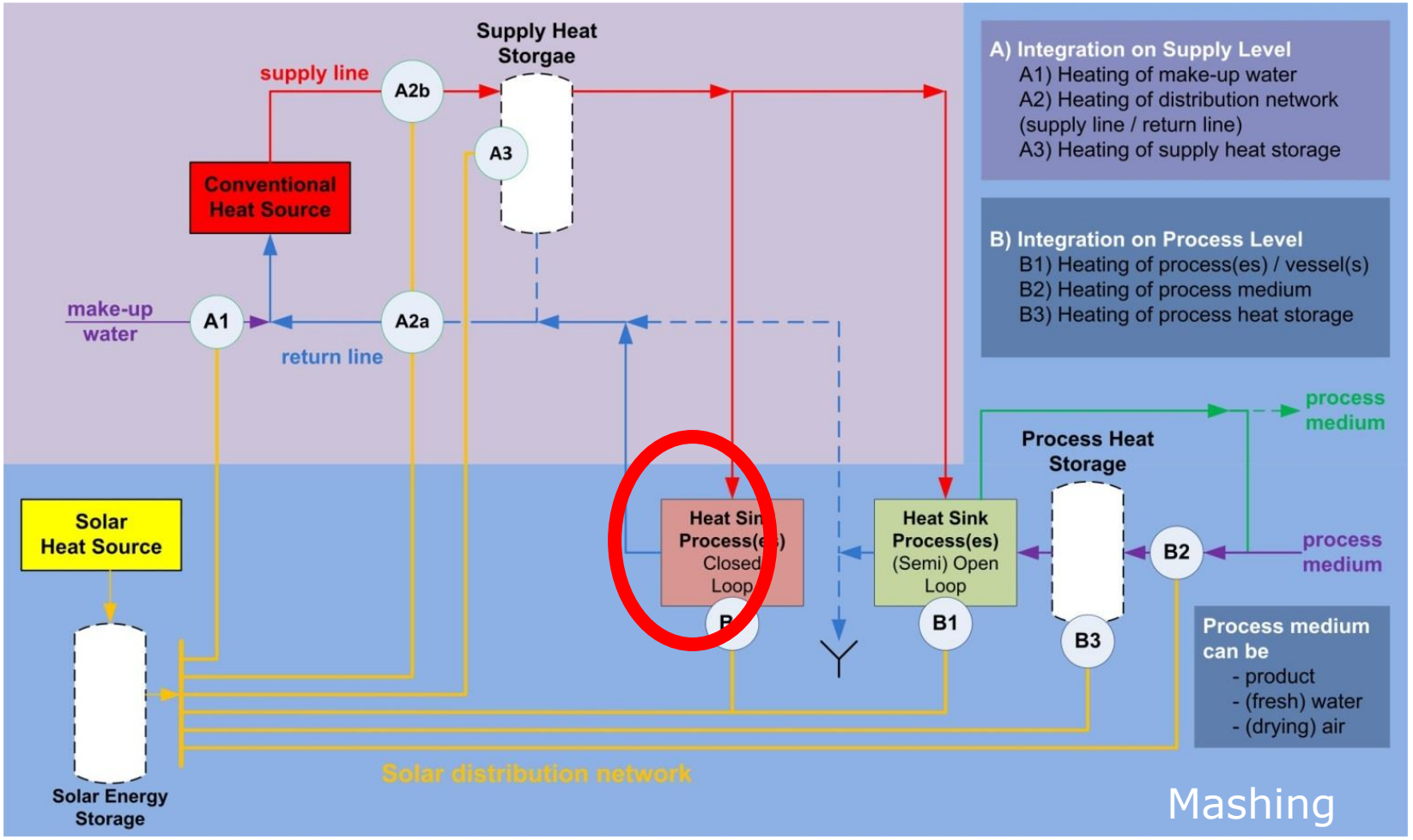
Source: AEE INTEC

Case study 1 – Göss Brewery

- **Göss – construction of collector field**

Source: AEE INTEC

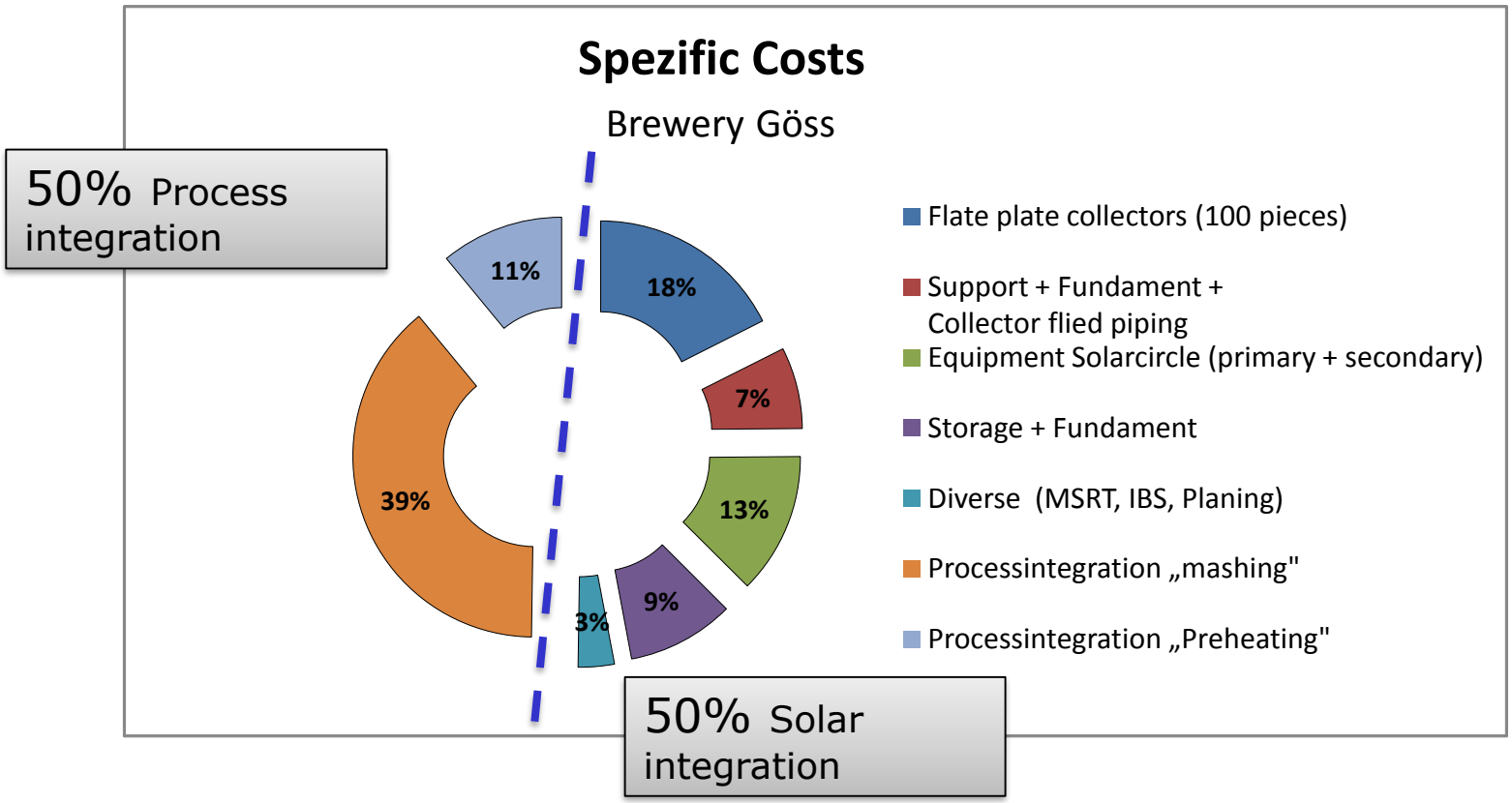
Case study 1 – Göss Brewery



Source: AEE INTEC

Case study 1 – Göss Brewery

➢ Cost analysis (preliminary)

