

Monitoring of coolant emulsions in wire drawing

Reliable Quality Control in Pharmaceutical and Food Applications

Cooling Lubricants (CL) are used in the metal processing industry for both chip-forming and non-chip-forming operations to cool and lubricate the process. This applies, of course, to drawing and rolling processes in cable manufacturing and to the subsequent heat treatment as well. Due to the very high speed of drawing and the high degree of elongation, significant friction occurs between the semi-finished products and the tools. The generated heat must be evenly dissipated to ensure a stable process and guarantee high cable quality. To effectively reduce frictional heating and remove it from the process, it is necessary to ensure that the emulsion concentration is kept within a defined range.

A CL emulsion consists primarily of water, combined with lubricating oil, emulsifiers, solvents such as alcohols, defoamers, bactericides, and various additives. Regular monitoring of coolant emulsions is essential for process reliability, employee safety, cost-efficient production, and consistent high product quality. This has been increasingly emphasized by regulations in recent years.

Typical emulsion concentrations in wire drawing processes range between approximately 2% and 10%, depending on the application. Even small deviations from the target concentration can significantly impact lubrication performance and cooling efficiency. For example, under-dosing can lead to reduced tool life or surface defects on the manufactured wires. On the other hand, excessive dosing leads to an unnecessarily high consumption of CL and, consequently, to rising production costs.

A common method for determining the concentration of emulsions is refractive index measurement in Brix. The value is then multiplied by a coolant-specific refractometer factor to determine the actual concentration.

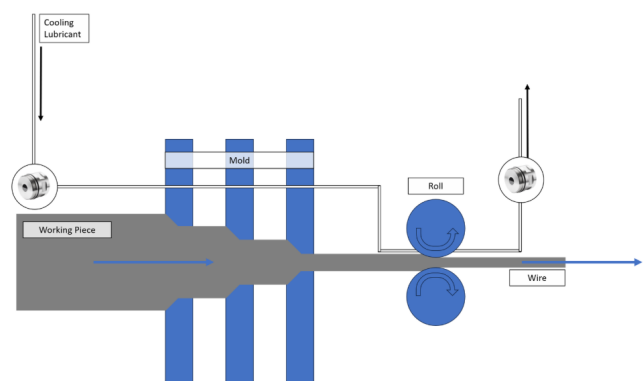
Today, this measurement is often carried out using handheld refractometers. However, this approach is time-consuming, requires personnel efforts and is prone to human error. In addition, inaccuracies can arise due to temperature variations in the tank and high turbidity of the emulsion caused by wear. Particularly with "richer"

emulsions, handheld refractometers often provide only a rough approximation. Further disturbances, such as metal particles, abrasion, and microbial contamination, can negatively affect conventional measurement methods and lead to unreliable results.

To overcome the limitations associated with handheld refractometers and to ensure precise measurement of coolant concentration, the metal processing industry increasingly relies on direct measurement methods using inline process refractometers and highly accurate laboratory instruments for quality control of coolant emulsions.

During operation, the CL concentration can change due to carryover losses, evaporation of water, and oil discharge. Accordingly, the emulsion must be closely monitored to detect any changes and take appropriate corrective actions.

Workflow example:



Solution from SCHMIDT + HAENSCH

Using the SCHMIDT + HAENSCH iCS²-CL inline concentration sensor provides a reliable method for monitoring coolant emulsion concentration during wire drawing and rolling processes. Installed directly in the process line or in the circulation system of the coolant, the refractometer delivers real-time measurements of the refractive index, enabling continuous control of emulsion concentration under actual operating conditions. This allows immediate adjustments to maintain optimal lubrication and cooling performance, ensuring a stable process conditions and consistent wire quality. Alternatively, the system can be installed in a bypass line for flexible integration without interfering with the main process flow. For applications requiring an even wider temperature range, the iPR C² can be used as an alternative. In addition to inline process monitoring, SCHMIDT + HAENSCH offers laboratory refractometers for offline quality assurance and process validation.



iCS²
Inline Concentration Sensor

Product type	Product
Process Refractometer	iCS ² CL Inline Concentration Sensor Cooling lubricant
Process Refractometer	iPR C ² Compact Inline Refractometer
Accessories	VARINLINE® housings (severals ends and diameters)

Advantages

- Continuous real-time monitoring of the coolant concentration
- Longer service life for machine tools and emulsions
- Consistently high part quality
- Reduced staffing requirements
- Minimisation of human error
- Optimised consumption of cooling lubricants
- Decreasing production costs at consistently high part quality

Typical industries

- Cable industry
- Wire industry