**Opentron viscosity project**

**Objective:**

1. Find optimized parameters for accurately pipetting liquids with different viscosities.

* Parameters to tune:
  + Positioning of the pipette tip
  + Aspirate rate
  + Dispense rate
  + Delay time
* Problems you might encounter
  + Dripping
    - Potential solutions: Air gaps
  + Excess liquid transferred due residual liquid in outer walls
    - Potential solutions: Touching walls

1. Create transfer functions that take account viscosity of the fluids.
2. Come up with a visual or easy to come up proxy for viscosity value of a liquid.

**Methodology:**

The amount of liquid transferred by pipetting will be validated by measuring the transferred mass for each viscosity standard. The pipetting parameters will be tuned to transfer the mass equivalent to the desired transfer volume.

* For P1000 the following volumes will be studied: 100, 500 and 1000µL
* For P300: 20, 150, 300 µL

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Standard | Viscosity  @25C | Density  @25C | Viscosity  @20C | Density  @20C | Notes |
| 1 | 3.32 | 0.8181 | 3.78 | 0.8216 | might have petrol like smell |
| 2 | 28.53 | 0.8470 | 36.46 | 0.8502 | might have petrol like smell |
| 3 | 99.85 | 0.8578 | 135.1 | 0.8609 |  |
| 4 | 204.8 | 0.8639 | 285.6 | 0.8664 |  |
| 5 | 398.4 | 0.8672 | 568.4 | 0.8702 |  |
| 6 | 505.4 | 0.8683 | 727.1 | 0.8713 |  |
| 7 | 817.4 | 0.8466 | 1136 | 0.8476 |  |
| 8 | 1275 | 0.8736 | 1899 | 0.8765 |  |
| 9 | 4806 | 0.8802 | 7406 | 0.8830 |  |
| 10 | 5882 | 0.8819 | 9065 | 0.8848 |  |
| 11 | 6695 | 0.8726 | 10205 | 0.8754 |  |
| 12 | 7782 | 0.8826 | 12119 | 0.8855 |  |
| 13 | 9884 | 0.8844 | 15368 | 0.8872 |  |

**Helpful material**

Opentron API functions

<https://docs.opentrons.com/v2/new_protocol_api.html>

<https://github.com/mat-fox/polylectric/blob/main/opentrons/OPENTRON%20SOP_v1.pdf>

Handling viscous liquids

<https://opentrons-landing-img.s3.amazonaws.com/application+notes/Viscous+Liquids+App+Note.pdf>

Aniket has been working on pipetting viscous fluids for his project, but he does not really know the viscosities and can’t really calibrate the weights he is transferring because he does not know the densities of his solutions. He sent me this picture with some parameters of what he currently uses, maybe it can give you an idea to what to look at when playing with the parameters.

