

# HASZ CONSULTING, L.L.C.

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June 11, 2014

Mr. Chanley Chambers  
Member  
Total Grinding Solutions (TGS)  
Warren, MI

Dear Chanley:

We were honored that you chose Hasz Consulting, LLC to perform the prototype testing of your newly designed TGS-CL-6020 Centerless Grinding Machine. The design is a much needed improvement over other centerless grinders. In fact the static and dynamic stiffness values are greater than other centerless grinders that are in the market and therefore the machine will be more capable and more accurate.

The machine is well built and attention has been given to detail. The mechanical system is well balanced, as indicated in the vibration mode shapes and corresponding FRF's. Major problems in previous machine designs have been overcome. Using antifriction grease packed angular contact spindle bearings and lower slide *INA* roller ways has proven to be an excellent choice. The dovetail slide of the upper slide is equipped with *Turcite* which is also an excellent choice for low friction, minimum stick slip and good wear qualities. The use of the upper and lower individually controlled slides is very advantageous to machine versatility. The dressing units move smoothly, position very accurately and are well suited for single point tooling. Diamond disc dressing can also be supplied. The Regulating Wheel spindle drive is smooth and the out-board bearing is stiff, accurate, and is easily disassembled for easy wheel replacement. The Cast Iron bed is well designed and shows no need for improvement.

Infeed accuracy of the lower slide is within 1 micron and has good control down to 0.1 micron with virtually no reversal error. With hydraulics eliminated, accurate automatic wheel balancing, and balanced spindle motors, the vibration level of the machine is in the sub-micron level. Machine guarding not only looks good but is very functional and helps control thermal errors due to shop temperature fluctuations.

Good job! The machine, given the proper price, should meet the market well.

Sincerely;



John R Hasz, PE  
President