CNC Machining Centers Maintenance Guidelines

For businesses that use Computer Numerical Control (CNC) machines, equipment failures can lead to damage and costly business disruptions. Regularly inspecting and maintaining this equipment is essential for long-term machine safety, accuracy and reliability.

CNC machines normally operate in a semi-autonomous fashion, sometimes continuously, which may cause scheduled maintenance to be overlooked or recommended maintenance frequencies to be greatly exceeded. Having a qualified operator who is familiar with the proper operation of the equipment goes hand-in-hand with an effective maintenance program. A well-trained operator is the primary safeguard for ensuring that that the equipment is functioning normally. However, even with a skilled, qualified operator, a preventive and predictive maintenance program is essential.

Preventive and Predictive Maintenance Guidelines

The following guidelines are provided as an aid for developing a maintenance program specific to your operations. There are many factors, such as variations in equipment type, use, and location, that should be considered. It is best practices to consult with the original manufacturer for further guidelines. Only qualified operators or technicians should complete the maintenance program elements listed below.

Maintenance records:

Keep a detailed history of all maintenance performed and repairs made. Review these records regularly to ensure inspections and needed maintenance are performed at recommended intervals.

Visual inspections:

Includes external and internal examinations, looking for visual and audible clues that may indicate an abnormal condition. It is recommended that a daily checklist be developed and used to establish consistent visual inspections for each machine type. These should include the following:

- External Inspections:
  - Housing and Surrounding Area – Check the physical integrity of the housing while evaluating surrounding area for storage buildup or hazardous debris.
  - Machine Supports - Inspect supports for deterioration, such as corrosion, cracking and physical damage.
  - Cooling Fans and Vents - Should be cleaned and inspect regularly to help prevent electronics and controls from overheating.
  - Electrical Power Connections – Inspect incoming power cables for damage, pinched or frayed wiring, loose connections and missing covering panels.
- Internal Enclosure Inspections:
  - General Cleanliness – Check for excessive buildup of product chips, dirt, debris, contaminated coolant, seals, leaks and improper drainage.
  - Moving and Stationary Parts – Check for abnormal conditions such as wear, dirt, debris and improper lubrication.
  - Spindle – Check that the unit is properly mounted, has freedom of motion, no signs of physical damage and no abnormal sounds.
  - CNC Chuck – Check that the chuck is properly mounted, that there are no signs of physical damage, loose bolts, debris, and is tightened adequately to secure the workpiece in place.
  - Tool Turret – Check that there are no signs of physical damage, there is freedom of motion, no loose bolts or tooling, and the correct tool heads are in corresponding sockets.
  - Electrical Wiring – Verify that electrical wiring is not damaged, pinched, frayed or improperly connected.

CNC Machining Centers Maintenance Guidelines

Lubrication and fluid systems checks:

Verify adequate fluid levels, lubrication and timely replacement or treatment. The following systems should be evaluated according to manufacturer guidelines:

- Hydraulic System – Maintain hydraulic levels to ensure proper operation. Low fluid levels may indicate a leak in the system. Fluid level checks and replacement frequencies should follow manufacturer recommendations.
- Coolant/Cutting Fluid – Maintain proper coolant levels to prevent damage to the circulating system. Improper concentration and/or contaminates may lead to the fluid becoming corrosive or less effective, which may be harmful to the equipment or workpieces.
- Way Lubricant – Monitor and maintain way lubricant levels to help prevent damage to the lubrication system and the machine ways. A reduction in way lubrication usage may indicate a problem with the system.
- Gear Boxes – Follow manufacturer recommendations for fluid checks and replacement frequencies. High-speed gear boxes may require additional inspections or controls.

Electrical system checks:

The following should be checked in accordance with manufacturer guidelines.

- Safety and Limit Controls – Periodic maintenance, inspection, and testing of protection devices can help increase equipment reliability. Safety devices should be tested at least annually or as recommended by the manufacturer. The safety and limit controls vary by equipment and manufacturer and may include guard or protective cover proving switches, end of travel/overtravel limits, spindle overload, fluid level and/or pressure sensors, temperature monitoring, etc.
- Transient Voltage Protection – It is a best practice to incorporate transient voltage protection if it is not already incorporated in each system.
- Thermographic Inspections and Amp Draw Testing – Can be useful in identifying electrical system problems and may help prevent equipment breakdowns.

Calibration:

Periodically inspect and calibrate components such as the spindle, servos, backlash, tool changer alignment/indexing, etc., according to manufacturer recommendations to identify wear and misalignment before they result in unplanned downtime

Pneumatics:

Maintain a clean and dry air supply, within the pressure range recommended by the manufacturer, to help ensure proper pneumatic system operation and reliability.

Accessories and Spares:

Accessories and spare components should be maintained to help ensure these components are functional in the event that they are needed.