Viscosity Measuring Procedure for Somos Resins

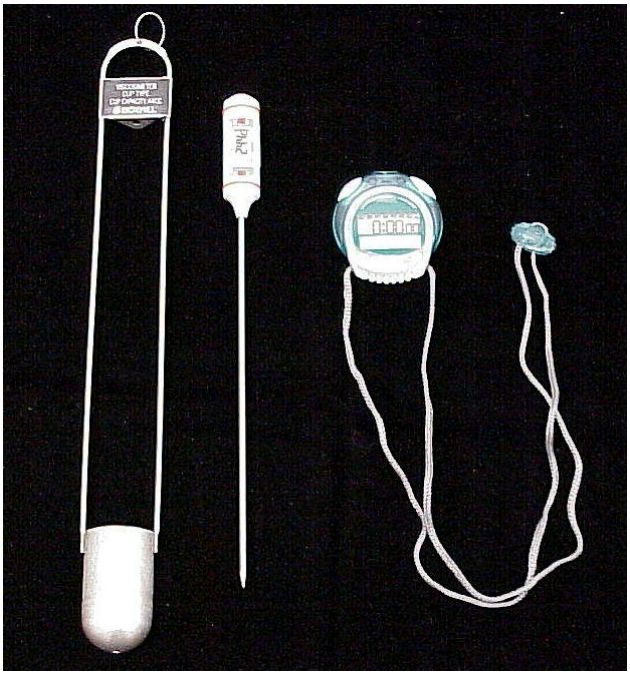
A. Introduction

Maintaining proper resin viscosity in your stereolithography machine is very important. The viscosity can increase over time, and this can cause problems in building parts. If the viscosity increase is severe enough, the resin may have to be replaced, resulting in significant expense and lost production time. If increasing viscosity is identified early, the resin can be saved in most cases. Early detection of the problem can be accomplished by regularly measuring the resin viscosity. This must be done even if the machine is not used often, as resin viscosity can change even if the machine is not used.

The following procedure will explain how to measure and record the resin viscosity.

B. Required Equipment

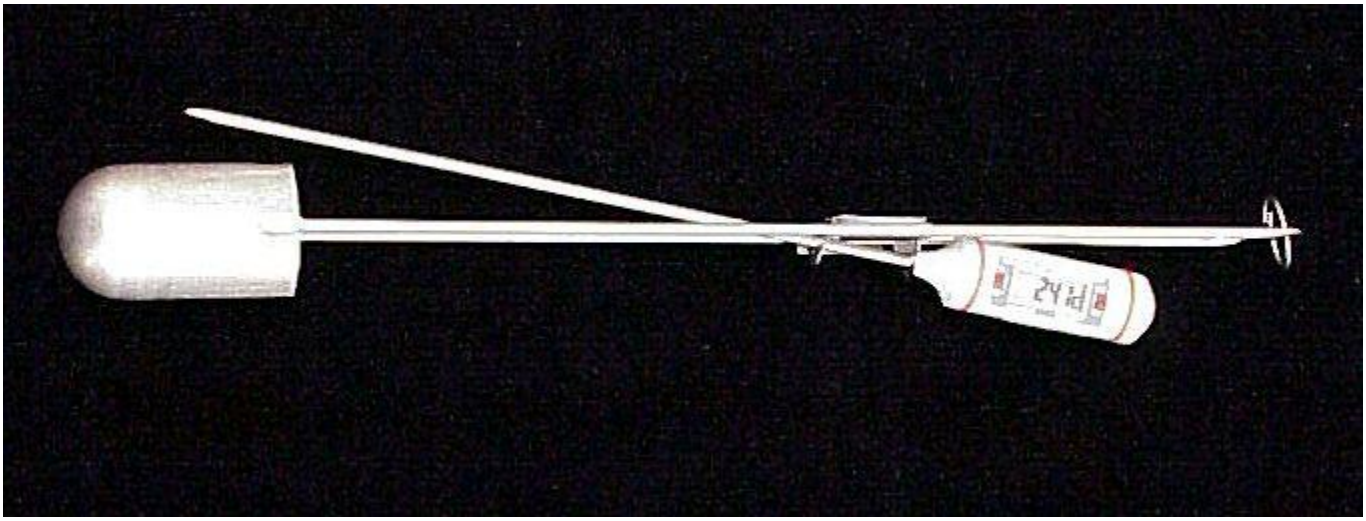
#4 Zahn cup
Thermometer (Long Stem) that mounts onto the Zahn cup handle
Stopwatch



