



# Mobile Heat Systems Based on the Deployment of Thermal Oil as a Heat Storage Medium to Reutilise Waste Heat from Industrial Sources

M. Ohl, M. Blesl, U. Fahl

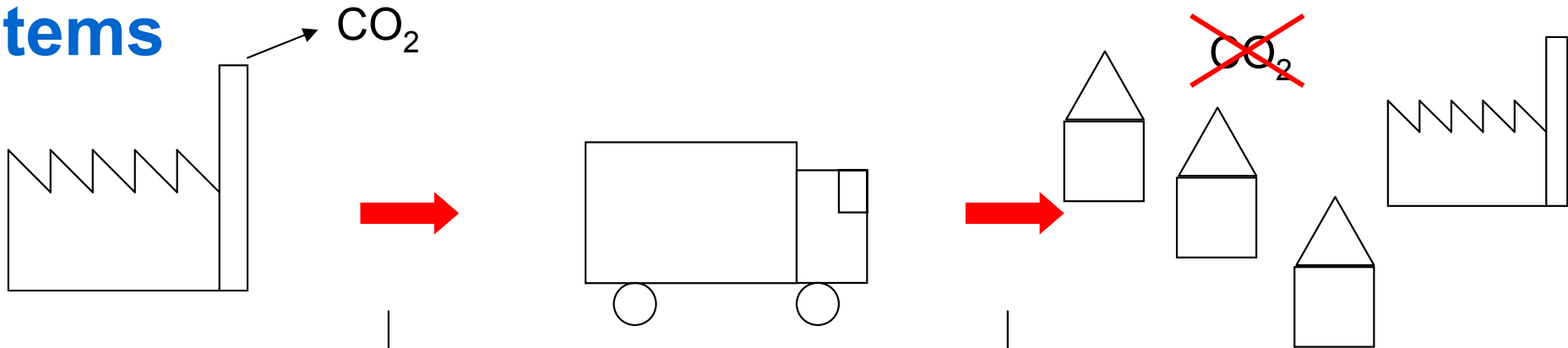
Institute of Energy Economics and the Rational Use of Energy  
University of Stuttgart

Parma, 4. June 2009

III Congresso Nazionale AIGE



# Waste Heat Utilisation by Mobile Heat Transport Systems



## Waste Heat Sources

e. g. industrial plants  
combustion plants  
power stations

## Requirements

high temperature  
permanent operation  
large heat quantities  
high thermal performance