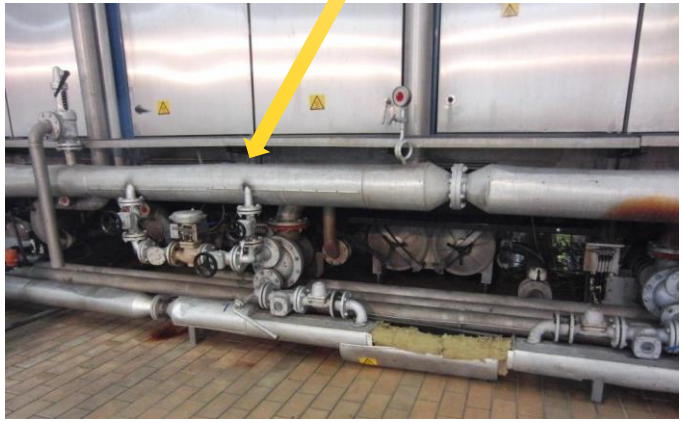


Brewery Valencia - Spain

Pasteur 1 Can

Pasteur 2 Bottles

Steam-WT Inventory

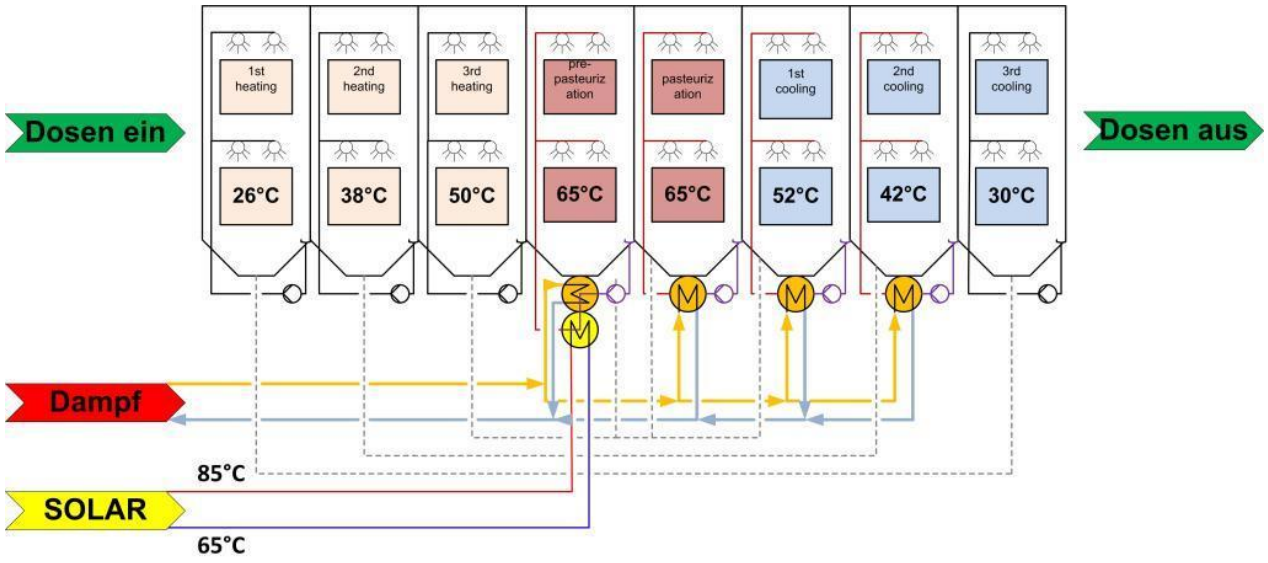


Sprinkeling of the bottles

Source: AEE INTEC

Brewery Valencia - Spain

- **Solar Heat Integration (tunnel pasteur 1: Can)**
- **Expansion of Solar water/water Heat exchanger and existing Steam-WT stays or**
- **Basic Data**
  - ⇨ 2.835m² flat plate collector (gross area)
  - ⇨ 350m³ energy storage



Brewery Valencia - Spain

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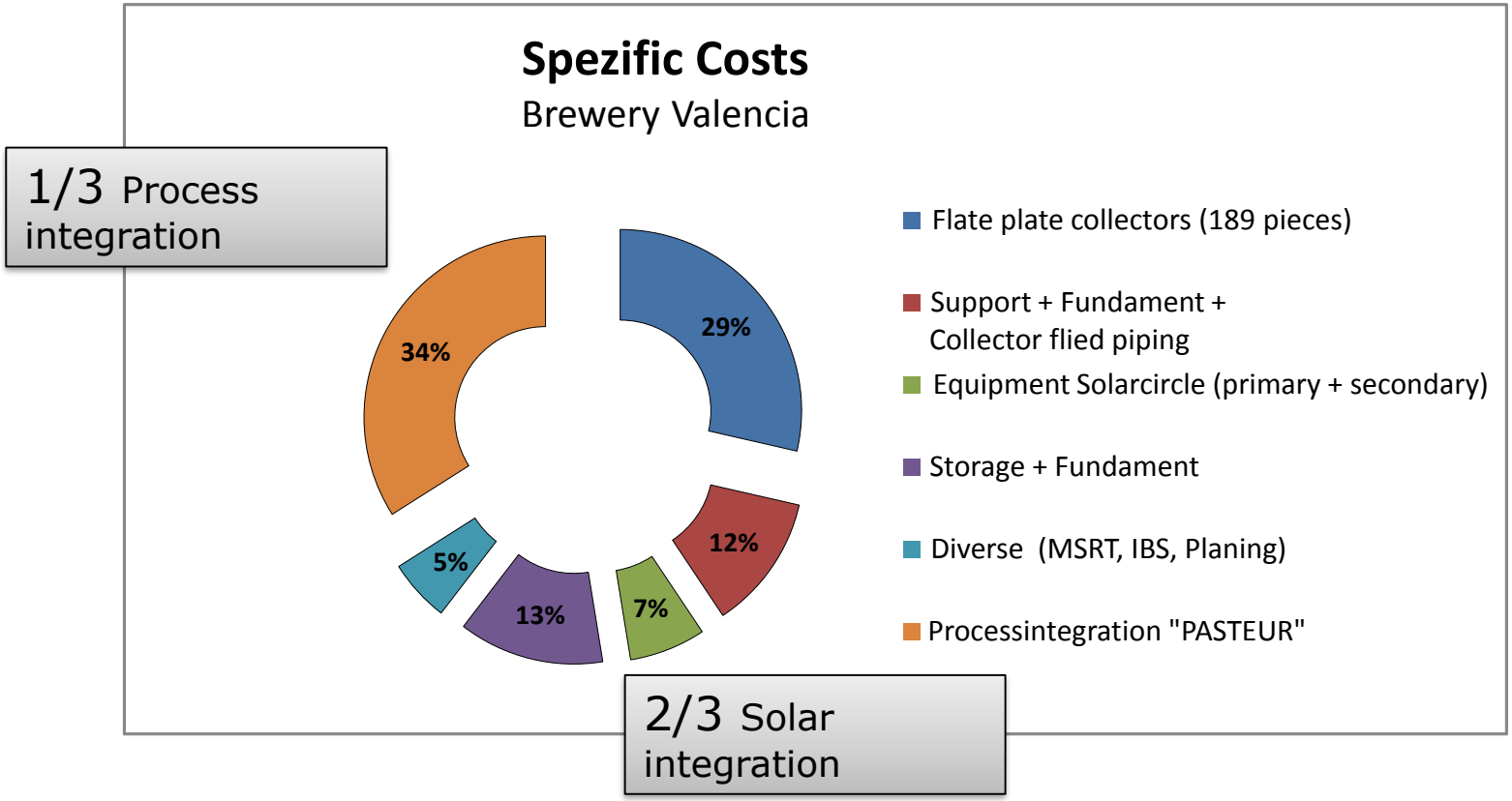
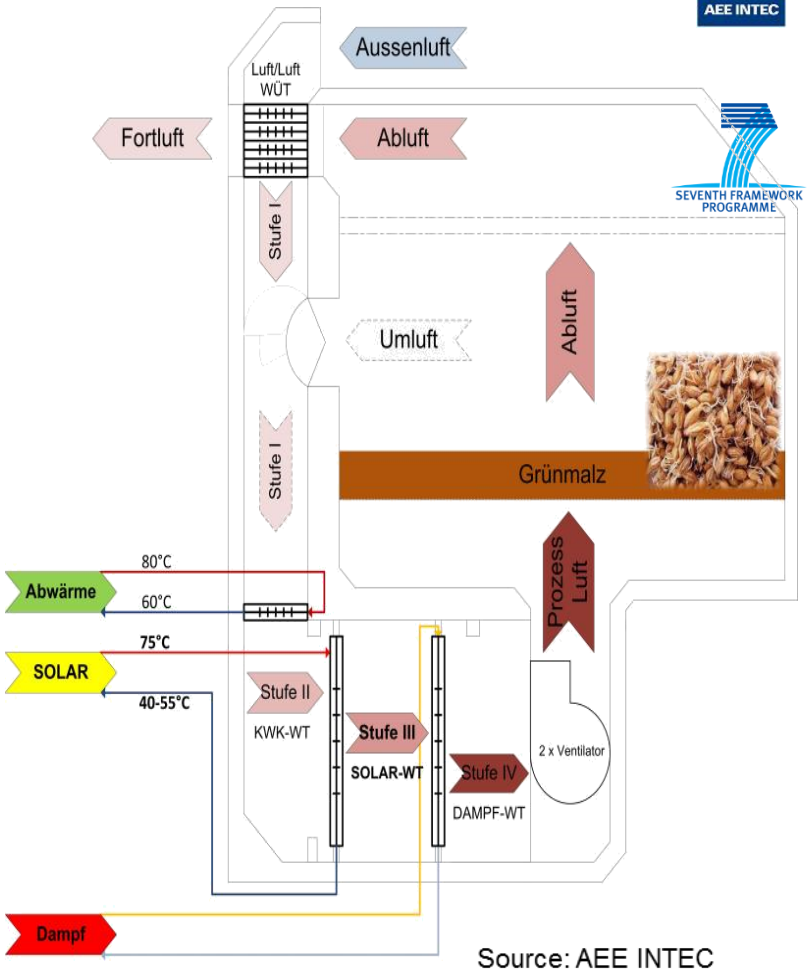


