

WOOD MACHINING & TOOLING RESEARCH

PROCESS MONITORING RESEARCH - Monitoring Spindle Vibration and Power Consumption

The NC State University Wood Machining & Tooling Research Program (WMTRP) conducts research in a wide variety of wood machining focus areas including high speed-high power machining on CNC routers. The NCSU wood machining research facilities include a high speed CNC machine manufactured by Accu-Router, Inc. capable of spindle speeds in excess of 30,000 rpm and cutting feed speeds in excess of 2000 inches/minute. NCSU research on high speed spindle design and performance, tool holding systems, dynamic balancing, and many other high speed related areas has been greatly enhanced by the acquisition of the Accu-Router machine. The high speed-high power machining research includes the development of process monitoring systems, which utilize spindle power sensors, vibration sensors, and a variety of other sensors. These systems are being used to observe important characteristics of the machining process and verify computer models being developed at NCSU. One of the process monitoring systems in use in the NCSU laboratory has been installed on the Accu-Router IWF machine in order to demonstrate the monitoring of real-time spindle power consumption and spindle vibration. Power consumption is important in assessing spindle performance as well as tool and tool holding system design requirements for various feeds and speeds. Vibration data can help detect excessive unbalance, excessive cutting loads, dull/broken tools, and can also aid in assessing spindle bearing health.

The NCSU process monitoring system being demonstrated at the Accu-Router IWF booth utilizes Montronix™ vibration acquisition and signal filtering instrumentation and Load Controls™ spindle power monitoring sensors. Data processing and graphic displays are done in Labview™. The process monitoring displays shown on the opposite side of this page show power (horsepower) and high pass filtered and low pass filtered spindle vibration during idle and cutting conditions. Threshold settings for power and each vibration signal are set for the specific application and an alarm signal appears on the CNC control screen when the preset threshold limits are exceeded.

NCSU would like to acknowledge Accu-Router Inc. for supporting high-speed machining research at NCSU and facilitating the demonstration of NCSU process monitoring technology at IWF2002.

*The **Wood Machining & Tooling Research Program (WMTRP)** is a multidisciplinary program involving the fields of Mechanical Engineering, Industrial Engineering, Manufacturing Engineering, Material Science, and Wood Science. The program mission is to provide the woodworking industry with personnel educated in machining and tooling technology and provide applied research results aimed at improving efficiency and wood utilization. Major program support is provided by the U.S. Department of Agriculture.*

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