## Heat Transport

truck  
railway

## Requirements

favourable distance source-user  
permanent reachability

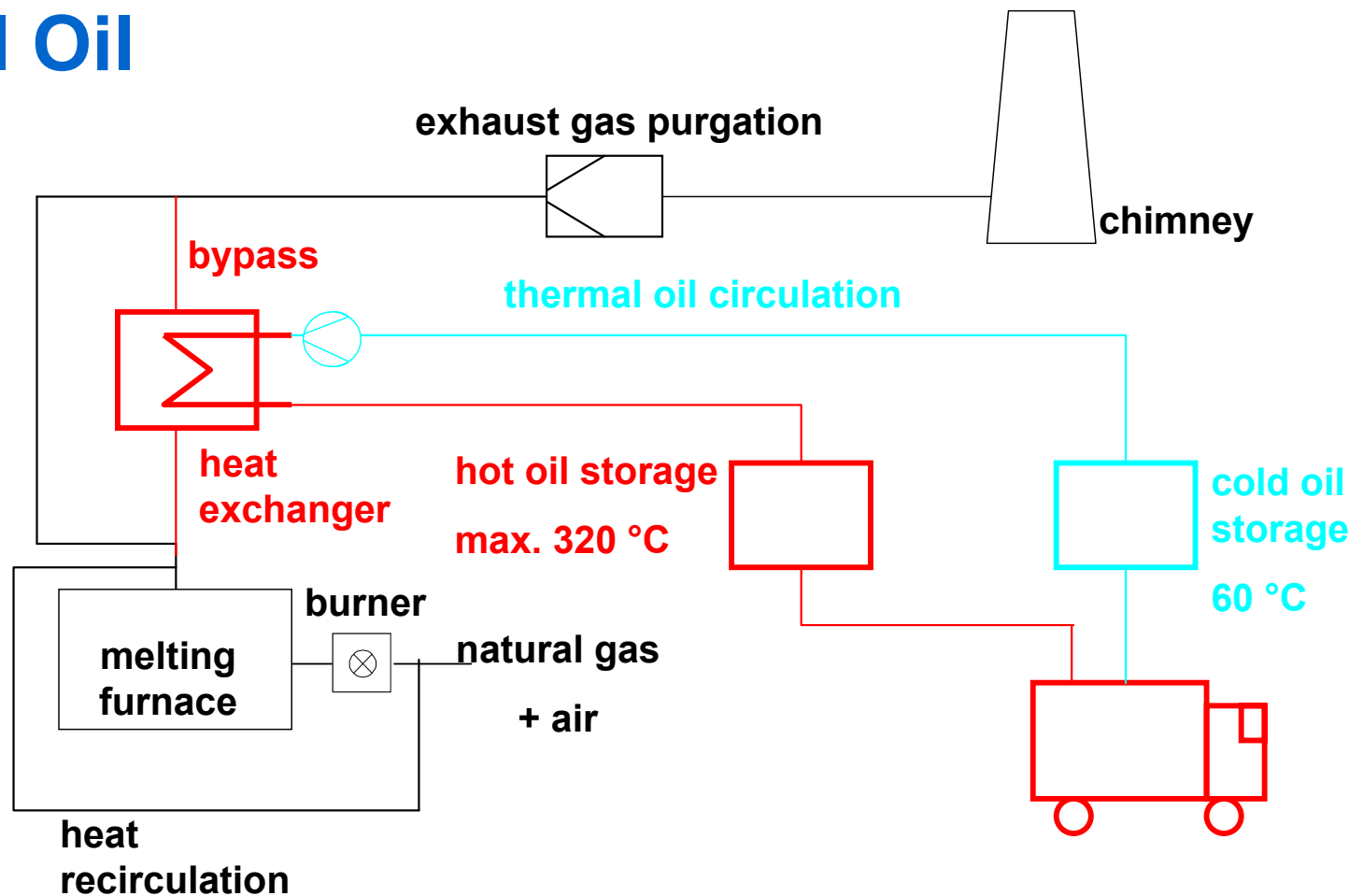
## Heat Utilisation

e. g. industry and commerce  
hospitals, swimming pools  
district heating systems

## Requirements

low temperature  
permanent operation  
large heat quantities  
high thermal performance

