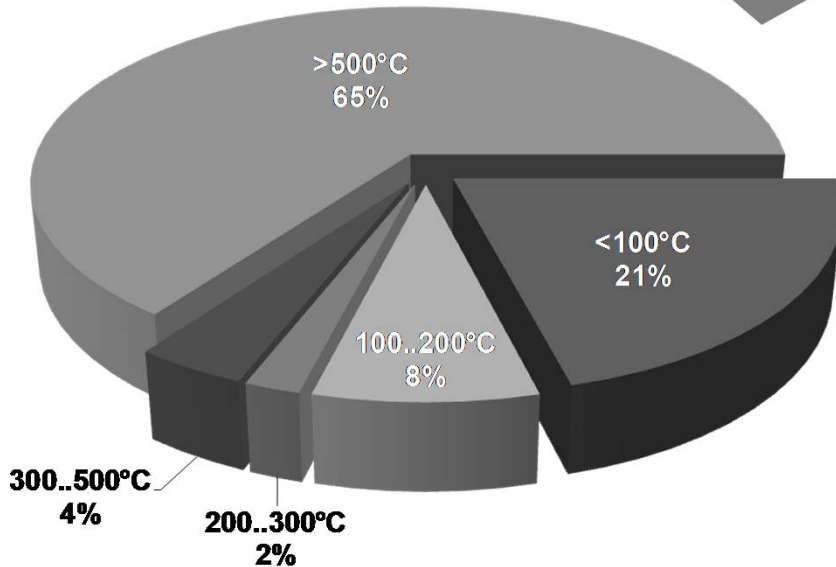
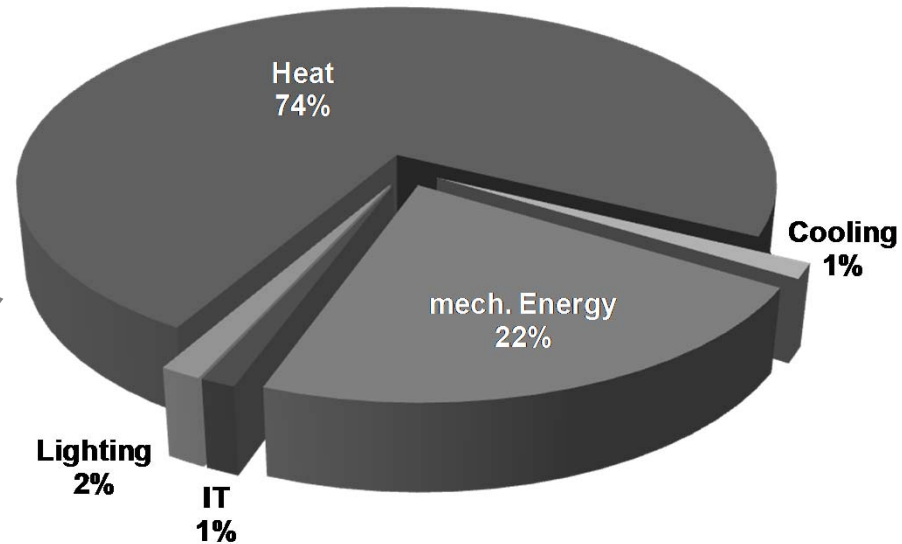
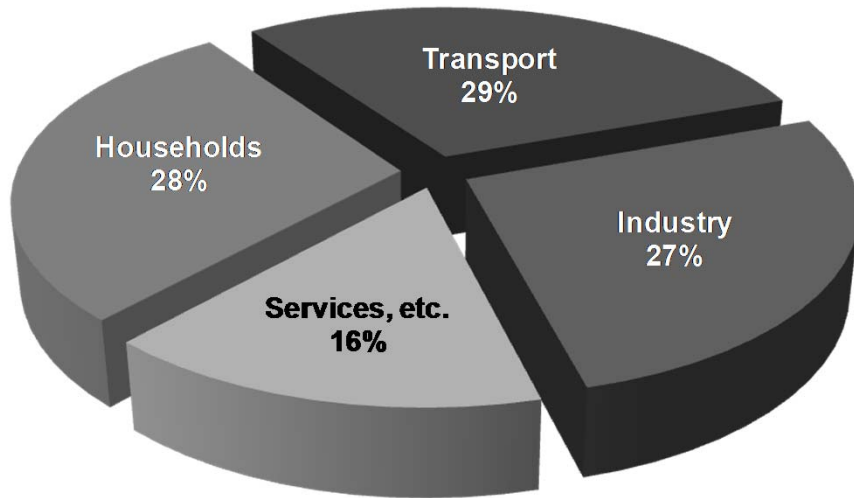