Malting Vialonga - Portugal

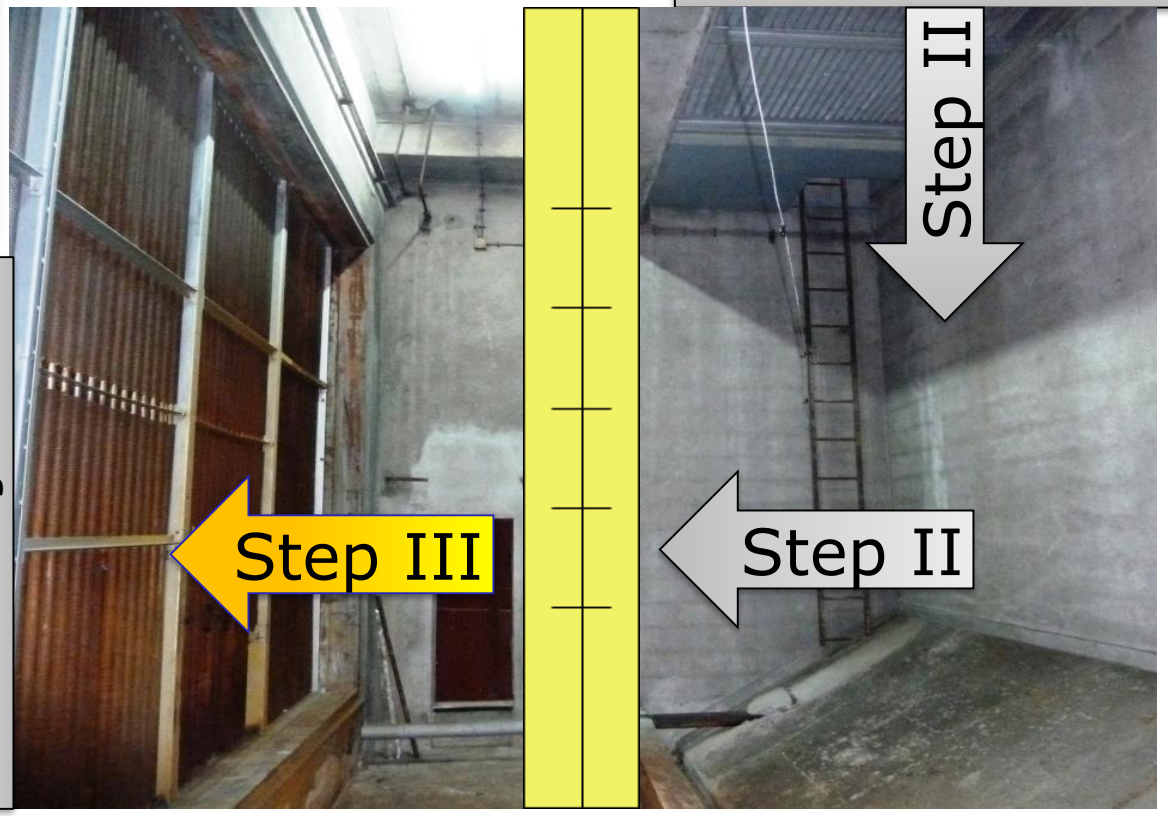
- **Basic Data**
  - ⇨ 3.510m² flat plate collectors
  - ⇨ 300m³ energy storage
- **Solar heat integration**
  - ⇨ Drying of malt
- **Process temperature:**
  - ⇨ 35 - 60°C (Grade 1)
- **Supply temperature: 75°C**
- **Load profile:**
  - ⇨ Mon – Sun continuous, but 18 hours batch-process at different temperature levels



