**Conserving Water**

Power plants are great generators of electricity, however, methods to keep a power plant running come with increasing consequences such as the loss of water. Instead of the traditional methods of wet cooling which remove heat through the evaporation of water, dry cooling methods can perform the same job while conserving water. The direct-contact liquid-on-string heat exchanger (DILSHE) model includes direct contact heat transfer between a non-evaporative liquid and gas. This model will aim to maximize its performance to match wet cooling methods.

**Goal**

Optimize flow rate and ultimately conserve water.

**DILSHE: Convective Heat Transfer**

- Hot liquid coolant flows down the string
- Thermocouples capture data

**Spatiotemporal Diagram**

Displays the lines that represent falling beads traveling in accordance to time (where each line corresponds to one bead) used to calculate velocity and frequency.

**Bead Diameter/Film Thickness Along Four Positions**

- Bead diameter increases as air velocity increases for all 4 positions.
- Film thickness remains relatively constant as air velocity increases for all 4 positions.

**Comparing Four Different Liquid Flow Rates (same scale)**

- Bead diameter and film thickness increase in size as liquid flow rate increases.
- As liquid flow rate increases, the beads become less symmetrical.

**Comparing Bead Velocity with Air Velocity at 160 cm**

- Bead velocity is constant in relation to air velocity.
- Liquid flow rates slow down relatively as the air velocity increases.

**Frequencies at Two Liquid Flow Rates**

- Frequency has a consistent trend, unaffected by the increase in air velocity.
- Frequency is higher with the faster liquid flow rate and lower with the slower liquid flow rate.

**Broader Impacts of Dry Cooling**

- While wet cooling methods have been known to be more efficient, the advantage that the DILSHE model provides is the conservation of precious water resources.
- The implementation of the DILSHE model can serve to improve current issues such as drought and bring an overall environmental impact to conserving water.

**Future Works**

The lab plans on further experimenting with variables such as:
- String diameter
- Different types of liquids
- Increasing gas flow rates

Within an industrial setting:
- Match or exceed wet cooling efficiency
- Scale to hold thousands of strings for massive cooling

**Acknowledgments**

We would like to thank all NSDSP faculty for guiding us through every step of this process; Hanbi Kittur and Luke Shaw for their guidance and William Herrera for giving us the opportunity to participate in this program. But most importantly, Professor Ju and our daily lab supervisor, Zezhi Zeng, for welcoming us into the lab and providing us the knowledge to grow and truly experience a research setting.