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Exclusively in the Blue Valley Times

Heat Pump Concept

I will attempt to explain some things that are hard to understand about how a heat pump moves heat from one place to another. The whole principle is based on energy that is transferred by a medium changing state from gas to liquid or liquid to gas. The refrigerant that is inside a heat pump was created for the properties it has. It is made up of several different materials. The most important property for a refrigerant is the boiling point. Why would that be important you ask? When energy is added to a material in liquid state it changes its phase from liquid to vapor. The energy absorbed in this process is called heat of vaporization. The vaporization is the opposite process of condensation. The heat of condensation is defined as the heat released when a material changes from a vapor to a liquid.

We are most familiar with the properties of water and the one constant we don't give much thought to is atmospheric pressure. That is a constant for us here on the earth. Water boils at 212° F at sea level. It boils at lower temperatures in the Rocky Mountains because atmospheric pressure is lower. It boils at a higher temperature inside a pressure cooker because of the added pressure of trapping the steam in a closed vessel.

Since energy cannot be created or destroyed, we harness it by transferring it from one place to another. The refrigerant inside a heat pump system boils at about -40° F and when it evaporates it gathers heat from the surrounding air. In heat mode, the tubes with fins on the outdoor unit of a heat pump contain the vapor as it evaporates and at -40° easily picks up heat from even the coldest winter air. Then the gas is compressed and sent inside to the other finned coil to release the heat just picked up outside. It goes on continuously. In cooling mode the evaporation takes place on the inside of the house as the refrigerant absorbs heat from the house air and the compressor sends that warm gas back to the outdoor unit to be squeezed and condensed. The hot gas is about 350° when leaving the compressor and is easily condensed back into liquid even on a 100° summer day. The cycle repeats until the thermostat is satisfied.

Since pressures and temperatures are critical, there has to be an exact amount of refrigerant in the system and the heat exchange coils must be clean to allow proper airflow. Any variation in outdoor or indoor airflow or refrigerant charge (due to leakage)

will reduce the efficiency of a heat pump.

Ken Field is the owner of Slate Belt Energy and Field's Service, Inc. As a certified energy rater and contractor, he is qualified to assess every aspect of energy usage and prescribe solutions to save energy. He can be reached at 610-759-6306 or email

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Lehigh County 4-H Equine Club has Success at State Level

By Kelly M. Weisner

HARRISBURG - Several members of the Lehigh County 4-H Equine Club participated in the 62nd annual State 4-H Horse Show held October 27-30 at the Farm Show Complex and Expo Center in Harrisburg, Pennsylvania.

Caleb Moyer, with his horse Dancer, placed 7th in Raised Box Keyhole Ponies (Ages 14-18) (14.2 hands and under) and 10th in Cutback Ponies (Ages 14-18) (14.2 hands and under).

Parker Haydt placed 4th in Pleasure Horse Driving and 8th in Ranch Riding, Ages (14-18), with Skipa Star Goer.

Riding Romero, Megan Brenner achieved 7th in Hunter Under Saddle Ponies (13.2 hands and under).

Liliana Xander took 4th in Beginner English Pleasure, 5th in Beginner Trail, 7th in English Grooming and Showmanship (Ages 8-11), and 9th in Beginner English Equitation, with Urban Legend.

Also with Urban Legend, Rebecca Galius placed 2nd in Pleasure Horse Driving, 5th in English Grooming and Showmanship, (Ages 15-18), and 7th in Hunt Seat Equitation on the Flat (Ages 15-18).

In the Equine Skill-A-Thon, Payge Haydt earned 5th place in the senior division.

In the 2022 State 4-H Horse Show Photography Contest, Rebecca Galius placed 2nd with her entry in the Senior Animal Photo category. Ava Horwith also took 2nd place in the Junior Other Photo category.

Equine Educational Exhibits were on display throughout the show for youth to demonstrate acquired horsemanship knowledge. Exhibits were judged on equine related facts and educational content. Lehigh County was named the team grand champion with their exhibit entitled "Trailering Safety – I'm Hauling Mine."

The State 4-H Horse Show is the final competition of the year for 4-H horse members enrolled in performance horse projects. To be eligible for the show, members must advance through qualifying competitions at county and district levels. More than 600 youth from over 50 counties participated in 80 performance classes at the state level.

For additional information on 4-H horse programs in Pennsylvania, contact your county Penn State Cooperative Extension office at extension.psu.edu/counties or visit the Pennsylvania 4-H Horse Program web site at extension.psu.edu/4-h/projects/horses.

Administered in Pennsylvania by Penn State Extension, 4-H is a community of more than 6 million young people across America learning leadership, citizenship, and life skills. Penn State Extension 4-H youth development educators in all 67 counties throughout the commonwealth administer local 4-H programs through non-formal education and outreach. To find your local program, visit the Penn State Extension website at <https://extension.psu.edu/programs/4-h>.

Lehigh County 4-H Equine Club Members pictured at the State 4-H Horse Show in Harrisburg. Many educational and fun activities are offered by 4-H in Pennsylvania. In Pennsylvania, 4-H is coordinated by Penn State Extension through the U.S. Department of Agriculture. 4-H programs are open to all youths regardless of race, color, religion, sex, national origin, or disability. For more information about the above events or other 4-H activities, call the 4-H office in your county: Lehigh 610-391-9840 or LehighExt@psu.edu.



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