

# Improving Process Control on Fine Paper Machine

## Efficient wet end management with white water Cs measurement

### The Challenge

In a fine paper process, the use of fresh filler and coated broke (ash retention) are central factors in wet end control. Other challenges include:

- maintaining good runnability with the high paper ash content
- different ash components
- coated broke
- recycled pulp
- effective dewatering
- required savings in chemicals, energy, fresh water
- retention, effect of calcium

### The Solution

White water total Cs control based on Valmet RM3 adjusts the retention chemical dosage to maintain a stable white water consistency.

### Results

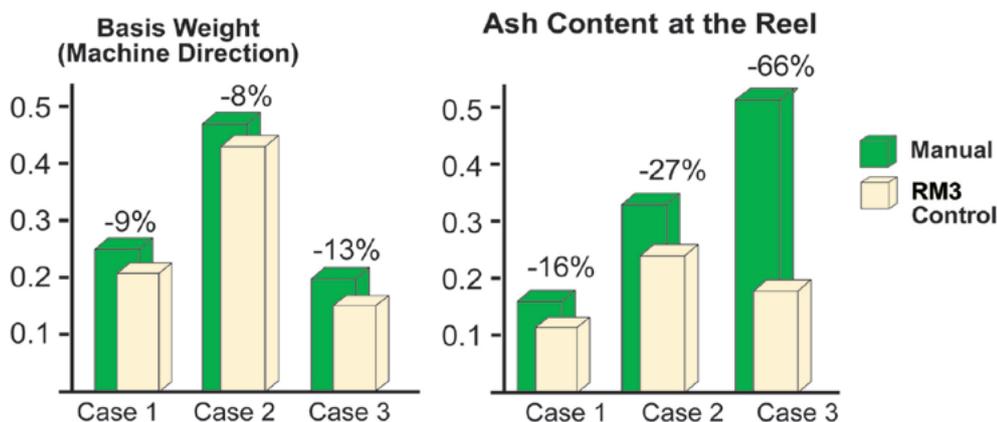
The control levels out white water consistency variation, stabilizing the wet end. A more stable wet end gives more uniform paper quality in the machine

direction. This in turn means better PM runnability and enables process optimization (higher ash target, tighter quality specifications, etc.).

### 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
- Proven results



White water control improves MD quality of the produced paper

## Improving Process Control on Fine Paper Machines: Efficient wet end management with white water consistency measurement – Read more detailed information on the topic here!

### The process

In a fine paper process, the use of fresh filler and coated broke (ash retention) are central factors in wet end control. Control challenges include:

- high paper ash content and maintaining good runnability
- different ash components
- coated broke
- recycled pulp
- effective dewatering
- savings in chemicals, energy, fresh water

Valmet retention control is an effective tool for tackling these challenges, and has proven results on many fine paper machines.

### The measurement

Valmet RM3 sensors have proved well suited to this process. Headbox and white water sensors measure the total and ash consistencies with high accuracy, even in varying conditions. The example in Fig. 1 comes from a small fine paper machine producing both machine coated and surface sized grades.

### How the control operates

The headbox stock of a fine paper machine contains very little fibrous raw material, whereas the quality and quantity of ash may vary considerably. Thus the retention is mainly filler and coating pigment retention. Fig. 2 illustrates the ash flows on a machine producing uncoated grades. As the drawing shows, more than 70% of the ash contained in the headbox stock circulates with the white water back to wire pit. This means that the first opportunity to detect changes in wire retention is to measure the consistency of the white water. The white water Cs control is based on this principle.

By controlling the total Cs of white water we can reduce consistency variations in the wet end. To accomplish this, the retention chemical dosage is adjusted to maintain a stable white water consistency. Consistency variations are eliminated, and the MD and CD quality of the produced web is more uniform.

The process itself determines how the control can best be used. For example the white water Cs setpoints given to the control system are dependent on process status. The upper graph in Figure 3 shows

how the same Cs setpoint can be used for several days. The lower graph illustrates how efficiently the given setpoints are reached by changing the chemical dosage. Both periods include several grade changes.

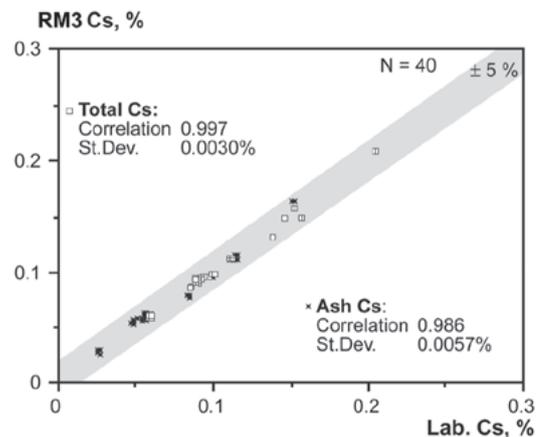


Fig. 1. Valmet RM3 vs. laboratory, 4-month period.

