

# TAPPI - PaperCon Nashville 2014

## Absolutely New Approach to Control Task

Franz Maischberger



**Mondi Frantschach GmbH**

**Frantschach 5**

**A 9413 St. Gertraud**

[franz.maischberger@mondigroup.com](mailto:franz.maischberger@mondigroup.com)

[www.mondigroup.com](http://www.mondigroup.com)

**Austria**

**Europe**

Peter Fisera



**Schulstrasse 14**

**A 8077 Gössendorf**

[office@procsim.eu](mailto:office@procsim.eu)

[www.procsim.eu](http://www.procsim.eu)

**Austria**

**Europe**

## Absolutely New Approach to Control Task

All processes are controlled using information from the past!

The control systems are correcting deviations, which has already happened. The process is moving itself into wrong direction and controllers try to correct it back to target.

Our approach is to control process from the future!

We are analyzing and optimizing control results in virtual future via **SIMULATION** before activating controller in order to avoid process deviation in the real future.

We are carrying out the process to the target using the best way there. We are leading the process keeping it near to the optimum with precision close to instrumentation accuracy!

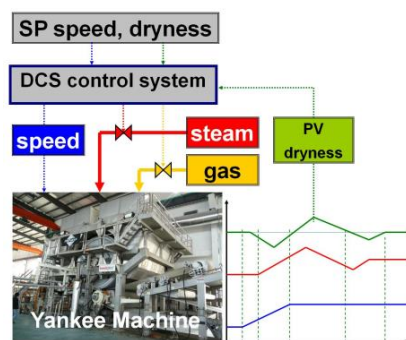
This is a completely different approach comparing classic controller reaction on deviation, especially for processes with long dwelling time!

This is absolutely new access to control task. All control steps are checked and optimized on virtual paper machine, which represents behaving of real one in all production conditions.

The virtual machine simulation is composed from physical equations, geometry data and drying process thermodynamics. The paper dewatering and drying properties are continuously deriving from behaving of real machine. The simulated results are validated with measured ones in all production conditions during several months.

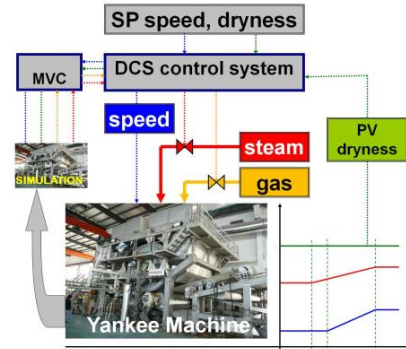
The automatically working adapting routine covers long period changes due to equipment wear!

Classical speed control loop takes too much time to stabilize new working conditions. This costs production and energy.



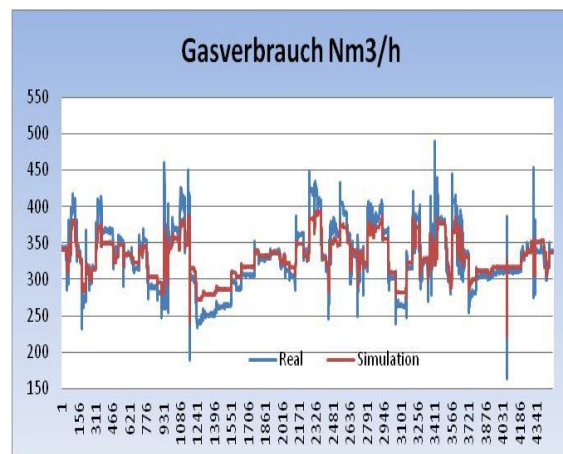
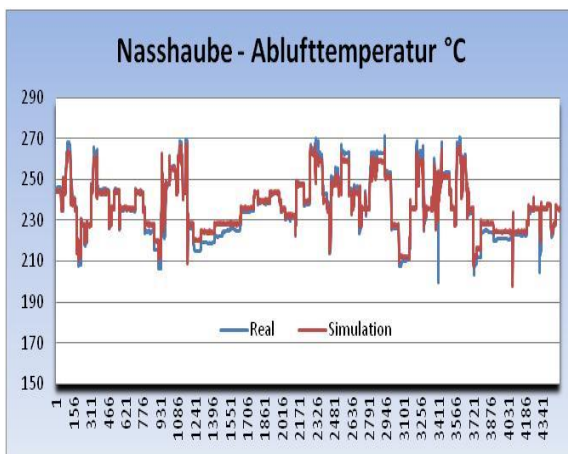
The machinery and technology is able to react significantly faster than classic process control enables. The slowest element in this chain is the control approach itself based on lack of information from process.

The multivariable controller (MVC) supported by **rigorous physical simulation models** leads the process on shortest way to the target. Minimising unproductive time and Saving energy costs.



The MVC proves control response and optimises ramping of set points primarily using simulation, then controls the real machine. MVC leads drying process to optimum for each grade maximising production and minimising energy consumption.

Validated physical simulation model of drying process once validated copies the real process online with highest precision. The simulation of heat transfer and evaporation in the wet hood results into the same exhaust air temperature over 2 month production period.



The physical modelling of gas burning camber and web drying in both hoods (as part of drying process simulation) simulates gas consumption in all production conditions with highest accuracy over 2 month observing period

The virtual machine is connected to MVC equipped with expert system to control paper machine in difficult process situations like break, start up, big grade changes etc.

To access immeasurable ambient conditions of paper production the **school grade based rating system** set by operator has been integrated to the multivariable control in order to impact aggressiveness of control algorithm.

The results of virtual machine are additionally used as soft sensors for difficult measurable process variables like cylinder surface temperature, web temperature and air humidity.

The controller includes optimizing function **for energy split between steam and gas** to optimize specific energy costs.

During one year observing period the new control approach using virtual paper machine connected to the multivariable expert system achieved following results:

#### Benefits

- Increase of production about 2%
- Halving of start up and boot time up to key performance parameters
- Reduction of gas consumption by 6%