

Institut für neue Energie-Systeme

Development of a methodology for the design and implementation of solar process heat systems in the food industry

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Agenda



Motivation

- Status quo
- Methodology design
- Case studies
- Evaluation of the methodology

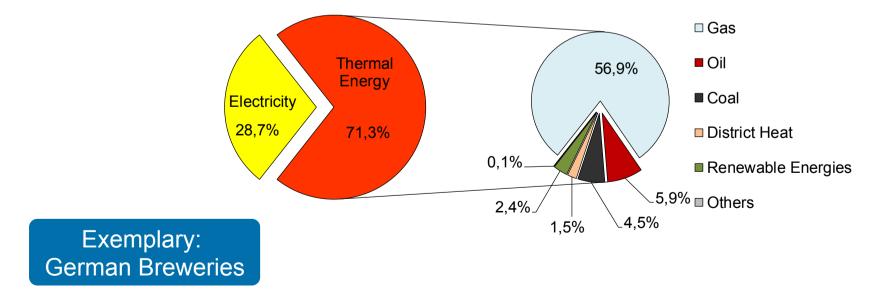
Conclusion

Motivation

Industrial energy supply



- Fossil fuels dominate energy supply in the industry
- Focus on food industry sectors dairies and breweries
 - large fraction of thermal energy demand
 - mainly low grade heat (up to 100°C)
 - promising conditions for solar thermal process heat



Status quo Definition of problem



• What is the reason for the low use of solar process heat in industry?

Insufficient system components and/or technology?

Does the industry oppose the technology?

Economic efficiency and propensity to invest?

Awareness / familiarity at the industry?

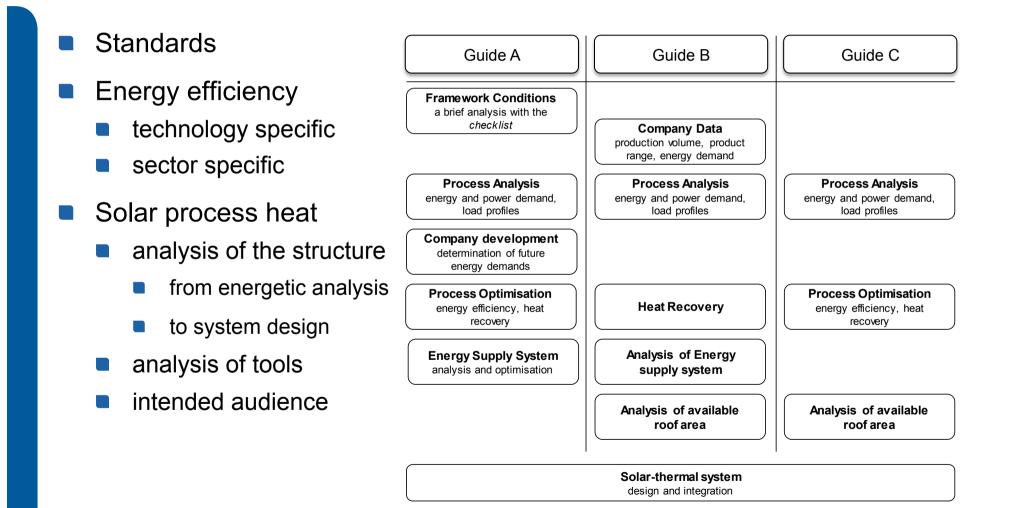
SPH is often not known at industry

Missing expertise of decision makers

Status quo

Analysis of several kinds of guides





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Methodology design Structure of the methodology



		Element	l
		Function	Expertise
	-	I. Energetic Analysis	lais
		Energy Balance Energy Supply and Distribution Energy Consumer	Company Professionals
ture		II. Energetic Optimisation	any Pro
Struc		Optimisation Potentials Heat Recovery Concept Development	Comp
Matrix Structure		III. Solar Process Heat System	
Ŵ		Application Potentials System Heat Source Management	sionals
		IV. Simulation	External Professionals
l		Modelling of Concept Simulation of Variation Optimisation	ternal
		Technical and Economic Feasibility	Ex

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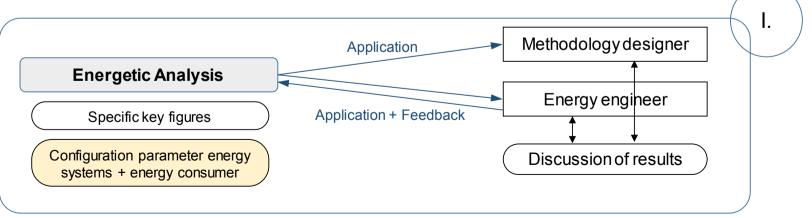
Solar Process Heat in the Food Industry

Case Studies

Methodology application



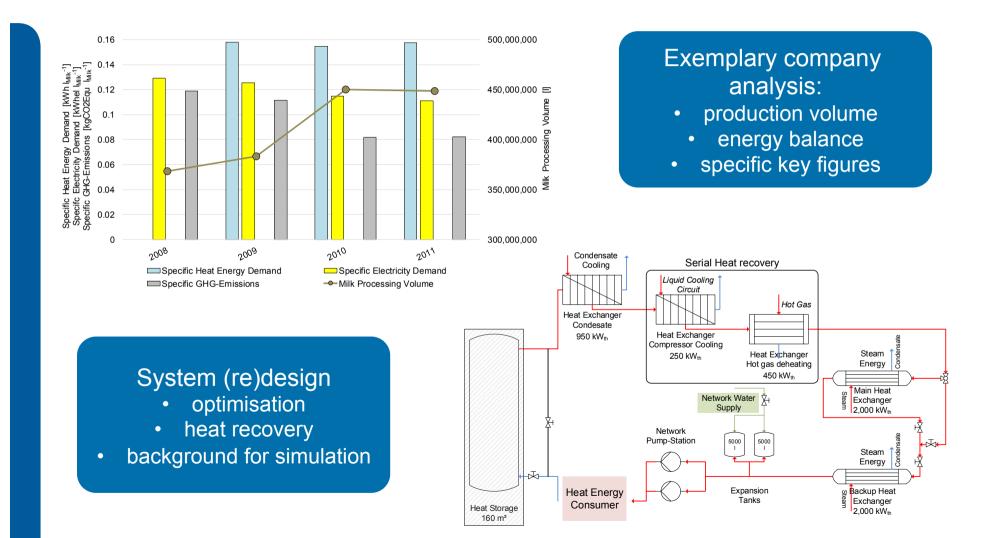
- Real world application
 - Medium-sized brewery
 - Large-sized dairy
- Active participation of company energy engineer
 - Independent application
 - Feedback on procedure, tools …
- Focus on methodology usability



Case Studies

Methodology application





Evaluation of the methodology Assessment of methodology elements



Assessment of essential functions

- Energetic analysis → not essential
- Energetic optimisation → partly essential
- Solar thermal process heat system
- Simulation

- \rightarrow essential
- *→* mainly essential
- Usability (elements, functions and tools)
 - Energetic analysis \rightarrow high
 - Energetic optimisation \rightarrow high/medium
 - Solar thermal process heat system \rightarrow low
 - Simulation \rightarrow low
- Flexibility adaption to various uses and application area

Conclusions



Solar thermal process heat in the food industry

- case studies result large potentials
- part of an efficient process heat supply
- necessity of a methodical optimisation
- The methodology design process turned out target-oriented
 - including the energy engineers from the very beginning
 - application and evaluation with the energy engineers feedback
 - results in good usability and high flexibility
- Feedback of energy engineers contributes to methodology design (improvement of usability)