# Glassmill Waste Heat Utilisation by **Mobile Heat** with Thermal Oil

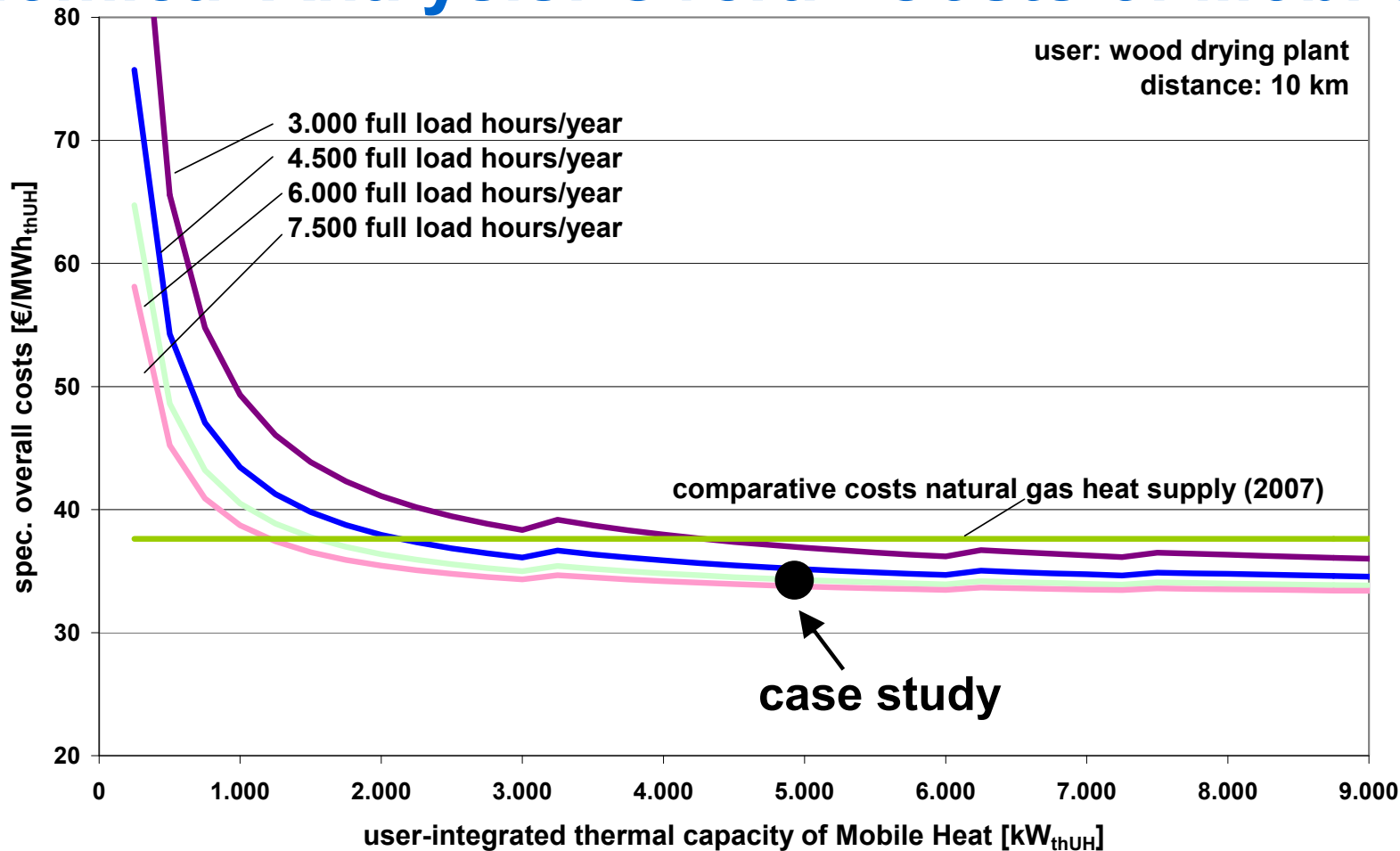


## Case Study

- Heat recovery from a glassmill  $5 \text{ MW}_{\text{th}}$ , 7.000 h/a,  $35 \text{ GWh}_{\text{th}}$ /a, operation period 15 a, cumulative heat turnover  $525 \text{ GWh}_{\text{th}}$
- Complete heat utilisation in a wood drying plant ( $T < 100 \text{ °C}$ ), 10 km from heat source



