“Having accurate consistency control of the wet-end’s stock is of prime importance to the overall efficiency of the plant’s paper-machine”.

That statement effectively sums-up the result of my better than 50 years' past experience within the pulp and paper industry.

Having more than 40 of them within the Instrumentation / Process Controls field, always needing to solve sources of upsets to the plant's production.

In my trade, having worked throughout the pneumatic control phase, allowed me to see previous limitations compared to present digital methods.

Having available today's DCS controls' capabilities has enabled having an insight into solving some of the plant's greatest production problems.

The biggest of which was to have the availability of trending of all the variables to better effectively tune the stock prep area for true stability.

As well as having to work with digital controls; having to re-learn previously used tuning rules, as the old system's response times were gone now.

Due to having the plant's old control system's pneumatic signal lines being replaced with DCS instantaneous values being written to field devices.

Since tighter control tunings had been made available along with the trend capabilities, it allowed a greater chance to more clearly address problems seen.

Having these new tools available allowed arriving of the conclusion that **stock consistency** is the greatest overall **upsetting factor** to system stability.

Consistency variations introduce further system upsets by causing varying pump flows, even as its speed has been kept constant by effective earlier tuning.

These unaddressed variations cause tanks' levels upsets, which in turn lead to more possible system upsets caused by head changes feeding further pumps.

The overall effect being a great source of instability to the whole stock prep system never being able to stay in a well tuned state, regardless of effort.

Leading to the conclusion that the most beneficial method by which to allow a more robust stock delivery system is to have a reliably true consistency value.

Which is easier said than done, as all available consistency transmitters available to paper-mills are all based on **‘inferred measurements’** of the stock.

Since the **only true** measurement is to have a hand sample be carried out according to industry standards, hardly beneficial for present high speed needs.

Since that method is far from being practical, the next best thing is to have the inferred reading be done on line as having been based on slurry thickness.

While that accepted method is the best alternative, it's also imperative that to have a **valid** value, all the transmitter's quoted needs have to be followed.

The greatest of which is keeping the stock flow past the measurement sensor within the needed max-min value to get the transmitter’s quoted accuracy.

Which have been provided by the manufacturer, as their results have been based upon **resistance to torque** as being the actual consistency value.

Which is a very difficult goal, as the water pressure needing to be constant for optimal control has also rarely been made available by the mill.

As well as being aware that varying production rates with varying flows past the sensor should never be the cause of industry seen zero shifts.

That being the greatest reason found, to having to shift the zero when carrying out field calibration checks due to faulty conditions.

Only to have the newly shifted zero be a possible source of further downstream upsets not having been accounted for with previous tuning.

Having the knowledge that with the proper conditions being present, the need for shifting the transmitter’s zero should never be a requirement.

That leaves the only option for getting repeatable accuracy, is to keep the flow within the manufacturer's specification, regardless of production rate.

It was found, that the best method to achieve that was to align the whole of the stock delivery system to be *‘in sync’* with the needs of the wet-end.

That is preferred, as the best actual correlation to the stock feed's final consistency value has been reflected by the sheet scanner's results.

Since the only means of getting the needed weight of the final product, is by adding or subtracting the stock supply requirement to the headbox.

That has been established by the sheet's **scanner** at the end of the paper-machine; it seeing the **actual weight** of the produced product.

Realizing that the scanner is considered to be absolute truth, it made sense to have it be the standard for which the whole stock feed system needs to meet.

With that in mind, the whole stock supply system’s consistency transmitters were correlated to reflect the scanner’s basis weight values.

Working backwards from the last transmitter before the headbox, a setpoint was chosen with a flow value in acceptable range having been available.

Allowing the fact that the chosen consistency value being used has been verified as being the same consistency value as seen by the basis weight unit.

Once that was carried out without having any adverse flows, the next consistency transmitter feeding that one was set up in the same manner.

Using the same method for all the system’s consistency transmitters, with ideal setpoints for each unit, they all became aligned with the scanner.

When having completed all 11 of our transmitters within the stock feed system feeding the wet-end, the whole delivery system became very stable.

Along with that achievement further realized values were seen, such as steadier tank levels without the need to play catch-up from being too light.

While also clearly showing the upsets that have been created when a system's level or consistency controller's setpoint has been changed to a new value.

The level setpoint change causing the controller's 'gain' factor to have an instantaneous action leading to upset a previously stable level/water system.

While a changing of the consistency controller’s setpoint, could possibly upset the previously accounted for value as had been compared to the others.

The previous description has outlined what had been completed with measurable success over a period of about a ten year stretch with our DCS.

But certainly not without issues that needed to be overcome, having been caused by manual interference along with unwarranted setpoint changes.

Either of which would introduce wild system upsets that made null and void all previously effective tuning values with new responses.

Having to initiate the plant-wide usage of a **Standard Operating Procedure** to prevent set-point changes unless warranted by descriptive reason.

Which would be followed-up with an investigation to address the situation to finding a solution, or keep the newly used value for the set-point.

After completing all that, we now had a complete stock delivery system that responded **‘as a whole’** with the varying needs of the paper-machine.

Due mainly to the whole system being capable of having a more consistent weight, achievable with more accurate readings from the needed transmitters.

As well as from experience gained from tuning three DCS systems over 25 years, allowing our plant a greater production capability without stock induced upsets.

Leading to the biggest hurdle to overcome, being having to address the actual stock being to be in range leaving the system’s hydrapulper.

Since it’s considered to be the most problematic due to extreme conditions around the extraction plate and possible pump cavitation issues.

A situation problem we have addressed with a solution called **Autorate**, that controls the actual consistency of the pulper while still in the tub.

To have your plant receive the same benefits, drop us a note.

Our address being:

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