CHAPTER 6

CONCLUSION AND FUTURE WORKS

In order to enhance the efficiency of EWMA controllers, methodologies of dynamically tuning single and double EWMA controllers have been developed. At first, we develop a neural-based adaptive algorithm for the single EWMA controller by taking SACF as input feature. We have shown that the proposed neural-based adaptive algorithm possesses better performance than the Patel-Jenkins adaptive algorithm. Furthermore, we also develop an enhanced neural adaptive algorithm by taking SACF and SPACF as input features. The off-line trained results showed that the enhanced neural network learns fast and possesses lower RMSE performance. Beside this, we also showed the enhanced neural adaptive algorithm outperforms Patel-Jenkins adaptive algorithm through comparing three examples. The proposed methodologies could update the single EWMA gain automatically, which would reduce the needs for operators to tune recipes in the process.

The double EWMA controller has been shown to be an effective algorithm to compensate for the wear-out process. In this study, we proposed a heuristic time-varying weights tuning strategy in order to enhance the performance of double EWMA controller. We have shown that the proposed tuning strategy possesses a significant improvement over the fixed trade-off solution weights control scheme, especially for processes with a moderate to large drifting rate. In addition we also proposed a dynamic tuning double EWMA controller. In the proposed controller, the EWMA control chart was used to trigger the Dynamic Tuning Loop Module, in order to adjust the control parameters. We have shown that the proposed controller is effective in responding to the disturbance changes.

Although the proposed methodologies were implemented via simulations,

nevertheless it is anticipated to improve the performance of the EWMA controllers in an actual process such as in a CMP, PVD or Etch process in the semiconductor manufacturing industry. Further researches can extend the proposed neural network based adaptive algorithms to the double EWMA controller or the multiple-input multiple output (MIMO) system. In addition, the determination of the stability conditions and proving the robustness of the time-varying weights tuning strategy are also important issues.