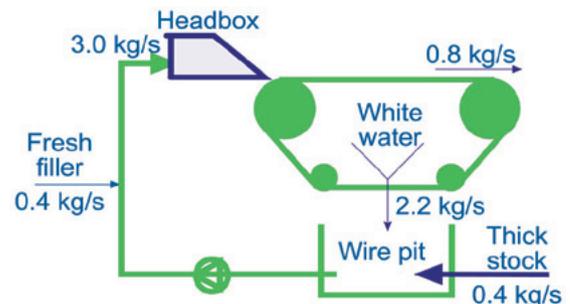


Fig. 2. Example: wet end ash flows of a PM producing uncoated fine papers.

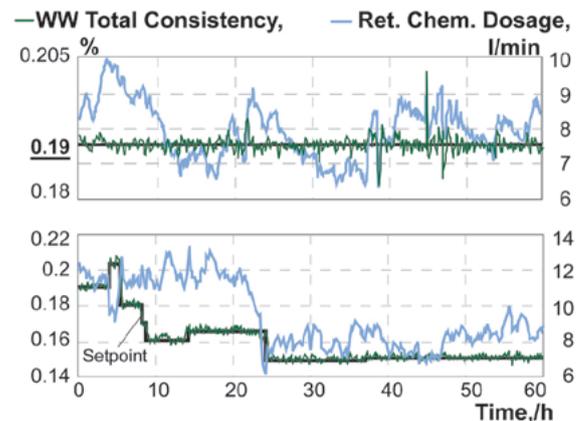


Fig. 3. Example of white water Cs control: changes in setpoint.

## Effect of control on the wet end

Typically the control system is able to reduce consistency variations down to  $\pm 0.005\%$  or even lower. Figure 3 shows that a well-operating control system can give even better results.

Figure 4 shows results from a trial period where the consistency variations with and without control were compared. Even though the initial situation on these paper machines was rather good, the control was able to reduce the variation still more. On all machines, producing both coated and uncoated fine paper grades, the wet end operation is clearly more stable with the control on, resulting in numerous benefits.

## Effect of Control on Paper Quality

A stable wet end gives more uniform paper quality in the machine direction. Figure 5 illustrates the effect of

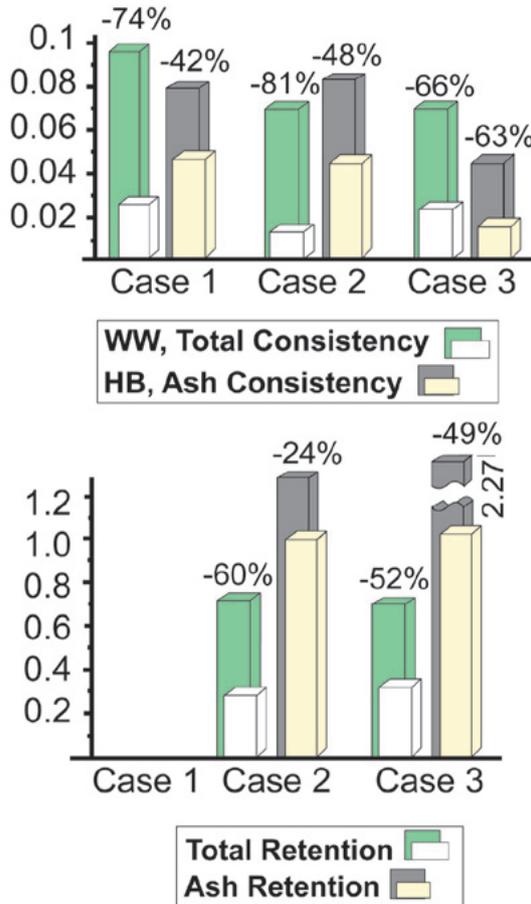


Fig. 4. Effect of white water control on wet end variations.

the control on some paper quality variables measured at the dry end. As the picture shows, the control improved appreciably the MD paper quality – this means better PM runnability and enables process optimization (higher ash target, tighter quality specifications, etc.).

## Process optimization

White water consistency control can be used as a tool when searching the optimum operating parameters for the PM. When ash variation in machine direction is reduced, the ash target of the paper can be changed to optimize production cost and quality (Fig. 6).

