

# Retention Management and Control on SC Paper Machine

White water consistency control helps manage the challenges posed by high filler content

## The Challenge

A crucial factor for wet end control on SC machines is the high filler content that is linked to

- the use of fresh filler, at the same time maintaining correct ash retention level
- mechanical pulp properties,
- optimization of the wire section,
- on multi-grade machines, controlled use of broke.

## The Solution

Valmet RM3 is well suited for SC processes. The sensors measure the total and filler consistencies accurately even in varying conditions. White water total Cs control helps to reduce consistency variations in the wet end and prevent their effects from showing up in the web.

## Results

The control significantly reduces consistency variations in white waters as well as fluctuations in wire retention. It stabilizes the wet end, and a more stable wet end produces more uniform paper in machine direction – an important aspect on SC machines, with high quantities of fillers and fiber fines in the furnish.

White water Cs control is also a powerful tool for process optimization; especially in processes using a dilution headbox it improves the CD control performance.

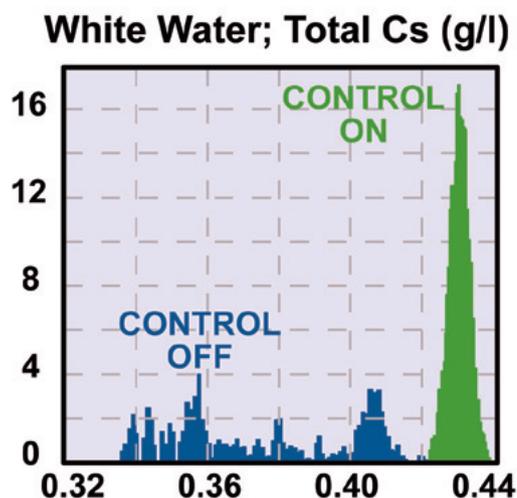
**Effect of white water Cs control on the wet end of one SC paper machine:**

Reduction in Std. Deviation	Grade	
	Low ash	High ash
White water total Cs	68 %	68 %
White water filler Cs	63 %	51 %
Headbox total Cs	47 %	53 %
Headbox filler Cs	34 %	38 %

## Why Valmet?

Innovation leader with a wide range of measurement and control application references.

- Accurate, reliable ash consistency and total consistency measurements for both headbox and white water
- Proven control solutions: single loop and multivariable control
- Professional help at all phases of control system implementation
- User training based on real experience in the field



**White water consistency control helps manage the challenges posed by high filler content in SC paper processes – Read more detailed information on the topic here!**

**The process**

A crucial factor for wet end control is the high filler content, maintaining the correct ash retention level, mechanical pulp properties, optimization of the wire section, and – on multi-grade paper machines – controlled use of broke. Valmet RM3 wet end measurement system is an essential part of efficient wet end control on SC paper machines.

**The measurement**

Valmet RM3 is well suited for SC processes. After calibration the sensors measure the total and filler consistencies accurately even in varying conditions. The example data shown in Figure 1 comes from a relatively large SC machine with an annual capacity of 230,000 t.

**How the control operates**

On most SC machines, retention chemical dosage is based either on wire retention or total solids Cs in headbox, and dosage changes are made relying on the operators' experience. Manual adjustment of chemical flow leads to stepwise changes in flows, wet end consistencies and wire retention. Reaction to disturbances usually follows only when the consistencies are way out of target.

White water total Cs control aims to reduce consistency variations in the wet end, preventing its effects from showing up in the paper web. This results in better PM runnability and more uniform machine-directional web quality. Control of SC machines follows the standard control principle (see Valmet RM3 white water Cs control).

