

Application of Oil Flooded Compression with Regeneration to a Packaged Heat Pump System

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Outline

- Introduction
- Experiment
- Results and Discussion
- Conclusions

Introduction

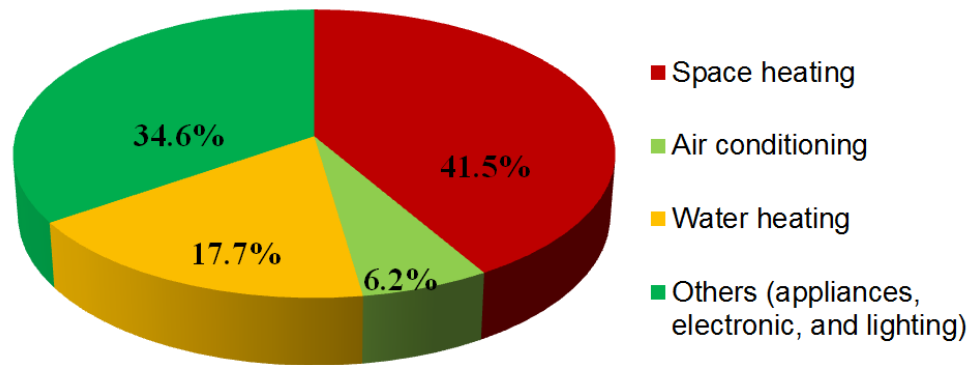


Figure 1: Energy consumption in residential sectors in U.S.

(<http://www.eia.gov/consumption/residential/index.cfm>)

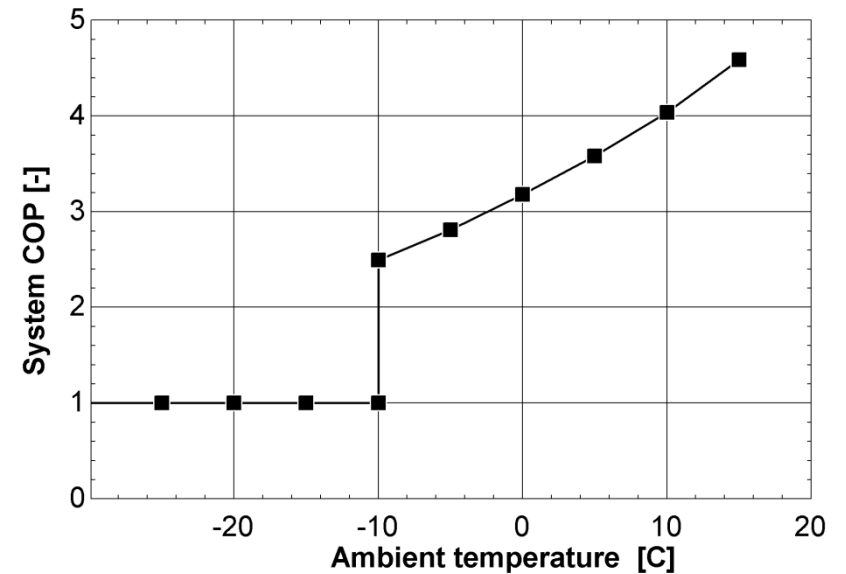


Figure 2: System performance of the air source heat pump at different ambient temperatures (Ramaraj, 2012)

