

Troubleshooting Guide: CNC Milling Machine – Cutting Tool Wear

Problem Description:

The machine is producing parts with reduced surface quality and dimensional accuracy. Increased vibrations and inconsistent cutting performance suggest that the cutting tool may be worn or degraded.

Step-by-Step Troubleshooting Instructions:

1. Visual Tool Inspection:

- Remove the tool and inspect it for visible wear, chipping, or rounding of the cutting edges.
- Compare the tool with a new or known-good tool to assess the degree of wear.

2. Examine Machined Parts:

- Review recent parts for signs of poor surface finish, burrs, or dimensional deviations.
- Identify any patterns that may indicate progressive tool wear.

3. Analyze Sensor Data:

- Check vibration and force sensor readings for abnormal spikes during cutting.
- Correlate these readings with periods of extended operation or high load.

4. Review Operational Parameters:

- Confirm that spindle speeds, feed rates, and depths of cut are set according to the manufacturer's recommendations.
- Adjust parameters if the tool appears to be under undue stress.

5. Coolant and Lubrication Check:

- Verify that coolant flow and lubrication are adequate and not obstructed.
- Ensure the coolant system is free from contaminants that could accelerate tool degradation.

6. Test Run:

- Reinstall a new or reconditioned tool and conduct a controlled test run.
 - Monitor the machine for improved performance and consistency in part quality.
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Preventive Measures to Avoid Recurrence:

- **Regular Tool Inspections:**

- Establish routine visual and sensor-based inspections after a set number of operational hours.
 - **Scheduled Tool Replacement:**
 - Implement a replacement schedule based on usage hours or wear indicators to prevent degradation before it impacts quality.
 - **Optimize Cutting Parameters:**
 - Continuously review and adjust operational settings to match tool capabilities and material requirements.
 - **Maintain Coolant and Lubrication Systems:**
 - Schedule regular maintenance for the coolant and lubrication systems to ensure optimal performance.
 - **Operator Training:**
 - Train operators to recognize early signs of tool wear and to report deviations in cutting performance promptly.
 - **Data Logging:**
 - Utilize system logs to track tool performance trends, enabling proactive adjustments to maintenance schedules.
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