EXECUTIVE SUMMARY

Eliminating harmonics, which can produce tool chatter or poor surface finish, is critical for maximizing productivity. If you have an Okuma horizontal or vertical CNC lathe with a P200 or newer control (also available on the P100 control as an option), you have tools that help prevent chatter by allowing for RPM changes. Harmonic Spindle Speed Control (HSSC) and Variable Spindle Speed Threading (VSST) are functions available with Okuma’s THINC® OSP CNC control that are highly effective harmonics problem solvers. HSSC and VSST are particularly useful when machining parts with high L/D ratios, thin-walled parts, or thin-walled parts with threads.

HARMONIC SPINDLE SPEED CONTROL (HSSC)

The concept of Harmonic Spindle Speed Control (HSSC) is not new, but historically this has been a manual process. Basically this function constantly changes the RPM of a lathe spindle in order to prevent the build up of harmonics or vibration (chatter) during a cutting operation. To implement HSSC, the machinist of the past would manually use the spindle speed control knob, turning it up and down, varying the RPM. Now you can use the HSSC function that is built into Okuma’s control to constantly change the RPM of a CNC lathe spindle in order to prevent harmonics or chatter (see Figure 1). With this function, the OSP control (with the addition of a few lines of NC code) automatically adjusts the following variables according to pre-set parameters or parameters that are programmed to suit your particular needs:

- Amplitude (Q) – the percentage amount of variation in the RPM
- Interval time (R) – how long we stay at the peak or valley of RPM change
- Speed variation cycle (P) – the pitch of the RPM variation

The result is reduced or eliminated chatter during turning operations. Use of HSSC is advised when absolute accuracy is required when machining challenging parts.

![Figure 1: HSSC prevents chatter by automatically adjusting variables according to pre-set or custom-programmed parameters](image-url)
VARIABLE SPINDLE SPEED THREADING (VSST)

In the past, changing RPM during threading was out of the question. That's because most machines cannot maintain thread pitch when changing RPM, thus scrapping the part. But Okuma recognized that in some thread cutting applications, chatter can exist and can be very difficult to control without the ability to vary the RPM. Today, with the power and speed of the OSP CNC control, we can vary RPM while accurately maintaining the lead during threading, thus preventing the introduction of chatter. This unique Okuma function is used heavily in the oil field industry on our LOC lathe product line. VSST comes standard with Okuma LOC machines, and is available as an option for others. Variable Spindle Speed Threading enables the operator to use the “spindle speed override switch” during the threading process to manually change the spindle speed without losing the thread pitch. By varying the RPM, the build up of harmonics is prevented, eliminating chatter and providing a quality thread.

VSST allows users to do two things. First, and this is the most common, it lets users manually change the RPM during the threading cycle. This function is enabled either by turning it on by parameter (for continuous use) or by M-code in the program (for occasional use). Secondly, VSST allows users to change the speed, in the program, for each threading pass—a functionality not often used, but available. Most users set the parameter and vary the speed manually, so in the majority of cases there is no programming required.

PREVENT VIBRATION-INDUCED DEFECTS THAT CAUSE SCRAP

Okuma’s HSSC and VSST are very effective in controlling harmonics and dampening vibration. The Aerospace, Oil Drilling Equipment, Automotive, and Agriculture Equipment industries each have applications that require harmonic control. Many industries are moving to smaller, more precise parts, often fabricated from alloyed steels or composites. There is no need to continually fight vibration-induced defects that cause scrap. When you are machining parts with high L/D ratios, thin-walled parts, or thin-walled parts with threads, HSSC and VSST help you keep productivity high by preventing defects.

YOUR COMPETITIVE EDGE

Avoiding scrap caused by harmonic-induced vibration can be a challenge using conventional solutions. HSSC and VSST functions on an Okuma CNC lathe make it easier to achieve consistent surface finishes for your parts. This creates manufacturing efficiencies that increase productivity and establishes a competitive edge in the marketplace.

LEARN MORE

Learn more about HSSC and VSST in the blog post, CNC Controls – For Chipmakers, By Chipmakers. You can also view video demonstrations that show VSST in action during a threading operation on an LB4000 EX.

FOR MORE INFORMATION ABOUT HSSC/VSSST AND THE PRODUCTS ON WHICH THEY’RE AVAILABLE (OKUMA CNC LATHES) —
CHECK WITH YOUR LOCAL OKUMA DISTRIBUTOR, OR VISIT THE OKUMA WEBSITE AT WWW.OKUMA.COM