VISCOSITY APPLICATION NOTE: Shampoo

USE
To wash and moisturize hair.

METHOD I
TEST EQUIPMENT
- Viscometer/Rheometer, RV torque
- Spindle: RV-3 Disc
- Accessories: TC-502P Programmable Refrigerated Bath
- Speed: 5, 10, 15 and 20 rpm.
- Temperature: 25°C

TEST METHOD
We used an RVDV-II+Pro Viscometer with RheocalcT software for automated instrument control and data acquisition. Our test temperature of 25°C was maintained by a Brookfield TC-502P Programmable Refrigerated Bath. The sample was poured out of its original container and into a 600-mL beaker, where it was tested. Representative data from the analyses are shown in Figure 1.

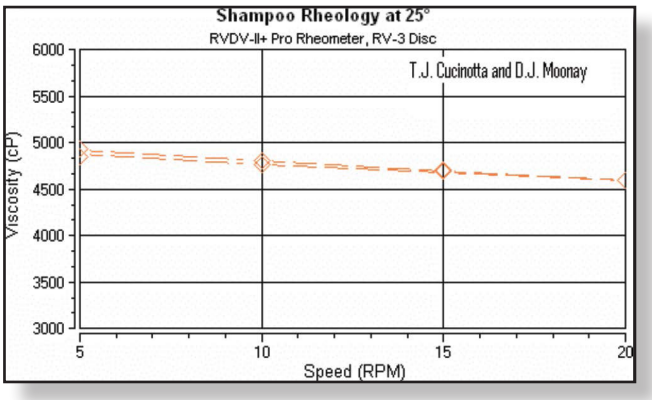

Figure 1: With RV spindle at 25°C

METHOD II
TEST EQUIPMENT
- Viscometer/Rheometer, RV torque
- Spindle: SC4-27 / 13RPY Sample Chamber
- Accessories: TC-502P Programmable, Refrigerated Bath; Small Sample Adapter
- Speed: 10, 20, 30, 40, 50, 60 and 70 rpm.
- Temperature: 25°C

TEST METHOD
We used an RVDV-II+ Pro Viscometer with Rheocalc software for automated instrument control and data acquisition. Our test temperature of 25°C was maintained by a Brookfield TC-502P Bath. A syringe was used to measure 10.4 mL of sample and dispense it into the chamber. The Small Sample Adapter is very useful because it allows much smaller samples to be tested than in the beaker method discussed in Method 1. Also, its coaxial or concentric-cylinder geometry allows shear rates to be calculated. Viscosity vs. Shear Rate data for various materials are often used in process design. Representative data from the analyses are shown in Figure 2.

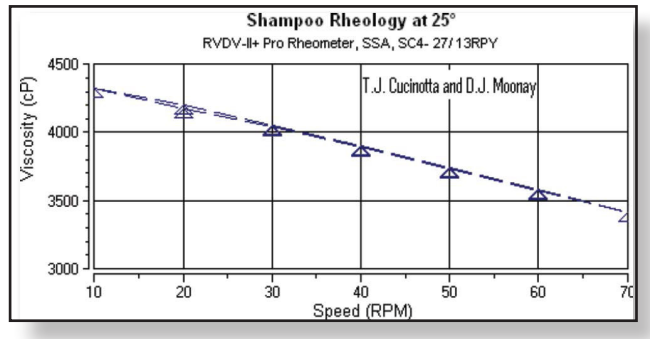

Figure 2: With SC4-27 Spindle at 25°C

METHOD III

TEST EQUIPMENT

- Viscometer/Rheometer, HA range
- Spindle: CPE- 40 Cone with 44PSY Sample Cup.
- Accessories: TC-502P Programmable Refrigerated Bath
- Speed, rpm: 10, 20, 40, 60, 80,100, 120, 140, 160,180, 200, 220 and 240 rpm.
- Temperature: 25°C

TEST METHOD

We used an HADV3T CP Rheometer with RheocalcT software for automated instrument control and data acquisition. Our test temperature of 25°C was maintained by a Brookfield TC-502P Programmable Refrigerated Bath. A syringe was used to measure 0.5 mL of sample and dispense it onto the plate. Utilizing Cone-Plate geometry can be very useful if you would like to use even less sample than is necessary for Small Sample Adapter™. Cone-Plate geometry also allows calculation of shear rates. Representative data from the analyses are shown in Figure 3.