Source: AEE INTEC

Malting Vialonga - Portugal

- **Solar heat integration**



Case study 2– Prestage Food

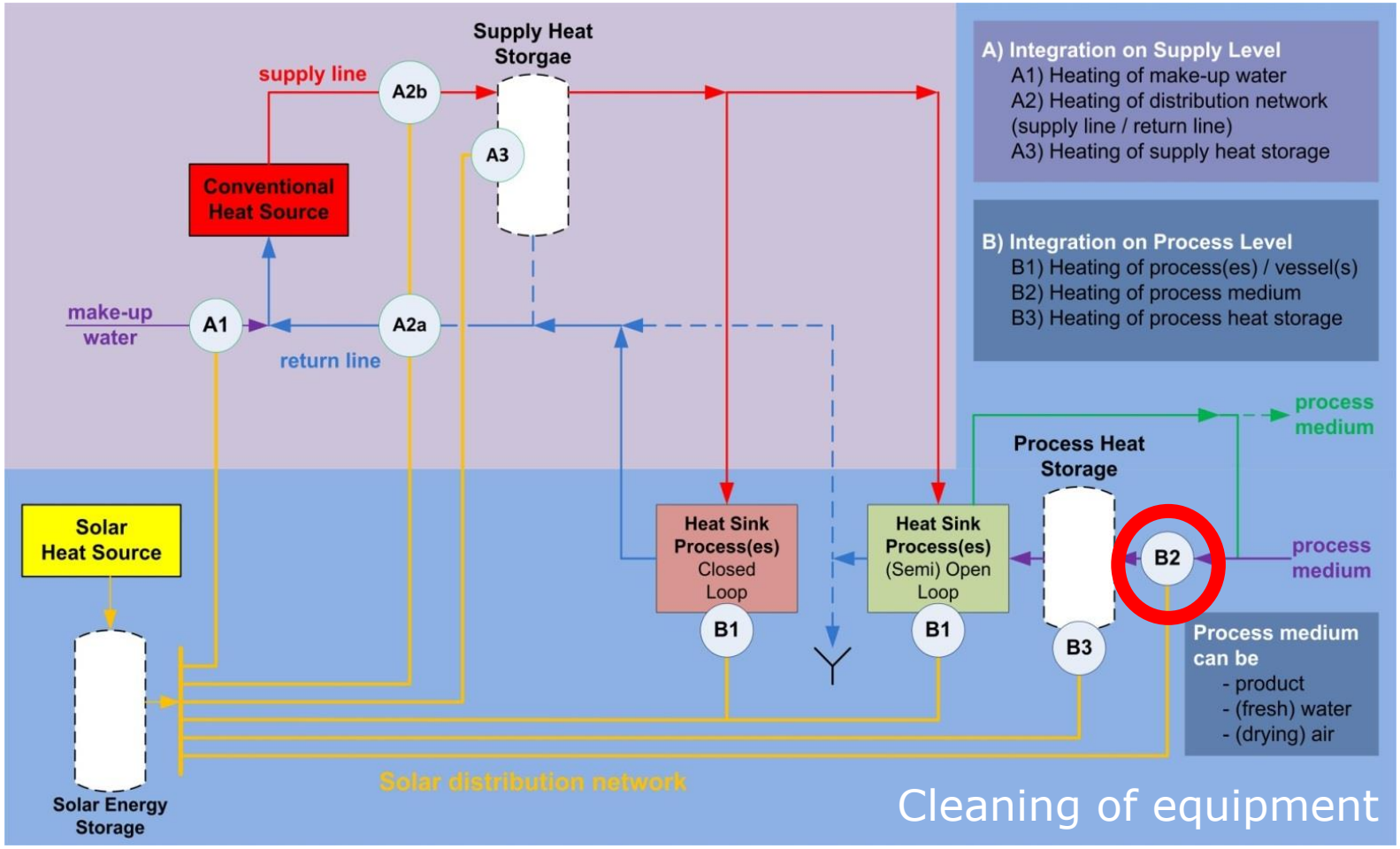
- **North Carolina, USA**

Case study 2– Prestage Food

- **Poultry processor in NC, USA**
- **Energy contractor: FLS Energy owner of system**
- **Demand of 568 [m³/d] of hot water (>60 °C) for cleaning of equipment**
- **System in operation since 2012**
  - ⇨ 7.804 m² flat plate collectors
  - ⇨ 852 m³ storage tanks (10 x 85 m³)
  - ⇨ Covers 50% of hot water demand

Source: FLS Energy

Case study 2– Prestage Food



Case study 3 – Hellenic Copper Mines

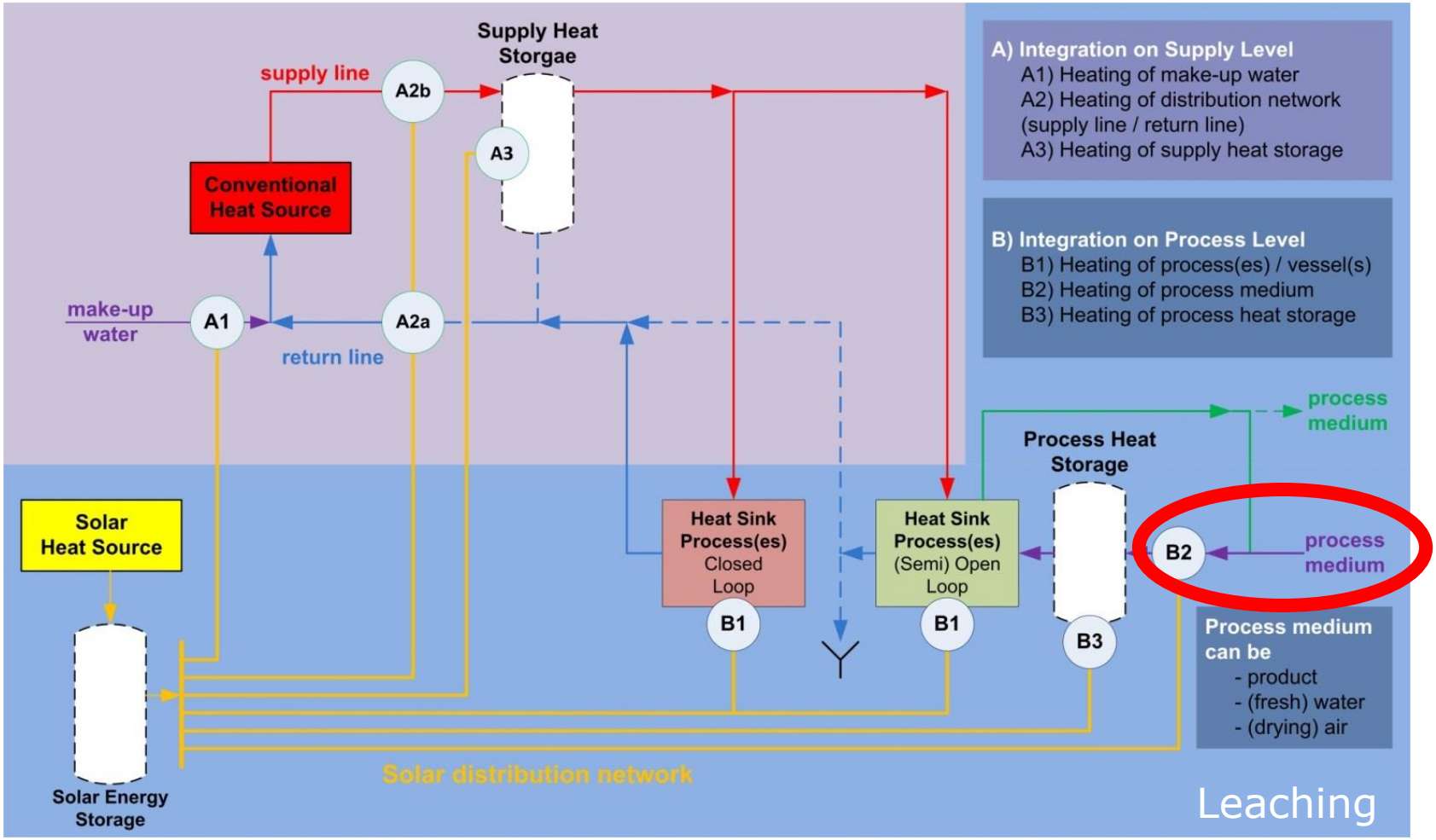
- Cyprus: leaching (extracting copper from ore)
- Hot water (20 – 50 °C)
- Millennium Energy Industries
- In operation since March 2013
- 760 m² flate plate collector
- 100 m³ storage
- Stand-alone system