Introduction

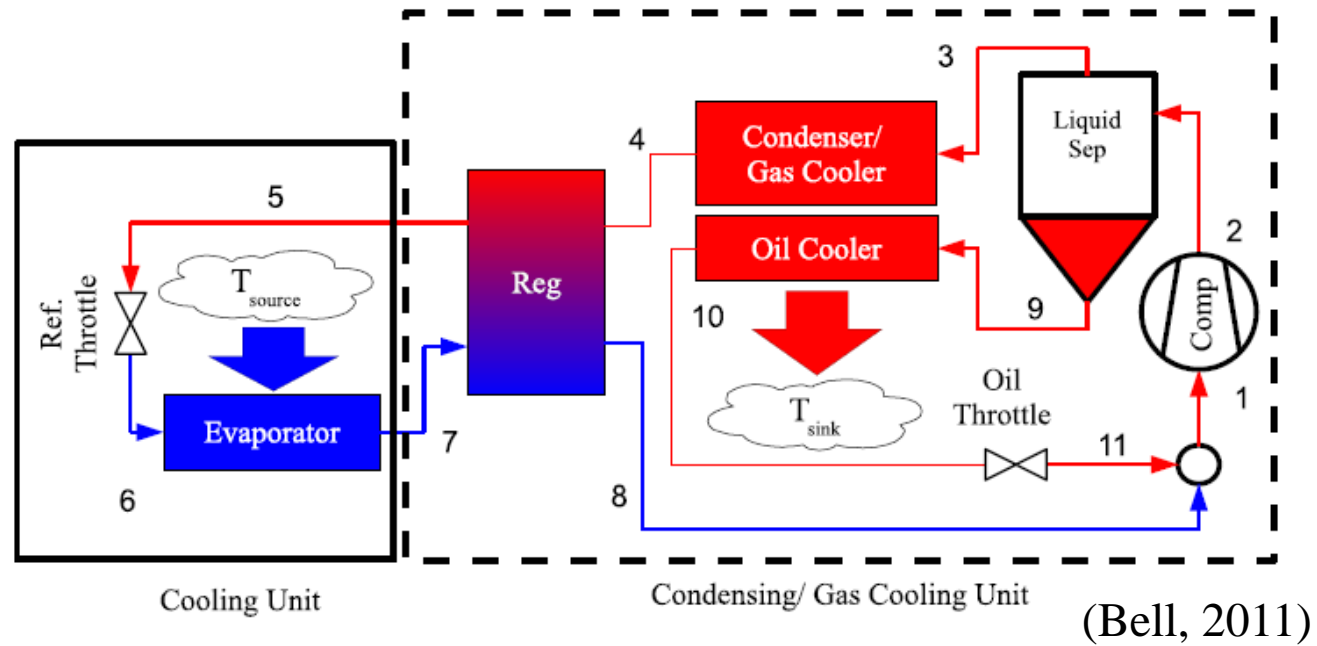


Figure 4: Schematic of the typical heat pump system using oil flooded compression with regeneration technology

Introduction

Table 1: Research on the oil flooded compression technology at Herrick Labs

Hugenroth <i>et al.</i> (2006)	<ul style="list-style-type: none">➤ Studied on the effect of liquid flooding in the Ericsson cycle;➤ Experimentally investigated the oil flooding effect on a heat pump system performance.
Bell <i>et al.</i> (2011, 2012)	<ul style="list-style-type: none">➤ Developed a detailed scroll compressor model with oil flooded technology;➤ Investigated the effect of oil flooded compression technology combined with regeneration on an air source heat pump.
Ramaraj (2012)	<ul style="list-style-type: none">➤ Experimentally tested an oil flooded compressor prototype.

