Detmaster quality measurements

23.05.2005

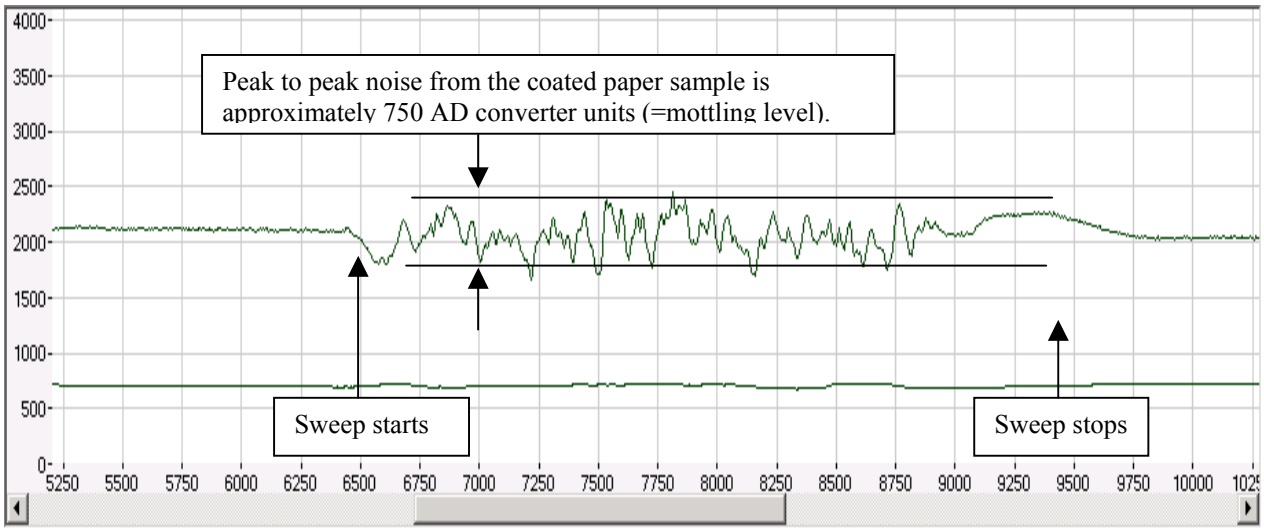
Detmaster *Web Inspection Systems*

Detmaster P-series web inspection systems developed and marketed by SR-Instruments Oy enable various critical surface quality measurements such as e.g. gloss-mottling, brightness, gloss, white top mottling and formation measurements whilst detecting accurately the most critical defect types such as e.g. streaks, holes, impurities, etc. appearing in different paper and board applications. This feature makes Detmaster P-series systems unique on-line web inspection systems among the other available alternative technologies since they got to concentrate on pure defect detection work with their limited performances.

Detmaster P-series web inspection systems provide the widest variety of measurement features with the coated paper and board products because those materials require revealing of some special defect types as well as interesting surface parameters based on which the immediate process and quality control will be remarkably facilitated. One of the most hazardous and challenging defect types for coated paper and board products is streak, which causes useless printing surface for the print shop customer and the inevitable consequence is a customer complaint if the customer receives a roll including streaks. The Detmaster system reveals reliably even streaks, which have width of only 0.1 mm and informs the process operators concerning the exact location of the streak. Based on that guiding the process operators can even eliminate the further forming of the concerned streak and produce once again streak free printing surface for the print shop customer.

Another serious problem for the print shop customers is surface quality phenomenon gloss-mottling, which also causes useless printing surface. At present such gloss-mottling phenomenon in coated paper and board production is tested and revealed with paper samples in laboratory environment, which in fact is only a random sampling procedure to catch such a harmful phenomenon. The Detmaster system is able to reveal the gloss-mottling phenomenon in on-line conditions whilst detecting surface defects such as streaks. The Detmaster system informs the process operator immediately when it recognizes gloss-mottling phenomenon and reports the starting point and coverage of the gloss-mottling on a paper or board web surface.

