COMPUTER CONTROL OF M&D CONTINUOUS DIGESTER; BASIC PRINCIPLES AND AN APPLICATION

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SUMMARY

The stabilization of the conventional control loops, the determination of optimal values for the setpoints of these and the optimal utilization of raw materials with the aid of a digital computer system in the M&D continuous digester process have been studied. The resulting control strategy reduces the variations in the quality i.e. in kappa number of the produced pulp and it makes also possible to change the production rate or quality smoother than by conventional control. Also an effective reporting system has been included in the system.

The main ideas in this control system are the automatic calculation and correction of the demanded flowrates for the white liquor and for the black liquor. Here use is made of alkali-to-dry wood and liquid-to-dry wood relations. The calculation of cooking time is based on the constructive details of the digester and it will be controlled according to the desired production rate. The desired product quality will be achieved by controlling the target kappa with the aid of the H-factor simulation model. This strategy has been applied to the sawdust cooking process using Bauer M&D continuous digester in the Kaukas Company, Lappeenranta, Finland. The computer control system used here is the Nokia PP 6500.

The first results and experiences of this project will be presented here.

INTRODUCTION

The computer control of discontinuous cooking of kraft pulp has been applied for several years and good experiences have been reported /1,3/. Also the continuous Kamyr digester has been intensively studied /2,4/ and some DDC- applications exist but there
have not been resulted such profitable figures as in the discontinuous case. This is quite understandable because the batch process is much more suitable for optimization than the continuous process; for example a small decrease in processing time can increase the production rate remarkably.

Anyway a closer control achieved by the digital computer with static process models can in many cases improve the process economy also in continuous processes.

The starting point in this project was the following: The cooking process will be handled as a static lumped parameter process with a few measurable input and control variables. The output variable is the product quality ie. kappa-number, clorine-number etc., which so far can not be measured directly. Instead of direct measurement a simulation model is used for calculation of various setpoints. The result will then be corrected based on the laboratory measurements of kappa, if necessary.

The first stage included the improvement in process instrumentation with some process changes included, the stabilizing control, reporting and the use of simulation model for kappa control. After this the static and dynamic optimization of the process can be done.

Figure 1. the schematic lay-out of the process.