

REAL – TIME (ON-LINE) TOOL WEAR CONDITION MONITORING IN DRILLING PROCESS

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Abstract

Modern sophisticated machine tools need accurate tool condition monitoring techniques to facilitate timely withdrawal of the worn-out tool. In our work, A new method to monitor tool wear condition in real time using spindle motor current measured with the aid of an expensive current sensor installed on the AC motor of a drilling machine is presented. To achieve this, the spindle drive system model is analyzed, the spindle motor current is measured and the relations between spindle motor current, cutting force and tool flank wear are addressed. It is very important to develop a reliable and inexpensive intelligent monitoring system for use in cutting processes. A successful monitoring system can effectively maintain machine tool, cutting tool and work piece. We observe that the tool wear rate increases quickly as soon as the tool enters the abnormal wear phase. Whatever the cutting conditions and tool and work piece material, the threshold value for the spindle cutting current gradient is calculated first during the period of known normal tool wear. Only then is the floating threshold value thus established used in the monitoring process. Such approach allows the flexibility of self-adaptation across a variety of cutting conditions, work and tool materials.