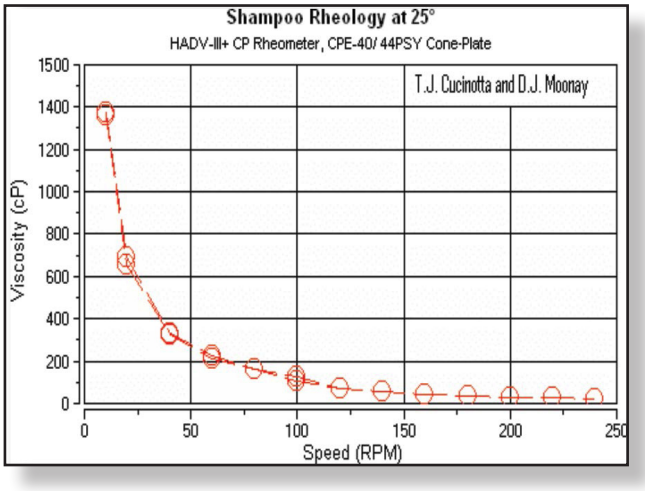

Figure 3: Method 3 at 25°C

Figure 4 shows that valid rheological data of Shampoo can be obtained with various geometries. However, Figure 4 also shows that with different geometries, different speeds and spring torque ranges may be needed to obtain on-scale torques. We recommend measurements between 10 and 100% of full scale range. All data displayed in Figure 1 are valid. However, in order to more properly compare data between geometries, one should plot viscosity vs. shear rate, instead of viscosity vs. speed (refer to Figure 5).

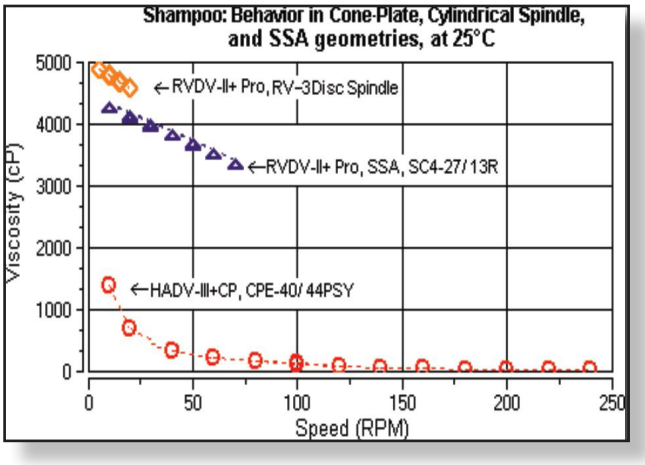

Figure 4: Various Methods at 25°C

Figure 5 compares data obtained using two different geometries. Shampoo A is the same shampoo as the one in Figures 1, 2, 3 and 4. Shampoo B is another shampoo, used for comparison purposes. These shampoos are "shear thinning". Shampoo B is more viscous than shampoo A and will, therefore, have a thicker feel in a consumer's hand. Data for Shampoo A, with the HADV3T CP and CPE-40/ 44PSY, was obtained for shear rates up to 1,800 s^{-1}. However, the highest shear rate data were not shown, in order to simplify the graph. The results were repeatable. Disc spindles do not provide well-defined shear rates, so those results are not shown in Figure 5.

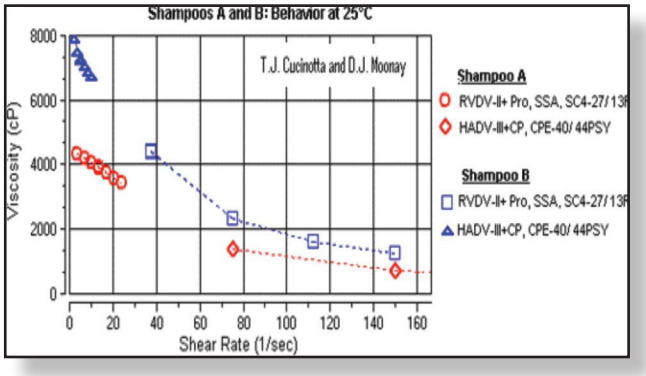

Figure 5: Shampoos A and B at 25°C