Source: Millenium Energy Industries

Case study 3 – Hellenic Copper Mines

Source: Millenium Energy Industries

Case study 3 – Hellenic Copper Mines



Source: AEE INTEC

Case study 4 – Nestle Waters

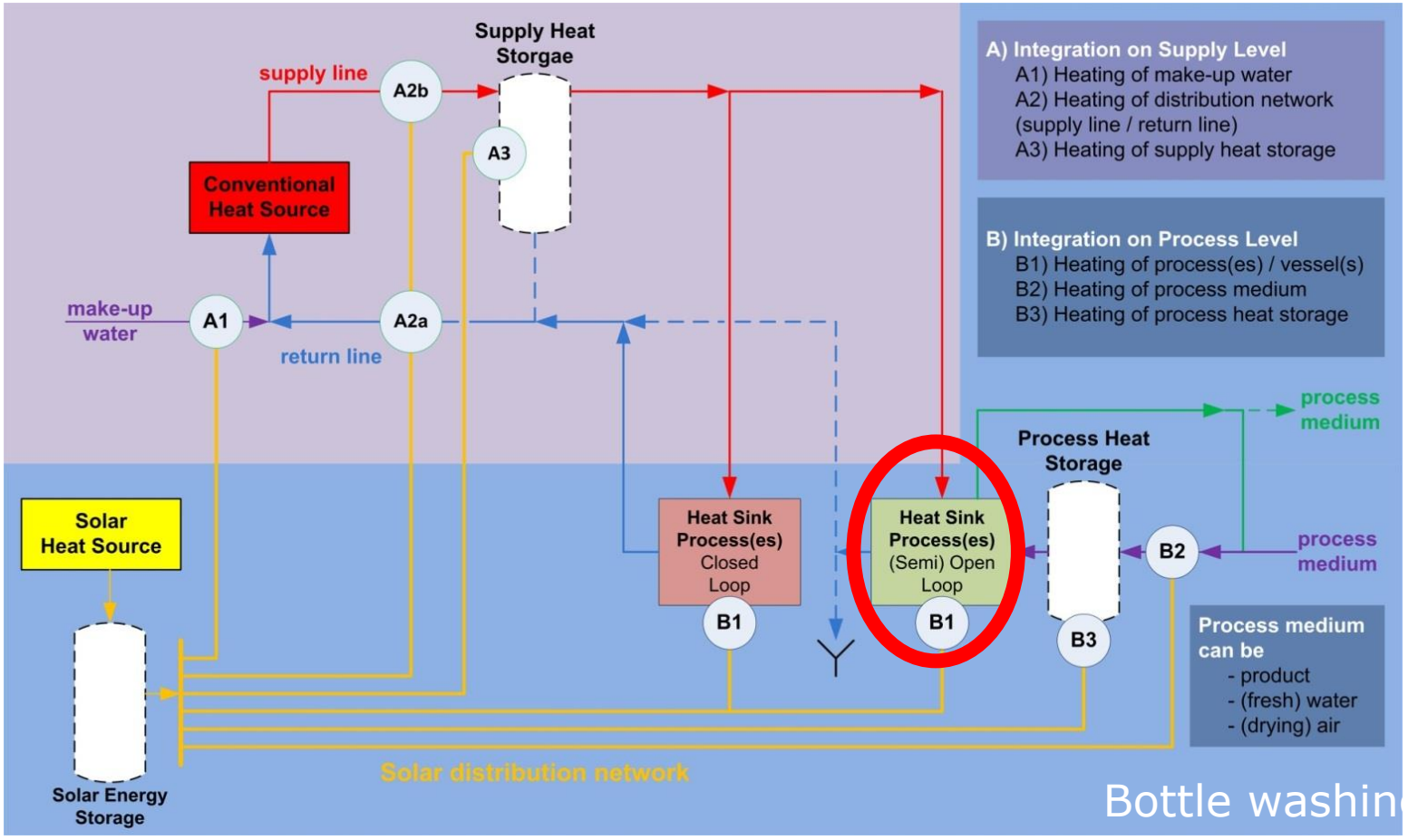
- **Al Manhal, Riad, Saudi Arabia**
- **Millennium Energy Industries**
- **In operation since Jan 2012**
  - ⇨ 515 m² flate plate collector
  - ⇨ 15 m³ storage
- **Replacing electrical power for hot water generation for bottle washing process (Temp ~ 70°C)**

Case studies – Nestle Waters (3)

Source: Millenium Energy Industries

Case study 4 – Nestle Waters

- **Al Manhal, Riad, Saudi Arabia**



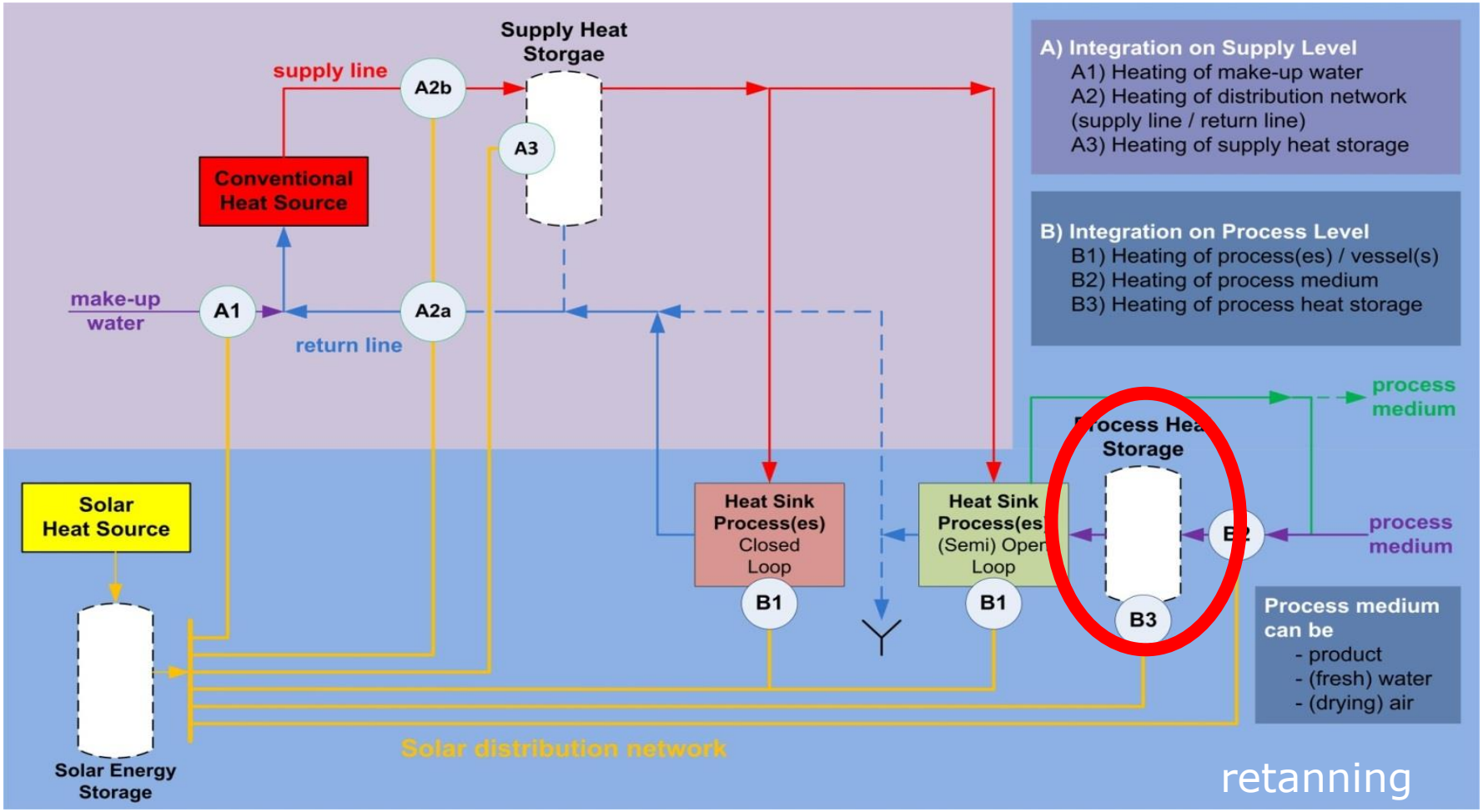
Source: AEE INTEC

Case study 5– Sadesa Leather

- **Sadesa, Thailand - Tannery**
- **Hot water for retanning process**
- **Aschoff solar**
- **In operation since 2013**
  - ⇨ 1.890 m² of evacuated tube collectors
  - ⇨ 35 m³ Storage
- **Open cold water of 30 °C is warmed up to 80 °C for retanning process**

