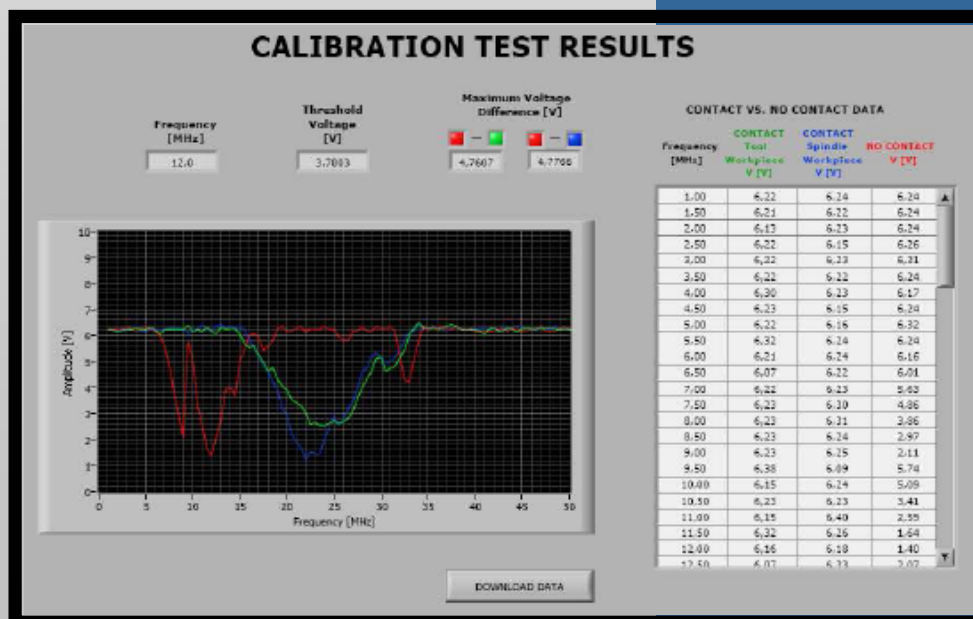
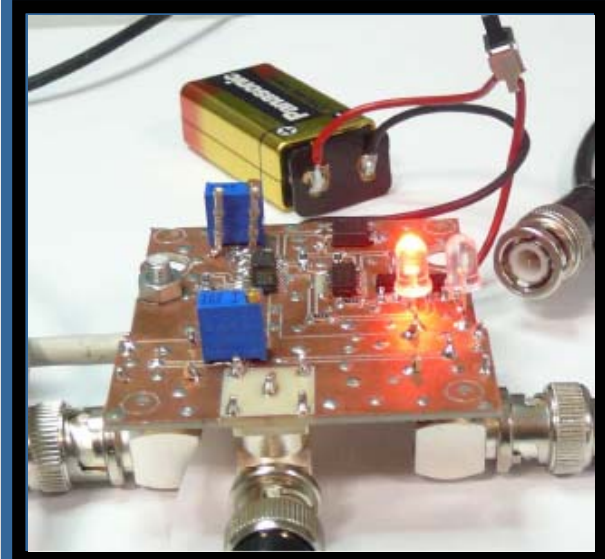


