

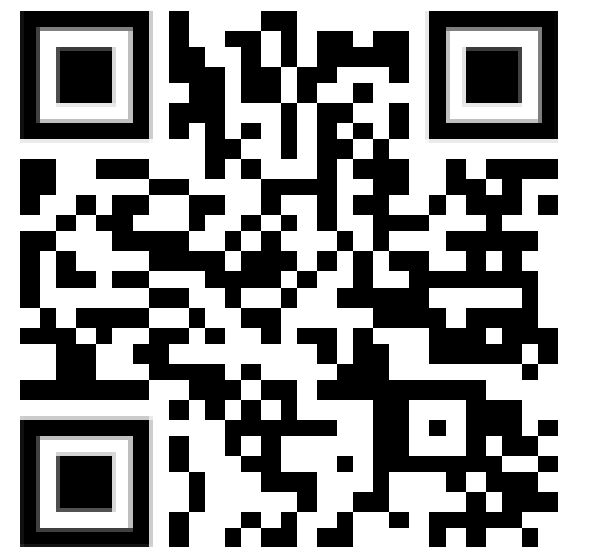


High-Efficiency High-Temperature Heat Pumps with Refrigerant Blends for Temperature Glide Applications

Project partners:

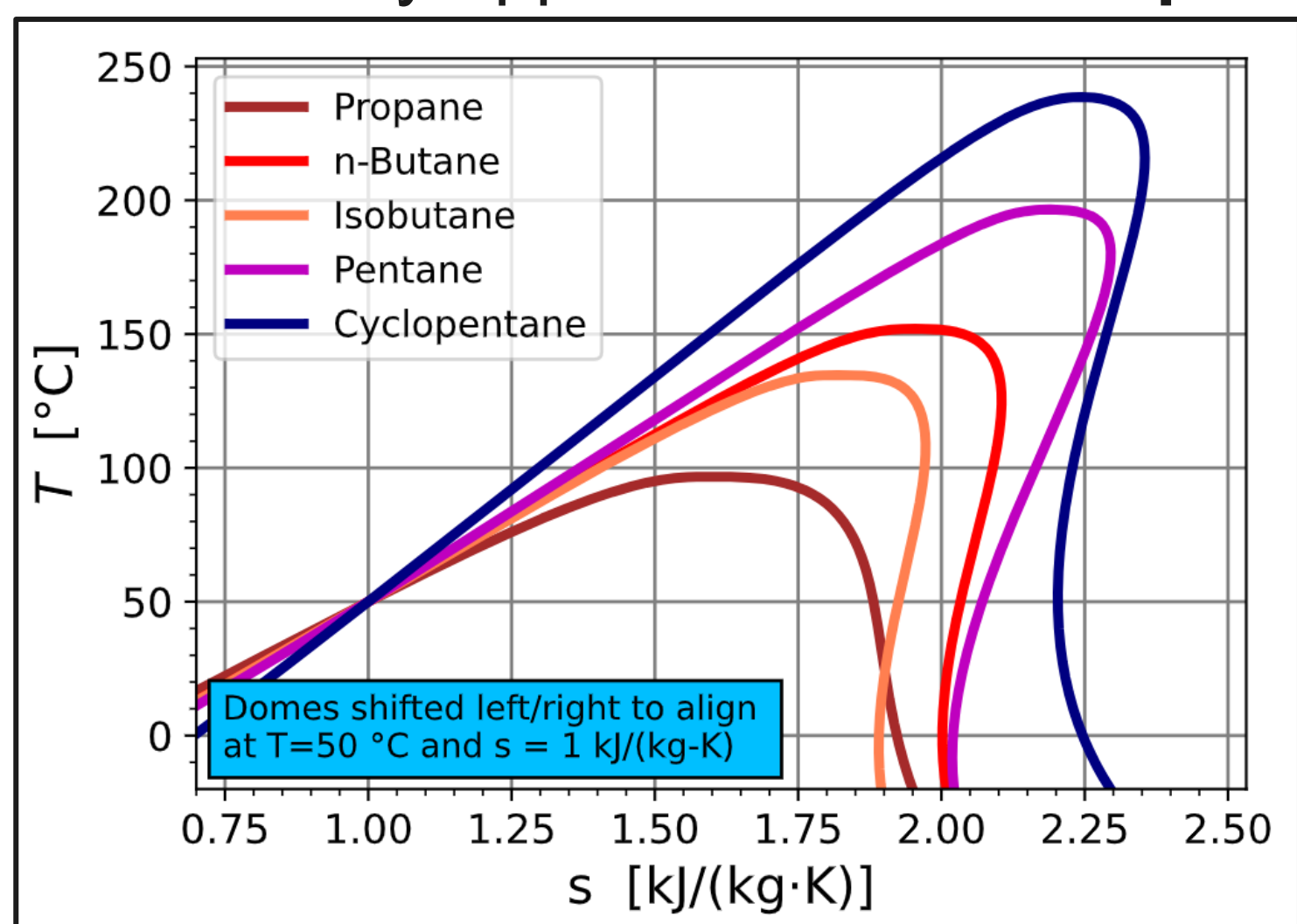
OST: Leon P. M. Brendel, Cordin Arpagaus*, Paul Lemke, Stefan S. Bertsch
Institute for Energy Systems, OST - Eastern Switzerland University of Applied Sciences

