

Sorption air conditioning and heat pump systems for fuel cell buses

Status:	Available
Group Members:	TBA
Sponsor(s):	Self-funded project
Supervisor(s):	Majid Bahrami, PhD, P.Eng., Professor, Mechatronic Systems Engineering

Project Description

Current air conditioning systems in New Flyer buses employ vapor compression refrigeration technology, VCR, which uses a considerable portion of the electrical energy generated by Ballard PEM fuel cells. Moreover, VCR utilizes HFC refrigerants, which contribute to climate change due to the greenhouse gas effect. On the other hand, a significant portion of the input hydrogen energy in PEM fuel cells is transferred to the ambient in the form of low-grade heat (temperatures less than 100 °C). This waste heat can be used to run sorption cooling systems, SCS, for air conditioning, while leaving the output energy of fuel cells for bus powertrain. Furthermore, SCS employ environment-friendly refrigerants such as water. There are two main challenges against the adoption of SCS in New Flyer buses: (i) large mass and volume of SCS, and (ii) control and optimization of the cycle time based on different operating conditions. The capstone team will be working on the SCS prototype to address these two challenges by (i) designing a light and compact SCS, and (ii) developing a PLC (programmable logic controller) for SCS to control and optimize the cycle time. The developed SCS will be tested in LAEC and further incorporated in PEM fuel cell buses.

Required Skills:

- Hands-on experiences on plumbing and electrical systems
- CAD design of the system using Solidworks
- PLC development and programming
- General knowledge of control systems, SolidWorks, and LabVIEW