

**Dissertation title:**

**Energy efficient operation of precoat filter systems for coolant cleaning**

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The coolant supply uses in typical applications of metal cutting manufacturing on average 50 % of the electrical energy. A main optimization option is the retrofit of demand-based control strategies in the supply system. The study of the state of the art shows that a high energy saving potential remains in central precoat filter systems for coolant cleaning.

The achievable flow rate through the precoat filter with the filter pump is reduced in filter operation due to the rising filter resistance. The precoat filters in the filter system need to be regenerated as soon as the achievable flow rate through the filters falls below a certain level. So far the filter pumps are throttled and operated constantly with maximum speed since this allows triggering the regeneration based on the filter pressure. Thereby the filter systems are operated constantly on an excessive power level, independent on the coolant demand.

Within this thesis, an automation procedure for an energy efficient operation of central precoat filter systems is presented. The flow rates through the filters are regulated demand-based with a follow-up control using variable speed pumps. Thereby the energy intake is adapted based on the current coolant demand. The filter pressure is no longer utilizable to trigger the filter regeneration due to the variation of the flow rate. Therefore the filter pressure which would arise in uncontrolled operation is reconstructed in controlled operation with measured variables using a model.

The presented procedure was successfully implemented in an existing central precoat filter system. The energy saving potential using the existing pumps and throttle setting is 62 %. Simulation results using filter pumps which allow in addition a reduction of the throttle lead to the conclusion that the energy saving potential is 73 %.