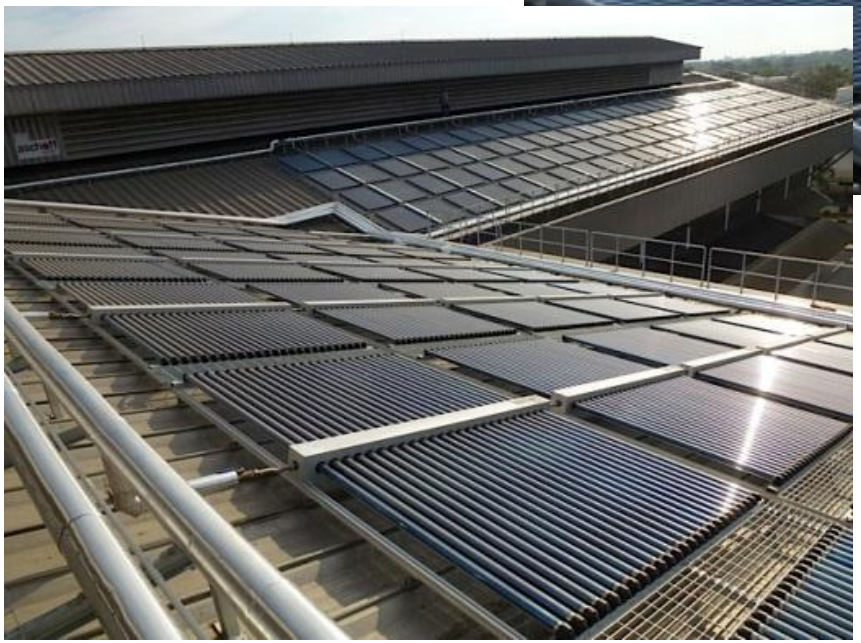
Source: Aschoff

Case study 5– Sadesa Leather



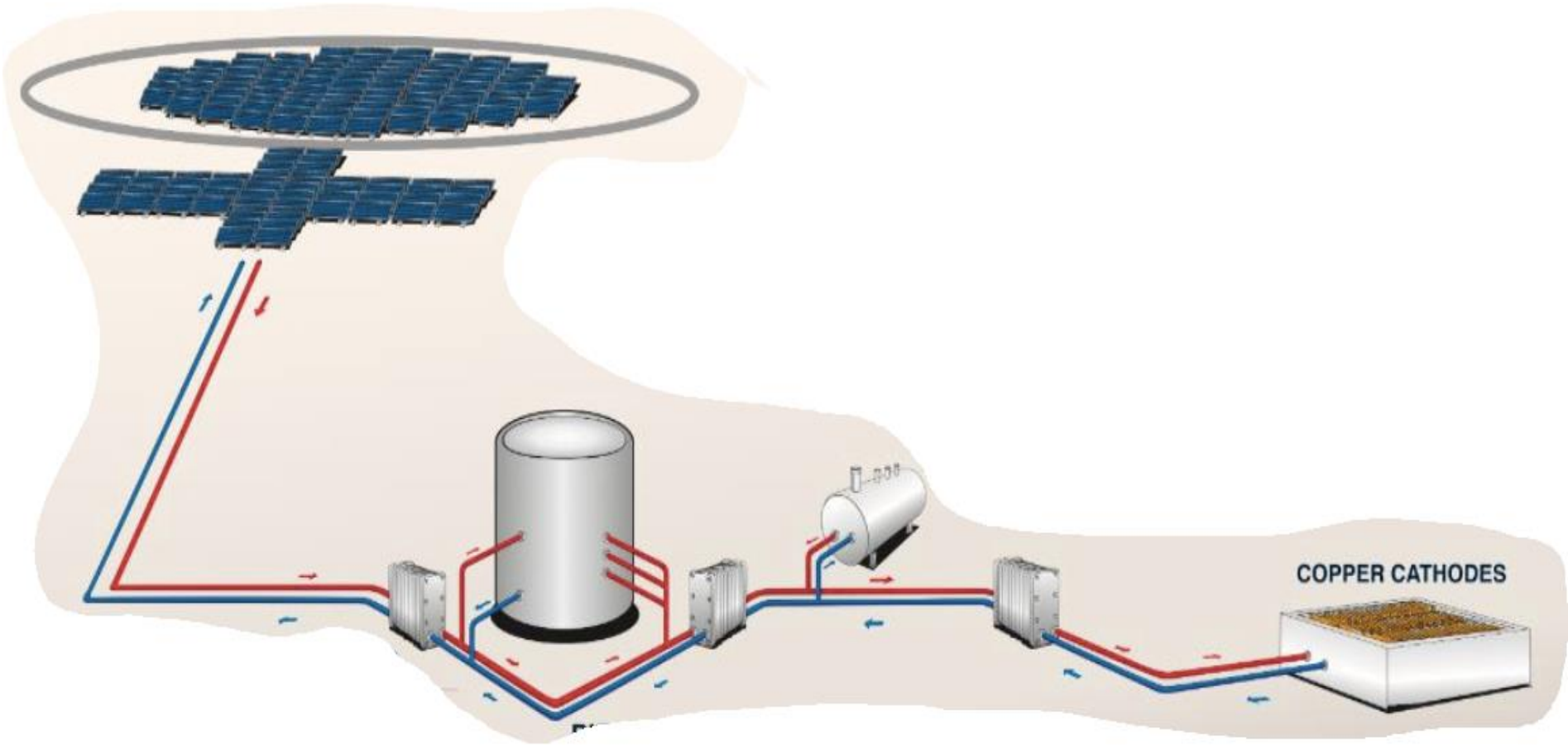
Source: AEE INTEC

Case study 5– Sadesa Leather



Source: Aschoff Solar

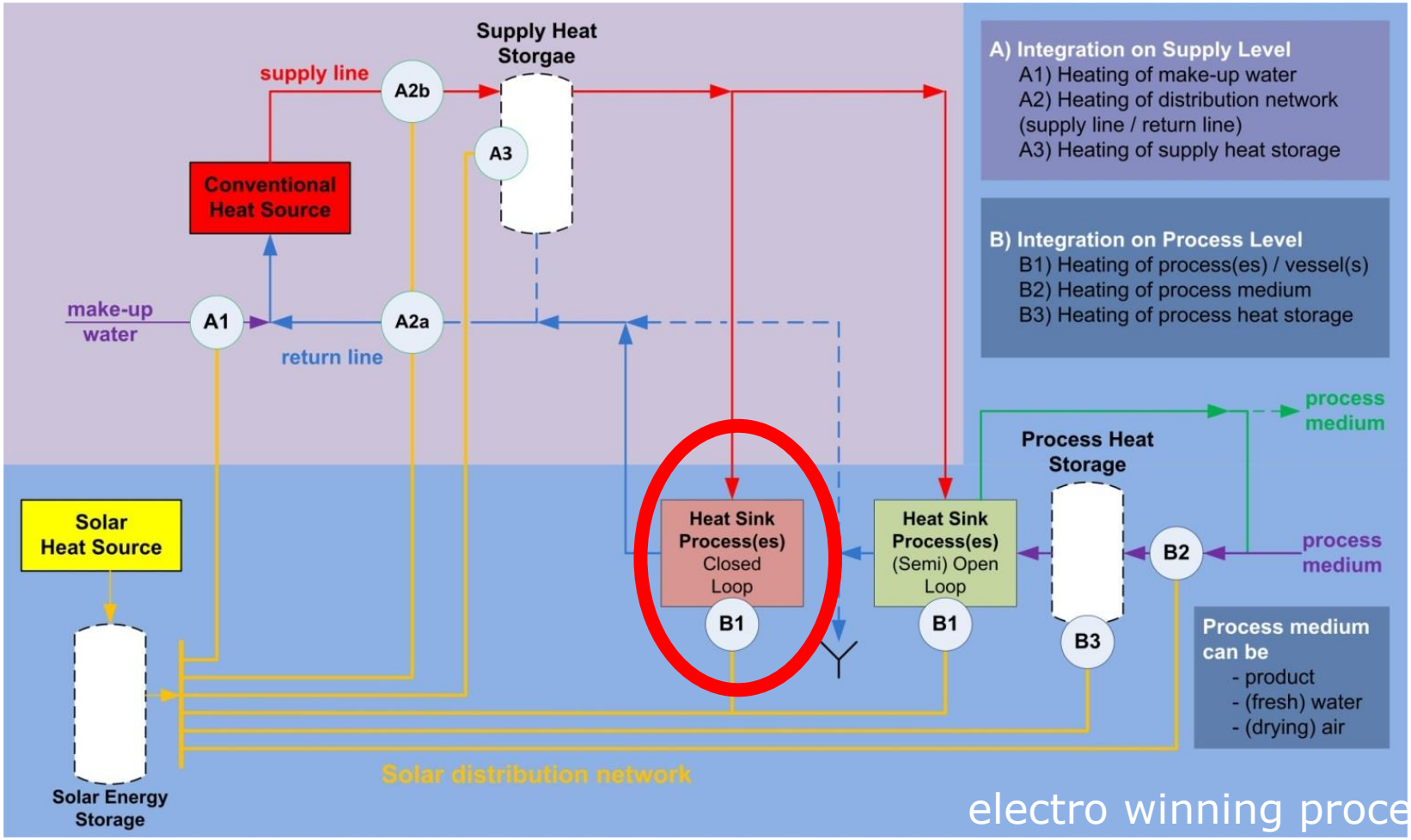
World largest collector field – Codelco Chile (1)