Experiment

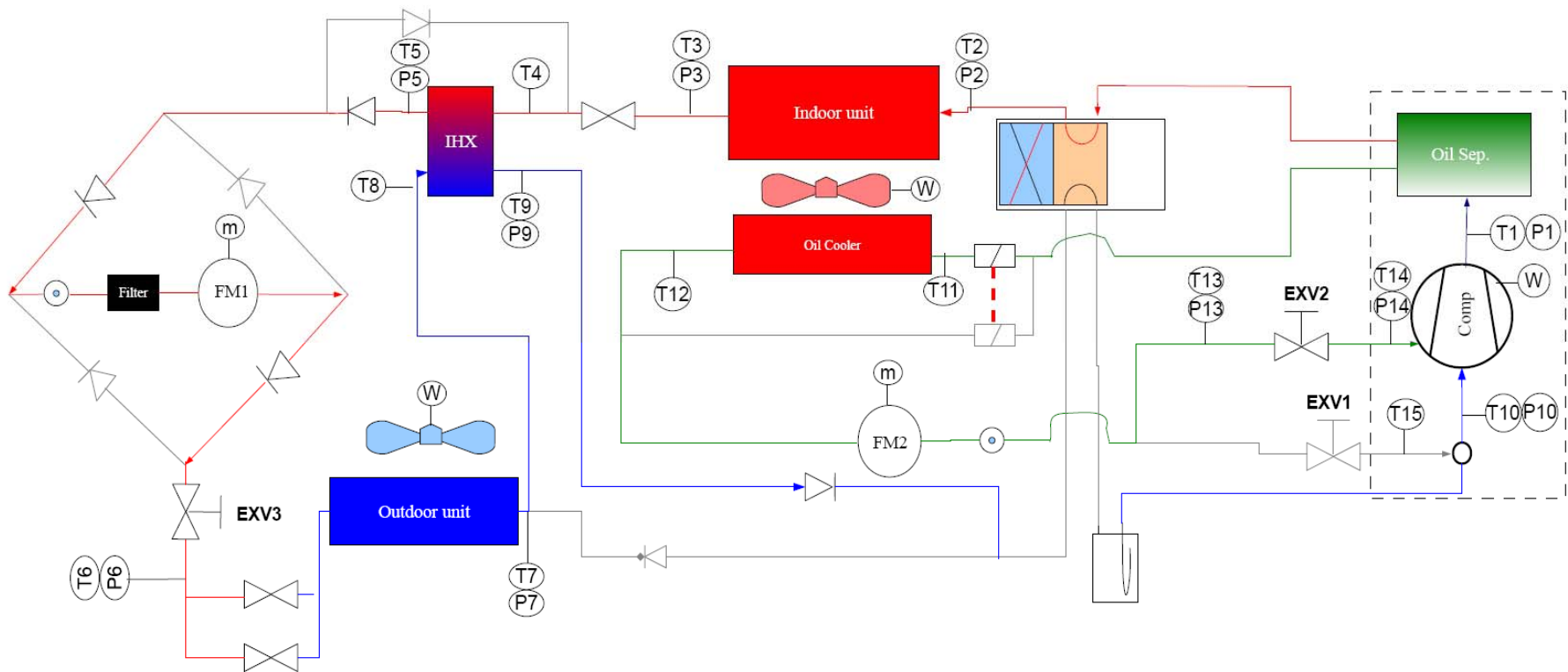
