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Research area: Process aims

Process measuring and control technology // Other

Key words:

NIR spectroscopy, paper bale quality

Title:**Automation of the Control of paper Bale in Control of Incoming Goods in Paper Mills****Background/Problem area**

The composition of paper bales is determined in accordance with their grades. Only a few chemical properties of the bales are set within limits. Basically, the bales should be free of unusable components and should have a moisture content below 10%. As even these two requirements are not consistently adhered to, there will be considerable additional costs of treatment and disposal of non-paper components and for the purchase of additional material. A real incoming goods inspection of bales to humidity is generally only carried out in case of clearly visible overrun of the limits and in case of unusable components after external visual assessment. Questions about the ash content, the pulp content and the nature of the fibers may be answered only after opening of bales and statistical sampling. For the incoming goods inspection of waste paper, delivered as pressed bales, a measurement method has been developed and put into practice by the PTS, using NIR (near infrared) technology. This provides after drilling a hole in the ball and after a measurement with a lance data on moisture, ash and plastic content as well as for ratio of mechanical pulp / chemical pulp from the inside of the bales. Approaches to use a core drilling (sampling method) as well as analytical method have so far not yet put into practice.

Objectives/Research results

The objective was the design and development of a measurement technology and hardware environment, based on PBS, to carry out PBS measurements in an automated way and in an expanded scope.

The project's minor objectives have been:

- o adjustment and testing of the NIR measurement technology and drilling techniques to the measurement task.
- o development of a control system to monitor the measurement process.
- o assessment and evaluation of the entire amount of paper bales without human labour.

At the end of the project, a prototype of a combined drill und measuring device, capable of working under harsh environmental conditions could be presented. The device is portable and on the other hand heavy enough to stand stable at a certain spot.

The system can work over a period of 24 hours without human interference and is capable the make the principle actions (recognising of bales, drilling, measuring, calculation of the results and calibration) on its own. Furthermore it can react on the main disorders appearing under normal working conditions.

Within the Project the quantitative methods to measure moisture, plastic, filler and the contend of mechanical pulp have been fully renewed. On the other side, new mathematical methods have been developed to handle rare paper types and to deal with the problems of automated working, such as the influences of sun light, pollution of the probe and unknown circumstances. The software environment has been as well adopted on independent working.

Application/Economic benefits

The automated bale measuring system can be used directly at the gate of the mill or in other stationary places. In principle, it can be also used as goods output control for producers of paper bales.

Manufacturer of medium and low grades have the need, to monitor and to keep the moisture content and the content of unusable components low. Producers of higher paper grades (e.g. Tissue) want to have recovered paper with a low content of mechanical pulp and low ash content. These producers have to handle white, wood-free but strongly filled or coated sorts.

For the calculation of the real potential of the possible savings is assumed that only half of the incorrect paper bales are acknowledged and again only 50% of the costs can be got back.

The price of recovered paper is assumed with 60 € / ton. This applies to a mixture of the common sorts 1.02, 1.04 and 1.11. For these sorts humidity and plastic problems are usual. For higher sorts the plastic content is not so high and humidity is usually not a rejection criterion.

From the monitoring of the ash content it is expected that the savings will be over 10% of the material. Even for these good sorts the range of the ash content is from 20 to 45% for the same fiber quality. A reduction of 10% is possible with continuous measurements.

With the stationary used of an automated system and more stable NIR measurement technology higher accuracy of the results is expected. This will allow monitoring the thresholds more precise. This will lead to cost reduction.

The costs for deposition of rejects are about € 100 per ton. In the future increasing prices are expected. The possibilities for disposal of these substances in own incinerators will fall due to the higher environmental requirements.

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Remarks

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