Solar process heat plant at a brewery – Experience and outlook

1. Solar process heat
2. Pilot plant
3. Lessons learned

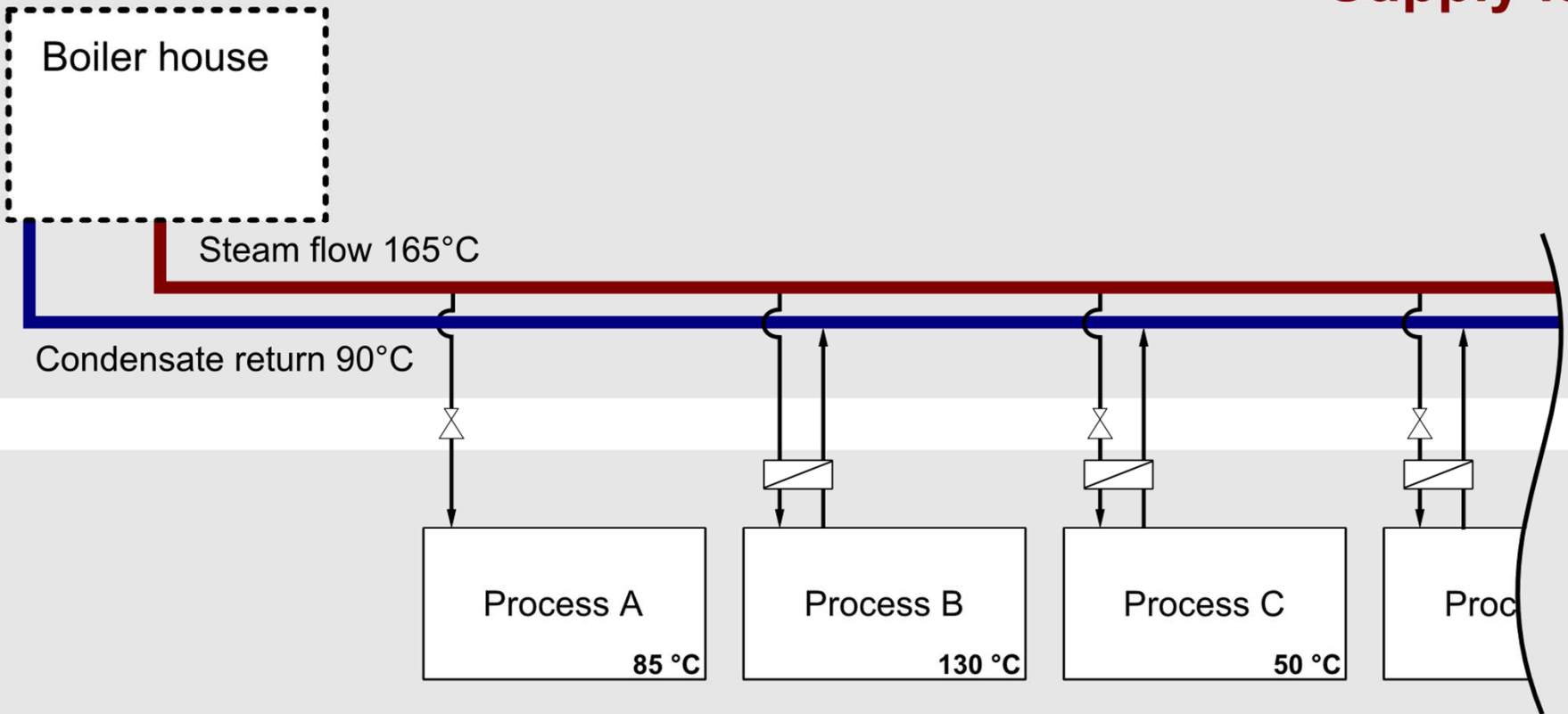
Potential for solar process heat



Potential for solar process heat
≈ 16 TWh/a (3,1 %)
=> approx. 40 Mio m² collector area

Principles of system integration

Supply level



Process level

Collectors for process heat applications

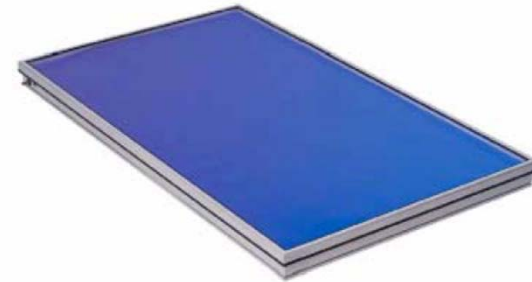
Up to 80 °C

Flat plate collectors



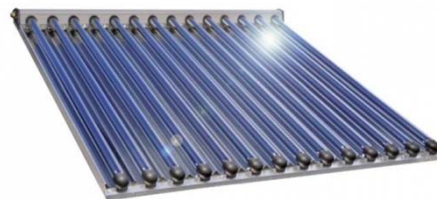
80..120 °C

Vacuum tube
Advanced flat plate
collectors



120..250 °C

CPC-, Fresnel-,
parabolic through
collectors



Outline

- Solar process heat
- **Pilot plant at brewery**
- Lessons learned



Typical SME with 45 employees

Production in 2010:

- 65,000 hl beer
- 60 % bottled beer

77 kWh/hl

Natural gas: 4.000 MWh

Electricity: 1.000 MWh

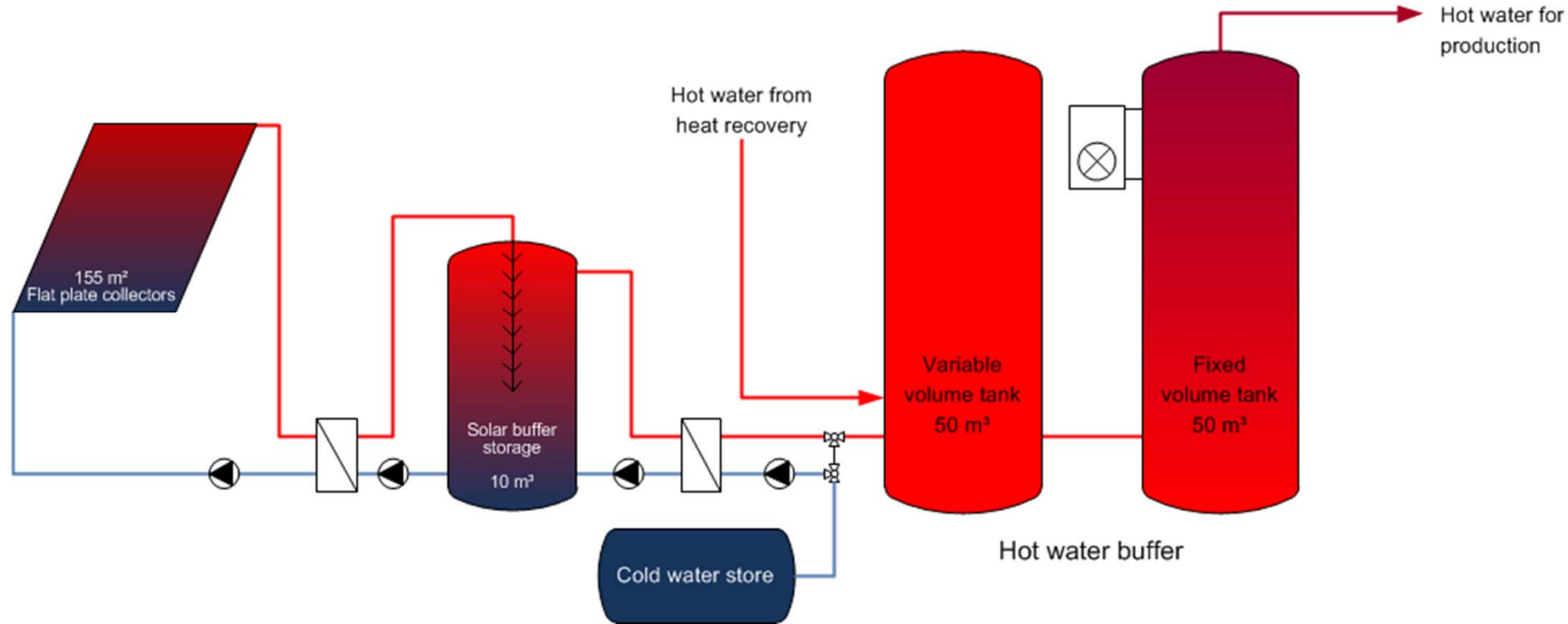
Pilot plant

Detailed case study

- Energy efficiency measures
- Optimization of heat recovery
- 155 m² flat plate collectors, 10 m³ solar buffer tank



Pilot plant



- Pre heating of brewing water for hot water buffer
- Dependent on fill level
- Expected solar yield 480 kWh/m²a
- System costs 300 €/m² (incl. 50% subsidy)

Outline

- Solar process heat
- Pilot plant at brewery
- **Lessons learned**

Lessons learned

- No staff for energy management
- Poor knowledge regarding energy consumption
- Intense planning period of solar heating system
- Integration into hot water buffer relatively expensive
- Manual control of brewery staff
- Expected yield was not reached
- Share of production processes on overall consumption
- Relevance of utilities and space heating

Potential for energy efficiency



Conclusion

- Large potential for solar heat
- Early market stage
- Large potential for energy efficiency
- Relevance of utilities, space heating, etc.
- Necessity of energy manager in SMEs

Thank you very much

bschmitt@uni-kassel.de

www.solar.uni-kassel.de

