NEW UVP-PD BASED SYSTEM FOR IN-LINE RHEOMETRY

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Rheological properties can be correlated with product microstructure, they govern the performance of unit operations and detailed knowledge is fundamental for the design of new process equipment and for predicting e.g. heat transfer. The consistency and viscosity, which can be described by fluid rheology are becoming important as quality control parameters within the fluid industry since the trend is towards continuous production. The determination of rheological properties in-line, in real time, thus has a great economical impact and is important from a quality perspective for the development of innovative and competitive products.

Although a method for in-line rheometry combining the Doppler-based Ultrasound Velocity Profiling (UVP) technique with Pressure Difference (PD) measurements was investigated for the first time over a decade ago, there exists no UVP-PD system on the market. A complete UVP-PD system that meets the industrial requirements has recently been developed at SIK. The UVP-PD methodology and system developed at SIK has now been successfully installed in industry thus meeting all industrial requirements. The UVP-PD system can be used to monitor several industrial unit operations such as fat crystallization, heat treatment, rapid start-up or shutdown of the process, liquid displacements during rinsing or product change and in-line mixing in real-time. Experiments have been carried out in industrial process lines or pilot plants under true realistic processing conditions. The UVP-PD methodology and system developed at SIK has been successfully applied to a range of model and industrial fluids and suspensions, including fluids containing large particles and fibers, such as real foods, complex fat blends, paper pulp, mineral suspensions and concrete.

In addition, simultaneous measurements of the attenuation of transmitted ultrasound and changes in sound velocity provide an interesting option for determining particle concentration (e.g. solid fat conten,t SFC) in-line.