

University of Stuttgart
Institute of Automotive Engineering

External Thermal Management Concept for BEV Fast Charging

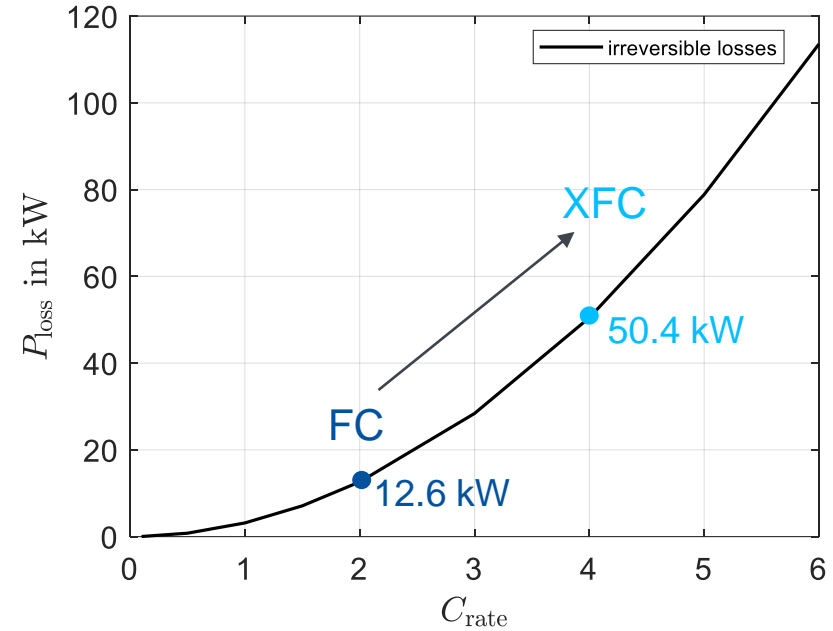
Marcus Auch

Motivation

- **Problem**

- Demand of shorter BEV charging time
- **Fast Charge (FC)**
20 to 80% State of Charge (SOC) in 20min
- **Extreme Fast Charge (XFC)**
10 to 80% State of Charge (SOC) in 10min
→ Increased charging currents
- Increased battery waste heat

$$\dot{Q}_{\text{loss}} = \underbrace{R_i I^2}_{\text{Irreversible losses}} + \underbrace{I T \frac{dU_{\text{OCV}}}{dT}}_{\text{Reversible losses}}$$



