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**ON THE USE OF STATISTICAL PROCESS CONTROL APPROACHES FOR
AUTOMATED AND REAL-TIME MONITORING OF MACHINING PROCESSES**

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ABSTRACT

The paper proposes an SPC approach for automatic forecasting and monitoring of sensor signals in presence of cycle-based data (i.e. signal data which periodically repeat themselves) which can be observed in different machining processes, such as milling, forming or water-jet cutting. The monitoring system exploits an univariate time series analysis and monitoring technique based on an Exponentially Weighted Moving Average (EWMA) Control Chart for auto-correlated data coupled with the Holt-Winters exponential smoothing method, that is used to forecast future signal behaviour given its past history. The approach allows one to exploit only data coming from the on-going process and avoids the need for a-priori knowledge about signal pattern. Furthermore the control limits are automatically defined on-line by using only statistical moments of the currently monitored time-series. A case study is proposed to demonstrate the feasibility of monitoring the condition of the tool in milling processes by on-line analysis of cutting force signals.