## Heat Pump Research and OSU

When I was an engineering student at OSU in the early 1990s, I took Dr. Spitler's Thermo and HVAC classes. His Thermodynamic II class was probably my favorite out of all the classes I had. In that class, Dr. Spitler assigned everyone a big design project, and due to his extensive background in geothermal heat pump research, the topics we could work on were related to that subject. My project was entitled "*Rankine Vapor Power Cycle Utilizing Solar Energy and a Phase Change Thermal Storage Unit*." The final report was 29 pages long including figures and appendices. I still have a copy of it today. When I read through it, I can't believe I was the one who wrote it. Especially thinking back to that time in history when you couldn't simply ask Google for answers. The internet was very primitive, containing mostly FTP sites and forums with very few actual web servers. Most of the research came from textbooks and a lot of time in the library.

The history of heat pump research at Oklahoma State University acts as the foundation for the modern ground-source heat pump industry, earning the institution the reputation of being the "Silicon Valley" of this technology. This journey began during the energy crisis of the 1970s, driven by Dr. Jim Bose, a professor of Mechanical Engineering who is now widely considered the father of the modern geothermal heat pump industry. The catalyst for this research was a practical problem involving a local homeowner who wanted to use a heat pump to heat his swimming pool. Dr. Bose engineered a system to circulate water through pipes in the ground, effectively creating a closed-loop ground heat exchanger.

Before this, geothermal systems were largely experimental, one-off projects lacking standardized sizing methods. Dr. Bose and his colleagues changed this by developing the foundational engineering equations for closed-loop ground heat transfer, which allowed engineers to reliably calculate borefield sizes based on load and soil thermal properties. Recognizing that the technology could not scale without a trained workforce, Dr. Bose founded the International Ground Source Heat Pump Association on the OSU campus in 1987. This organization served as the central hub for training, certification, and standards development, creating the Accredited Installer credential that became a benchmark in the trade.

As the industry matured into the 1990s and beyond, the focus at the university shifted from basic feasibility to complex system modeling and optimization. This era was led prominently by my professor, Dr. Jeff Spitler, who helped develop GLHEPRO, the industry-standard software for commercial ground loop heat exchanger design. His team focused on experimental validation, utilizing test borefields to verify simulation models against real-world performance data. Today, this legacy continues under the Center for Integrated Building Systems (CIBS), formed in 2020, where researchers investigate optimal control of hybrid systems and long-term ground temperature changes, ensuring that the work begun by Dr. Bose continues to evolve to meet modern engineering needs.

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