Irreversible losses of LG21700M50T at SOC=50%
scaled up to battery pack losses

Solution

- External thermal management system to reduce in-vehicle cooling requirements

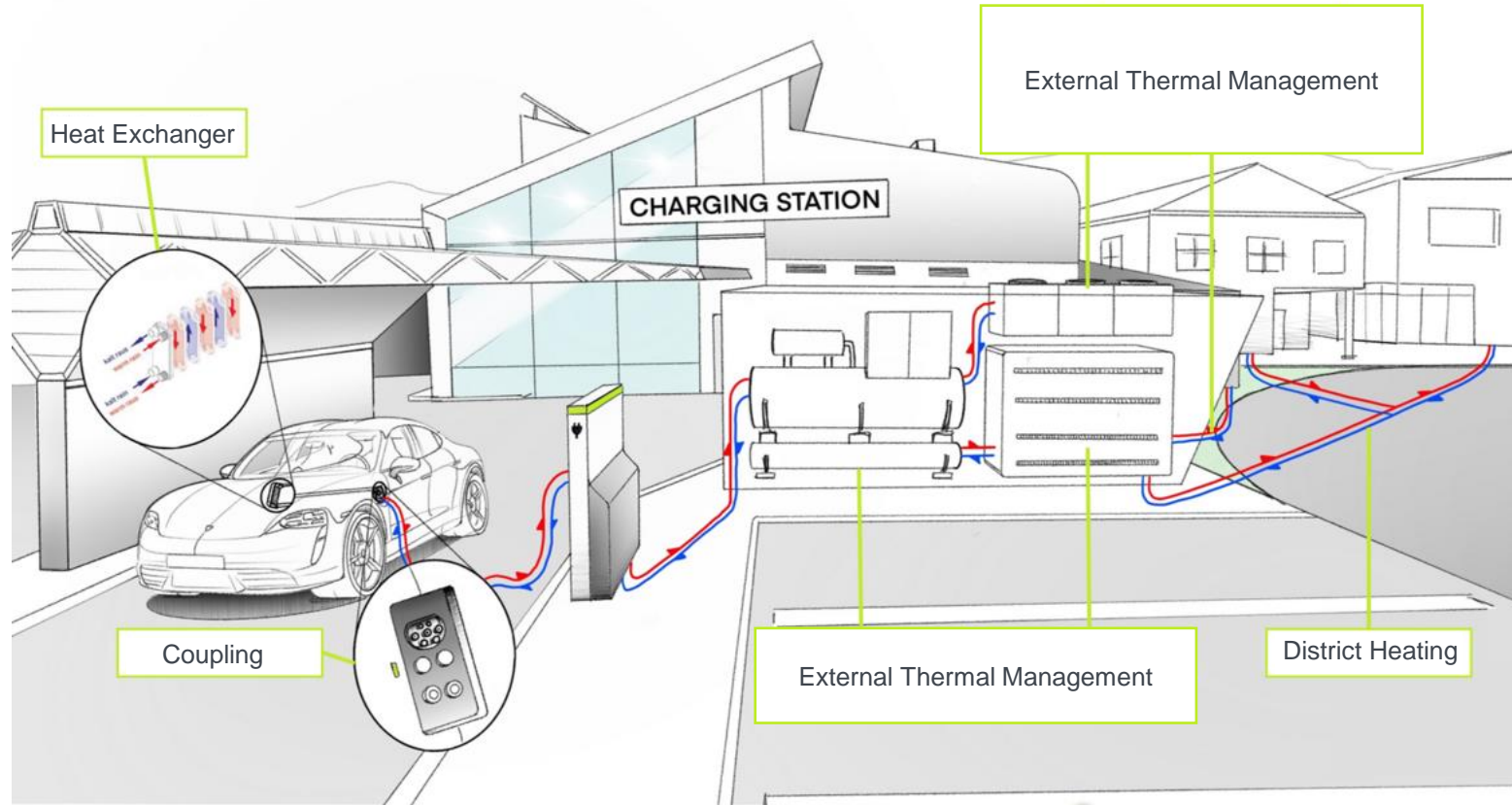
Motivation



Solution

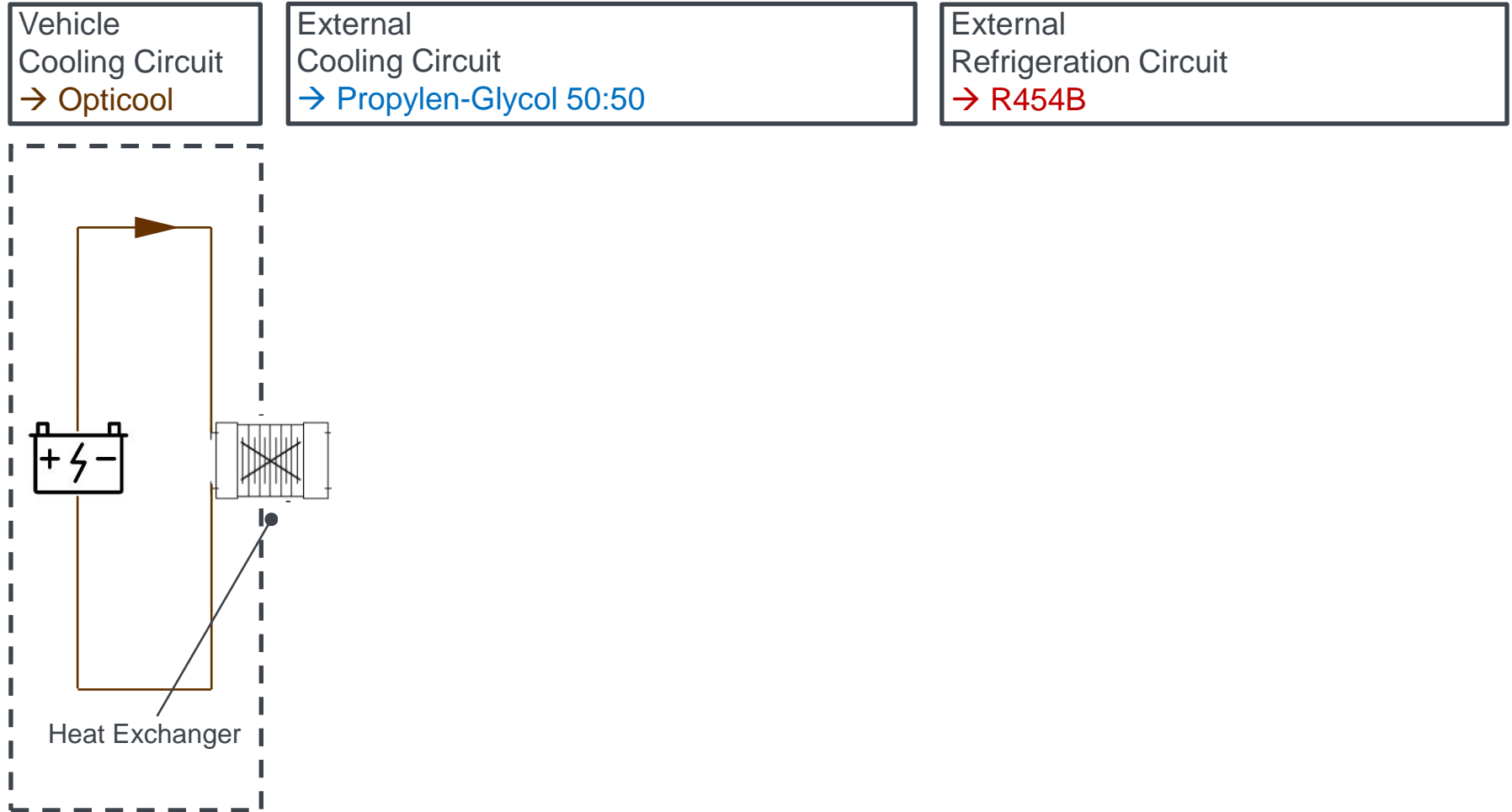
- External thermal management system to reduce in-vehicle cooling requirements

