SLUDGE DEWATERING MADE EASY

- Checking sludge dewatering during effluent treatment
- Targeted selection of polymeric flocculants
- Identification of economical flocculant additions

BACKGROUND

The final process step of effluent treatment is the dewatering of sludge that has been thickened in a sedimentation stage. For dewatering purposes, polymeric flocculants are dosed into the sludge for conditioning. These will agglomerate and flocculate existing sludge particles to enable industrial-scale dewatering in filter presses or centrifuges. Since the disposal of dewatered sludge dry solids and the required polymer additions are the most important cost drivers, industrialists are trying to generate a maximum of solids content whilst keeping polymer dosages at a minimum. To create ideal dewatering conditions, polymer overdosage and underdosage must be avoided (Fig. 1). To achieve this goal, a method is needed which is capable of identifying an efficient interplay between the dewatering characteristics of effluent sludges and the applied polymers.

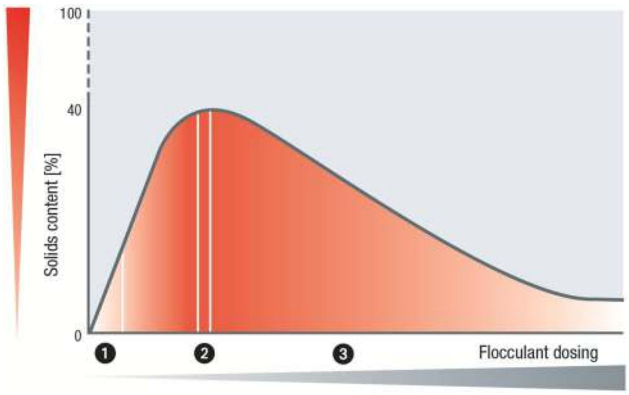

FIG. 1: Discharged dry solids vs. amount of polymeric flocculant: (1) Underconditioning, (2) Ideal conditioning and (3) Overconditioning

Mütek™ LAB INSTRUMENT

Mütek™ DFR-05 Drainage Freeness Retention

The measuring principle of the Mütek™ DFR-05 relies on gravimetry of a filtrate flow which results from flocculated sludge particles retained on a defined-mesh screen. The filtrate volume obtained is recorded over time and its final weight is taken as a direct measure of the dewaterability of a conditioned effluent sludge. Prior to measuring the sludge dewatering characteristics, flocculant is introduced into the sludge sample in the instrument in order to assure complete reaction of the polymer with the studied effluent sludge – a practice called integrated conditioning. Finally, shear stresses originating in the screen press or centrifuge are simulated by stirring the sample with defined stirrer profiles.

FIG. 2: Mütek DFR-05 Drainage Freeness Retention

BENEFITS

- Targeted selection and dosage of polymeric flocculants
- Polymer savings of at least 10%
- Automated lab measurements giving user-independent results
- Simulation of industrial dewatering machinery

RESULTS

To identify the most effective polymeric flocculant, six different polyacrylamides (P1 to P6) in identical concentrations were added to a digested sludge (DS) sample for subsequent measurement in the DFR. As is obvious from Fig. 3, sample DS+P6 exhibits the steepest gradient and the highest value for the final filtrate weight. Additive P6 thus performs superior in terms of dewatering as compared to the other studied polymeric flocculants that were dosed in identical concentrations. This flocculant should preferably be used to achieve optimum dewatering results.

