

eg1

# Thermal Energy Storages in Automobiles an Example

eg2

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## Folie 1

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- eg1** Untertitel beinhaltet:  
Tagungsort / Veranstaltung  
guenther; 24.01.2008
- eg2** Präsentationstitel  
guenther; 24.01.2008
- eg3** Name des Vortragenden auf dem Folienmaster anpassen  
guenther; 24.01.2008



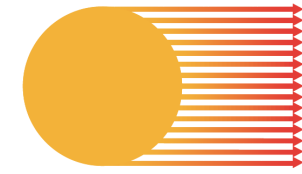
- Dr. N. Khelifa, Mr. W. Krämer

## Folie 2

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**eg13**      Veranstaltung / Datum auf Folienmaster anpassen  
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**eg14**      Text in Arial und Schriftgröße mindestens 18pt  
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## Present Situation

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- North American heavy good vehicles need about 9000 liters of diesel per year for overnight air conditioning, using the idling main engine (1.45 €/h).
- About 500'000 trucks drive more than 800 km per day and need to stop at night.
- The diesel consumption for idling is about  $4.5E+9$  liters per year.
- Anti-Idling-Regulations exist in an increasing number of states.

### Folie 3

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## Options (Idle Control Technologies)

eg28

- Truck Stop Electrification / electric heating and cooling
- Idle Aire: additional warm or cold air supply for driving cabs (1€/h)

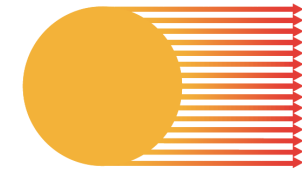


## Folie 4

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## Options (Idle Control Technologies)

eg30

- **APU Auxiliary Power Units:** 75 ..90% reduction of fuel and emission, 4000 .. 7000 €, fuel consumption 10 liters/night
- **Separat electrical motor** for driving the main cooling compressor, additional batteries, limited capacity because of limited generator.
- **Direct or indirect evaporative coolers:** low electrical consumption, water required, dependend on ambient humidity

- **Webasto solution:** Accusphere I & II

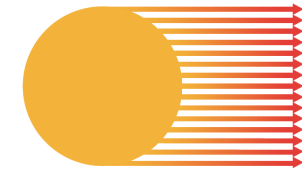
PCM Storage, Water - Ethylenglycol (90% / 10%) mixture

## Folie 5

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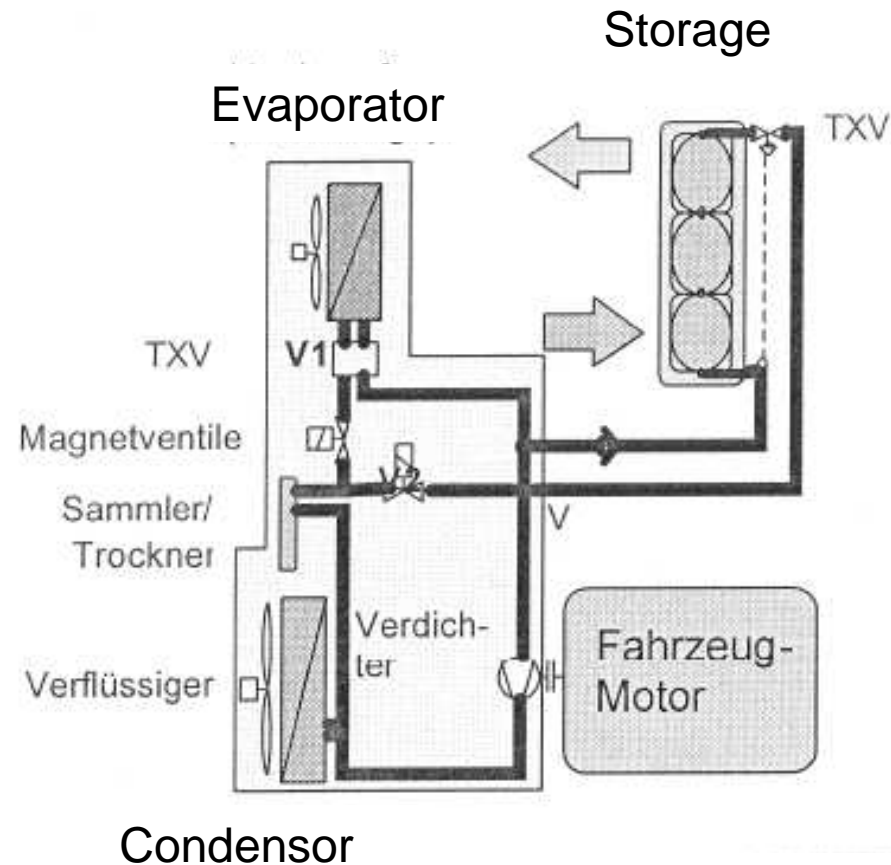
**eg30**      Text in Arial und Schriftgröße mindestens 18pt  
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## Accusphere I

Charging medium	refrigerant
Charging time	1 .. 3 h
Discharging medium	air
Discharging time	several hours
Capacity	$\leq 3.5$ kWh
Application	DaimlerCrysler Actros