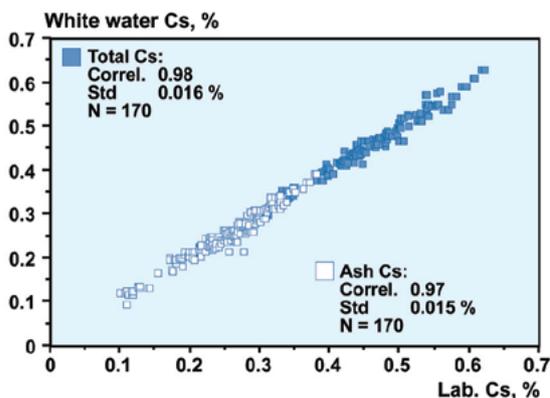


Fig. 1. White water consistency, Valmet RM3 measurement results from a 5-month period.

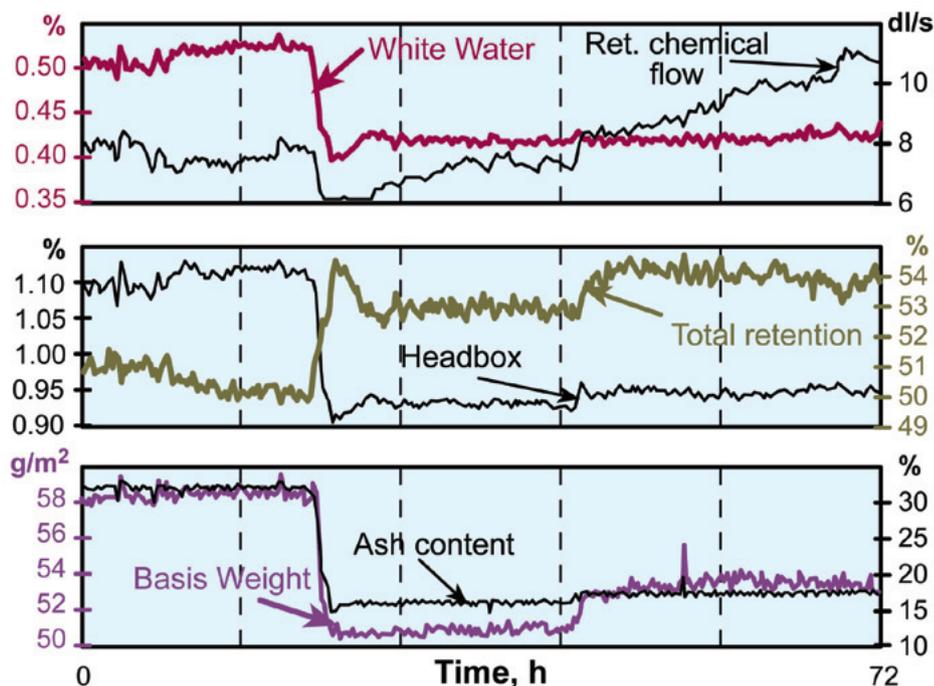


Fig. 2. How white water consistency control functions during grade changes.

The operator gives the setpoint for white water consistency. This is a powerful tool for optimizing the wet end running status: the operator can optimize formation, retention aid consumption, drainage, etc.

Sometimes it is necessary to use different white water Cs targets, as several different qualities with widely differing ash targets are normally produced on SC machines.

In view of the control, special situations include grade changes, breaks, and PM start-ups. Grade changes can be handled either with or without the control on, depending on the control implementation and the grade change. For major grade changes the control is often switched off first, and then started again once the consistencies have settled on the new range. Figure 2 shows two different grade changes: the first of these involves a clear change in ash target (control off), the second is only a minor grammage change (control on).

During web breaks the control is kept on: while stabilizing the wet end, it also makes web weaving easier and helps to get back to the required quality quicker. The control can also be utilized during start-ups.

Reduction in Std. Deviation	Grade	
	Low ash	High ash
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Fig. 3. Effect of white water Cs control on the wet end of one SC paper machine.

### Effect of control on the wet end

Typically the control reduces consistency variations in white waters down to  $\pm 0.005\%$  or lower (Figure 4), in other words significantly below the original range. The figures in Figure 3 were collected while running the same grade, half of the time with control on automatic and half of the time without control. The obtained results were then used to calculate how much the standard deviations were reduced when the white water Cs control was on.

