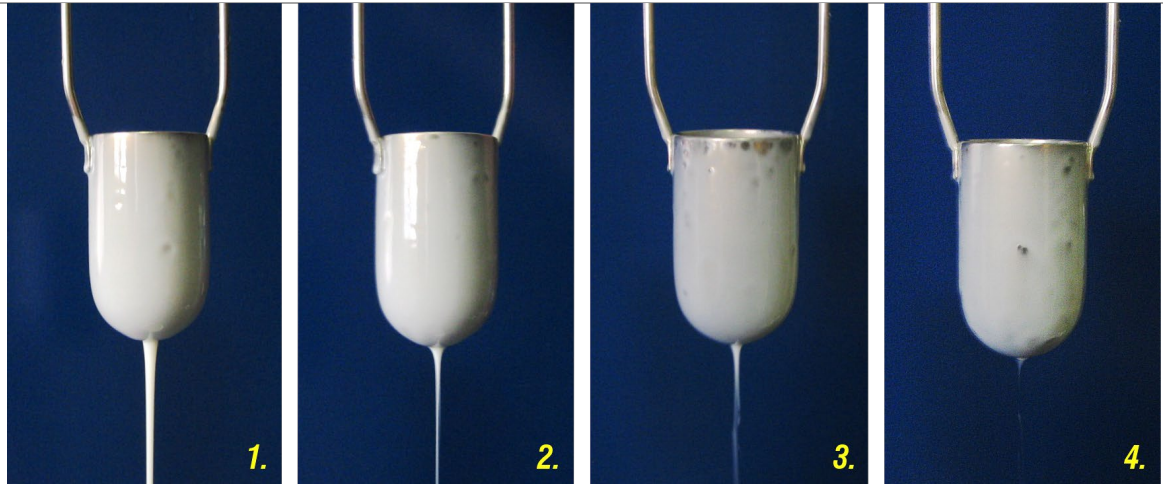


Waterbased Coating – Viscosity Testing Considerations

Scope	This test is used to measure the viscosity of a waterbased coating product to determine that the proportion of water and solids is correct at a known coating temperature. The correct proportion of water and solids of the coating product is necessary to ensure that the performance potential is in-line with the intended formulation characteristics.
Measurement Instruments/Tools	<ul style="list-style-type: none"> - Mixing capabilities - Thermometer/Pyrometer - Timer - Zahn Cup - #3 size - Writing tools - INXCAC Temperature/Viscosity Index Chart, specific chart for viscosity letter designation
Pre-mixing	<ul style="list-style-type: none"> - All coating products should be mixed thoroughly prior to viscosity testing to ensure the coating is homogenous as separation/stratification can occur - this includes new/unused and partial/used coating containers. - The use of an adequate mixing tool is necessary to sufficiently blend the ingredients into a homogenous state. - The act of moving/relocating the coating container from a storage area to press-side is not proper mixing. - To properly mix, remove the container lid and mix the coating product thoroughly using the mixing tool. - An uneven discoloration on the coating surface is an indication that the coating is not sufficiently mixed. - The following tools are recommended for mixing: <ul style="list-style-type: none"> • Drum-mixer, ensure the propeller is adequately sized for thorough mixing • Drill with mixing-blade attachment • Paddle
Temperature	<ul style="list-style-type: none"> - Measuring coating temperature is a necessary part of a viscosity test, as viscosity and temperature values will be used to correlate the actual viscosity to the intended/manufactured viscosity. - Coating temperature should be measured using a calibrated temperature tool AFTER the coating product has been mixed. - Whenever possible, acclimate the coating product to pressroom conditions prior to viscosity testing. - The following tools are recommended for measuring coating temperature: <ul style="list-style-type: none"> • Probe/stem thermometer • Infrared pyrometer
Zahn Measurement Cup	<ul style="list-style-type: none"> - Identify that the appropriate Zahn Cup size is being used for testing - #3 cup size is most typical. - The condition of the cup is crucial to ensure an accurate viscosity measurement - the inside of the cup and drain-hole must be clean and free of any dried coating and mechanical defects. - Never use a mechanical tool/device to clean the inside/drain-hole of the cup as this can cause damage. - For cleaning of dried coating, soak the cup in 50/50 mix of ammonia and warm water to soften the dried coating for removal with a soft cloth. - Always clean the cup immediately after use and dry before storage.
Timing	<ul style="list-style-type: none"> - Proper timing is necessary when checking viscosity to ensure that an accurate measurement is recorded - starting and stopping the timer at the correct points during the measurement is critical. - Timing should start when the top of the cup breaks the surface of the coating liquid. - The stream draining from the cup drain-hole should be observed and timing should stop when the coating stream breaks completely at the base of the cup (image 4 below) indicating that the cup is empty. - Interruptions in the coating stream (image 3 below) several inches from the cup bottom does not indicate that the timing should be stopped as coating continues to drain from the cup. - If the stream from the cup appears irregular with starvation and surges, or becomes interrupted at the base of the cup, this should be considered an invalid test, and the measurement should be repeated.

