IGT NEWSLETTER

IGT Testing Systems

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The Stora Enso Berghuizer Paper Mill in Wapenveld has a long tradition of papermaking, its history going back as far as 1711. As the name indicates, the paper mill is now part of the Stora Enso group. The Berghuizer, as the mill is commonly called, has two paper machines with which they focus on the top of the market for envelope paper and office paper, among other things. The company uses test equipment provided by IGT Testing Systems to maintain and improve the high level of quality.

Bert Bagerman has just printed a test strip on the F1 tester.

High-level quality assurance at 'The Berghuizer'

The Stora Enso envelope paper "Superior Envelope" is considered one of the better varieties in this sector in Europe. The Berghuizer has succeeded in raising quality even further over the past few years. The paper is available in rolls or in large format sheets. A number of specific quality requirements apply to envelope paper. It must have a high degree of whiteness, but must also be non-transparent and have high print opacity. The formation of the paper is therefore very important. Formation refers to the fibre distribution in the paper. If the paper is held against the light, it should not be cloudy. The inside print is characteristic for envelopes, this must make the contents of the envelope invisible. High demands are also set for this. It is also notable that there are no differences between the two sides of the paper: it is nearly impossible to distinguish the wire side from the felt side. Finally, there is still the runability, the paper must run though the ever-faster operating envelope presses without causing any failures.

Requirements for the inside printing

The inside of an envelope is nearly always printed in flexo, while either flexo or offset is used for the outside. The inside must be nicely, uniformly printed. The ink may not bleed through the paper and the print also should not have effect on the white-reflection of the outside.

To check the effect of the inside printing, The Berghuizer uses a F1 flexo tester. Strips of the paper to be tested are printed and several measurements are taken, involving properties such as bleeding, white-reflection on the back, ink absorption, the density and evenness of the solid print. These tests used to be done at commercial envelope printers, but that was quite time-consuming. The flexo test using the F1 is now an essential part of the regular quality control in the production process. When a new batch of envelope paper is manufactured, the test strips are printed immediately after production starts, and the paper is checked for meeting the specifications. This process facilitates quick feedback.

The test strips are tested with water-based inks, which are most commonly used in envelope printing, these special inks form the critical limit in envelope printing from a technical point of view. If it is possible to print the paper with these inks, all commonly used inks will deliver good results in practice. Tests are sometimes performed with inks supplied by the envelope printer, especially to check if the inks are actually suitable for printing the inside. So-called deep-colouring inks in particular have a tendency to cause bleeding problems.

(continued at page 2)

Evenness of office papers

Office papers are another important component of the Berghuizer Paper mill product package. These are papers that are used in colour copiers and digital printers. Many of these systems use dry toners, while others use ink-jet as their technology. Copiers and printers of all the well-known brands are set up in the test area. Roughness and formation are important properties of office papers.

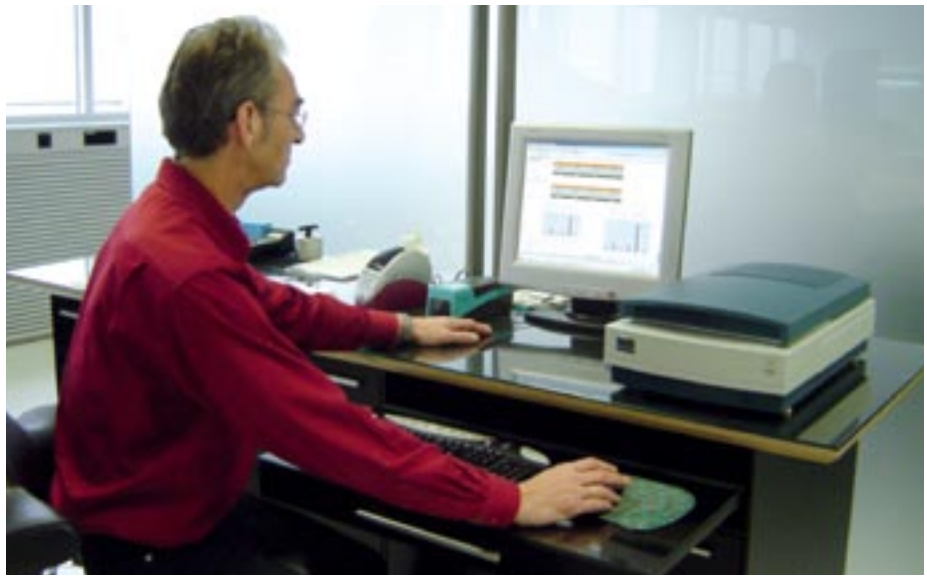
For dry toner technology there is a trend towards finer toners, which enable thinner layers to be applied to the paper. The uniformity or evenness of such a layer has become a critical property as a result. Evenness is checked by means of the PTS-DOMAS system, which consists of various modules. In this case the PTS Print Unevenness module is used, about which more information is provided elsewhere in this issue. Although this module was developed for evaluation of the evenness of printed samples, it can also be used quite well for measuring the evenness of prints and copies.