As an example the following laboratory tests illustrate how convincing the Detmaster system reveals the gloss-mottling phenomenon from coated paper and board surfaces:



The graph above illustrates one sweep of the coated paper sample, which contains gloss-mottling phenomenon, through the Detmaster inspection area. The signal graph shows that the gloss-mottling phenomenon creates remarkable signal variation from peak to peak in the measurement channel of the Detmaster system.

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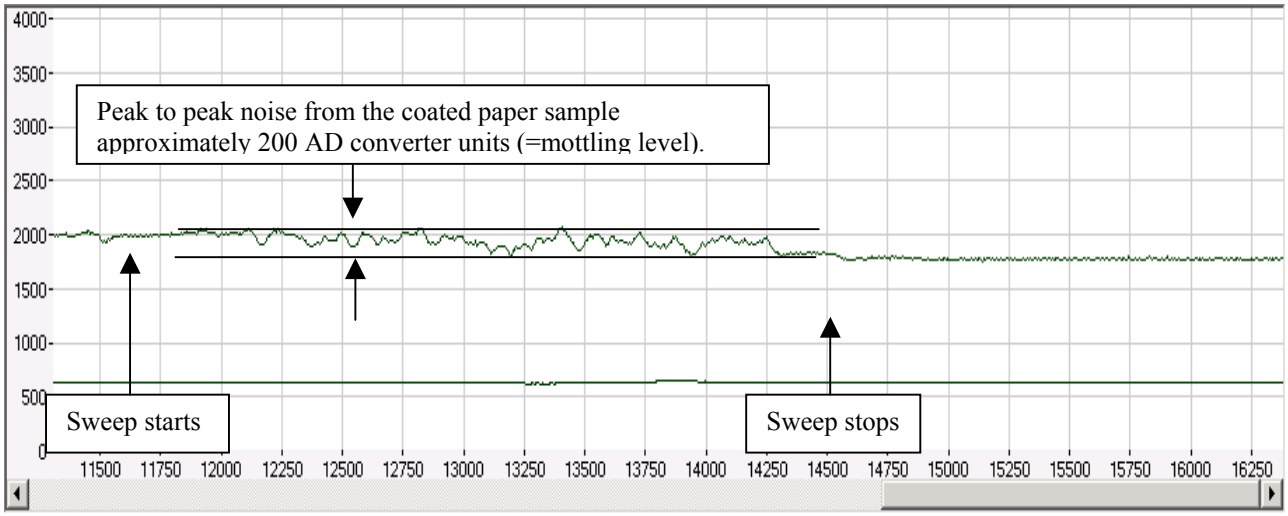
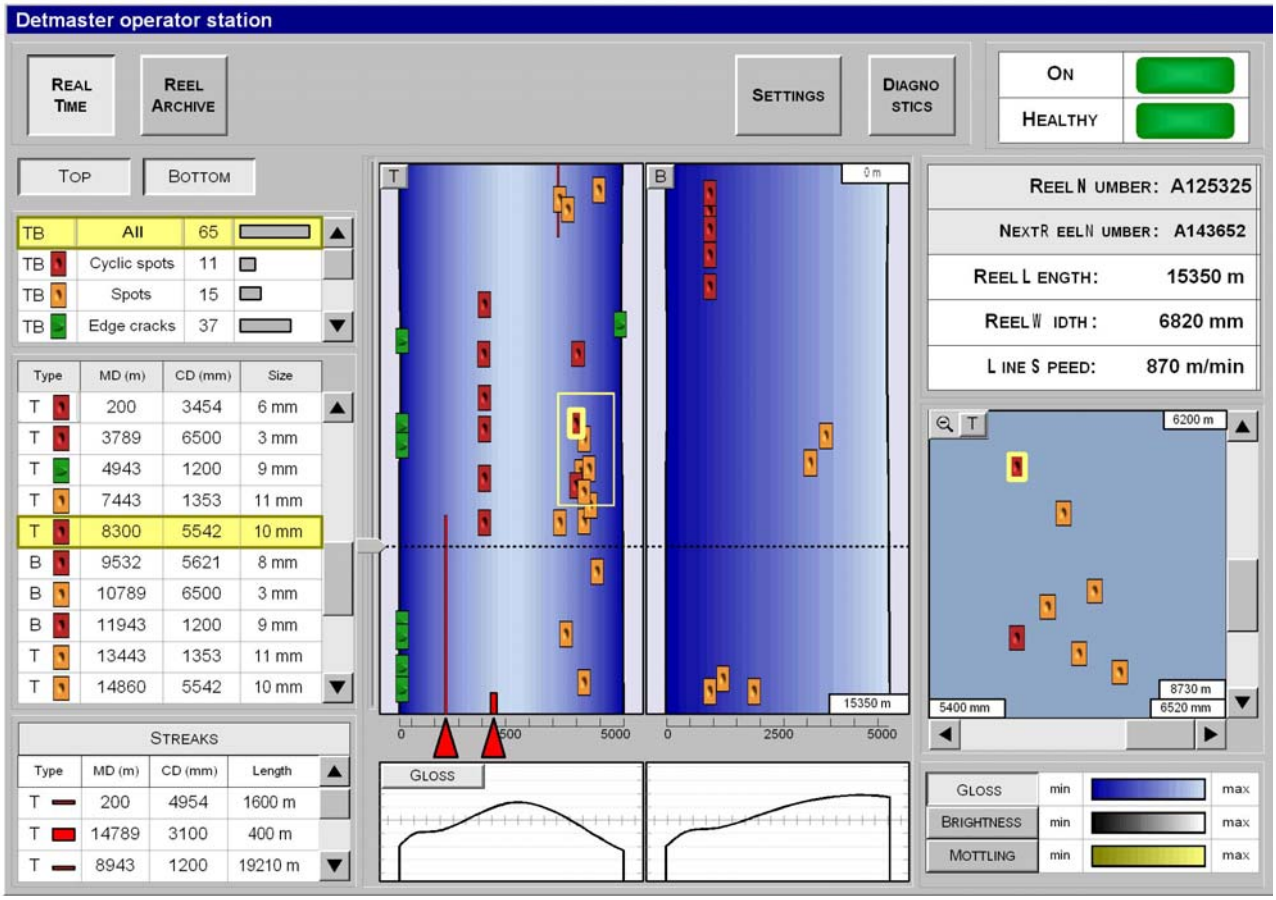
The graph below represents the signal from a coated paper sample excluding gloss-mottling phenomenon. That sample was swept through the Detmaster inspection area in a same manner as the sample providing the graph above. It can be clearly noticed that the signal noise level from peak to peak due to gloss-mottling phenomenon is considerably higher in the graph above than in the graph below having no gloss-mottling phenomenon.





