Pulsation or Dynamic Straigtness Measurement performed on a Diamond-Dressing for Grinder

Gianmarco Liotto
optodyne@optodyne.it

Abstract

The purpose of measurement here reported, is to check the dynamic straightness or pulsation on a linear stage for diamond dressing using Schneeberger Ball-Monorail linear guide.
In particular is identified the contribution to the lateral movement, depending by the insertion and expulsion of balls by the preloaded tracks. With traditional methods it is possible to check the straightness of movement in static or quasi-static condition and with contact, methods that are not adequate to the very little variation and dynamics. The measurement are performed with a new generation laser interferometer and a flat mirror where is possible to measure lateral variation in respect of the travel direction. Where also performed a check measuring the speed variation of the axis to have an indication of the oscillation due to the servo control. Have been observed oscillation of 0,5micron with fix frequency of 0,8 Hz and oscillation of 0,16 micron with frequency 25Hz, probably the lower level oscillation is not directly due to the bearings because of the almost perfect periodic sub harmonic structure.

Measurement and Equipment

The measurement was performed on 5-10-2001 with Laser Doppler LDDM manufactured by Optodyne on a Ghiringhelli grinding machines equipped with ball recirculation linear guide manufactured by Schneeberger . The data was collect by an high frequency data collection board IPC1-400 manufactured by Optodyne, by Optodyne WinCatch software for dynamic data collection and analysis. The data analysis was performed using WinCatch and Microsoft Excel software.

Lateral pulsation

The first measurement is a dynamic straightness measurement for lateral deviation orthogonal to the travel direction and perpendicular to the grinder axis. It is possible to recognize a modulation, due to well identifiable frequencies of decreasing intensity. The main oscillation shows 0,5 micron amplitude pick and frequency 0,8 Hz. The subsequent oscillation goes down to 0,16 micron and frequency 25 Hz.

Speed pulsation

The second measurement was performed along the longitudinal movement of the axis; it is a speed measurement. The measured average speed is 4,2 mm/s . The speed variation or main speed pulsation have an amplitude of 0,7 micron pick at 0,7 Hz. the secondary oscillation is 0,3 micron pick and 21 Hz of frequency.

Conclusion

The oscillations are very small and they have the same amplitude in both directions and the level is compatible with the application. The accurate analysis of the collected data, going deeply in the analysis of the harmonic structure, is too complex to be performed in this phase.

