MASTER CATALOG

HAIMER®

HAIMER

BALANCING TECHNOLOGY

Top 10 Reasons to Use HAIMER Balancing Technology

1

Faster Speed and Higher Productivity

Vibration is often the reason higher speeds and feeds are not realized.
Balanced assemblies permit 10~15% faster spindle speeds and higher productivity without degradation of sound or tool life.

2

Longer Tool Life

On average, balanced tools (tools, inserts and grinding wheels) last 20% longer when the entire tooling assembly is balanced. Depending on the amount of unbalance, the tool life increase can be much greater.

3

Repeatable Tool Performance

The elimination of vibration dramatically reduces problems like chatter and tool chipping, thereby stabilizing tool performance and making lights out machining possible.

4

Longer Spindle Life

Unbalance in a tool assembly creates excessive centrifugal forces that can damage spindle bearings.
Such damage reduces spindle life and can lead to costly unplanned downtime.

5

Better Surface Finishes

Unbalance creates excessive vibration that can be translated to the finished part in the form of chatter and poorer finishes.
To achieve the best finish, balance the full assembly.

6

Improved Accuracy

At higher speeds, unbalance can actually induce runout during rotation where none was measured statically.
Without balance, the result is slower speeds, less productivity and lower accuracy.

7

Fewer Tool Changes

When tool life increases 20% to 100%, tool changing time is reduced.
This means less time needed for tool changes in the tool room and less set up times of the machine.

8

Accurate Process

A solid concrete base construction, centrifugal force sensors for measuring, patented spindle that clamps the tools identical to the machine tool, and a simple/reliable machine calibration process.

9

Ease of use

Simple software and clear compensation options (removing, adding or displacing weight) make the balancing process fast and simple for all users.

10

Industry 4.0 Success

Industry 4.0 is all about using gathered data to automate changes on the fly that optimize the machining process.
Without balance, the optimal machining logic will ultimately require a reduction of speeds until the problem is resolved, thereby reducing productivity.

WHY SHOULD I BUY A BALANCING MACHINE?

"I'm only running tools at 1,500 RPM. Is balancing really necessary?"

You are running only at 1,500 RPM, but the real question is why?

Is that because you have always machined your part at that spindle speed with the appropriately related feed rate, or is it due to the fact that if you tried to increase your spindle speeds and your feeds, you heard vibration, noticed chatter marks on the work piece, cut oversize, bored oval holes, etc.?

Naturally, this would cause you to slow things down in order to create good parts, while giving away potential productivity.
There is always a benefit to having balanced tool holder assemblies, even at low spindle speeds. In fact, some of the most eye-opening benefits of running balanced tools can be found in traditionally lower speed applications, such as face-milling, machining with boring heads, or in use with special form tools.
With balancing the full tooling assembly, you can really get the most potential out of your machine tool and gain productivity in order to machine your parts faster, with greater tool life and higher accuracy – regardless of the RPM you are running.

"I don't need balanced tool holders."

Modern milling machines operate with high spindle speeds. An unbalance causes centrifugal forces. The centrifugal forces increase squared to the spindle speed. Older machines have spindle speeds of about 2,000 rpm. Even at 10,000 rpm, the unbalance in the same exact tool holder causes a centrifugal force that is 25 times higher.

- The centrifugal force stresses the spindle bearings. The lifetime of the bearings decreases with excessive stress. Consequently, the spindle bearings become damaged and unnecessary repair costs are incurred.
- The manufacturers of milling machines and spindles specify the use of balanced tools. Often times, if unbalanced tools are used, there will be no warranty on the machine spindle.
- The direction of the centrifugal force is changing steadily as it rotates with the spindle. This is why centrifugal force causes vibrations.
- Vibrations shorten the life of the cutting tools. This causes higher cutting tool costs and a decrease in the quality of the surface finish.

"I only have a few parts to balance. For this purpose a simple machine is sufficient."

When balancing is not done regularly, the operators have no experience. The risk of incorrect measurement due to improper handling of the machine is very high. Therefore, in such cases, it is important to have a balancing machine that guides the user through the procedure.
Plus, it would be unfortunate to have an inferior balancing machine that limits your balancing potential for the future.

"Balancing is too complicated."

It depends. Simple balancing systems often aren't handled correctly because the operators don't know the physical background of unbalance and balancing. Sometimes the existing unbalance is increased instead of reduced, since some balancing machines are not adjusted or calibrated correctly for the specific tool. Overall it is rather difficult to have a specialist just for balancing and this is not necessary.

With a good machine, balancing is simple. The operator only has to choose the type of tool he or she wants to balance. From then on the machine tells the operator what to do. The machine has the expert knowledge, not the operator.