C. Measurement Procedure

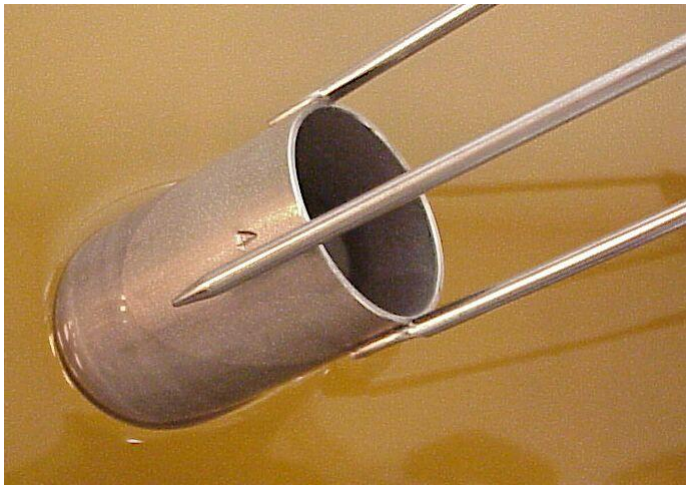
1. Ensure that the vat temperature is at the part building temperature, for example: 32ºC for Somos 11120 or Somos 14120.

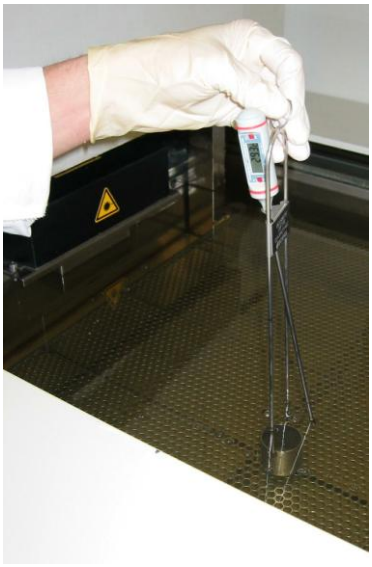
2. Mount the thermometer on the Zahn cup handle and make sure that the tip of the thermometer is at the center (half way up) of the bowl. The tip of the thermometer will not be in the bowl. It will be by the side of it. Turn the thermometer on and set it to ºC.



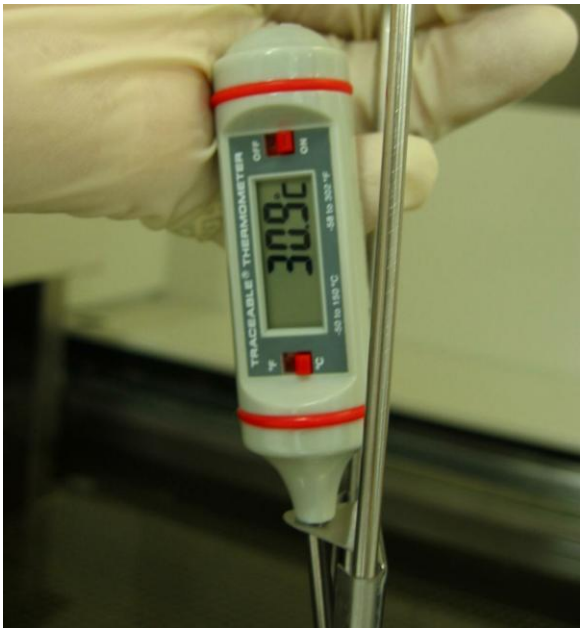
3. Lower the machine platform about 100 mm below the resin surface.

4. Immerse the Zahn cup at a 45-degree angle slowly into the vat resin so that you do not create bubbles and stand it on the platform. Be careful that it does not fall into the resin.