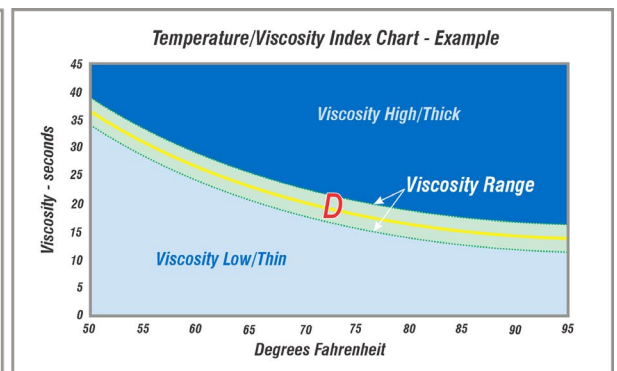
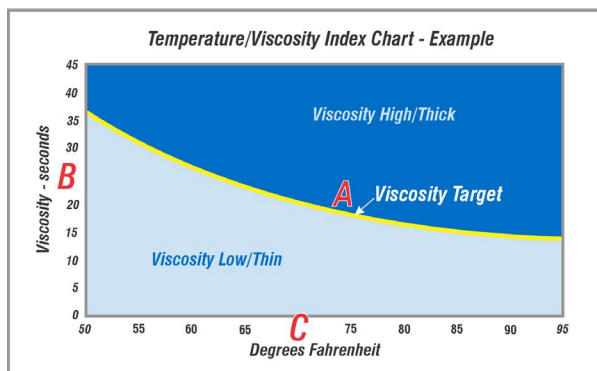


INXCAC Viscosity Designations

- Located on the container of every product manufactured by INX Coatings and Adhesives is a label which features important product information including a viscosity designation.
- The viscosity designation is a letter located at the end of the product number – for example: 1423C
- This letter designates the intended/manufactured viscosity range of the coating product and should be used to correlate the actual viscosity measurement with the intended manufactured viscosity.
- INXCAC manufactures waterbased coating products with the following Zahn #3 cup viscosity designations – all viscosity designations/temperature ranges are established at a coating temperature of 77F/25C:
 - **A:** 35 – 45 seconds
 - **B:** 30 – 35 seconds
 - **BC:** 25 – 30 seconds
 - **C:** 20 – 25 seconds
 - **D:** 15 – 20 seconds
 - **DE:** 12 – 18 seconds
 - **E:** 10 – 15 seconds

Temperature/Viscosity Index Chart

- The Temperature/Viscosity Index Chart is used to correlate the actual measured viscosity/temperature of the coating with the intended/manufactured viscosity.
- The Index Chart contains the following elements:
 - **Curve A:** represents the intended/manufactured coating viscosity target at a given temperature - since coating viscosity changes with temperature, the graduating curve will represent a higher viscosity at lower temperatures and lower viscosity at higher temperatures.
 - **Vertical Axis B:** represents the actual coating viscosity timed measurement in seconds.
 - **Horizontal Axis C:** represents the actual measured coating temperature.
 - **Curve Range D:** the range is +/- (2) seconds from the target viscosity curve - range is (5) seconds.
- Using the actual viscosity and temperature values, pinpoint on the chart where these values intersect and compare to the viscosity curve and determine if the coating viscosity is: within range, too high, or too low.



