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Research area:

Raw material / recycled paper

Key words:

NIR-spectroscopy, paper bales, control technique

Title:

Spectroscopic quantification of non-paper material in recycled paper bales using NIR-measurement techniques**Background/Problem**

Recycled paper is specified by the European norm EN 643. This includes that the sorts 1.02 and 1.04 should be free of non- paper material. On the other hand the maximum amount of water is set at 10 %. Several tests have shown that paper of these sorts contains about 3 % non-paper material and has water contents of about 13 % (mean values). If the maximum values of water and non-paper material are exceeded less usable material comes into the paper plant and more material has to be separated from the fibre material. Unusable material has to be sold at high prices which makes it much more undesirable.

Various techniques have been developed to quantify the amount of these undesired materials, but all of them rely on visual control of the bales surface or a visual inspection of an opened bale. Full scale assessments of paper bales by gravimetric measurements of all components or lower scale assessments after a core drilling are seldom used in Germany.

Experiences in the use of NIR spectroscopy showed that there are some technical ways to distinguish material in the paper and non-paper material. Furthermore NIR spectroscopy is capable to detect water with a high accuracy as well. Within the last two years PTS has developed a lab-scale device with a suitable probe to collect spectroscopic information within a paper bale. This follows a simple hole drilling with a diameter of about 20 mm.

Research objective/Research results

The aim of this project is the determination of the quantitative amounts of non-paper material and water within paper bales of the sorts 1.02 and 1.04. This will be based on a portable NIR spectroscopic device. Within the project this device will be tested under real conditions in three companies. The mathematical methods will be developed, validated and adjusted in this series of test measurements.

Until now the following results have been achieved. The existing methods to quantify water, polymers (non-paper material) ash, fibre material and mechanical pulp will have been finished soon as well as the transformation of the complete analysing software from the desk-top computer to the new portable system called SentroCube.

To provide possible users with a reliable and cheap device to drill the necessary holes into paper bales, PTS is in contact with a supplier of compact drilling systems. These devices can be mounted with standard drilling machines and work fast enough to produce several holes per minute.

The core software, that serves as a connection between the hardware and the touch screen has been adapted to the new environment of the SentrCube. The only way to communicate is now this screen. A key board is only available on demand. The screen design of the software has been improved as well, for the size of the screen has decreased to about 20 cm.

At the actual state of the project the on site trials of the portable system can start in early August and will be finished in October.

Application/Economic benefits

After finishing the tests in several paper mills and the final software development PTS will have an integrated hardware and software product, that can be sold to paper mills in Germany and later on in Europe. The price for the portable system will be about 40.000 Euro. For the drilling system PTS works with a partner company providing the system on demand.

Taking into account the actual prices for paper bales of the sorts 1.04 and 1.02 and the average amount of water and non-paper material of bales of this kind, a NIR system will amortize after testing about 10.000 t of paper bales. This can of course only happen, if the prices of those paper bales, that are outside the range of undesired material will decrease.

Project period: 01.01.2005 - 31.12.2005

Remarks

Research project INFOR 72 will be funded by the Federal Ministry of Economics and Labour.

Are you interested? Then send us this short description with your name and address via fax. The project manager will contact you afterwards.

I want more information

I want to participate in the project

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