MICROM MICROM

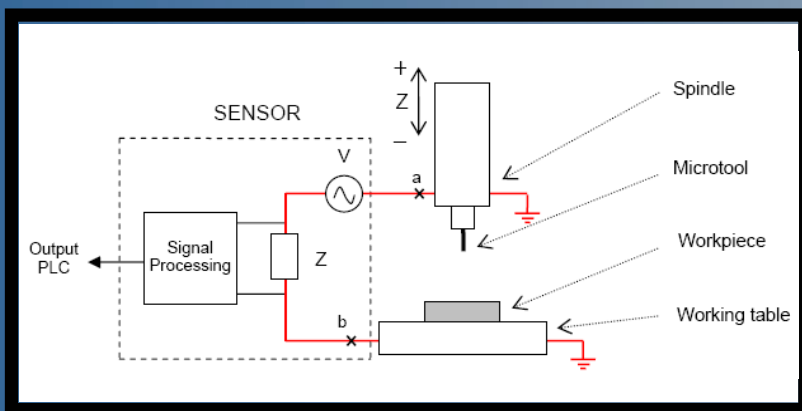
MICROM

*Sensing your
 machining to
 increase the
 efficiency.*



WHAT IS IT? ... FUNCTIONALITY

The MICROM (Machine Impedance Change based Robust On-line Method) system is a revolutionary machine/tool control and monitoring system to increase the machine productivity.



HOW DOES IT WORK? ... DESCRIPTION

The MICROM monitoring system is based in the detection of voltage variations when the tool/spindle make contact.

A simplified image of the system is illustrated in the Figure above. The electrical circuit consists fundamentally of a signal generator, an impedance (Z) and a signal processing unit.

Three different states can be identified:

- 1.- No contact state.
- 2.- Contact tool-workpiece state.
- 3.- Contact spindle-workpiece state.

WHY TO USE IT? ... ADVANTAGES

The innovative MICROM system results very promising for machine monitoring as offers the following advantages:

- *On-line monitoring method;*
- *Ultra-high system response time.*
- *Very stable and robust signal;*
- *No minimum threshold required;*
- *Cost-effective solution;*
- *Simple signal processing and decision making algorithm;*
- *Does not affect on the machine integrity;*
- *Does not reduce working space;*
- *Easy to install and low maintenance;*
- *Suitable for industrial environments.*

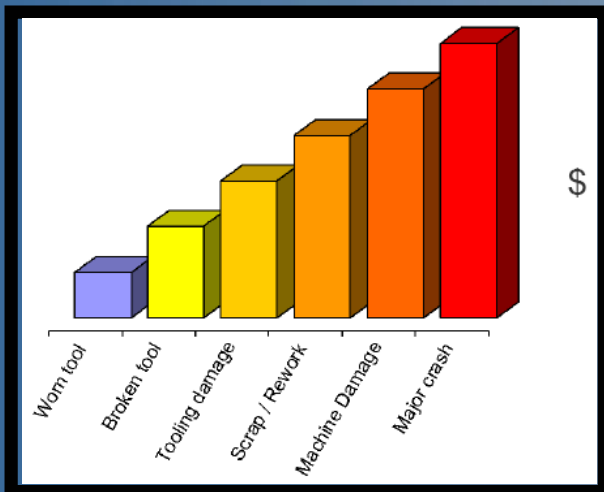
Sensing your machining to increase the efficiency.

APPLICATIONS

The MICROM monitoring system can be used in multiple applications at different manufacturing technologies such as milling, turning, drilling or grinding processes.

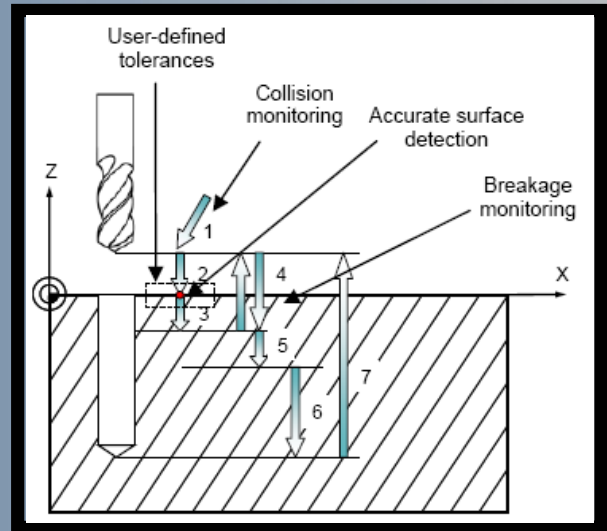
Some of these applications are listed as follows:

- *Tool breakage detection system.* Tool failures are detected immediately and feasibly in all cases.
- *Machine collision detection system.* Collisions are undesirable dramatic impacts between functional parts of the machine involving relevant economical expenses as shown in the figure below. The MICROM monitoring system minimizes considerably those effects.



