# Viscosity Cup Calibration With Standard Oil

## 1.0 Maintenance Objective & Frequency

The objective of this procedure is to calibrate a viscosity cup (Zahn, Ford, or ISO flow cup) using certified standard oil of known kinematic viscosity. This ensures the cup's flow time is within the acceptable tolerance specified by the cup manufacturer or relevant standard (e.g., ASTM D4212, ISO 2431). Accurate viscosity measurement is critical for maintaining consistent coating thickness, paint application, and fluid handling processes.

Frequency: Calibrate every 6 months (semi-annually) or after 500 hours of cumulative use, whichever comes first. Additionally, calibrate immediately if the cup has been dropped, damaged, or if routine viscosity checks show drift beyond acceptable limits.

## 2.0 Lockout/Tagout (LOTO) & Safety

- No electrical, pneumatic, or hydraulic energy isolation is required for this manual calibration procedure.
- Wear chemical-resistant gloves (nitrile or neoprene) to avoid skin contact with standard oil and any residual solvents.
- Wear safety glasses to protect against splashes during filling and draining.
- Ensure the work area is well-ventilated. If using solvent for cleaning, use an approved solvent and follow local exhaust ventilation requirements.
- Dispose of used standard oil and cleaning solvents according to local environmental regulations.

## 3.0 Required Tools, Parts & Lubricants

- Certified viscosity standard oil (e.g., Cannon N35, N100, or equivalent) with known kinematic viscosity in centistokes (cSt) at 25°C.
- Viscosity cup (Zahn, Ford, or ISO flow cup) to be calibrated.
- Digital stopwatch or timer with resolution of 0.01 seconds.
- Thermometer (digital or mercury) with accuracy of ±0.1°C, capable of measuring 20-30°C.
- Clean, lint-free wipes or cloths.
- Approved cleaning solvent (e.g., acetone, MEK, or mineral spirits) compatible with the cup material and standard oil.
- Graduated cylinder or beaker (500 mL) for collecting drained oil.
- Calibration log sheet or digital CMMS (e.g., ServiceGrid) for recording results.

## 4.0 Step-by-Step Maintenance Procedure

1. Verify that the viscosity cup is clean and free of any residue from previous use. If dirty, clean the cup thoroughly using the approved solvent and a lint-free wipe. Allow the cup to air dry completely.
2. Inspect the cup orifice (nozzle) for any nicks, burrs, or deformation using a magnifying glass or loupe. If damage is found, replace the cup before proceeding.

3. Condition the standard oil and the cup to 25°C ± 0.5°C. Place the sealed standard oil bottle and the clean cup in a temperature-controlled environment (e.g., water bath or climate-controlled room) for at least 30 minutes prior to testing.

4. Record the temperature of the standard oil using the thermometer immediately before starting the test. The oil must be at 25°C ± 0.5°C. If not, continue conditioning until stable.

5. Pour the standard oil into the viscosity cup until it is completely full, ensuring the cup is level. For Ford and ISO cups, fill to the brim; for Zahn cups, fill to the top of the cup body.

6. Start the stopwatch simultaneously as you release the cup's orifice (for Zahn cups, lift the cup out of the oil; for Ford/ISO cups, open the bottom orifice). For Ford/ISO cups, use a finger to seal the orifice while filling, then release cleanly.

7. Stop the stopwatch the instant the first break in the continuous stream of oil occurs at the orifice. This is the flow time. Record the time in seconds to the nearest 0.01 seconds.

8. Repeat steps 5 through 7 two more times for a total of three flow time measurements. Between each test, clean the cup with solvent and dry it thoroughly, and recondition the oil and cup to 25°C if necessary.

9. Calculate the average flow time from the three measurements. If any individual measurement deviates by more than 5% from the average, discard the set and repeat the entire calibration procedure.

10. Compare the average flow time to the cup manufacturer's calibration chart or the standard's expected flow time for the given standard oil viscosity at 25°C. The acceptable tolerance is typically ±5% of the expected flow time. If the measured average is outside this tolerance, the cup is out of calibration and must be replaced or sent for professional recalibration.

11. Record the calibration results in the maintenance log or CMMS (ServiceGrid), including: cup identification number, standard oil lot number and viscosity, test temperature, individual flow times, average flow time, pass/fail status, and technician signature.

12. If the cup passes calibration, clean it thoroughly with solvent, dry it, and store it in a protective case. If it fails, tag the cup as 'Out of Calibration' and remove it from service immediately.

## 5.0 Verification & Return to Service

1. Confirm that the calibration log has been completed and signed off in ServiceGrid or the paper log.

2. If the cup passed calibration, place it back into the designated storage area or return it to the production line. Ensure it is clearly labeled with the calibration date and next due date.

3. If the cup failed, ensure it is physically removed from the work area and a replacement cup (pre-calibrated) is issued to production.

4. Perform a quick verification test using a production fluid of known viscosity (if available) to confirm the cup provides consistent results before full production use.

5. Notify the production supervisor or quality manager that the calibration is complete and the cup is ready for service.