Codelco Chile (2)

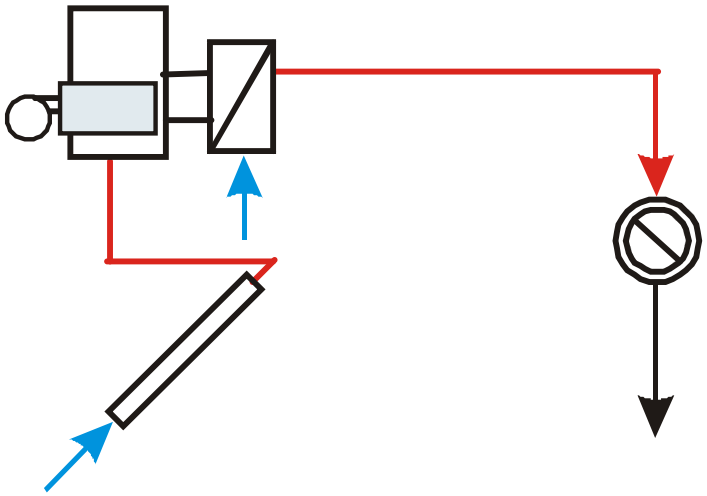
Source: Sunmark

Codelco Chile (3)



Generic System - 1Nso

- **Temperature range for the processes: 30 - 80°C**
- **Heat carrier: air**
- **Recommended Collector Types:**
  - ⇨ Glazed or unglazed air collector
  - ⇨ Solar Wall ®
- **Main Applications**
  - ⇨ Coffee Drying
  - ⇨ Tea Drying
  - ⇨ Maize Drying
  - ⇨ Tobacco Drying



Air based drying system

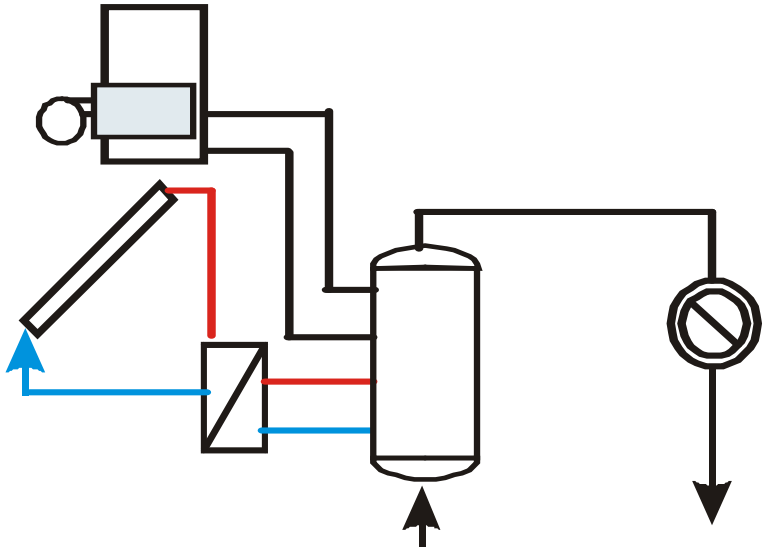
Air based drying systems in India

Leather drier with solar hot air ducts

Source:
C.PALANIAPPAN

Open process - water

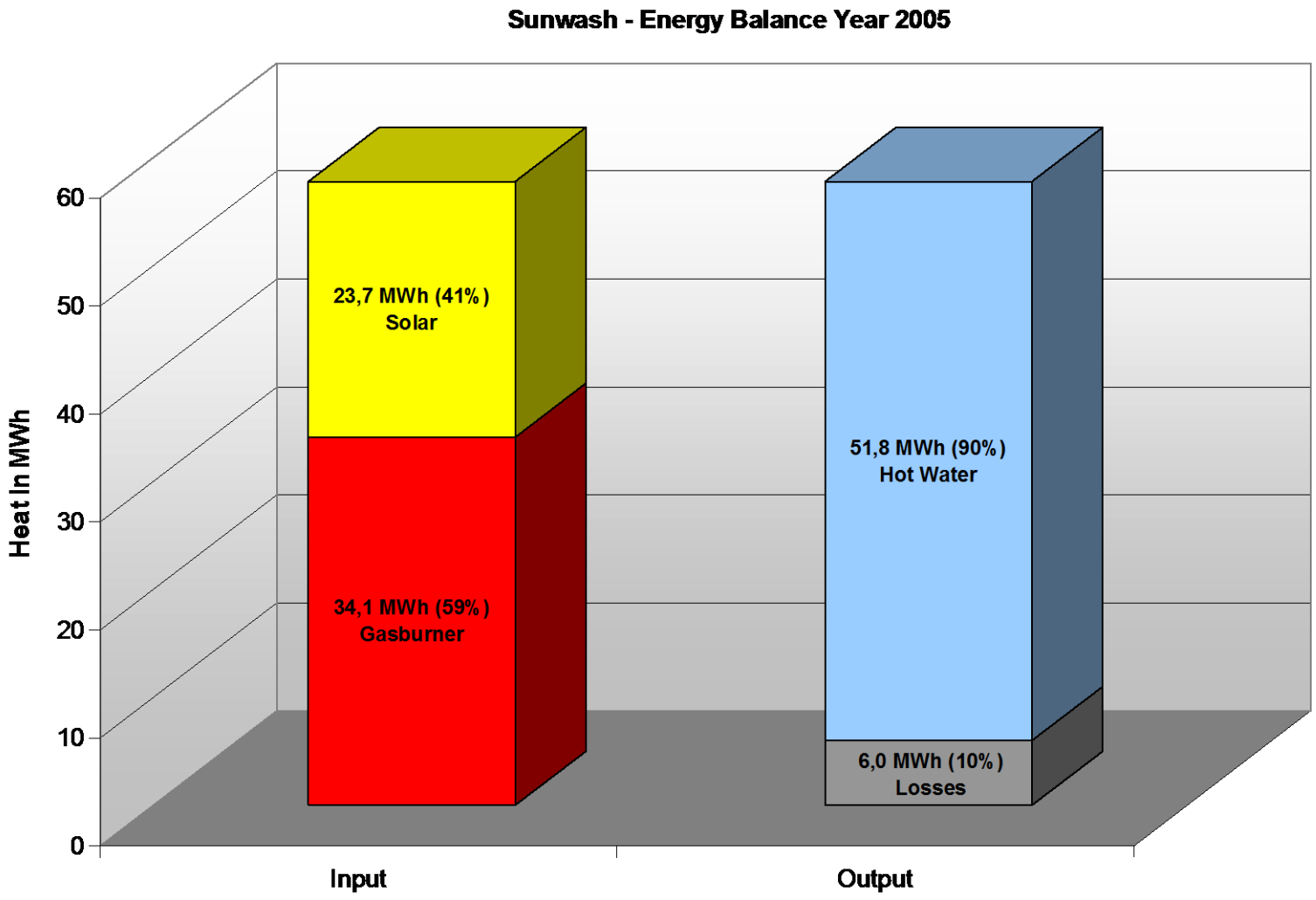
- **Temperature range for the processes: 40 - 90°C**
- **Heat carrier: water**
- **Recommended Collector Types:**
  Flat-plate collector
- **Main Applications**
  - ⇨ Cleaning of:
    - **Bottles**
    - **Textile**
    - **Cars**



