**IEE 572 Design of Experiments (Experiment 3)**

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* **Objective of Experiment:**

Water needs to be heated up to 200˚F for making noodles. Salt is added to the noodles after it is heated up to 200 ˚F. the aim of this experiment is to find the effect of size of container (open surface area large/small), Level of hot plate (high/medium), type of water (normal water/salty water), size of hot plate (coil size big/small), and temperature of the room (60˚F/ 95˚F) on the time taken by the water to reach 200˚F.

* **Factors:**

1. Size of container (small/ large)
2. Temperature of hot plate (high/ medium)
3. Type of water (normal/ salty)
4. Size of Hot Plate (big/ small)
5. Temperature of the Room (60˚F/ 95˚F)

* **Response:**

The response is the time taken by the solution to reach 200 degree Fahrenheit.

* **Experiment Type:**

2-level fractional factorial experiment with 5 factors (4 significant factors) (**2V5-1**), 2 replicates, with blocking.

* **Planning:**

The experiment is conducted in a random fashion. The order of the experiment is randomized using Minitab. A trivial order of run is ignored and a non-trivial order is chosen. The order includes the two levels of each factor and is mixed to avoid any lurking variables.

Blocking is another concept that was implemented during the planning of this experiment. The solution is a mixture of salt and water. To avoid any error due to different concentration of salt in the solution, blocking was done for every replicate. The amount of salt in the solution was constant (without human error in mind).

* **Experimental Setup:**

*Apparatus*: Two hot plates of different sizes with high and medium settings, Water, Salt, Large and small container, thermometer, stopwatch. The level of each factor in a run is decided based on the order obtained from Minitab. Each combination is carefully applied in the experiment. The time taken by the water to reach 200˚F is measured.

*Procedure*: The size of the Hot Plate (big/ small) and Temperature (60˚F/ 95˚F) of the room is selected. Water (normal/salty) solution is poured in the container (size large/small) and the level of hot plate is set to high/medium and stopwatch is started, temperature of the solution is constantly measured and time at which temperature of the water reached 200˚F is noted and the hot plate is turned off, solution is disposed, container and hotplate is cooled to room temperature.

* **Results:**