ETH: Philip Widmaier, Carl Hemprich, Emiliano Casati, André Bardow
Energy and Process Systems Engineering, ETH Zürich

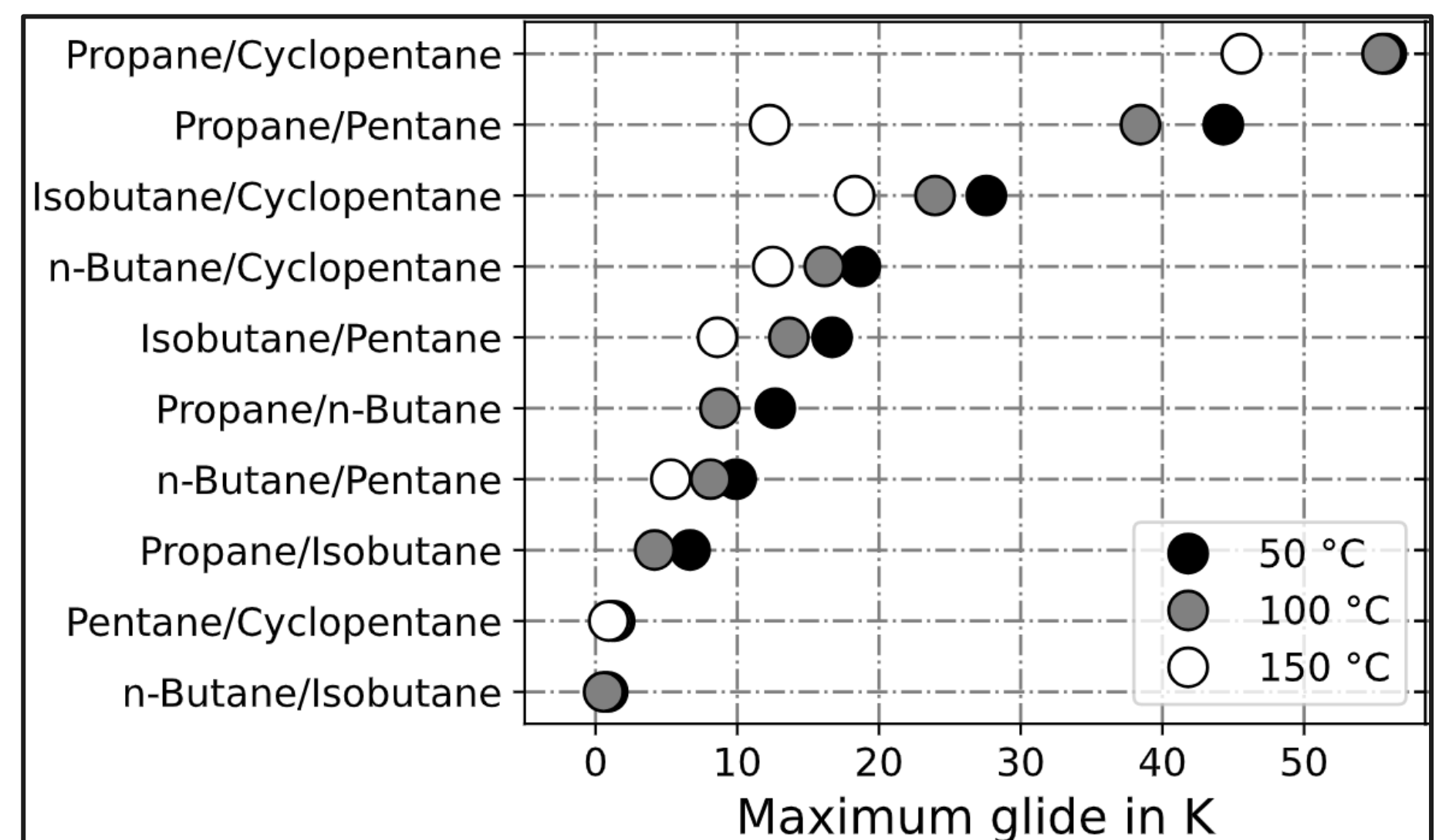


Abstract:

Historically, refrigerant mixtures were designed to have a small glide (if any). Industrial heat pumps often benefit from a **high glide of 20, 30 or 40 K**, but many in the field are sceptical and concerned about the glide. This project conducts experimental and theoretical research to **build up trust** and make **high-glide mixtures** the new normal for many applications. **COP improvements of up to 20 to 40%** are to be harvested.