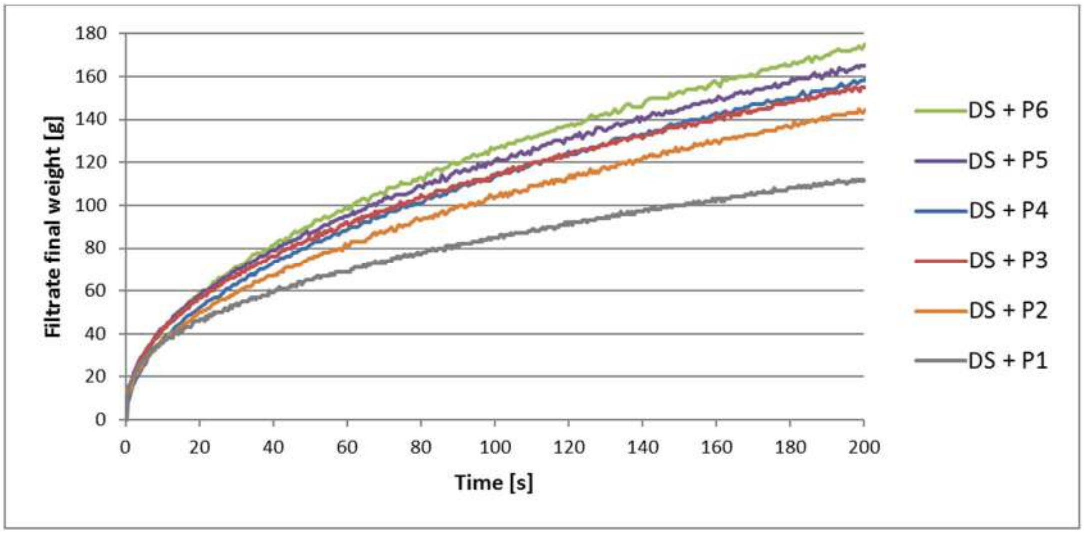

FIG. 3: DFR measurements of digested sludge after reaction with six different polyacrylamides (P1 to P6)

A surplus sludge sample was measured without and with additions of rising concentrations of a polymeric flocculant (Fig. 4). The ascending graphs of the untreated sludge sample SUS, SUS+C1 and SUS+C2 represent the increasing dewatering performance of the polymer up to an optimum level SUS+C3. On the other hand, a decrease in the final filtrate weight in the case of the two higher concentrated polymer additions SUS+C4 and SUS+C5 typically reflects overconditioning and thus poorer dewatering results. Measurements of surplus sludges to which polymeric flocculants were added in different concentrations have revealed that rising polymer dosages initially cause an increase followed by a decline of dewatering performance. Since DFR results allow ideal dosages to be ascertained on-site, users are able to apply flocculants in an economical and optimized way. Easy handling of the instrument makes it possible for operators to quickly intervene as soon as the sludge composition changes.

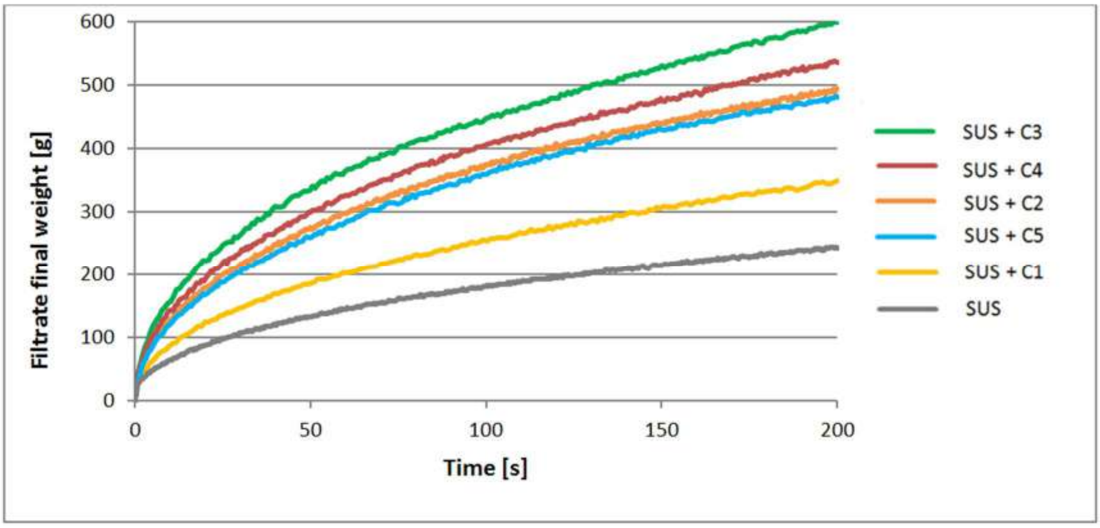

FIG. 4: DFR measurements of surplus sludge, untreated (SUS) and with different polymer concentrations (C1 to C5) added