Sunwash, solar car wash plant

- Solar car wash plant, Köflach, Austria
- Installed capacity: 30 kWth (43 m² flat plate collector)

SunWash – energy balance



Emmi dairy Saignelégier

- **Parabolic trough collector**
  - ⇨ 627 m² gross installed collector area
  - ⇨ 360 kWth installed thermal power
- **Point of integration:**
  - ⇨ Heating of supply heat storage
  - ⇨ Temperature range in solar loop: 140-180°C

Source: NEP Solar

Cremo SA.- milk processing & coffee cream production

- **Parabolic trough collector**
  - 581 m^2 gross installed collector area
  - 330 kWth installed thermal power
- **Point of integration:**
  - Heating of superheated water supply line on two different temperature levels for two different group of processes
  - Temperature range in solar loop: 170°C/ 125°C
  - Unit operation: sterilization

Source: NEP Solar

MOGUNTIA Meat Spices, Kirchbichl Tirol

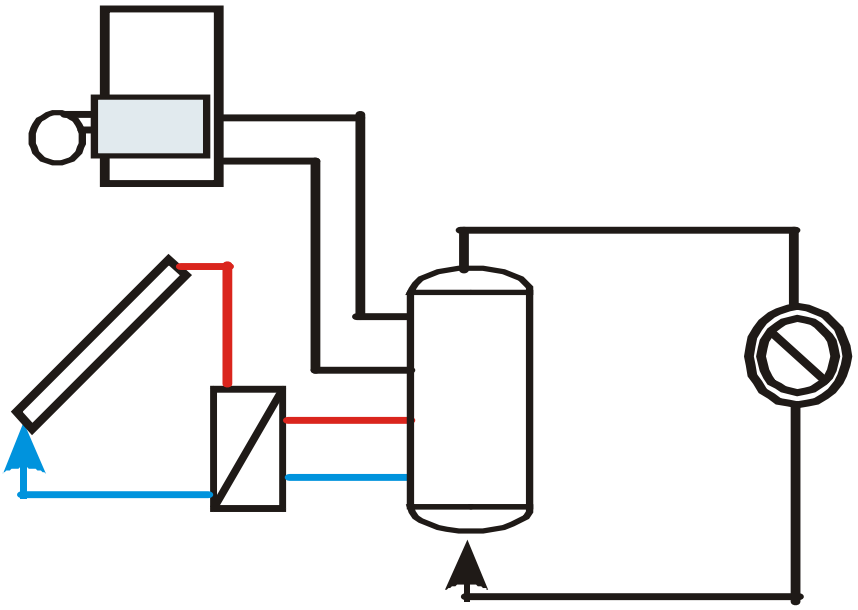
Source: TISUN

MOGUNTIA Meat Spices, Kirchbichl Tirol

- **Year of Installation: 2007**
- **Installed Capacity: 150 kWth (215 m² collector area)**
  - ⇨ Storage Volume: 10 m³
  - ⇨ Daily Hot Water Demand: 8.000 Liter
  - ⇨ Solar Fraction: 45%
- **Processes:**
  - ⇨ Cleaning of stainless steel containers for spices
  - ⇨ Cleaning of dispersing machines
  - ⇨ Hot water for processing liquid spices and pastes
  - ⇨ Dehydration of production halls in summer

Closed systems

- **Temperature range for the processes : 30 - 110°C**
- **Heat carrier: Water / Steam**
- **Recommended Collector Types : FK, CPC, VR**
- **Main Applications :**
  - ⇨ Textile Industry
  - ⇨ Tanneries
  - ⇨ Dairy
  - ⇨ Breweries
  - ⇨ Beverage



Pre-Heating of process water

- **Gatorade (PepsiCo)**
- **Phoenix, AZ, USA**
  - ⇨ 892 m² solar collectors
  - ⇨ 38 m³ buffer tank
  - ⇨ Pre-Heating fresh water for the soft-drink production at 35°C
  - ⇨ Annual Energy gains: more than 1 Mio. kWh (= more than 1.200 kWh/(m².y) !)

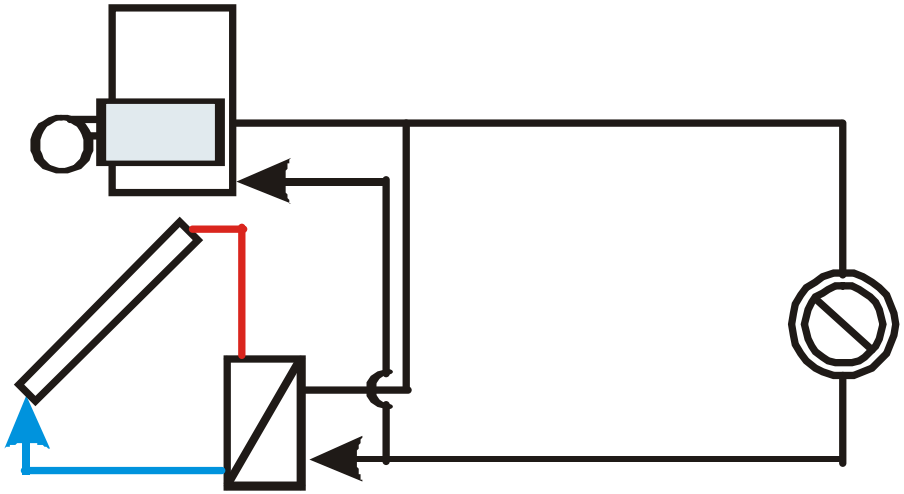
Source: SOLID GmbH. Graz Austria

Pre-Heating of process water

Source: SOLID GmbH. Graz Austria

Necessity of a storage tank

- **Temperature range for the processes : 30 - 90°C**
- **Heat carrier: Water**
- **Recommended Collector Types: FP, ETC, CPC**
- **Main Applications**
  - ⇨ Galvanic industry
  - ⇨ Food industry



Electroplating bath in Ludhiana, India
500 m² collector area (350 kWth)

- **158.000 m² of the total installed collector area in India was used for industrial applications (2009)**

Source: Greentech Knowledge Solution and Intersolar Systems , India

Future challenges and research topics

- **Space availability; static conditions of roofs**
- **Innovative hydraulic and control concepts**
- **New collector developments (reduced losses, temperature residence, cost reduction,…)**
- **Intelligent storage design and management (production profile and solar yield)**
- **Integration schemes for different sub sectors**
- **Integration software and simulation software for large scale applications**
- **New process technologies in order to increase the solar thermal potential**

SHIP Egypt

Best Practice Examples

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