

## **UKLA Metalworking Fluid Product Stewardship Group**

### **TOPIC REVIEW 4: Future Developments in Monitoring MWF Quality**

**Introduction:** Occupational exposure to metalworking fluids (MWFs) increases the risk of developing respiratory diseases such as occupational asthma, occupational hypersensitivity pneumonitis, and Chronic Obstructive Pulmonary Disease (COPD). The review focuses on future developments in sensor-based monitoring of MWF quality to reduce these health risks. The primary aim of the review was to assess whether these automated devices can address limitations of manual checks on MWF quality.

**Research Methods:** The review involved a thorough literature search of research published in academic journals from 2010 onwards across the UK, Europe, North America, and Asia. It also drew on insights from manufacturers of sensor and automated fluid management systems, without endorsing any specific commercial claims. The scope included various sensor technologies, methods for monitoring MWF characteristics, and the efficacy of these technologies compared with traditional manual testing methods.

**Main Findings:** Key findings indicate that automated fluid management systems have been in commercial use for several years. Current guidance has identified limitations of manual checks, noting that they fail to capture real-time dynamic changes in MWF quality parameters such as concentration, pH, and contamination. In contrast, sensors can provide consistent real-time data, enabling prompt corrective actions when fluid parameters deviate from specified limits, which in turn may help extend the life of MWFs and reduce associated costs.

**Discussion and Analysis:** The introduction of sensor technologies for monitoring MWFs is significant given the health and safety implications of MWF exposure. The review underscores that, while manual checks are prone to errors and limited in scope, sensors provide continuous monitoring, improve operational control, and may enhance machining quality and worker safety. However, challenges remain in developing sensors specifically for detecting the growth of bacteria and fungi in water-mix MWFs, highlighting the need for further research and technological advancement in this area.

**Conclusion and Suggestions:** The review concludes that implementing sensors and automated management systems for MWFs could improve fluid quality, enhance machining performance, and contribute to safer working environments while delivering cost savings. Future research should focus on evaluating the effectiveness of these technologies against manual inspections, with particular attention to cost-benefit analyses for small businesses in the manufacturing sector. It is also suggested that consultation with experts is needed to assess how best to use these developments to manage MWF quality.