Conceptualization: Overall Concept

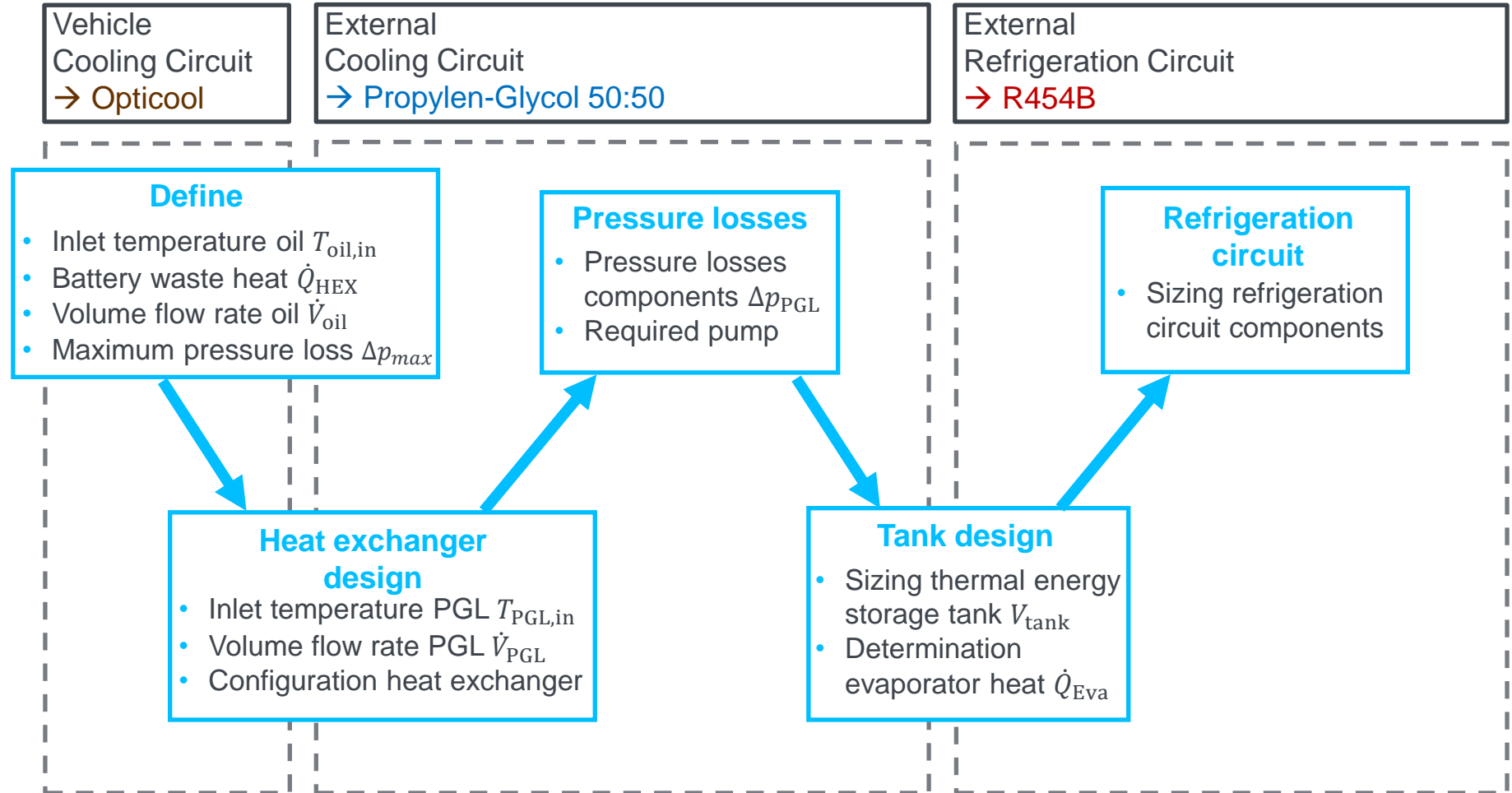


Source: Adapted from Hochschule Esslingen, Fakultät Mobilität und Technik (MT)-Professur Fahrzeugkonzeption/Deiningner

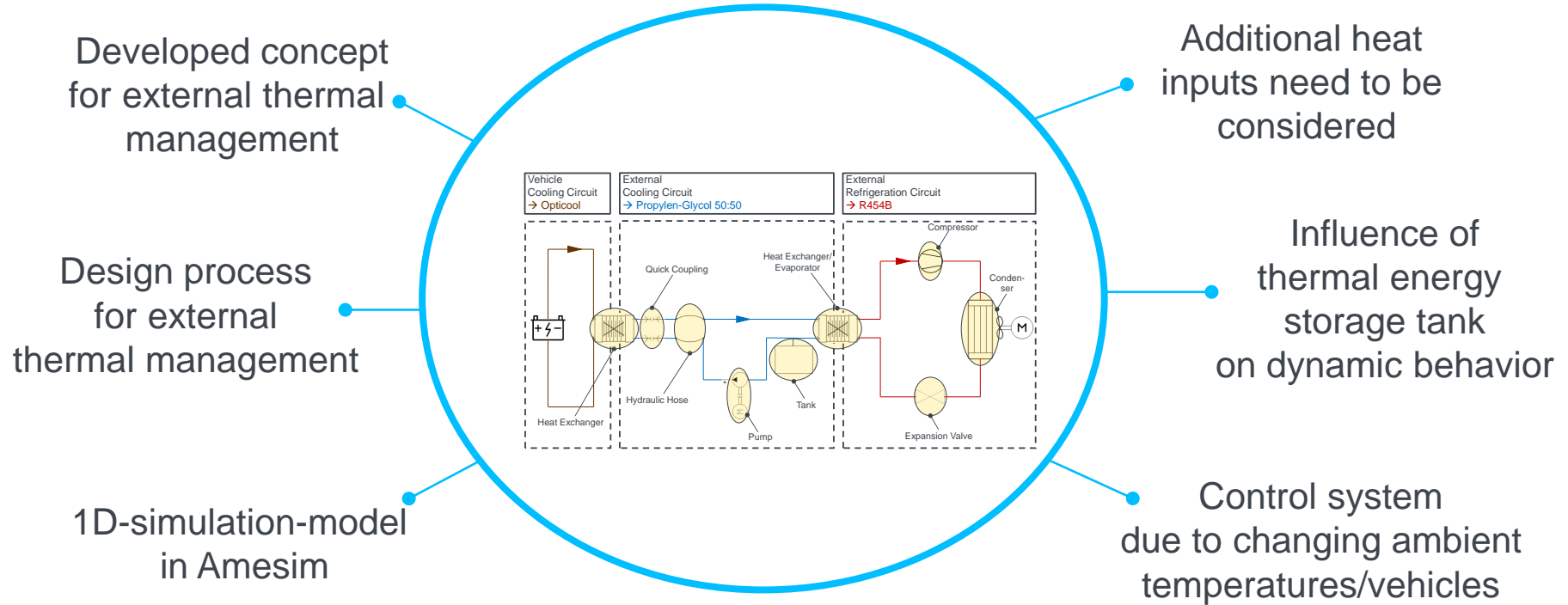
Conceptualization: Overall Concept



Conceptualization: Design-Process



Conclusion



→ Feasibility of external thermal management concept has been shown



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Thank you very much!



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