Static and Dynamic Analysis of Deep Hole Boring Bars using FEA

Student's Name	**Ratan Karan Shamlal**	**MD (FT-2012)**
Academic Supervisor(s)	Nithin Venkataram and Arun R. Rao	
Industrial Supervisor(s)	S. Murali Krishna, TaeguTec, Bangalore	

Ratan Karan Shamlal
karanratan2511@gmail.com
Ph. No: 0 80957 15057

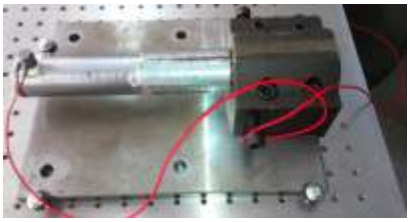
Keywords: Chatter, Reinforced Boring Bar, Viscous Damping, Constrained Layer Damping

Abstract:

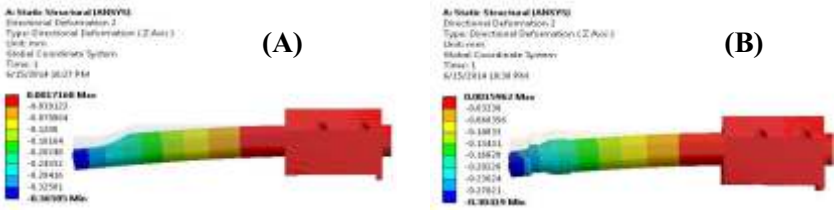
With advances in technology, every industry concentrates to boost productivity. Vibrations are the major limitations to productivity, product quality and machining cost. TaeguTec, an international tooling company, has developed a reinforced boring bar as a replacement for steel boring bar to reduce chatter vibration. In the present thesis, a comparative study of dynamic stability is carried out on reinforced boring bar over conventional boring bar.

Literature study shows stiffness and damping are the major cause for tool chatter. Static stiffness is evaluated for various lengths to diameter ratio through static analysis using ANSYS software. Modal and transient analyses are carried out for both boring bar to evaluate natural frequency and compare the damping response respectively. Shape optimization is carried out for both boring bar to reduce weight and cost. Experiments are carried out on specimens using oils of two different viscosities, constrained layer damping and combination of both (combination of oil damped and constrained layer damped). Using these experimental results, a new method of damping vibration in boring bar is proposed.

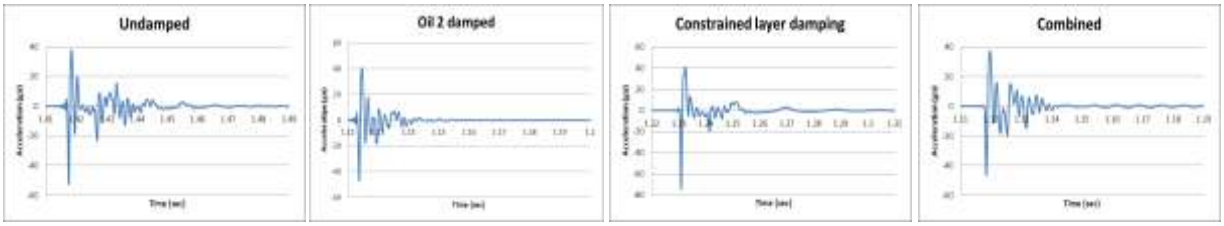
Analysis results show that reinforced boring bar is 76% effective in improving dynamic stability over conventional boring bar. Experimental results show that damped boring bar is 86% effective in improving dynamic stability as compared to undamped boring bar. From analysis results, it is concluded that damped boring bars are more effective and dynamically stable than reinforced boring bars.



Experimental setup for vibration testing



Deflections in (a) Conventional (b) Reinforced boring bars



Specimen response under various conditions