The starting point of the measurement is a copy or a print with a solid. The Image Analyzer scans this solid and converts the optical values measured into grey tones. In principle, 256 grey tones can be produced with dry toner technology. The essence is the distribution of the grey tones: what is the highest (white) and what is the lowest (black) value of the grey tint and how are all the values in between distributed over the paper? The Image Analyzer at The Berghuizer Paper mill is programmed in such a way that the differences in grey value registered by the Analyzer correspond with the differences observed by the human eye. In this way an objective measurement based on human perception is created.

A PC performs the statistical calculations and eventually it will produce a number for evenness. This value is compared to the reference value for the relevant paper.

"This is quite an improvement on the past process," says Bert Bagerman, quality assurance manager. "It used to be a more subjective, visual evaluation, but now we have an objective value for evenness. This allows us to check the paper production and compare it. Moreover, we now have a standard to evaluate improvements in our production process."

The F1 printability tester and the PTS-DOMAS system are two valuable resources in quality control for the Stora Enso Berghuizer Paper mill. Continuous pursuit of better quality paper types is now even better supported with objective measuring methods. ■



The PTS-DOMAS system converts the measurements of the Image Analyzer (on the right on the desk) into a value for evenness and a graph representing the distribution of the grey tones over the solid. If necessary, these can be compared to the values of a reference paper.

Beware of imitation pick oil

Imitating proprietary brands is big business. Even IGT pick oil does not seem to be able to escape these practices and is imitated especially in Asia and the United States. Research has shown, however, that these imitations cannot be compared with the pick oils as delivered by IGT. Moreover, there are large differences between the various offered oils. A comparison with earlier pick tests is therefore impossible. For executing pick tests according to the ISO norm, only the IGT pick oils in the known three viscosities qualify.

These oils are produced under strictly controlled conditions and after that are tested elaborately. This is how IGT Testing Systems can guarantee that all oils from batch to batch are the same. The use of pick oil in bottles is strongly advised against because of the hygroscopic character of the liquid. ■

Maintain a constant climate

In ISO 186 the climatic conditions for carrying out paper tests are standardized. These tests have to be carry out by a temperature of 23°C ± 1°C and a relative atmospheric humidity of 50% ± 2%. It is very important to keep up these values. If one deviates from them, different test results can be the consequence and the results can no longer be compared with each other.

It will not always be possible to maintain these climatic conditions. For example, in paper factories paper tests are often carried out in the production department to check the running paper production. In these departments there are no standard testing conditions. However, because of the comparability of the test results it is even then important to keep the deviating conditions as constant as possible. If possible, recalculate them to the standard conditions or record the applying conditions as best one can. In order to execute trustworthy correction the temperature must be measured with an accuracy of ± 0.1°C in the area of the tester and the inkingunit. ■

Measuring evenness using Domas digital image analysis

The Papiertechnische Stiftung (PTS) in Heidenau (Germany) is an international research institution which is well informed about the paperindustry. The activities of PTS cover the entire trajectory of pulp production all the way to paper production, including the machines used in these processes. In addition to research, PTS also provides consultancy, handles training, organises conferences and develops methods for quality control.

IGT Global Standard Tester 2

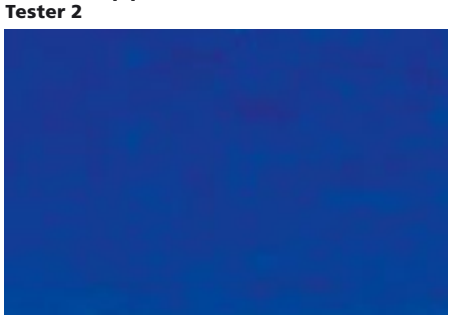
PTS has developed an image analysis system for studying coating and printability properties of paper: the Digital Optical Measurement and Analysis System (DOMAS). This system consists of a number of modules for various applications. PTS and IGT Testing Systems have been familiar with each other for a long time and co-operate closely in a number of areas. In that framework, PTS enjoys the use of the extensive international network for sales of IGT equipment. IGT Testing Systems has been selling the DOMAS system for a number of years.

DOMAS is used to convert paper samples or printed test strips into digital images by means of a scanner, which are subsequently analysed by means of a PC. Various modules are available for this analysis. One of these is the 'Print Unevenness' module, which enables analysis and evaluation of the evenness of printed matter. A special application is described in the opening article in this Newsletter.

Evenness is an important quality aspect of printed matter. This is a critical property especially in solids and in the shadow sections of halftone images. Evenness is often assessed visually in comparison with a reference print or standard scale. Even if done by experts, this is still subjective. Use of the DOMAS system makes it possible to measure the evenness in objective values.
For analysis of the sample to be examined one can choose from three methods:

1. Power spectrum analysis.
This method uses a Fourier transformation (FFT) to convert the original image into cosine terms, each related to a certain image structure. The frequencies in which they appear are united in a so-called power spectrum. An index can be calculated from this, which is a measure for the quality, or the evenness. The lower the index, the more homogenous the paper or the print is.