"A balancing machine is too expensive for me."

A balancing machine is an investment. An investment must provide a quick return on investment. The purchasing price only has a small influence on the payback of an investment.

A balancing machine will quickly pay for itself as:

– the process reliability in the production can be improved
– the life time of the spindle can be extended (one single replacement of a spindle costs more than a balancing machine)
– The frequency of the downtime of the machines is decreased. The most expensive factor in a production is machine standstill
– the result of the production is improved (better surface finish)
– the maximum spindle speeds and feeds can be utilized on your machine (quicker throughput)
– the tool life is extended
– the cutting capacity is improved

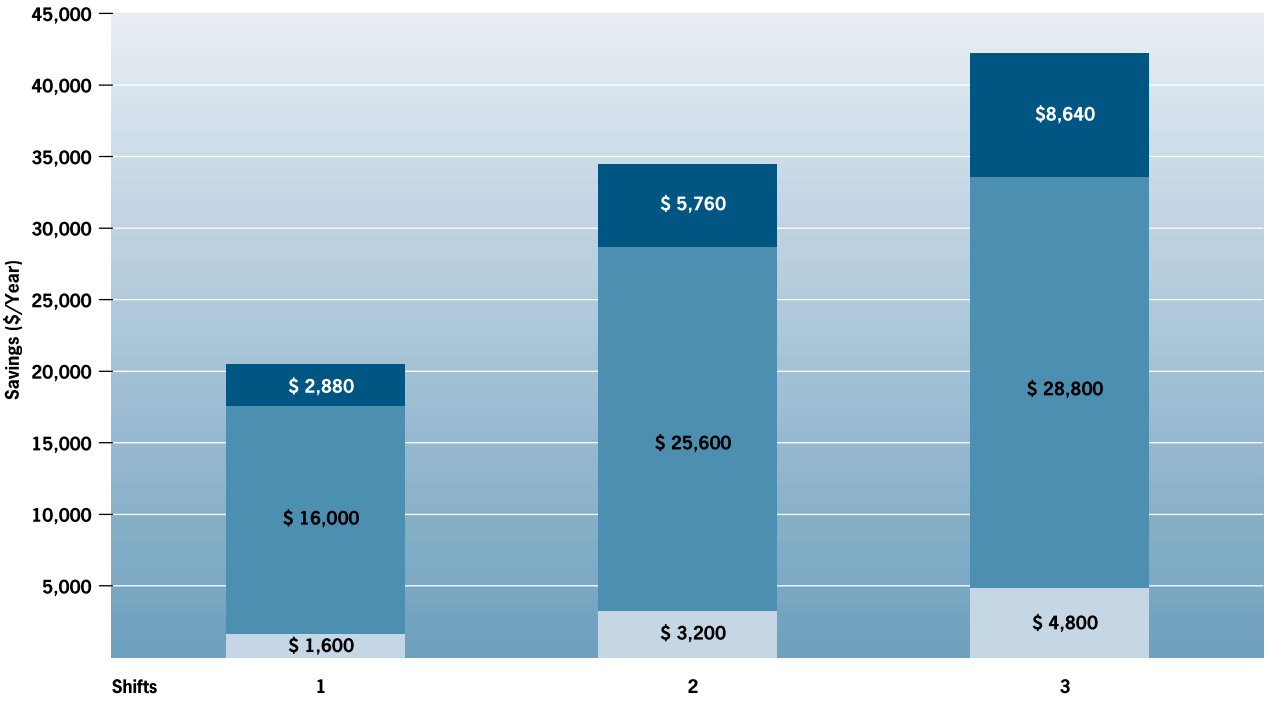
Overall, it is important that a balancing machine is easy to handle and that it gives you reliable and repeatable results. Ultimately, it should provide the easiest method to find your desired balance level to run at a safe and productive rate in your facility. It is possible to get all of that with a balancing machine that is easy and secure to handle, insuring that you reach the desired results.

"The tool holders that I buy are already balanced."

Generally a good idea. The manufacturer of tool holders normally can balance quicker and more efficiently. However:

