CNC Coolant Concentration (Brix) and pH Testing Procedure

1.0 Maintenance Objective & Frequency

The objective of this procedure is to verify and adjust the coolant concentration (measured in Brix units) and pH level in CNC machine tool sumps. Maintaining proper coolant chemistry prevents tool wear, workpiece corrosion, bacterial growth (tramp oil), and coolant degradation. This PM ensures optimal lubricity, cooling, and rust inhibition.

Frequency: Weekly for machines running 24/7; bi-weekly for standard production; immediately after any coolant top-off or sump cleaning.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Not required for testing; however, ensure the machine is in a safe state (spindle off, no automatic cycles running).
- Chemical Safety: Wear chemical-resistant gloves (nitrile) and safety glasses when handling coolant samples. Coolant may contain biocides and amines.
- Spill Control: Have absorbent pads or rags available to contain any coolant drips.
- PPE: Safety glasses, nitrile gloves, steel-toed boots.

3.0 Required Tools, Parts & Lubricants

- Handheld refractometer (0-32% Brix scale, ATC preferred)
- Digital pH meter (with calibration buffers pH 4.0 and 7.0) or pH test strips (range 6.0-9.0)
- Clean, dry sample cup (plastic or glass, 100 mL minimum)
- Distilled water (for refractometer calibration and rinsing)
- Calibration standard for refractometer (e.g., 30% sucrose solution or distilled water for zero)
- Clean lint-free wipes or lens paper
- Coolant concentrate (as per OEM spec) for adjustment
- Deionized or reverse osmosis water for dilution
- Personal protective equipment (PPE): safety glasses, nitrile gloves

4.0 Step-by-Step Maintenance Procedure

1. Calibrate the refractometer: Open the daylight plate, place 2-3 drops of distilled water on the prism, close the plate, and point toward a light source. Adjust the calibration screw until the boundary line reads exactly 0.0 Brix. Wipe the prism clean with a lint-free wipe.
2. Obtain a coolant sample: Using a clean sample cup, draw approximately 100 mL of coolant from the machine sump. Avoid taking from the surface (tramp oil) or directly from the nozzle; take from the middle of the sump.
3. Measure Brix concentration: Place 2-3 drops of the sample onto the refractometer prism. Close the daylight plate and read the Brix value at the boundary line. Record the reading. Wipe the prism clean.

4. Measure pH: If using a digital pH meter, rinse the probe with distilled water, then immerse in the sample. Wait for the reading to stabilize (typically 30 seconds). Record the pH. If using pH strips, dip the strip into the sample for 2 seconds, remove, and compare the color to the chart after 15 seconds.

5. Compare readings to OEM specifications: Typical target Brix for water-miscible coolants is 5-10% (check OEM data sheet). Target pH is typically 8.5-9.5 for semi-synthetic and synthetic coolants; 9.0-10.0 for soluble oils. Record the acceptable range.

6. Adjust concentration if out of spec: If Brix is too low, add coolant concentrate in small increments (e.g., 1% of sump volume) and mix thoroughly. If Brix is too high, add deionized water in small increments. Retest after each adjustment.

7. Adjust pH if out of spec: If pH is below the target range, add a small amount of coolant concentrate (which is typically alkaline) or a pH adjuster approved by the coolant manufacturer. If pH is above range, add deionized water or a pH reducer per OEM guidelines. Retest.

8. Document results: Record the initial Brix, initial pH, final Brix, final pH, and any adjustments made on the PM work order or in ServiceGrid. Note the machine ID, date, and technician name.

9. Clean up: Dispose of the sample properly (do not return to sump). Rinse the sample cup and refractometer prism with distilled water. Wipe dry. Store tools in designated location.

5.0 Verification & Return to Service

1. Verify that the final Brix and pH readings are within the OEM-specified acceptable range.

2. Run a short test cycle (e.g., 2-3 minutes) to circulate the adjusted coolant through the system. Check for any leaks at the sump or coolant lines.

3. Visually inspect the coolant for clarity and absence of tramp oil or floating debris. If excessive tramp oil is present, schedule a sump cleaning.

4. Confirm the machine is ready for production: no alarms, coolant flow is adequate, and the spindle is clear.

5. Sign off on the PM work order in ServiceGrid, attaching the recorded readings and any corrective actions taken.