

Simulation of a paper machine with the simulation software FlowMac

A part of a master thesis was building up a simulation model to find weak parts or bottlenecks of the paper machines wet end. There are many different simulation softwares on the market, after comparison of a couple of softwares the decision was made to use Flow Mac. Flow Mac is an extension for ExtendSim, it provides simulation blocks specific for the pulp and paper industry, such as pumps, chests, white water silos, drying groups, wire sections and so on.

Before the simulation was build up, a bunch of data was collected, to feed the simulation model with sufficient data to achieve a model working close to the real machine. Mostly it's consistencies in different part of the machine, the machine speed itself, pump and chest size, mass flows and the fiber – filler ratio.

After the data collection was done, the simulation was stepwise build up with big support of Mr. Opdal, owner and developer of FlowMac. Then the running model was continuous developed until the values were 99 - 100 % to the values of the machine. With this realistic model, some parts of the machine were changed to see the impact to the finished paper.

Most important parts were the size of the mixing chest, bigger mixing chest gives a more stable running paper machine in point of basis weight fluctuations.

Another result was the impact of different retention values during the simulation, this could be achieved with a wire section, which allows to change the retention during the simulation. It could be seen how the white water consistency rises. Low white water consistency is a target for every paper machine, it's a significant value how good a machine is working. With high consistencies in the white water, this machine will run into problems with the flotation unit, as this unit can only handle a low amount of filler and fibers in the water. If it's too high, the separation of solid and liquid is not working any longer. This then leads to filling up the system with fibers and fillers, where, in normal case, only clear filtrate is. This affects the whole mass balance of the paper machine system negatively.

The last result found out with the simulation model, was the required mixing pump power to run a new quality on the machine. The new quality is nearly double of the normal basis weight. Here the consistencies in the approach flow were set to maximum and then the possible machine speed was calculated by the simulation software. It is possible to run this new quality on the machine, but the maximum power of the mixing pump will be achieved.

The usage of FlowMac running on ExtendSim was also a test for the company if they will purchase the software. After a successful usage during this thesis, the group decided to buy several licenses to build up more simulation of other machines.

Conclusion:

The simulation tool FlowMac running on ExtendSim is a powerful tool to simulate paper machines from pulper to pope. It can predict precisely the mass flows, if the model is fed with enough and correct data. This helps to understand the paper making process better. It's more easy to change settings in the model, than on an existing paper machine and to see the impact to the process. This can help to make the right decisions in point of investments to improve a machine and of course save money.