Embracing Energy Storage Field of Work

Exploring different energy storage applications can be fun, yet challenging for the students of Dr. Amy Fleisher, Professor of Mechanical Engineering at Villanova University. Her students from undergraduate to post- doctorates investigate several different problems related to long-term energy storage. They work in a collaborative environment on the same team, each attacking different aspects of the problem and contributing at different levels. This team structure helps students to deal with difficulties or setbacks.

“Some of the things we work on, on a daily basis, are not the most interesting; however, it keeps the work going and interesting”, said Dr. Amy Fleischer, who also directs NovaTherm Research Laboratory. “The important aspect of this research is to look at ‘what the data is telling you’ and ‘what can be learned from it’--- because the world obeys physical laws in a very interesting way--- particularly on a nano-scale.”

One type of energy storage material being worked on at the NovaTherm Laboratory is ‘phase change energy storage’. This involves transitioning material back and forth from solid to liquid state (on a molecular level) on a regular basis. “Energy penetrates into the material—and it begins to melt. The higher the latent heat of the material, the more energy can be stored within the melted material,” she said. In manipulating the material, they are finding that there are efficient material with very low thermal properties; thermal conductivity, thermal diffusivities, makes it difficult for energy to penetrate and transition solids to liquid. Therefore, a lot of emphasis is being placed on ‘nano-materials phase change materials’ to see how the interaction between the nano structure and the materials can improve thermal behavior.

“Nanoparticles stay in suspension very well in both liquid and solid form—which creates all kinds of forces within the material,” said Dr. Fleischer. The challenge is to make this technology more efficient in the distribution of energy, capabilities to reuse and capture a surplus of energy when sources like the Sun are not available.

This is an exciting time for early career engineers to enter this field. Dr. Fleischer suggests that early career engineers interested in working in the thermal energy storage field (in academia or

in industry) , should be prepared to move far beyond the fundamental knowledge of thermodynamics--What was learned in undergraduate course study will not be sufficient on the micro-scale (nano-layer). “As a researcher, you will also need to be persistent and curious about where the work will take you---it’s when you are most open to other ideas,” is her advice.