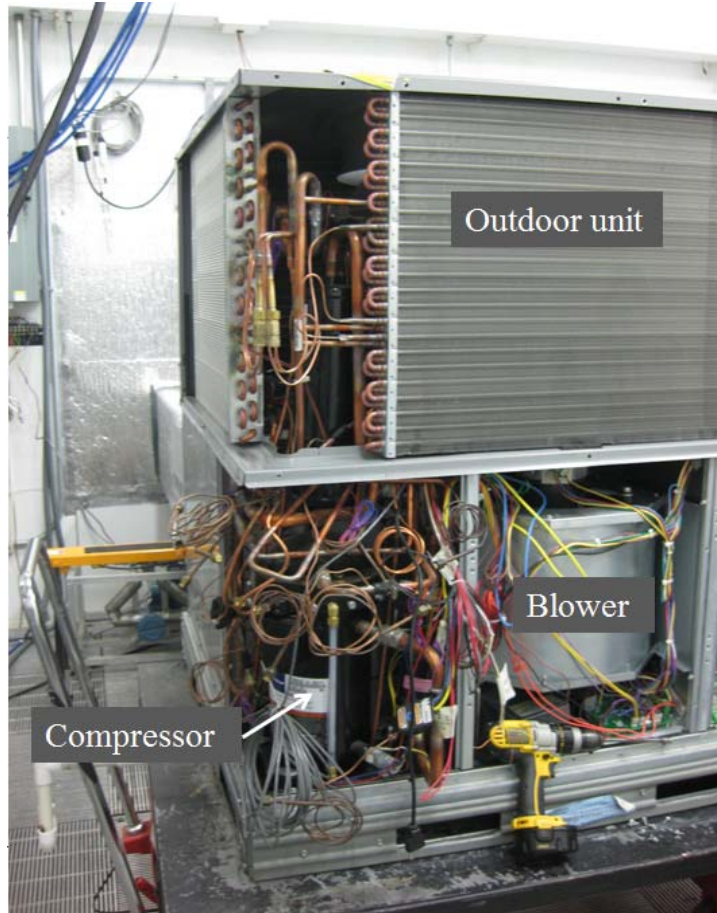
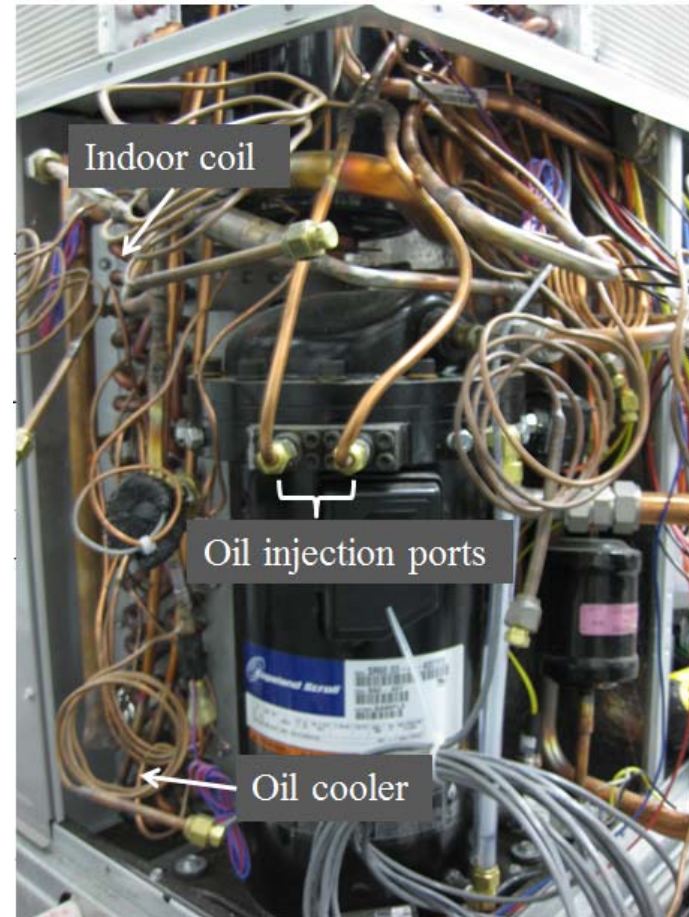