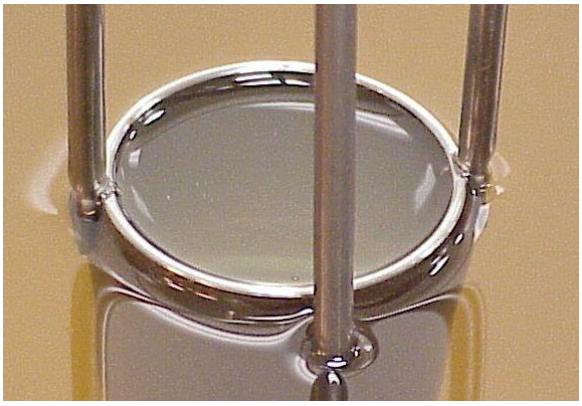




5. Monitor the temperature of the resin with the thermometer. You need to wait until the Zahn cup and resin have reached the vat temperature. When the Zahn cup thermometer reads that temperature and is steady, you are ready to take a measurement.



6. Slowly lift the Zahn cup completely out of the resin. When the top surface of the cup leaves the resin, start the stopwatch.



7. Watch the stream of resin flowing from the hole at the bottom of the cup. When the stream just under the cup breaks and changes from continuous to individual drops, stop the stopwatch.

8. Read the number of seconds on the stopwatch and use the table below to determine the approximate viscosity.

9. Repeat the procedure to obtain at least two values that are close to each other. Turn the thermometer off to save the battery.

10. Record the following data in a chart (sample attached) for each resin and machine: Date, Resin Temperature, Seconds readings, Viscosity (from table below). If the viscosity of the resin starts to increase, inform Somos and provide them with the data from the table.

11. Clean the cup and thermometer by wiping with a paper towel. Wash the cup and thermometer stem with solvent and dry them. Do not remove the long-stem thermometer from the Zahn cup until the stem is completely clean.

D. Measurement Frequency

1. When the resin is installed in the machine, start to measure and record the viscosity once each week.

Approximate Viscosity of Somos Resin Measured with a #4 Zahn Cup

Seconds	Approximate Viscosity (CPS)
20	245
22	280
24	310
26	340
28	375
30	410
32	440
34	470
36	505
38	540
40	570
42	600
44	635
46	667
48	700
50	730

Seconds	Approximate Viscosity (CPS)
52	765
54	800
56	830
58	860
60	895
62	930
64	960
66	990
68	1030
70	1060
72	1090
74	1120
76	1150
78	1190
80	1220
82	1255

E. Zahn Cup and Thermometer Ordering Information

The Zahn cup information is found at this address:
http://www.vwrsp.com/catalog/product/index.cgi?object_id=0014023&resultNum=0
The best one is for heavy liquids (220-1100 centistokes), Boekel No. 27134-004 and VWR Catalog # 66062-494 ($97.75). This model (#4 Zahn cup) must be used with the viscosity table to obtain the correct viscosity.

The long stem thermometer is found at this address:
http://www.vwrsp.com/catalog/product/index.cgi?object_id=0001901&resultNum=0
The best one is the ULTRA thermometer, VWR Catalog # 23226-658 (#39.60)

The stopwatch can be bought anywhere or it can be obtained from VWR.

Typical Viscosities of Unused Somos Resins Measured with a #4 Zahn Cup

Somos Resin	Calculated Seconds	Approximate Viscosity (CPS)
7100	46	665
7110	43	615
7120	52	770
8100	43	615
8110	43	625
8120	44	630
9100	38	535
9110	19	230
9120	37	515
10100	13	130
10110	12	110
10120	13	125
7620	22	270
11120	21	260
12100	34	475
12110	30	450
12120	39	550
14120	20	250

Calculated seconds are back calculated from recent Quality Control viscosity measurements with a Brookfield viscosimeter.

Resin Viscosity Record

Company: ______________________ Machine Model: _______________________ Resin: ____________

Date	Resin Temperature °C	Stopwatch Reading in Seconds	Viscosity From Table	Comments