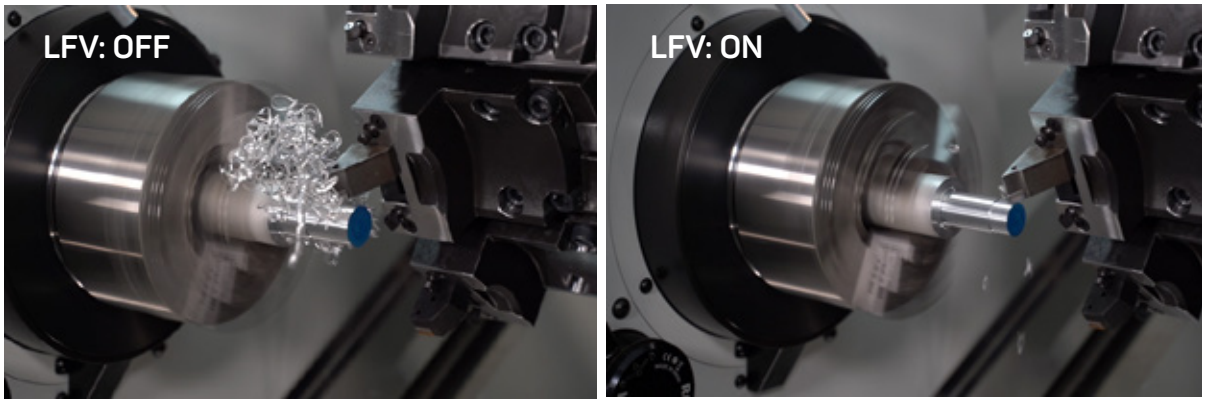
Turning your world

APPLICATIONS
OSCILLATION CUTTING (LFV)

THE FUNCTION: OSCILLATION CUTTING (LFV)

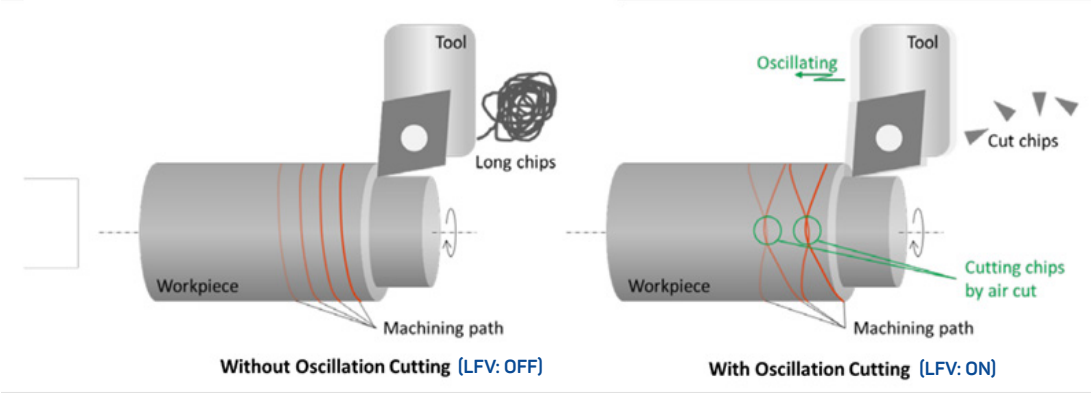
One of the most critical aspects in many machining processes is **chip formation.** Long and entangled chips are formed mainly in turning operations due to constant cutting conditions.
This issue requires changes in the process; such as modifying machining parameters or changing tools to get into a safer but less productive situation, decreasing the performance of the process.
Therefore, the impact of poor chip breaking management affects workpiece integrity, productivity, tool life or even operator safety leading to production stops.



Bad chip formation (left) and cut chips using the function (right)

Oscillation cutting (LFV) is a machining function which uses the sinusoidal oscillation of a servo axis to enable chip breakage. While oscillating the specified axis along the cutting direction, the cutting strategy is carried out synchronizing the movement with the rotation of the spindle.
CMZ can implement this function on demand in new **CNC lathes** as specific hardware and software are required, as well as fine tuning to the specific machine. This document explains the benefits of the function and how to use it.

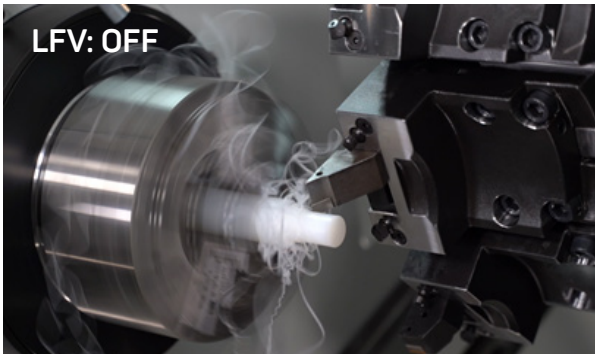
PRINCIPLE OF OSCILLATION CUTTING (LFV)

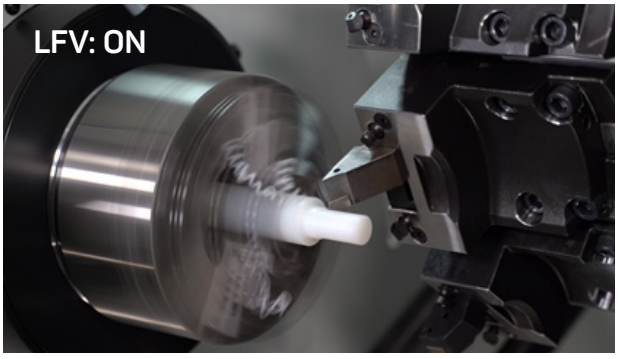


Principle of oscillation cutting

The sinusoidal oscillating movement forces the tool to pass through an already machined area, causing a **cutting zone in the air.** As a result, the interruption in the cut **breaks** material into smaller chips, solving the problem.