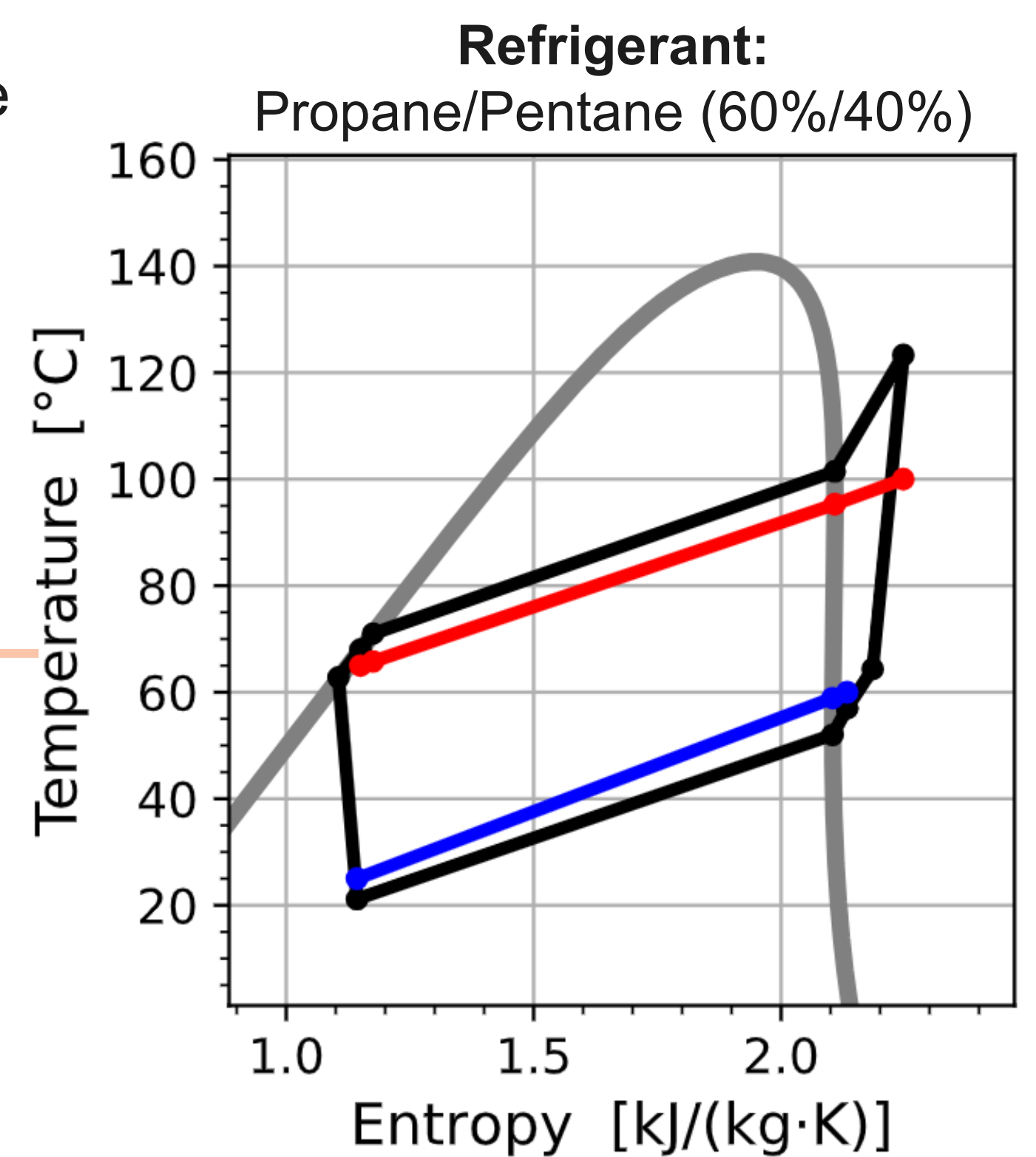


Just mix them



Example:

Imagine an application where water must be heated from 65 to 100°C and the heat source is cooled down from 60 to 25°C. The plot to the right shows how the glide of a Propane/Pentane mixture with 60% Propane by mass has a glide that **matches** the temperature differences in the **heat sink and source very well**. The COP is modelled to be 3.7, which is approximately 35% more than for the best pure hydrocarbon refrigerant (Butane with 2.9). Moreover, mixture allow to increase the volumetric heating capacity of a refrigerant.



Project achievements:

The project has **experimentally confirmed COP improvements of up to 20%** and solidified techniques for inline composition determination. Large-scale screenings have identified "all-rounder" mixtures, where one combination of fluids can cover a particularly **large range of applications** with a relatively high COP just by varying the compositions.

Industrial advisory board:

