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**Research area: General aims**

Production economy // Monitoring and control systems

**Key words:**

NIR-spectroscopy, recovered paper, substitute fuels

**TITLE:****Development of a method for rapid determination of quality parameters in recovered paper bales based on an NIR measurement system****Background/Problem area**

Recovered paper is still the most important raw material in the paper industry. As well there is the tendency to use more recovered paper. With the need to recover more paper, especially from households, the quality of this material will decrease further. On the other hand more and more substitute fuels have to be used to reach European ecological aims. These materials (e.g. rejects of paper production) contain reasonable amounts of recyclable fibres and a high content of water and unwanted plastic material (PVC). Because of this they cause problems when used as fuel.

The quality control of both materials (recovered paper and substitute fuel) is time and cost consuming. In most cases the personal knowledge of the staff is the only way of characterising the quality. Reference methods can only be applied in laboratories on a small part of the materials with a high statistical uncertainty. In some special applications measuring devices have been developed. So it is possible to measure the moisture of the outer layers of paper bales with the AP 500 or the moisture, plastic and ash content of those bales after drilling a hole into the bale (with PBS, paper bale sensor). Core drilling devices are in use as well, but are very cost intensive. For fast and reliable control and testing of substitute fuel no device is known, that is working without sample preparation.

The use of fast and on-site measurement techniques is a frequently named requirement. NIR spectroscopic measurement methods are in principle able to measure the ingredients in the quality relevant materials, using appropriate mathematical and quantitative methods. On the basis of a prototype of a portable diode array spectrometer PTS has developed a predecessor device, the Paper Bale Sensor (PBS). Ten units are in use worldwide and have delivered valuable information for the concept of a production-ready equipment for industrial applications.

**Objectives/Research results**

The goal of the PTS was to develop a method for the rapid, quantitative determination of constituents in waste paper bales, based on a new, compact and robust instrument. On the basis of a new device (Sentronic) paper specific mathematical evaluation algorithms and industry-specific user interfaces have been developed.

Priorities had been:

- creating methods for the parameters humidity, plastic, ash, mechanical pulp with improved accuracy
- recording and display of profiles of the parameters (eg humidity) along the test section
- creating methods for new parameters and new applications (whiteness, rejects)
- Industry-specific user interfaces (operation, visualization, communication)
- Industry-specific performance characteristics with regards to ergonomics (weight, handling, life cycle) and durability (outdoor use, safety, wear)

In close coordination with Sentronic and SensoLogic the operating software had been configured. Based on the theoretical insights of the previous work packages, the discussions with factories using RP-bales and specialists of the PTS, which work in RP-treatment, the concept of the use of a measurement device has been finished.

**Application/Economic benefits**

The project results will provide a tool to the paper industry for quick and easy quality monitoring in the value chain of RP-paper from acquisition to processing. Based on the experience of the predecessor device PBS a functionally significant increased measuring solution has been placed on a solid hardware basis.

This project has used existing skills in the PTS in the area of NIR spectroscopy, the measurement of recovered paper (bulk and bales) and the process and quality management and will continue to expand. The development of technical equipment in a collaborative basis lead to optimal conditions for achieving the objectives of the project.

Through the design and on the basis of prior knowledge, a procedure with unique features has been developed. Since the project also aims to RP-related and completely new applications, new markets can be opened up and existing can be addressed.

**Period of time: 01.11.2009 – 31.01.2012**

**Remarks**

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