The function also helps to **dissipate heat** during cutting without shortening tool life.



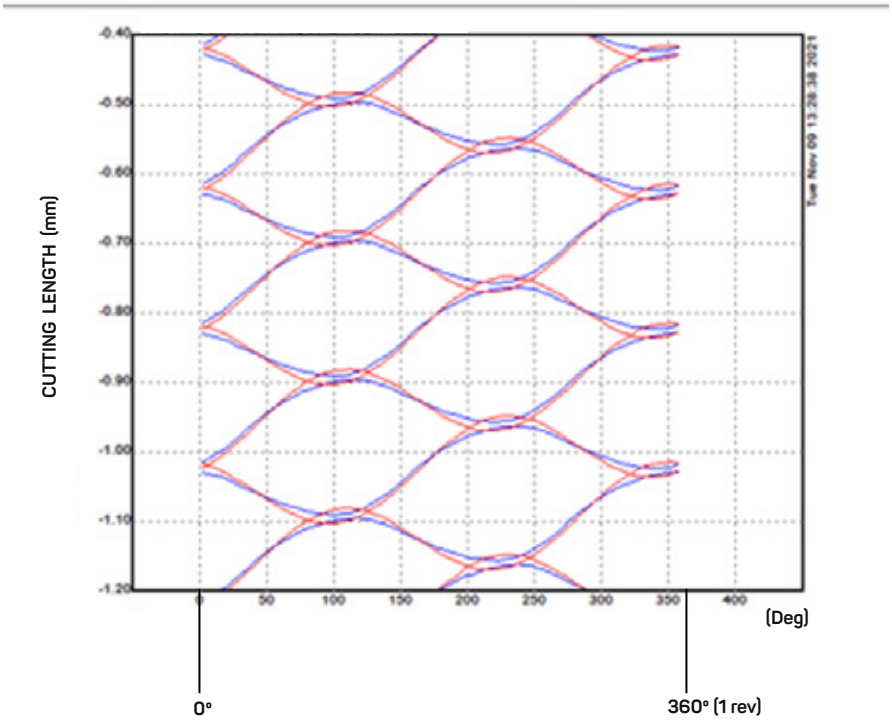


*Bad chip formation **(LFV:OFF)** and cut chips using the function **(LFV:ON)***

In addition to external turning (oscillating **Z axis**) this technology includes grooving, facing and cutting-off operations (oscillating **X axis**). The function is also useful as arc-shaped machining strategies or taper strategies are permitted (oscillating one axis at a time).

Different machining strategies

The following graph shows how the curves cut each other causing the air cutting when the function is activated. The peak of the first sinusoidal oscillation overlaps the valley of the next, creating an air gap and breaking the chip.



BENEFITS OF THE FUNCTION

The Oscillation Cutting function is a new solution for improving **chip evacuation** and for achieving a **stable process** without stops in difficult to cut materials that produce high quantities of heat during the cutting process.

HEAT REMOVAL

Depending on the heat treatment, lots of materials create a huge amount of heat within the machine which is tranfered into the cut damaging the tool.

With the interruption in the cut, oscillation cutting actually allows the heat to get away from the insert and then it reintroduces the tool back into the cut. So, every time it oscillates at a high rate it **reduces the heat**, eliminating some in the cut increasing tool life.

PRODUCTIVITY INCREASE

Chip breakage allows working uninterruptedly without door opening, creating a huge increase in productivity. It allows automating processes as the machine can be **continuously running** without interruptions.

This function suppresses the need for chip breakers in the inserts, **reducing equipment costs.** It also allows machine tools to operate continuously, leading to increased production efficiency.

There is **no variation in cycle time** compared to the process without activation of the function as long as the cutting conditions are the same.

EASE OF USE

Another attractive feature of this function is that it does not require tricky configurations, it can be **easily executed** by just adding a G code command.

Oscillation cutting is just added into your current program without anything else. It is only necessary to tune in the working parameters.

You can take a current program that you are running on your machine and add this G code right to your program, leaving everything else the same.

PROGRAMMING

To include the function into your process you need to program a specific G code.

MACHINING PROGRAM FORMAT

To use the Oscillation Cutting function you have to follow the following format:

G8.5 P2 Z0 I_ K_ (LFV ON)
P2: servo learning oscillation mode on
Z0/X0: oscillating axis Z or X (1 axis at a time)
I: magnification of oscillation frequency (tuning parameter)
K: magnification of oscillation amplitude (tuning parameter)

"Machining strategy"

G8.5 P0 (L FV OFF)
P0: LFV OFF

PROGRAMMING EXAMPLE: EXTERNAL TURNING IN ERTALON 6 SA

TA-15-Y

Operation: External turning

Material: Ertalon ® 6 SA

Tuning parameters: I = 0,5 || K = 1,2

(EXTERNAL TURNING)

T02002 (Tool call)
G54G96S150M3F0.12 (Cutting conditions)
G0X24Z3M8 (Approach)
G8.5P2Z0I0.5K1.2 (LFV ON)
G1Z-65 (Machining with LFV ON)
G8.5P0 (LFV OFF)
G97G0X250Z150M09M05 (Retreat and stop)
M30

NOTE

! Tuning parameters must be adapted to each type of material and machining strategy.

! There are limitations on the use of the variables, please contact CMZ if you need further information.

! Using this function requires the option of Servo learning oscillation, available for specific series and editions in terms of applicable software.

TA SERIES

Z400 MODEL

Z640 MODEL

Z1100 MODEL

TTS SERIES

TTS MODEL

TD SERIES

Z800 MODEL

Z1350 MODEL

Z2200 MODEL

Z3200 MODEL

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