Figure 4: Schematic of the packaged heat pump system using oil flooded compression with regeneration technology

Experiment



(a) Overview



(b) Oil flooded compressor prototype

Figure 5: Experimental setup

Experiment

Table 2: Test matrix for oil flooded system

Test Name	Indoor Unit [°F]		Outdoor Unit [°F]		Indoor Air Flow rate [CFM]
	EDB	EWB	EDB	EWB	
H1	70	<=60	47	43	1750
H2			17	15	
H3*			0	minimum	

Results and Discussion

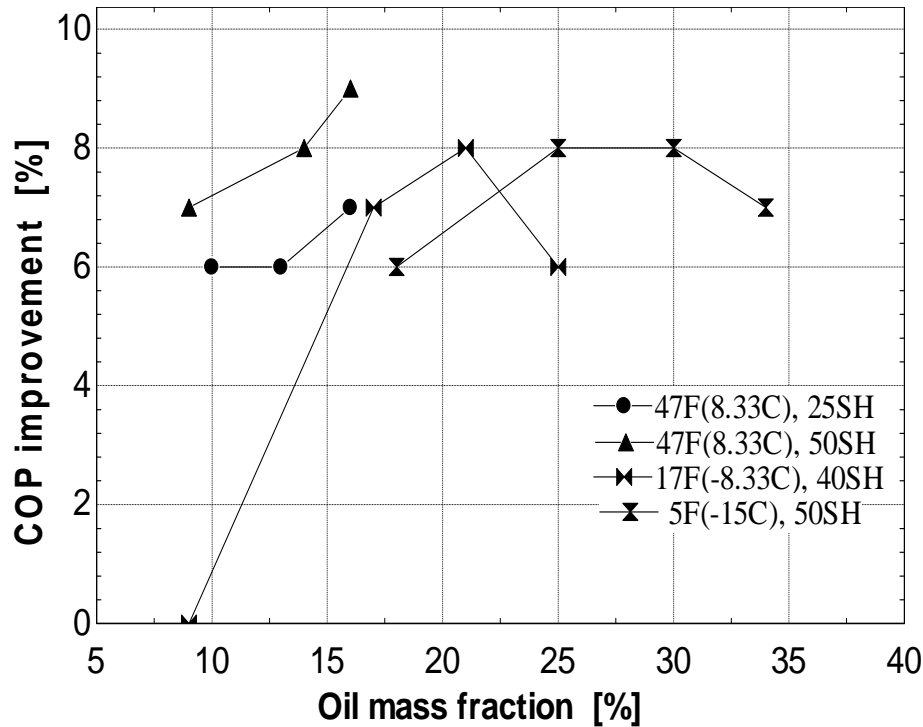


Figure 6: COP improvement for oil flooded system combined with regeneration technology

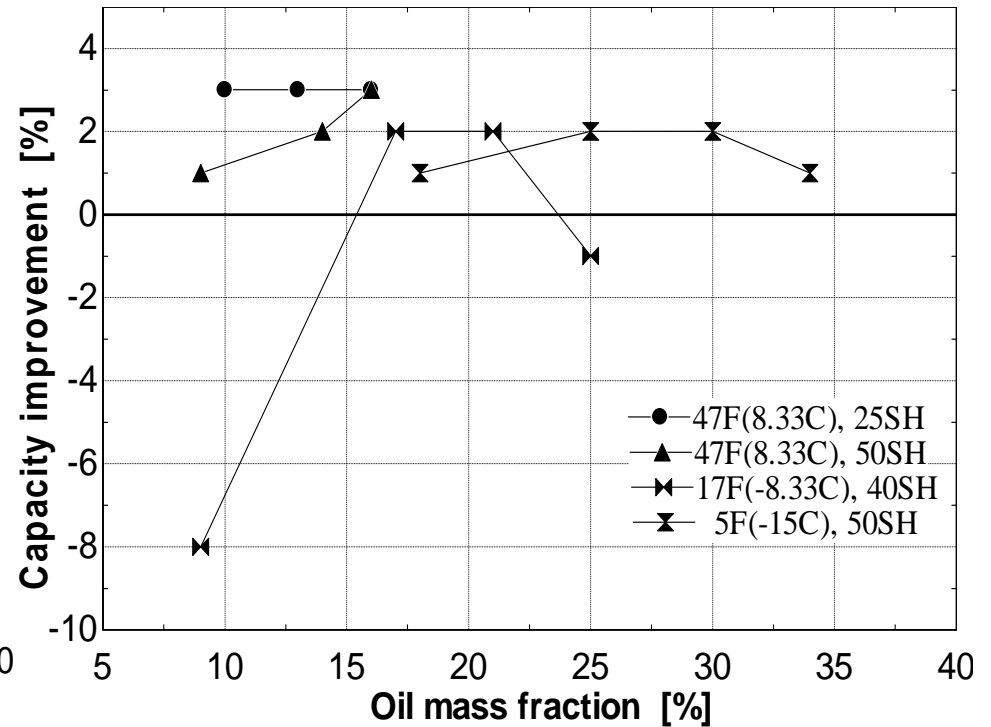


Figure 7: Heating capacity improvement for oil flooded system combined with regeneration technology