– What happens when you clamp a cutting tool into a balanced tool holder? The cuttings tools often are unsymmetrical (e.g. side lock shanks). Many tool holders have movable parts which can have different positions after being mounted (e.g. pull studs, clamping screws, bearing races, collets, locknuts). Tool holders for high speed machining should always be balanced when mounted as one complete set-up (tool holder, pull stud, collet, cutting tool, etc.). Once tool holder elements have been modified, the balance level changes.
– Most tool holder manufacturers stock products in a "Pre-Balanced" condition. A pre-balanced condition means that the tool holders are fully balanced without components such as cutting tools, pull studs, collets, clamping nuts, moveable bearings or data chips. Once these other components are added to the tool holder assembly, the tool holder may need to be re-balanced in order to conform to ISO balance specifications.
– What about the tool holders which are already in your factory? It is nearly impossible to avoid a mixing up of balanced and unbalanced tool holders. One single process with an unbalanced tool at high spindle speed can damage the spindle bearings. This is why the "old" tool holders should be balanced as well.
– How do you know your tool holders are balanced? After all, when one receives a shipment from a vendor they first check the items in the box and insure that selection and quantity of the items in the box is correct. Why not check that the balance of the tools is correct as well? What balance level does your "pre-balanced" tool holders come to you? Checking the balance of tool holders should always be part of the quality control of incoming goods, particularly if you are paying a premium for "fine-balanced" tools.

COST REDUCTION BY THE USE OF BALANCED TOOL HOLDERS (PER MACHINING CENTER)



Savings by raising spindle lifetime by 100%

Savings by raising cutting volume by 10%

Savings by extending tool life by 10%

Basics of the calculation	runtime h/year	cost rate $/h	tooling costs $/h
1 shift	1,600	100	10
2 shifts	3,200	80	10
3 shifts	4,800	60	10

Spindle lifetime (n_{max} = 15,000 rpm):
Tools not balanced: 5,000 hrs.
Tools balanced: 10,000 hrs.
Cost for spindle replacement: $ 18,000

Not taken into account:
– Improved surface quality
– Costs for unplanned downtime of the machine (spindle replacement)
– Improved accuracy
– Real savings may be much higher than calculated

ON THE SAFE SIDE: BALANCE YOUR TOOLS QUICKLY AND EFFICIENTLY WITH THE TOOL DYNAMIC SYSTEM

Reliable, quick and efficient – the perfect balancing system for tool holders, grinding wheels and other rotors.
– Flexibility for future requirements due to modular construction
– 4 versions available, offering a perfect solution for every need
– Balancing in 1 or 2 planes
– Unique high precision spindle taper adapter system with automatic clamping for all common tooling systems and tapers
– Highest measuring accuracy and repeatability
– Even low cost chucks (steep taper with low precision) can be clamped accurately due to elastic centering
– Adapters for rotors with a center bore (e.g. grinding wheels)
– Unbalance correction by drilling, milling, balancing rings and weights
– Unbalance correction using fixed components (e.g. balancing screws in threads)
– Easy service due to modular construction with plug connectors
– Calibration function for testing equipment control according to ISO 9001
– Single machine calibration for all tools, thanks to hard bearing technology (force measuring vertical balancing machine)

Simple and self-explanatory operation. User-friendly menu guidance on PC screen or integrated display. All languages possible.
– Excellent relationship between price and efficiency
– Multiple methods of measuring: simple measuring, index measuring, measuring with spindle compensation, measuring with zero setting
– Tool management for more than 5,000 tools, storing the most recent balancing results
– Interface to the local computer network
– Input of balancing tolerance in balancing quality grades (G or Q)
– Graphically displayed measuring results
– Printout of measuring results on label or certificate
– Clear indication if balancing tolerance has been reached
– Indication of actual balancing quality grade and permissible spindle speed
– Optical indexing aid: actual position of unbalance visible on screen
– Automatic positioning of spindle at position of unbalance
– Optical laser marks the position of unbalance directly on the tool
– Error diagnosis
– Density function with an integrated list of materials with different specific weights

Test Data Example
(Completed by a major auto parts supplier in South Carolina)
DR2002 FLCA machine Cast Iron/Tool #607 (Drilling/Boring/Facing Tool)

	Before Balancing	After Balancing	Comment
Tool life	250 Pieces per edge	350 Pieces per edge	100 Piece increase
Surface finish	20 Rz	15 Rz	5 Rz finer finish
Bore size and roundness	Presetter + .055 mm	Presetter 0 mm	Cut to set size
Vibration Analysis Results	1.821 mm/sec.	.051 mm/sec.	Lowered 1.77

Before Balance:
This tool would not consistently reach its full life (inserts would fail).
After Balance: This tool reached its full life 100% of the time.

Future Expectations include:
– Increase in tool life plant wide, better surface finishes and controllable bore dimensions
– Spindle bearing failure decrease plant wide
– Decrease in premature tool failures
– Overall tool performance and repeatability, chatter and scrap reduction

Summary:
As nearly all machine tool manufacturers recommend the tools used in their spindles should be balanced to G2.5 at all rpm ranges, not all tools require balancing. Determination should be made using a tool by tool method considering the following: tool rpm, tool weight, tool operation, stress applied to the spindle and application trouble shooting. Testing has proven that balancing tools at any rpm range can yield positive results, even below 8,000 rpm.