- *Conventional probing system.* Based on the MICROM monitoring system capability to distinguish the no contact from the contact state, it can be satisfactorily used as a probing method for workpiece setting up, measurements etc. See next page application.

- *Elimination of air-cut operations.* The MICROM monitoring system minimizes the non-machining times reducing the cycle-times.



- *New probing concept.* The MICROM system allows using the tool directly for measuring purposes instead of a probing device. This new method presents the advantage of taking the workpiece references at working conditions with elevated accuracies, reducing setting up times and increasing the process productivity.
- *Relative machining possibilities.* Integration of the probing and machining functionalities is a real possibility now using the MICROM monitoring system.
- *Intelligent cycles.* Cycles provided with process feedback information (tool breakage detection, machine collision detection, programming or clamping error detection, etc.) make process technologies more intelligent and consequently, increase the machining efficiency. See in figure above the intelligent drilling cycle.

EXAMPLES OF ONE APPLICATION

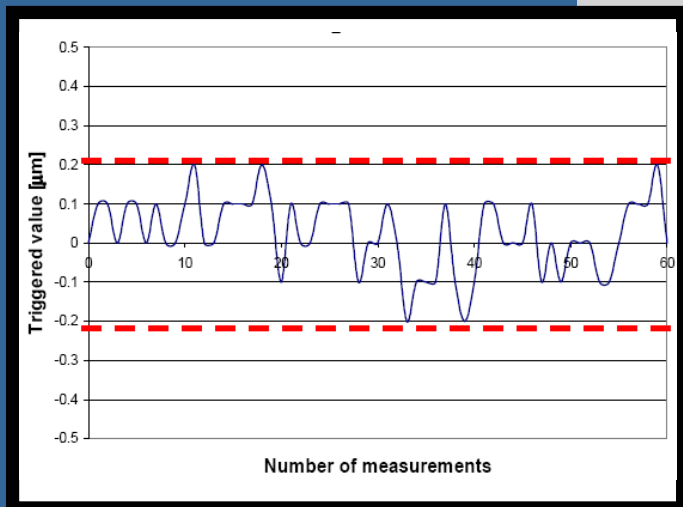
In this example, the repeatability that a commercially available touch probe has probing 60 points every 5 seconds in the same position is compared with the proposed MICROM probing system.

Test results illustrated in the graphics below show excellent repeatability values for the MICROM probing system.

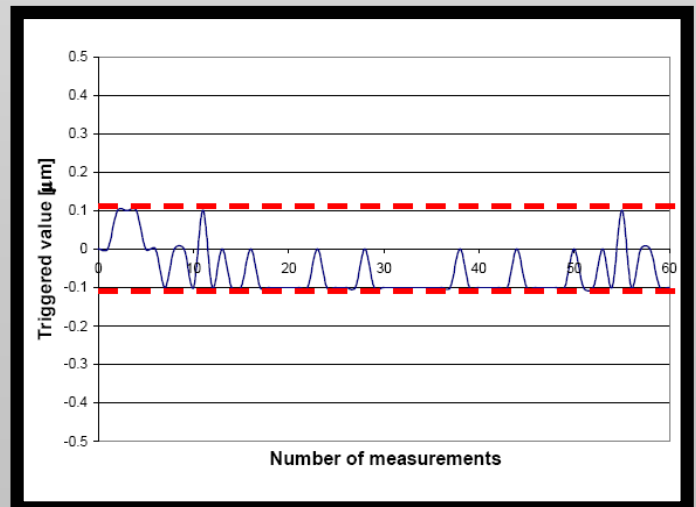
Repeatability values below $\pm 0.1 \mu\text{m}$ were obtained.



Commercial probing system



MICROM probing system



Repeatability < $\pm 0.1 \mu\text{m}$!!