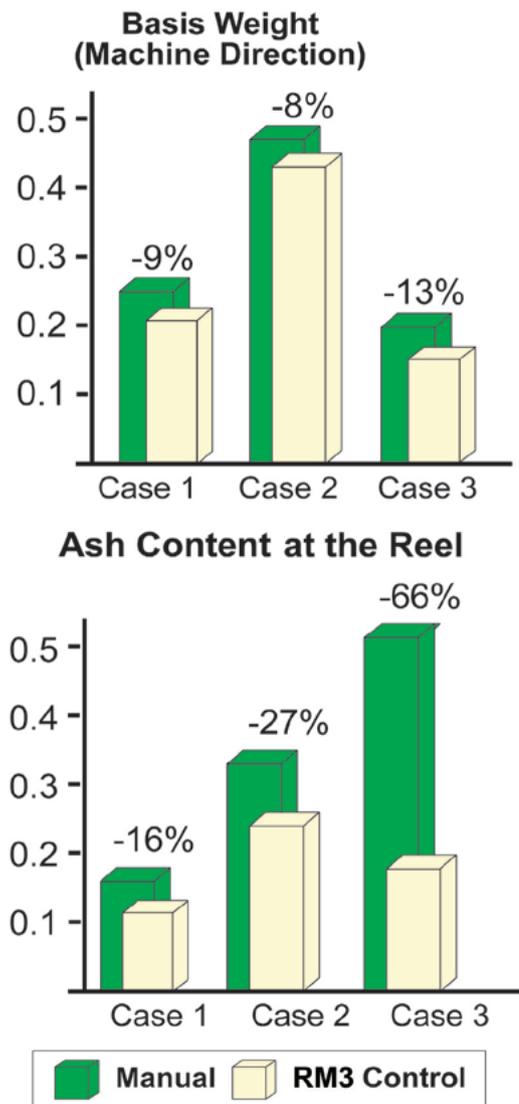


Fig. 5. Effect of white water control on MD quality of the produced paper.

Well controlled retention chemical addition allows the operators to make trials and to find the chemicals and dosaging methods best suited for their process. After web breaks and grade changes the control keeps the wet end stable; the PM is soon back on target and off-grade production is minimized. While the measuring system keeps the process under efficient control, it is also a good “watchdog” that alerts the operators immediately when anything unusual happens in the process. In the graph in Figure 7, the addition of furnish components was disturbed at the 7-minute mark. The control system gave alarm to the PM operators who were able to fix the malfunction in a few minutes. During this time the control stabilized the wet end operation and prevented a highly probable web break.

### Benefits of Valmet RM3

- More stable wet end operation
- Less MD variation in paper quality
- In many cases the system also gives retention chemical savings
- Better control of grade changes and PM start-ups
- Tool when optimizing retention/formation/ dewatering
- Gives more process information on a continuous basis – less need for laboratory testing

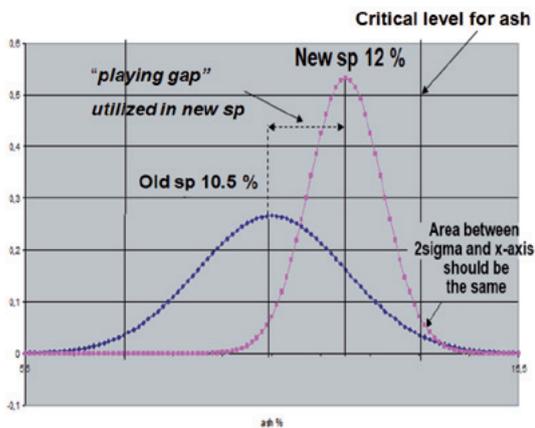


Fig. 6. Stable paper ash enables higher ash content in paper without loss of runnability.

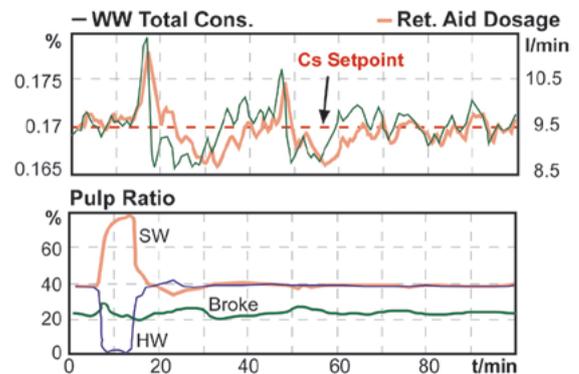


Fig. 7. Operation of white water consistency control during process disturbances.