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## Folie 6

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## Accusphere II

eg34

Improvements:  
specific energy density, dynamic, more flexible geometry

Graphite Matrix

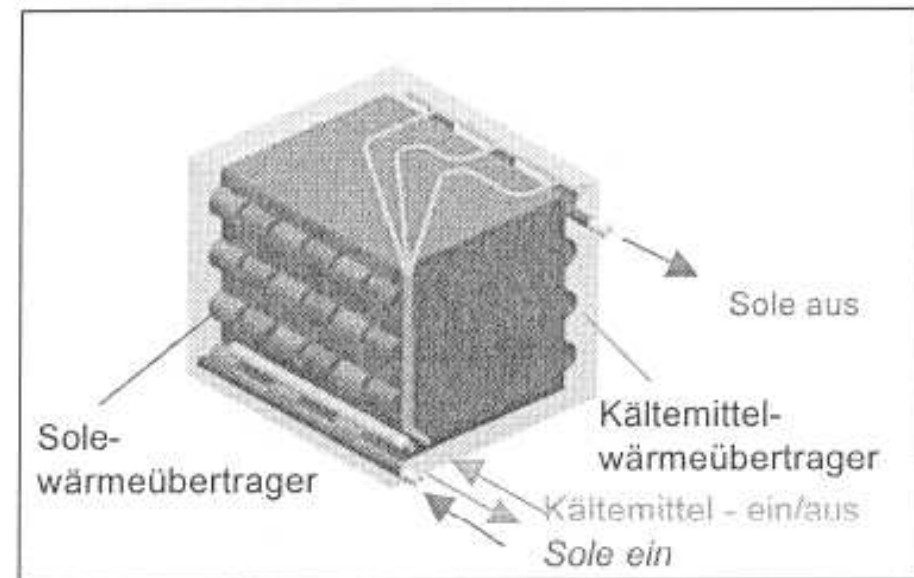
PCM = Water

5.7 kg<sub>Water</sub> / kg<sub>Graphite</sub>

Conduction improved

Expansion taken by matrix

More ice > better capacity

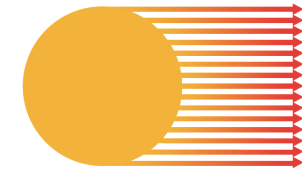


## Folie 7

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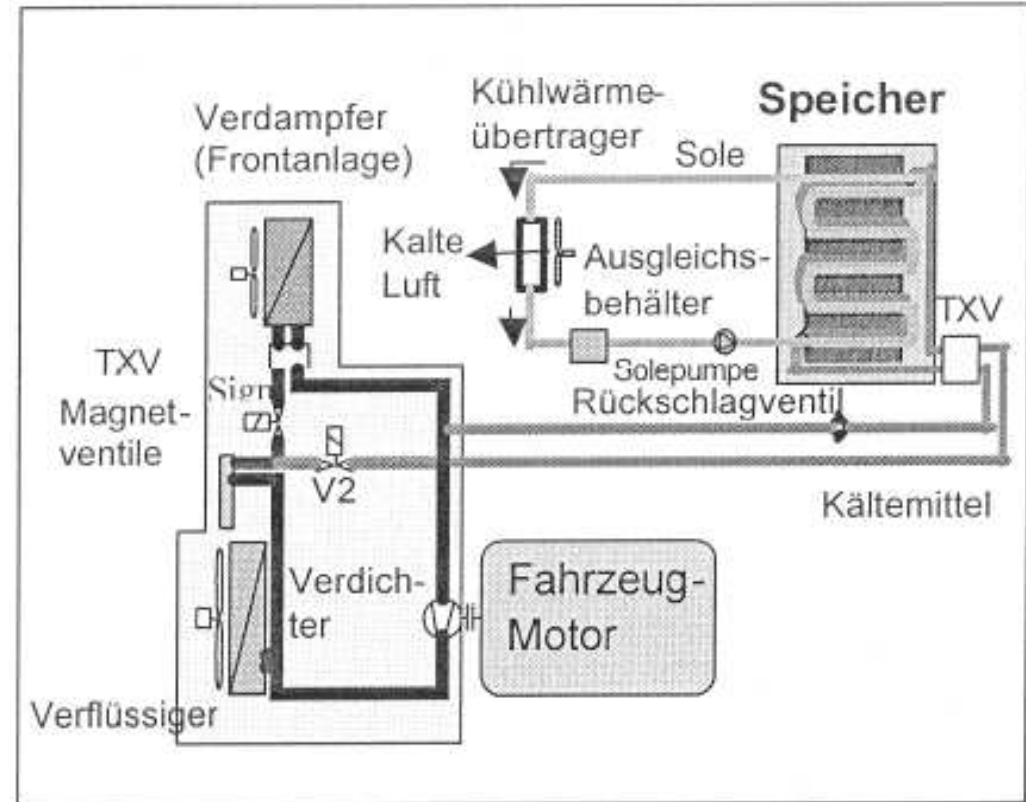
## Accusphere II

eg36

Charging medium  
refrigerant

Discharging medium  
liquid cooling medium

Temperature and humidity control

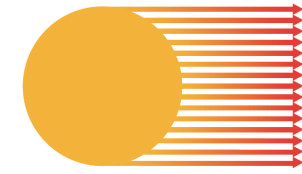


## Folie 8

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## Accusphere II

eg40

Some data

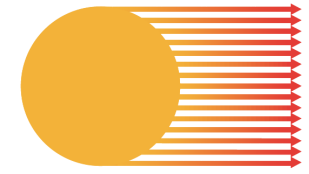
Kenngrößen der Speicher	Accusphere I (Wasser/Ethylenglykol)	Accusphere II (Graphitspeicher)
Cooling capacity / kWh	2,2	5,2
Weight / kg	88	73
Volume / l	220	112
Spec. cooling capacity / Wh/kg	25	71
Spec. cooling capacity / Wh/m <sup>3</sup>	10	47
Electric power consumption / W	90	90

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**Thank you  
for your attention**

## Folie 10

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