Results and Discussion

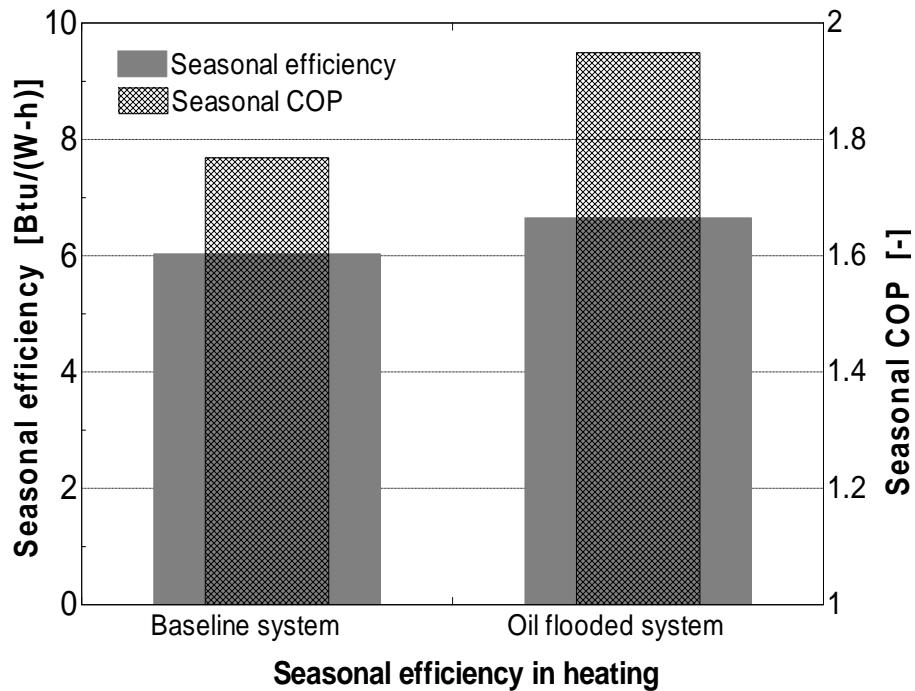


Figure 8: Heating seasonal efficiency and COP improvement of oil flooded system

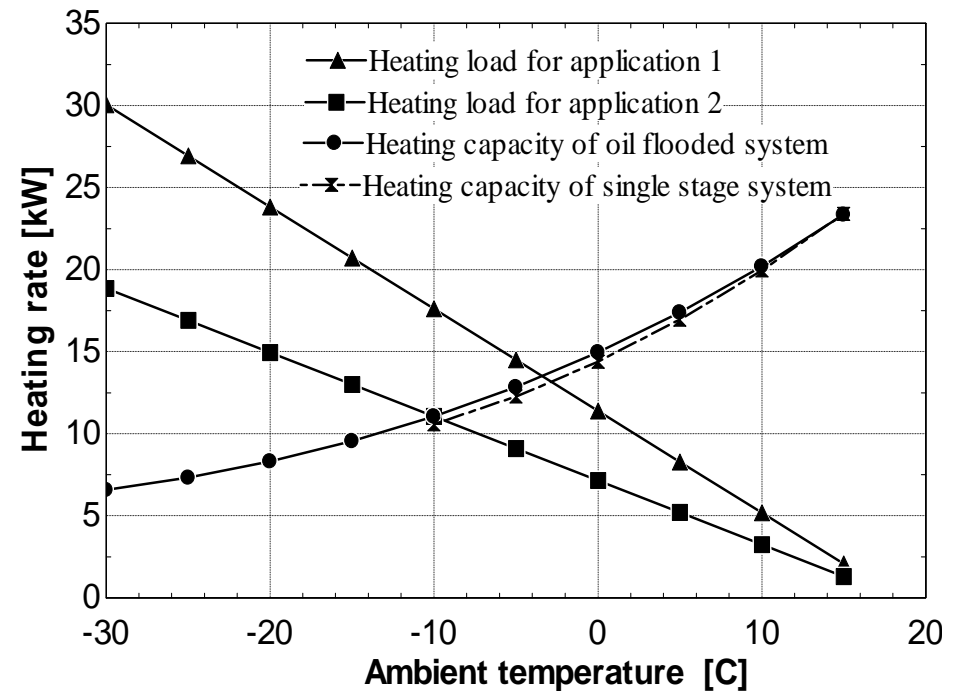


Figure 9: Heating load and heat capacity for different ambient temperatures

Results and Discussion

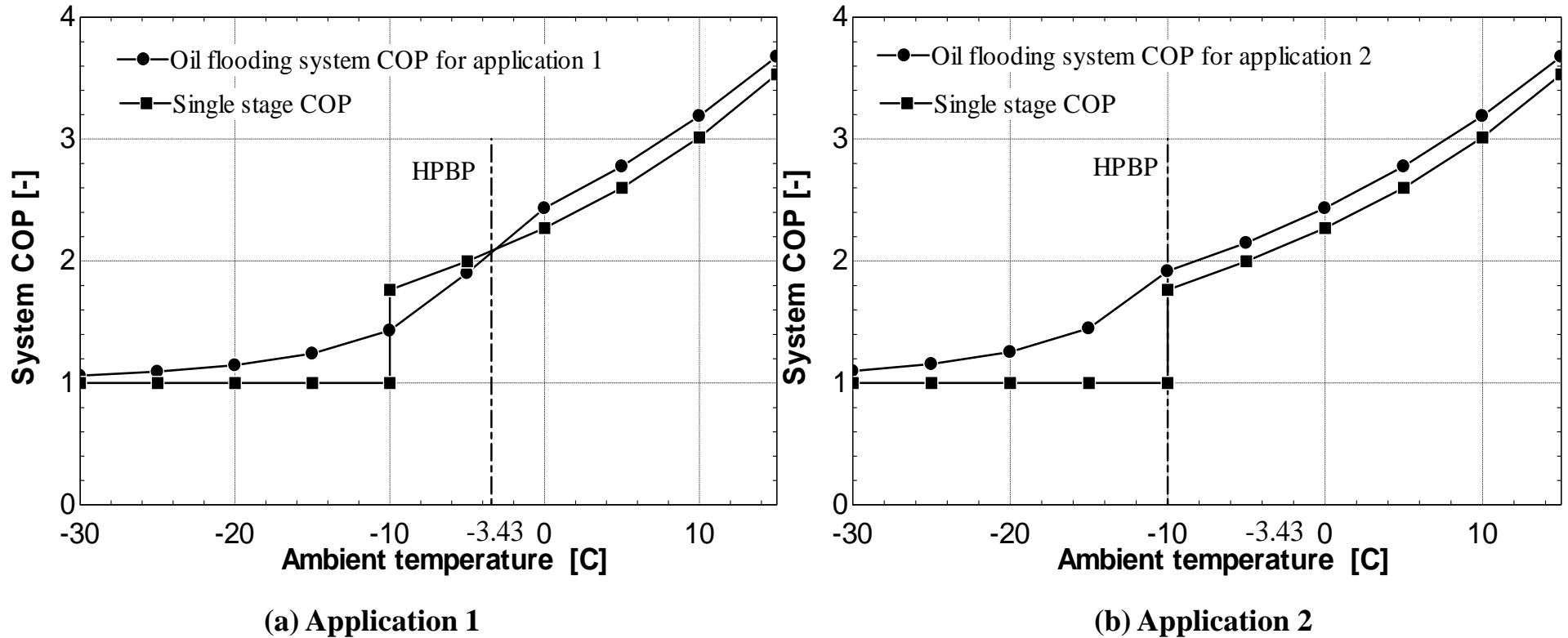


Figure 10: Oil flooded system COP at different ambient temperatures for application 1 and 2

Conclusions

- The tested prototype system demonstrates promising application of the oil flooded compression combined with regeneration technology into the low ambient heat pump;
- One circuit of the indoor coil was used as the oil cooler, leading to a smaller condenser heating transfer area and potential maldistribution inside the indoor coil;
- A new oil flooded system using a new prototype compressor and oil cooler will be tested soon at Herrick Labs.