Lateral Pulsations

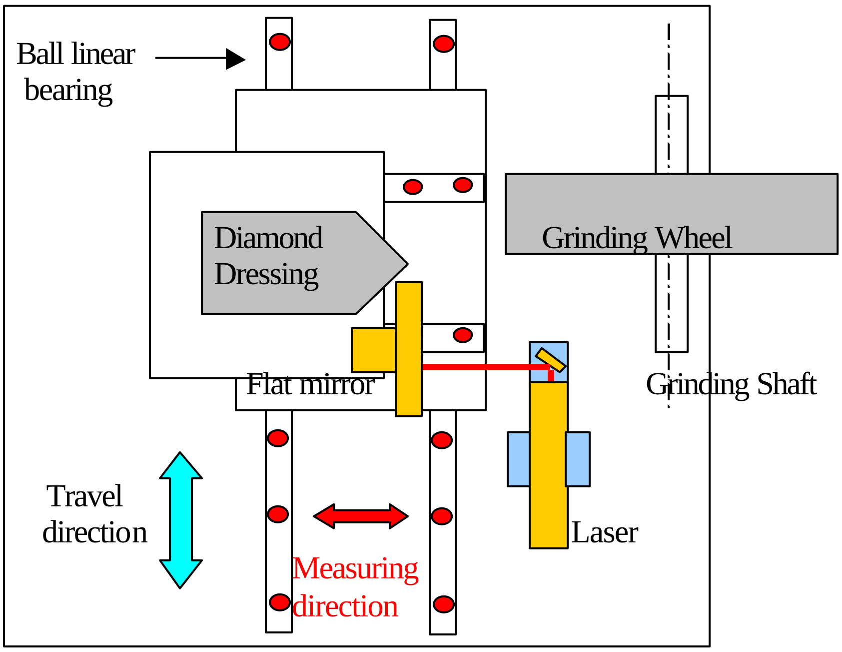
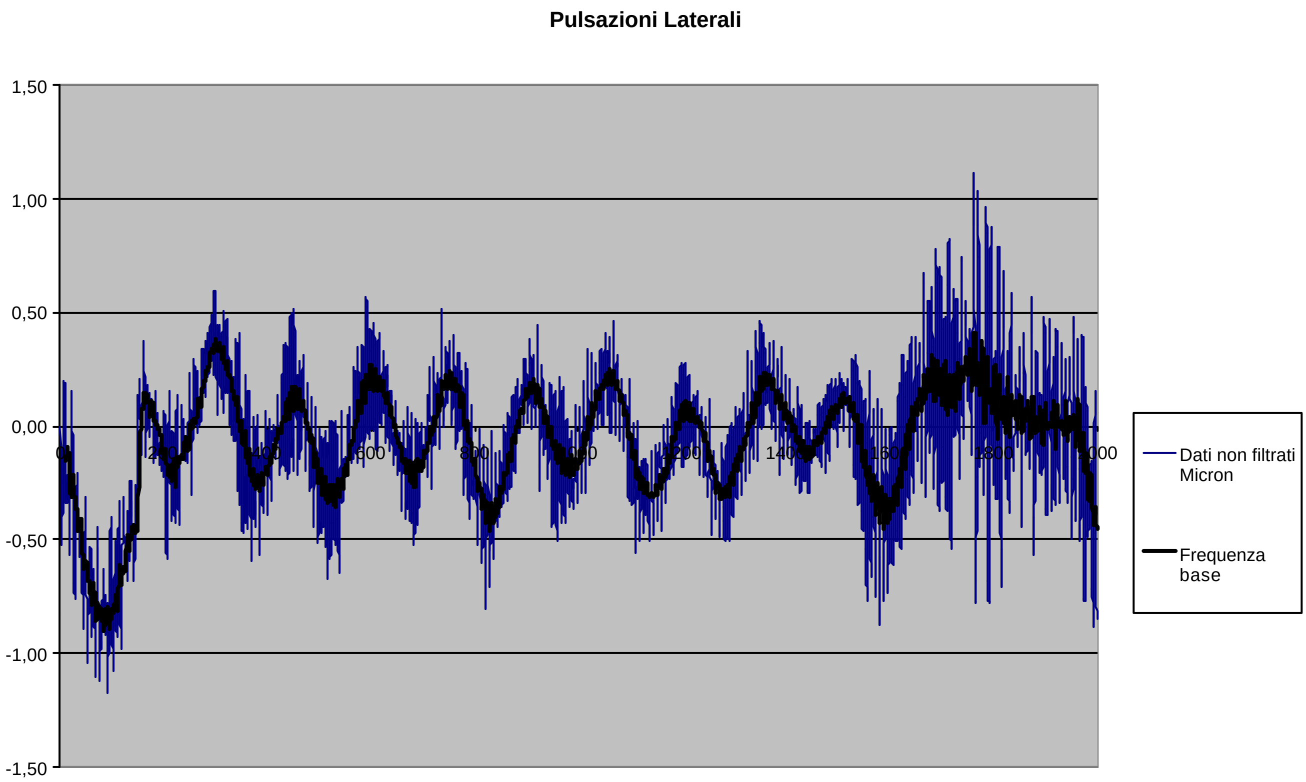