# Economical Analysis: Overall Costs of Mobile Heat



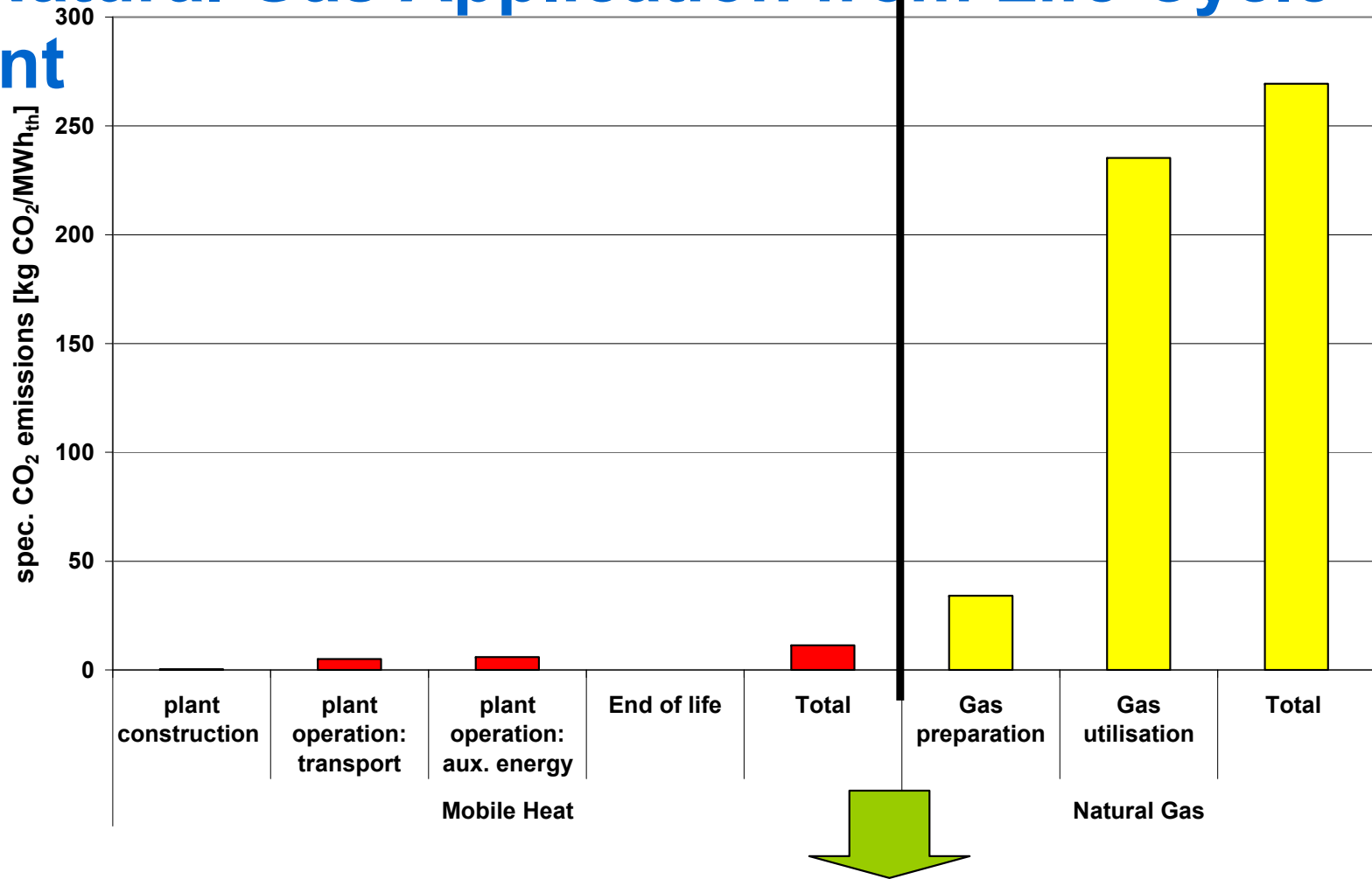
- Specific overall costs: 35 €/MWh<sub>th</sub> (50 % for transport)
- Comparative costs natural gas supply: 38 €/MWh<sub>th</sub> (fuel costs only)
- **Cumulative cost advantage Mobile Heat over operation period: 1.575.000 €**  
→ **negative CO<sub>2</sub> abatement costs**



# Case Study: Specific CO<sub>2</sub> Emission Data for Mobile Heat And Natural Gas Application from Life Cycle Assessment

Mobile Heat: 11,4  
kgCO<sub>2</sub>/MWh<sub>th</sub>

Natural Gas:  
269,4  
kgCO<sub>2</sub>/MWh<sub>th</sub>



Cumulative CO<sub>2</sub> abatement due to Mobile Heat application: **135.448 t**

**Specific CO<sub>2</sub> abatement costs: -11,6 €/t**



# Summary

- For **ideal partners** besides large primary energy savings negative CO<sub>2</sub> abatement costs can be realised as shown in the case study
- For competitiveness high full load hours both for heat sources and heat sinks plus short distances between partners required due to high impact of transport costs
- Industrial waste heat potential for Germany 242 TWh<sub>th</sub>/a saving 69 million t CO<sub>2</sub>/a (compared to natural gas utilisation), most interesting branches are metal production and recycling, bricks and cement, glass and ceramics
- Probable lowering of potentials due to unfavourable temperature ranges for storage materials and heat utilisation systems, esp. when using steam supply systems
- Individual technical lay-outs required for each partnership – large search efforts necessary in order to find economically attractive projects



**Thank you very much for your  
attention!**