Requirements for the Preparation Water
FOR THE PREPARATION OF A POLYMER SOLUTION

Some producers of flocculants recommend certain quality requirements for the preparation water to produce an optimal polymer solution. These are only a recommendation for the operators, as these requirements cannot always be met. Therefore, they only serve as guide values for optimising sludge thickening or dewatering. The quality requirements and their influence on the polymer solution can be summarised as follows:

- Temperature:
  Warm water accelerates the dissolving process of any polymer solution, the ideal water temperature is 10-30 °C

- pH Value:
  A high pH value leads to hydrolysis (degradation) of cationic polymers. The ideal pH value for the preparation water is pH 6-8. The ready to use polymer solution should have a pH value between 4-6.

- Water hardness:
  Too hard preparation water accelerates the hydrolysis (degradation) of a polymer solution. Medium-hard water 8-12 °, German hardness < 300 mg/l $CaCo_3$ is ideal.

- Conductivity:
  Too high conductivity increases the maturing time and the dissolving process of the polymer solution, as well as its viscosity. Ideal conductivity < 10,000 µS/cm

- Solids - process water:
  A solid content in the process water reacts with the polymer solution and causes deposits in the dissolving station and in the pumps. Ideally no solids or < 5 mg/l

- Divalent irons such as Fe^2, Cu^2,...:
  Free radicals can cleave the polymer chain and thus have an influence on the effectiveness. Ideal concentration < 1 mg/l

- Oxidants such as chlorides:
  A too high chloride concentration can cleave the polymer chain and thus have an influence on the effectiveness. Ideal concentration < 0.5 mg/l

- Bacteria/Algae:
  Bacterial growth accelerates the hydrolysis (degradation) of any polymer solution. Ideal: no biological activity

- Maturation time:
  A high mixing energy and an appropriate maturation time increase the efficiency of a polymer solution. Ideal maturation: time more than 30 minutes

Analysis of the parameters of the preparation water

Using the example of AWV Völkermarkt Jaunfeld, the parameters of the preparation water for the production of a polymer solution were analysed. AWV Völkermarkt Jaunfeld operates a sludge dewatering system using IEA screw presses. The conditioning of the statically thickened excess sludge is carried out exclusively with liquid polymer. The polymer preparation station is a "tower plant“ with 750 litres batch volume per preparation. From the preparation tank equipped with an agitator, the polymer solution is transferred to the storage tank by using a transfer valve.
The maturing time is about 10 minutes! Drinking water from the local network was

used for the preparation of the polymer solution. A water analysis was carried out, the exact results can be found in Table 1.

Furthermore, a polymer solution with a preparation concentration of 0.25 % commercial product = 0.125 % active polymer was prepared on a laboratory scale. The pH value and conductivity of this polymer solution were recorded over the entire period. Based on the conductivity and its course, a possible conclusion can be drawn about an ideal maturing time of the polymer solution. In a beaker, 800 ml of preparation water with about 6 °C was added and stirred with a magnetic stirrer.
Before adding the polymer, the pH value and the conductivity were noted. In addition, the pH value of the preparation water was adjusted to approximately pH 4 by adding acetic acid (0.6 ml acetic acid per 800 ml preparation water). Subsequently, 2 ml FlocStar® 200L (dispersion) were added under strong stirring and the conductivity and the pH value was recorded over the entire period.
The preparation concentration of the laboratory scale polymer solution was 0.25 % commercial or 0.125 % active polymer.
As can be seen from Table 2, the conductivity increases with increasing stirring time. The liquid polymer starts to dissolve in the water and causes an increase in conductivity.
From a stirring time/maturing time of 20 minutes, the maximum possible conductivity is reached, so that one can speak of an ideal dissolution of the liquid polymer. Therefore, we recommend a maturing time (net stirring time after reaching the maximum level of the preparation tank) of >/= 20 minutes.
The pH value of the polymer solution was about pH 4.

AWV Völkermarkt-Jaunfeld

Preparation Water Polymer Make up Unit:

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		Water Sample dtd 13th Sep 21
Appearance		clear
pH		7,68
Conductivity	µS / cm	300
Temperature	Degree°	5,5
m-Value	mml / l	2,88
Total Hardness	° d.H.	11,6
Chloride	mg / l	< 1,0
Iron (Fe)	mg / l	0,060
Copper (Cu)	mg / l	0,014
Sulphate	mg / l	< 1,0
Nitrate	mg / l	< 1,0
Total Bacterial Count	KBE	0

Comment:

All parameters are in a very good field.

The total bacterial count is 0 KBE/ml !! Clearly below the required target value!!

Table 1: Analysis of the preparation water of AWV Völkermarkt

Stirring Time [minutes]	Conductivity [µS/cm]	pH Value
Start	216	7,19
1	486	3,78
2	518	3,76
3	534	3,77
4	550	3,86
5	553	3,76
10	570	3,70
15	583	3,76
20	593	3,74
25	593	3,76
30	615	3,70
35	588	3,96
40	581	3,98

Table 2: Conductivity curve of a 0.25 % HW polymer solution over the entire period

Summary:

An optimisation of sludge dewatering and, associated with this, a possibly higher dry residue in the discharge is particularly important in view of rising disposal costs. Depending on the sludge quality and dewatering unit, the selection of the conditioning agent is the most important factor from a technical and economic point of view.
When using solid polymer, optimum wetting of the solid polymer with the preparation water is crucial.

A sufficiently high mixing energy, a sufficient preparation volume, an optimal maturing time as well as the quality of the preparation water, are only a few parameters to dissolve the flocculant in the preparation water and thus positively influence the dewatering results. The quality characteristics of the preparation water listed above are recommendations of the polymer manufacturers. How these characteristics affect the respective sludge dewatering can only be determined empirically; it is not possible to make a general statement.

There is a whole range of factors that can positively influence sludge dewatering in terms of process technology and lead to improved dewatering values. However, the main component is always the existing sludge composition and the proportion of „free water“ (water that does not bind to the sludge particles) in the sludge suspension.