As these figures show, consistency variations in the short circulation plummet when the control is on. Fluctuations in wire retention were also reduced by 20...40%. White water Cs control visibly stabilizes the wet end, even though the initial situation on this PM was rather good.

### Effect of Control on Paper Quality

A more stable wet end produces more uniform paper in machine direction. This is an important aspect on SC paper machines where high quantities of fillers are used and the amount of fiber fines in furnish is high as well.

On the PM described in Fig. 3, MD paper ash variations dropped by some 20% and basis weight variation by 15%. These improvements ensure the machine operators more stable running conditions and allow effective process optimization (higher ash target, tighter quality criteria, etc.).

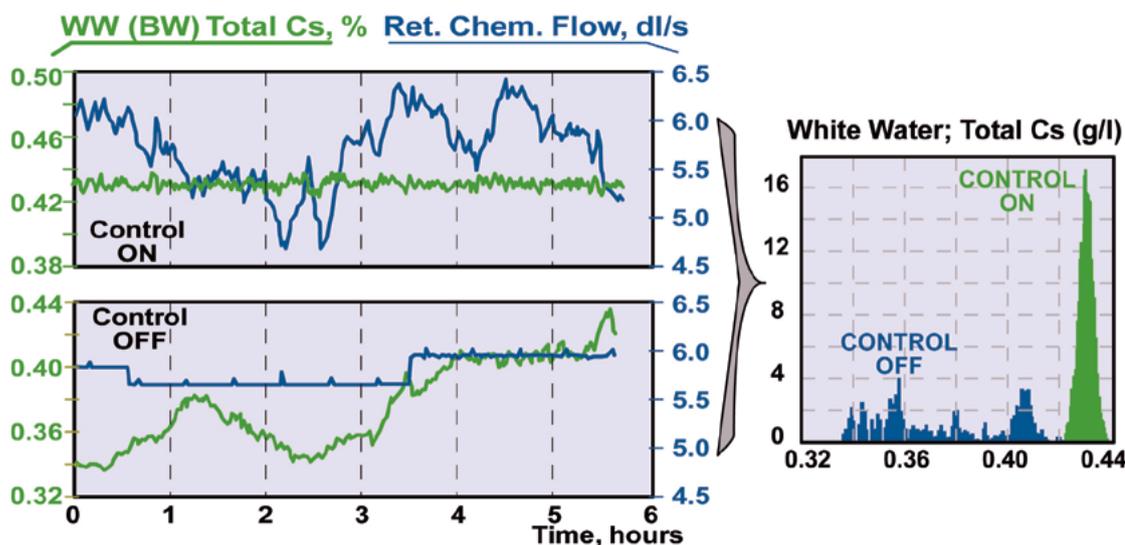


Fig. 4. Example of white water consistency control operation.

## Process optimization

White water Cs control is a powerful tool for process optimization. For example, when one white water Cs (bottom white water) is controlled on a twinwire PM, this Cs value can be used to give the Cs setpoint for the other (top wire) white water. If the ratio of these Cs values deviates from a set target, the control system alerts the operators. In other words, the control enables the PM crew to monitor product two-sidedness.

In dilution headbox, where headbox stock is diluted with white water to control CD profile, stable white water is very important. It improves the CD control performance. By maintaining the CD controller gain same all the time. This is particularly useful during various change situations—grade changes, startups, or web threading—or when the PM settings are changed.

In addition, during various trials (chemicals etc.) white water Cs control keeps one of the crucial wet end variables stable, so that changes in the studied variables can be seen better.

## Benefits of Valmet RM3

- Stabilizes wet end operation
- Reduces MD and CD quality variations in paper
- Improves PM runnability
- Enhances the operation of dilution in headbox
- Better control over grade changes and PM start-ups
- Powerful tool for product and PM optimization
- In many cases helps to cut retention chemical consumption
- Fewer sheet breaks
- Low maintenance need of Valmet RM3 sensors