Fig1 Description of lateral pulsation measurement

Fig 2 Results of lateral dynamic measurement



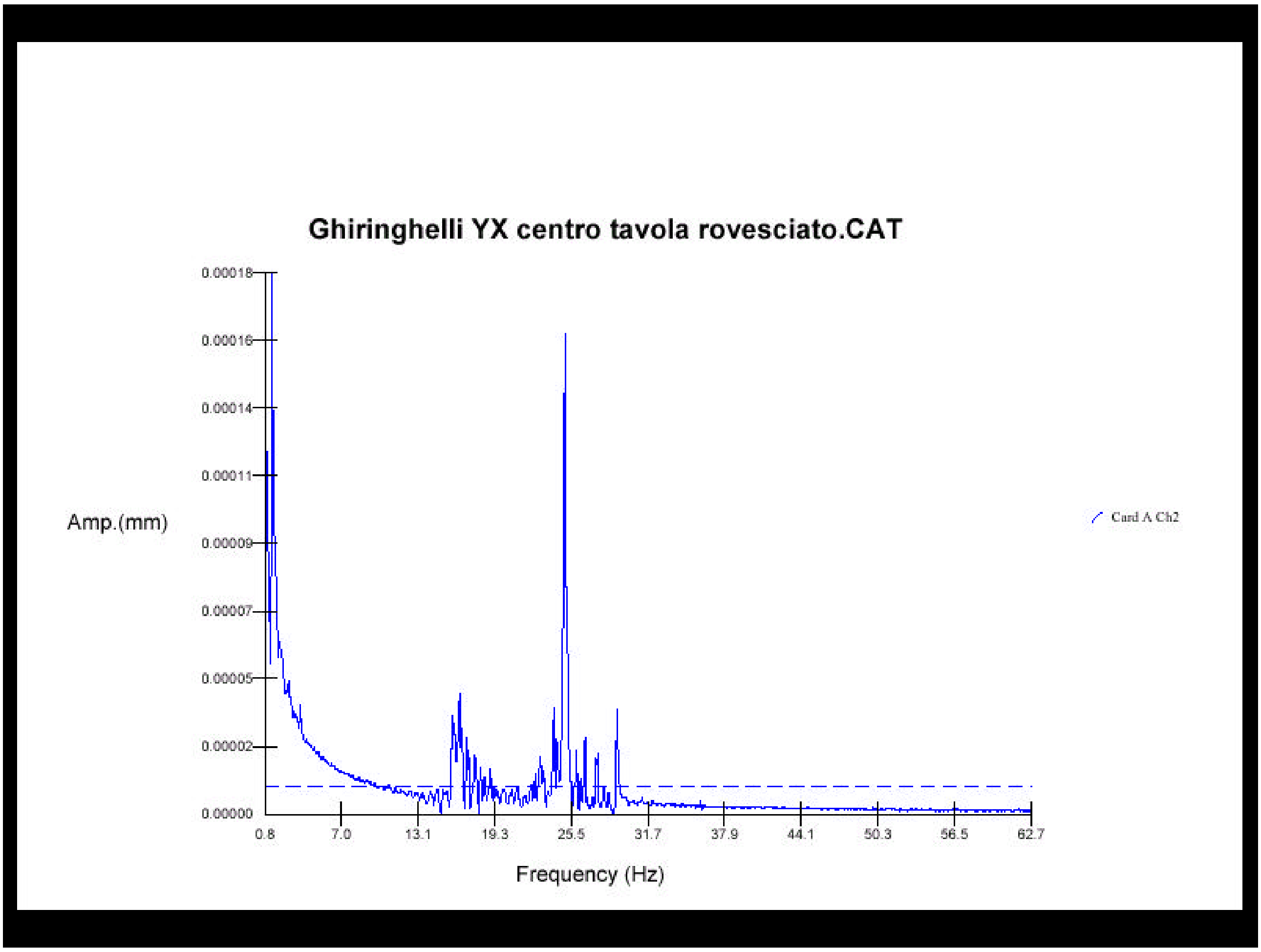
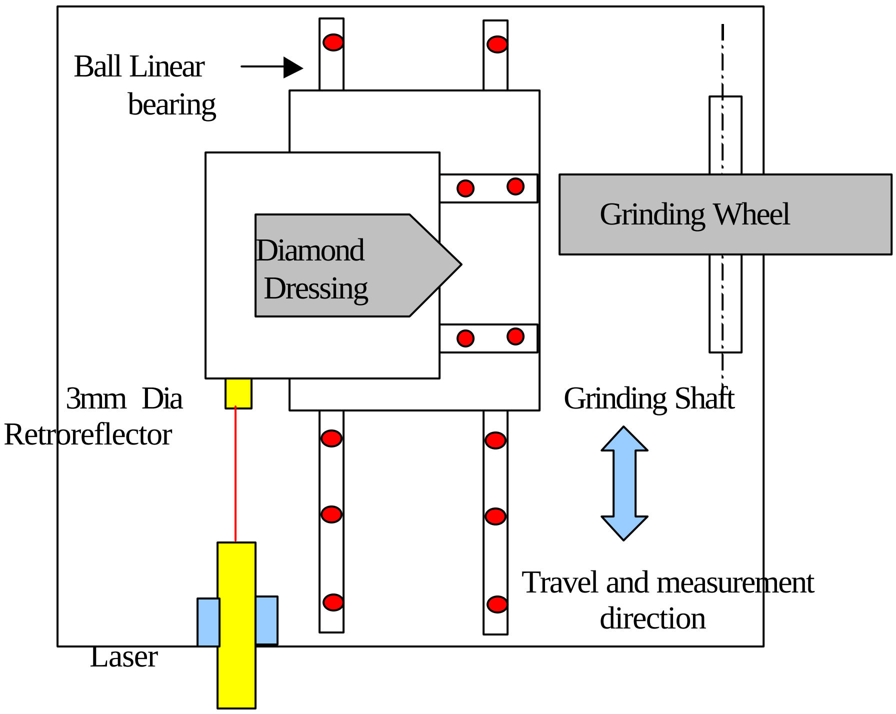


