

# Test Methods at the Innventia Wet End Chemistry Lab

At the Innventia Wet End Chemistry Laboratory we focus on solving problems related to detrimental substances in the paper mill. Our skilled and experienced personnel is available for consultancy activities such as mill surveys and laboratory efficiency tests of fixing agents. Here we summarize the most common analyses used for consultancy and research activities.

## Dewatering time, permeability and retention in fibre suspensions using a Dynamic Drainage Analyser (DDA)

The drainage properties and retention of different pulp suspensions can be measured in the Dynamic Drainage Analyser. Effects from pulp composition, degree of beating, filler content or chemical additives on the drainage properties can be studied.

## Zeta potential of fibre suspensions (Mütek SZP)

The zeta potential shows the ability of the fibre suspension to absorb additives or if the additive has been overdosed. This analysis can be used in combination with the determination of cationic demand in the sample in order to obtain complementary information describing whether the additive has been absorbed on the fibres or if it has been consumed by dissolved and colloidal substances in the water phase.

## Cationic demand in process waters (Mütek PCD)

The concentration of anionic, charged substances in the water phase is determined with a direct polyelectrolyte titration. The anionic substances in the water phase consume cationic additives such as retention aid or wet end starch, which is the reason why this analysis is often called “cationic demand”.

## Chemical oxygen demand (COD) in process waters

COD is used to estimate the total amount of organic material in water phase. We apply the Dr. Lange cuvette test method (LCK 114).

## Turbidity in process waters

The turbidity is the ability of the sample to scatter light. Most often it is a measure of the amount of colloidal material in the process water. The method is widely used to measure the effect of fixatives which remove colloidal material from the process water.

## Total content of carbohydrates in process waters (Orcinol method)

The amount of carbohydrates, e.g. dissolved hemicelluloses, in process waters is estimated by the orcinol method. This is a colorimetric method that is calibrated with a suitable calibration substance. The sample is treated with sulphuric acid containing orcinol which gives a reddish colour to dissolved carbohydrates. The concentration of carbohydrates is calculated from the absorbance.

## Carbohydrates, monosaccharide composition (IC or CE)

Two different methods are used. After freeze-drying the sample is either (a) hydrolysed by sulphuric acid and the formed monosaccharides (glucose, xylose, mannose, galactose and

arabinose) are quantified by ion chromatography (IC) or (b) the sample is hydrolysed by enzymes and the monomeric sugars are quantified by capillary electrophoreses (CE). In method (b) also uronic acids such as 4-O-Me-glucuronic acid and galacturonic acid are included. The original monosaccharide composition in the sample can be determined by either IC or CE without the hydrolysis step.

## Total Organic Carbon in process waters (TCO)

The total organic carbon (TOC) content is determined following SS EN 1484, using a TOC-analyser (Shimadzu TOC-5000). Also total inorganic carbon (TIC), mainly carbonate, can be determined. TOC is an alternative to COD determination.

## Extractives in process waters

The total amount of lipophilic extractives can be determined by solvent extraction, e.g. MTBE or petroleum ether. For extract composition a GC method giving group separation (fatty acids, resin acids, sterols, triglycerides and sterylesters) is used in most cases. It is possible to determine individual components by GC/MS.

## Lignin in process waters

The UV absorbance at 280 nm is used to obtain an estimate of the lignin concentration in the dissolved fractions.

## Low molecular weight acids

Low molecular weight acids (e.g. formic acid, acetic acid, glycolic acid, oxalic acid) can be determined by ion chromatography (IC).

## Sample preparation

Sample preparation is of great importance when determining the cationic demand, COD, TOC, turbidity, carbohydrates, extractives and the lignin content in the process waters. The sample preparation can be adapted to the specific type of pulp and water. We usually remove fibres and fines using centrifugation and/or filtration which results in a water phase that contains dissolved and colloidal substances. Sometimes it is preferred to keep the fines in the sample – in this case their contribution to the result of the analysis has to be considered.

## Fractionation of process waters into colloidal material and dissolved material

After the initial sample preparation where fibres and fines have been removed, it is possible to separate the water phase into a dissolved and a colloidal fraction using membrane filtration.

## Ultrafiltration of process waters into low and high molecular weight material

The dissolved substances can be further separated into low and high molecular weight substances using ultrafiltration. The low and high molecular mass materials are known to react differently with additives, which is why it is interesting to know the relationship between them.



Karin Athley  
+46 8 676 7456  
[karin.athley@innventia.com](mailto:karin.athley@innventia.com)



Lars Sjöström  
+46 8 676 7178  
[lars.sjostrom@innventia.com](mailto:lars.sjostrom@innventia.com)