Mottle strip printed on the Global Standard Tester 2



2. Contrast variation and co-occurrence matrix.
Two calculation methods are combined in this method. First, the standard deviation of the contrast variations present is calculated. However, this results have a limited value, as the three figures demonstrate. That is, the average and the standard deviation of the contrast variations are identical for all three figures while the images are indeed different. This is why a co-occurrence matrix is also used to determine the relation between the pixels positioned at a certain interval a from one another. Experience shows that an interval of three pixels usually leads to useable results, since mottling, "blackening" and paper formation become visible within this range. Another index can be determined from the combination of the two calculations. Also applicable here: the smaller the index, the more homogeneous the paper or the printing.

3. PTS method.
This method is used to determine the variation in grey values along the grid lines of an image. The minimum and maximum grey values are calculated and then the number of peaks and valleys on the grid lines is determined and expressed in an index. Both the differences in grey value and the size of the areas with an identical grey value are thus involved in the measurement. The result is a curve, the shape of which indicates to what extent the sample is homogeneous.
A simple push on the button allows the user to select which method he wishes to apply. The selection depends on the application. The results of the measurement are saved in an Excel document and can be used for evaluation and/or further processing. ■

Agenda

IGT Testing Systems will be present at the following trade fairs and congresses in the next few months:

June 14 – 16
SPCI 2005, booth A22:40, Stockholm, Sweden.

June 27 – 30
Zellcheming 2005, Wiesbaden, Germany.

September 20 – 22
China Paper, Beijing, China.

September 21 – 24
Labelexpo Europe 2005, booth 11P105, Brussels, Belgium.

October 4 – 8
JGAS 2005, Tokyo, Japan.

October 10 – 16
Polygraphinter, Moscow, Russia.

October 26 – 29
AFTA Conference, Kuala Lumpur, Malaysia.

December 7 – 9
Labelexpo China, booth A6, Shanghai, China.

Quantitative Pick or Linting

It is often difficult to determine the difference in pick resistance for lower quality paper grades, such as newsprint, and uncoated papers with the conventional IGT pick test. In that case, determining the degree of pick is recommended. This quantitative pick test is called linting test.

Picking of paper is normally defined as damaging the paper surface during printing. When the printing form is moving away from the paper, the ink exerts a certain force on the paper. This force increases as the viscosity or tack of the ink increase, and if the printing speed increases. If this force exceeds a certain limit, the ink will draw fibres from the paper surface. The printing speed and a certain ink viscosity at which picking starts to appear are determined in the customary pick test. For lower quality paper grades such as newsprint, picking will start to occur rather quickly and the printing speed at which picking begins is not a distinguished criterion. In those conditions, it is better to measure the degree of pick in order to obtain an idea of the surface strength of the paper. The term for this is 'linting', meaning the breaking loose of paper fibres.

Principle of the test

At increasing printing speed paper is printed with a special pick test ink on an IGT printability tester. The pick result is visually assessed for the extent to which paper fibres have been pulled loose from the surface. It is also possible to evaluate test strips with the 'Dirt specks' module of the DOMAS system.

Test implementation

The test can be executed on the IGT Global Standard Testers P, 1 and 1-W, and the AIC2-5 printability tester. The results can be compared if the same conditions are maintained on the different testers. Be careful in this case that the same type of printing disc is used for the tests. The test as described here is carried out on an IGT Global Standard Tester.
The test can be carried out with a 50 mm wide, rubber, coated printing disc of 85° Shore (optionally 65° Shore). The results with the two types of printing disc are different and cannot be compared to each other. The special Huber pick test ink is used as pick ink, which is available in low, medium, high and very high tack. Cut five 55 x 340 mm test strips from the paper to be tested. Mark the strips for top and bottom, machine direction and the paper type. Select 'Linting' on the menu of the Global Standard Tester and enter the test variables. Prepare the inking unit for operation, apply the necessary quantity of ink and start distribution so that an ink layer thickness of 8.0 µm is obtained. Ink the printing disc. Put a test strip on the sector. Place the inked printing disc on the printing disc shaft. Select 'Make print' on the menu and make the print. After printing, remove the test strip and keep it ready for evaluation.
To print the next test strip, remove the printing disc from the shaft, clean the disc with a lint free cloth and white spirit. Re-ink the disc and repeat the procedure described for each test strip.

Assessment

Visually assess the damage as a result of pick for each test strip. This can be done by means of a self made scale or in comparison with other papers. If the scale has an evaluation in numbers, an average value for the linting can be calculated, optionally including the standard deviation.

A more objective evaluation of linting is possible by using the 'Dirt specks' module of the DOMAS system. A description of this is included elsewhere in this Newsletter.
A detailed description of the linting test is described in the IGT Information sheets W44 (for the rubber, coated printing disc of 85° Shore) and W70 (for the printing disc of 65° Shore). Separate versions are available for the Global Standard Tester and the AIC2-5 printability tester. These information sheets can be downloaded from the IGT website www.igt.nl. ■