Fig3. Frequency analysis for the lateral pulsation

Speed Pulsation

Fig4 Measuring scheme of the measurements in the direction of travel



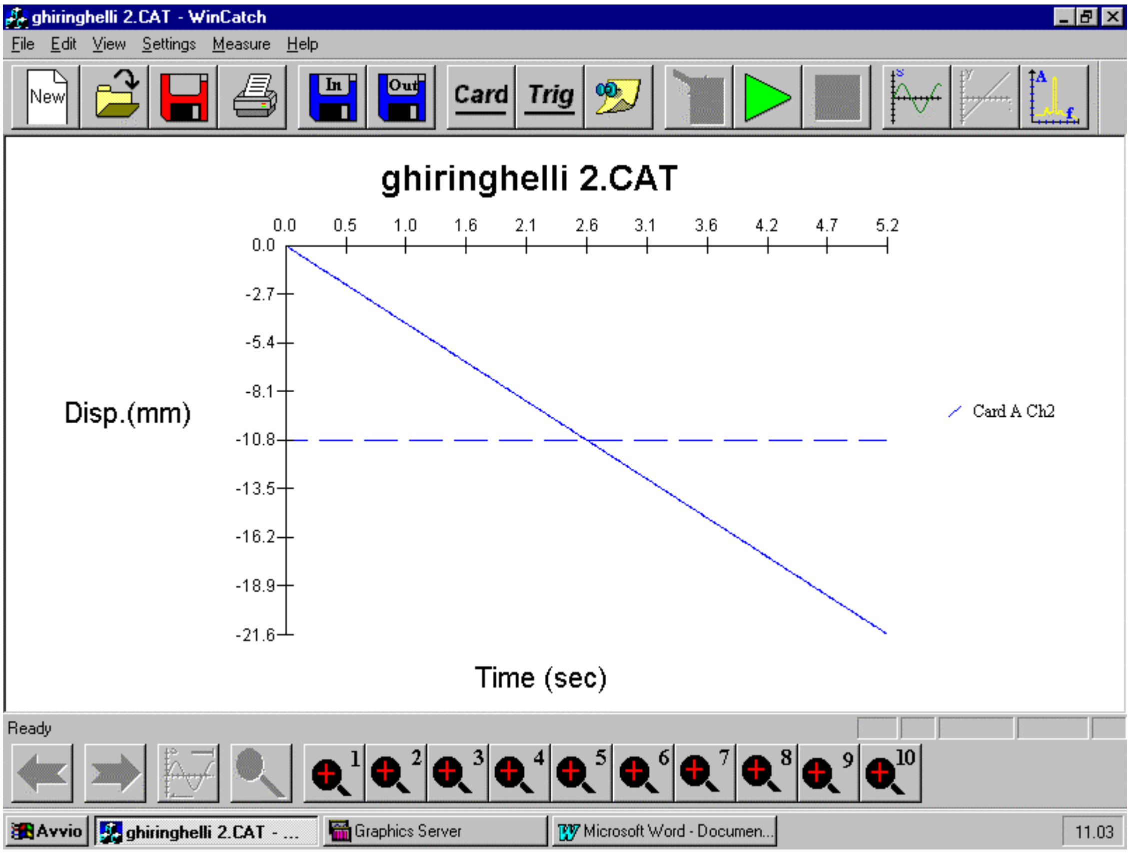


Fig 5 Axis Displacement, position plotted versus time.

Fig 6 Position Fluctuation from straight line due to speed variation, calculated subtracting the constant slope from the displacement of fig 5 above.