- If the actual coating viscosity is compliant within the specified product target range, the coating is considered to be at an optimum viscosity and requires no adjustment.

Waterbased Coating – Viscosity Testing Procedure

Viscosity Measurement Procedure

1. Remove the coating container lid and thoroughly mix the coating to be tested.
2. Measure the temperature of the coating using a thermometer/pyrometer and record.
3. Inspect the Zahn #3 cup to be used for contamination of dried coating within the cup and drain-hole.
4. Make certain cup and drain-hole are clean. Do not use any mechanical devices to clean the cup or drain-hole as scratches/damage can alter the accuracy of the cup. To clean, soak the cup in a 50/50 mixture of ammonia/water and clean with a soft cloth.
5. Immerse the Zahn cup into the coating until it fills completely. The top of the cup should be below the surface of the coating.
6. Make sure the coating inside of the Zahn cup does not contain foam. Air-bubbles in the coating will cause the measurement to be inaccurate.
7. Slowly lift the Zahn cup from the coating, starting your timer as soon as the top of the cup breaks the surface of the coating. Hold the cup steady and perpendicular with no ambient air-flow effecting/disrupting the stream.
8. Stop the timer when the coating stream breaks at the BASE of the cup.
9. Record the time of the viscosity measurement in seconds. Repeat test if necessary to verify results.
10. Clean the Zahn cup immediately with warm water and dry completely with a soft cloth prior to storing.

Viscosity Verification

1. Select the appropriate INXCAC Temperature/Viscosity Index Chart according to coating product viscosity letter designation – this is the letter after the numeric product code (A, B, BC, C, D, DE, E).
2. Using the measured viscosity and temperature results, plot on the chart the actual coating viscosity.
3. Compare the actual viscosity results with the target product viscosity curve and determine if the actual viscosity is within the compliant range or is 'High/Thick' or 'Low/Thin'.

Waterbased Coating – Viscosity Adjustment

For 'High/Thick' Viscosity

- If the actual coating product is determined to be 'high/thick', then the coating product has lost water due to evaporation and it is necessary that the lost water is replaced.
- This is most common in drums which have been held in long-term storage (check DOM, date-of-manufacture), or partial/used drums where the volume is reduced in the container.
- Use the following steps to dilute the coating product to the desired viscosity:
 - 1) Add 1% water to the coating product by volume - whenever possible, use treated water.
 - 2) Mix diluted coating product thoroughly using mixing tool.
 - 3) Re-test temperature/viscosity and determine if additional dilution is needed.
 - 4) Repeat steps as needed to achieve desired viscosity

For 'Low/Thin' Viscosity

- If the actual coating product is determined to be 'low/thin', then the coating product has had water introduced either intentionally or un-intentionally.
- In most cases, the reason is over-dilution by over-estimating the amount of water to add, OR residual waste-water in the coating lines from a previous coating-unit wash-up being pumped into the coating container.
- The following recommendations can be followed for using coating product that has been over-diluted:
 - Add the low/thin viscosity coating product in small quantities to several containers of fresh material that is measured at a compliant viscosity - make certain not to reduce the viscosity of the fresh coating material below the recommended range. This method will allow for the use of the diluted coating product over a period without negatively impacting product performance.
 - Add a higher viscosity designation product to the low/thin viscosity coating to raise the overall viscosity.

Temperature/Viscosity Index Charts

Temperature/Viscosity Index Charts

- The charts below can be used with the respective coating viscosity product letter designation for determining coating viscosity compliance.
- Larger, individual versions of these charts can be sourced from INXCAC for printing/posting in the press area for Operator reference.

