Cost Reduction Potential of Polymeric Collectors

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Main differences to solar heating systems with conventional flat plate collectors

- Aluminium collector frame
- Polycarbonate collector cover twin-wall sheet
- Absorber i “high-performance polymers” (PPS)
- Thermal insulation
- Absorber endcap with interated manifold
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Collector
- High-temperature performance polymers
- Flexible lengths
- Light-weight building modules (8 kg/m²)
- Replacing conventional building envelopes (roofs & facades)
Main differences to solar heating systems with conventional flat plate collectors

Collector
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System
- Water as heat carrier
- High-flow system
- Drain-back technology
- Non-pressurized collector loop (installation)
Major Production Steps

The number of production steps is significantly reduced compared to conventional solar collector production.

Structured sheet extrusion

Cutting

End-cap assembly and coating

Cutting of other sub-components

Transport & installation
Absorber production

- Highly-industrialised processing
- Very few production steps
- Low production costs with high volume
- Integrated design

Absorber of extruded structured sheets

Top endcap

Bottom endcap

IR welding

Absorber (various lengths)

Standardized PEX-piping (floor heating)
Weight of components, Solar combisystem

Average value of material (kg) "Combisystems 2008" with Conventional flat-plate collector

Material weight comparison (in kg) Combisystem, Housing Estate Oslo: Polymeric AventaSolar collector
Solar Thermal Value Chain

No wholesaler / distributor!

1. Architecture + Energy Consultant
2. Production
3. Distribution Transport
4. Installation
5. Installed System
6. Operation and Maintenance
7. LCOHs

B2B
Prices of solar heating systems in private homes

- Total end-user costs incl. solar collector system and heat store, reported by the customers, include installation, but exclude VAT and subsidies.

### Prices for Solar systems in homes (2015)

<table>
<thead>
<tr>
<th>Collector area, gross (m²)</th>
<th>Total end-user costs (EURO)</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2200</td>
</tr>
<tr>
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<td>13200</td>
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<td>15400</td>
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</table>

- Flat-plate collector
- Flat plate collector, non-pressurized
- Vacuum pipe collector

Savings due to replacement of other building envelope materials for building integration is not subtracted.
Cost examples: Medium-sized projects (1)

*Ilseng State Prison*

**Costs:**
Solar collector, heat store, pumps, control system, pipes, removal of tiles, installation, engineering and administration.

**SUM: 433 €/m² collector area**

8.4 m³ heat store, divided in 6 separate units

SDHW-system with 237 m² solar collectors
Cost examples: Medium-sized projects (2)

*Bjørkelangen Elementary School*

Solar heating system for domestic hot water preparation.
105 m² facade integrated solar collectors
5.6 m³ heat buffer store

**Costs**

Solar collector, heat store, pipes and controller, incl. installation: **SUM: 370 €/m² collector area**

Savings due to replacement of other materials/components are not included.
Cost examples: Solar combisystem (3)

_Housing Estate Oslo with 34 passive houses_

34 houses with totally 480 m² roof integrated solar collectors, decentralized with 0.8 m³ heat stores, incl. 100 liters DHW preheater and piping, operation control of the auxiliary heat supply and solar heating system, installation- and start-up support.

Costs

**SUM:** 370 €/m² collector area
Examples, Norway

<table>
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<th>Project</th>
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<td>237 m² Collector area</td>
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<td>8.4 m³ Heat store</td>
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<td>New-built, DHW preparation</td>
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<td>New-built, Solar combisystems with each</td>
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<tr>
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<td>14 m² Collector area</td>
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<td>1210 kWh/(m² a) solar irradiance*</td>
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* Solar irradiance on tilted collector surface.
Examples, Norway

Ilseng State Prison
Retrofit, DHW preparation
237 m\(^2\) Collector area
8.4 m\(^3\) Heat store
1100 kWh/(m\(^2\) a) solar irradiance*

LCoHs\(_{\text{retrofit}}\) = 0.099 €/kWh
LCoHs\(_{\text{new built}}\) = 0.073 €/kWh

Comments:
• Retrofit: roof tiles had to be removed
• Building is oriented towards east
• High solar fraction

Bjørkelangen Elementary School
New-built, DHW preparation
105 m\(^2\) Collector area
5.6 m\(^3\) Heat store
889 kWh/(m\(^2\) a) solar irradiance*

LCoHs = 0.035 €/kWh

Comments:
• Good planning, infrastructure

Housing Estate Oslo, 34 passive houses
New-built, Solar combisystems with each
14 m\(^2\) Collector area
0.8 m\(^3\) Heat store
1210 kWh/(m\(^2\) a) solar irradiance*

LCoHs = 0.082 €/kWh

Comments:
• Passive houses: designed for high solar fraction
• Installation partly included

Electricity costs = 0.115 €/kWh

* Solar irradiance on tilted collector surface.
Thank you for your attention!

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