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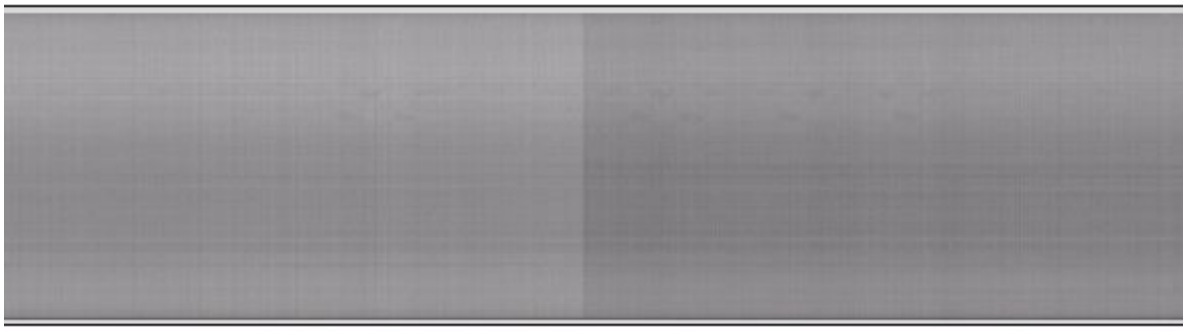
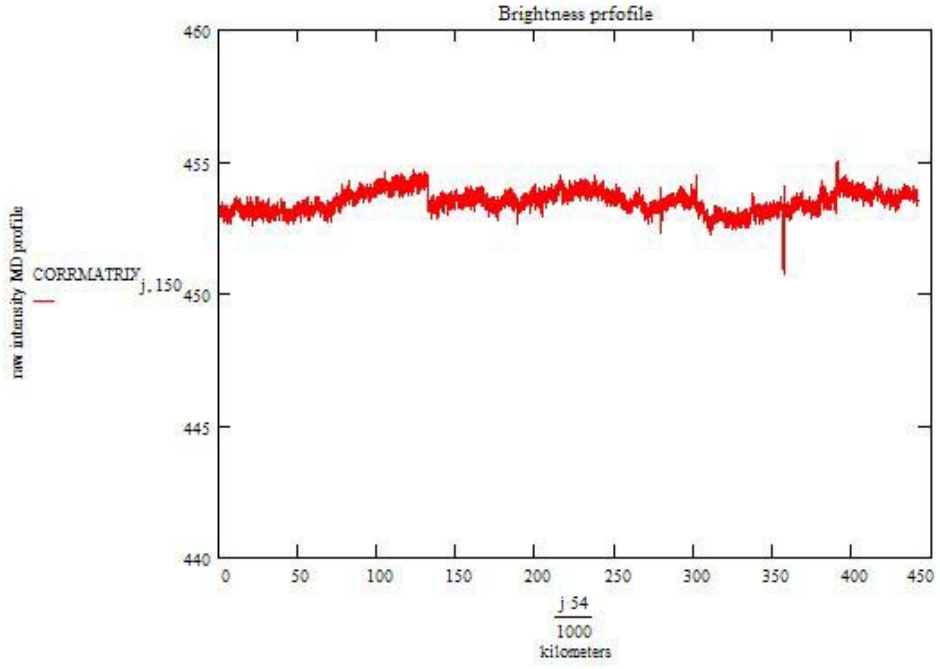
In on-line conditions the Detmaster system is able to measure the gloss-mottling phenomenon over the full width of the paper web at the highest line speed covering the 100 % web surface. The gloss-mottling phenomenon is displayed via Detmaster user interface in the defect map with colours (colour is changing when gloss-mottling increases) and furthermore with conventional x-y graph providing the profile of the signal (as in the above example picture of the Detmaster user interface the gloss measurement results are displayed).

Brightness measurement

Just recently a Detmaster system carried out in on-line conditions a successful brightness measurement of coated top side of the web and the received results are presented with the following pictures and graphs:



In the above picture can be seen in the middle of the picture a steep but slight change of the brightness over the whole width of the web and the same phenomenon can be seen from the below signal graph at the position of around 135 on the X-axis scale. Both illustration versions have been calculated and received from the data provided by the on-line Detmaster system installation.



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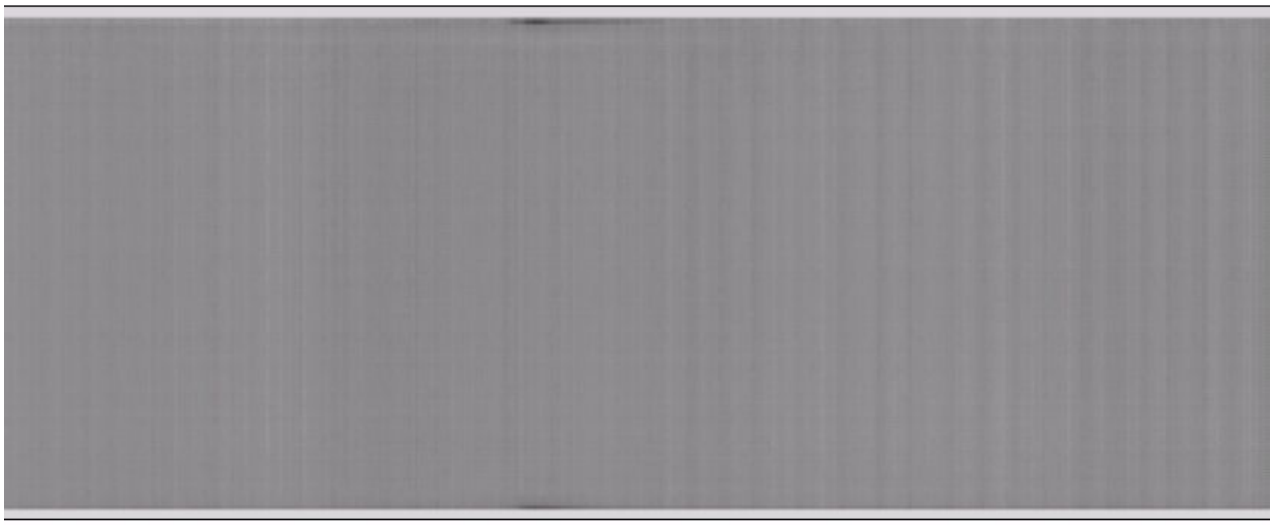
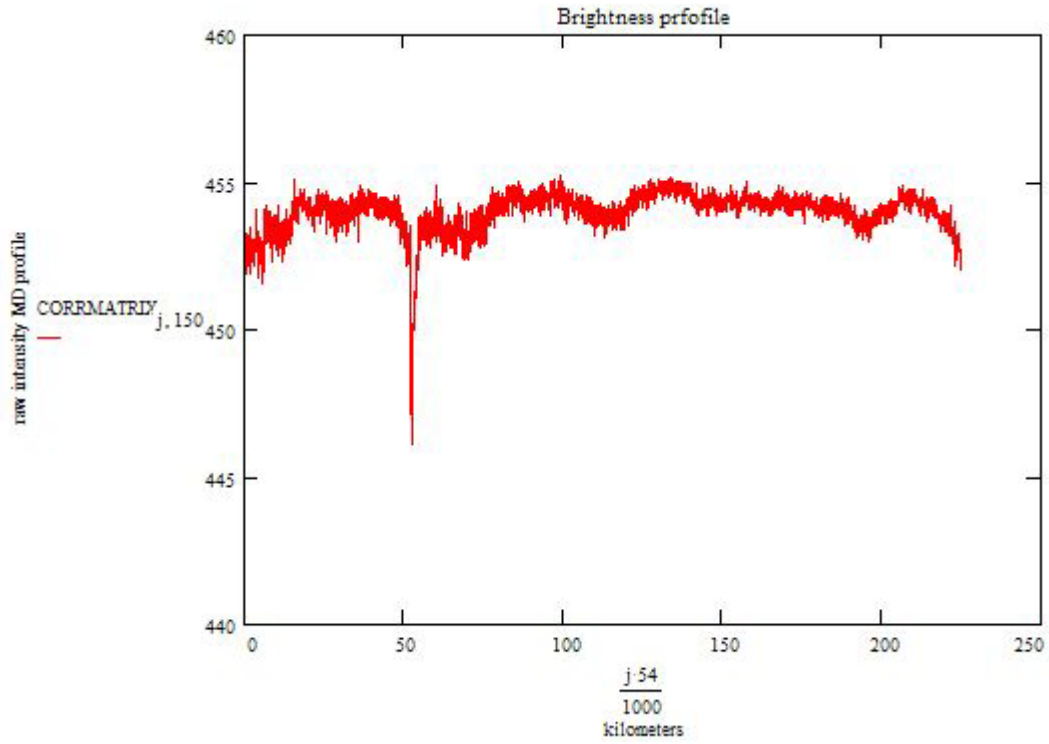
As another example regarding the successful on-line brightness measurement of the coated top side of the web can be presented with the following pictures and graphs:



In the above picture can be seen in the middle and top of the picture a dark area at the edge of the web and the same phenomenon can be seen from the below signal graph as a steep peak at the position of around 50 on the X-axis scale. Both illustration versions have been calculated and received from the data provided by the on-line Detmaster system installation.



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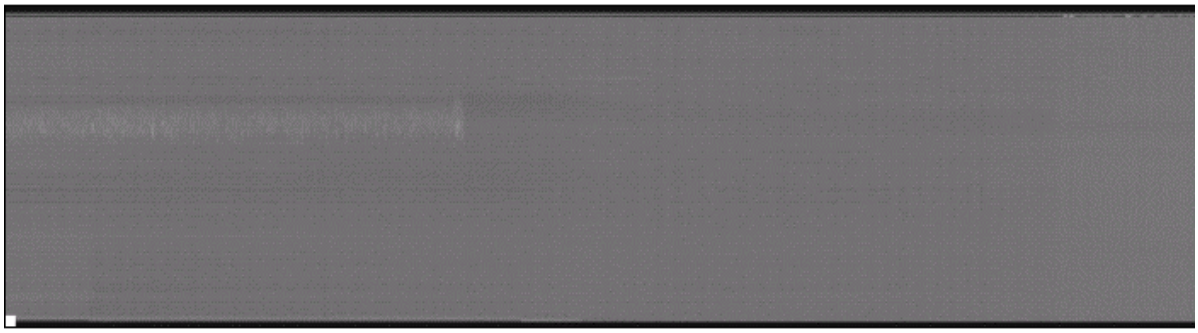
Gloss measurement

Detmaster system carried out also on-line the gloss profile measurements of the coated surface covering the entire web area in both CD and MD. One example of the measurement results is presented in the following picture:

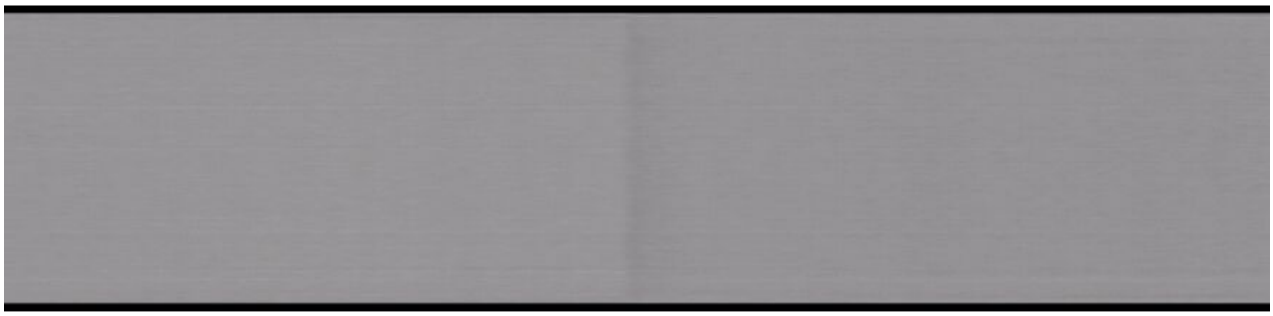


In the above picture can be seen a long and clear gloss deviation strip in machine direction, which starts from the left edge of the picture at the height of 2/3 from left lower corner to left higher corner. This gloss deviation strip continues in machine direction almost until the middle section of the picture. The gloss profile illustration has been calculated and received from the data provided by the on-line Detmaster system installation.

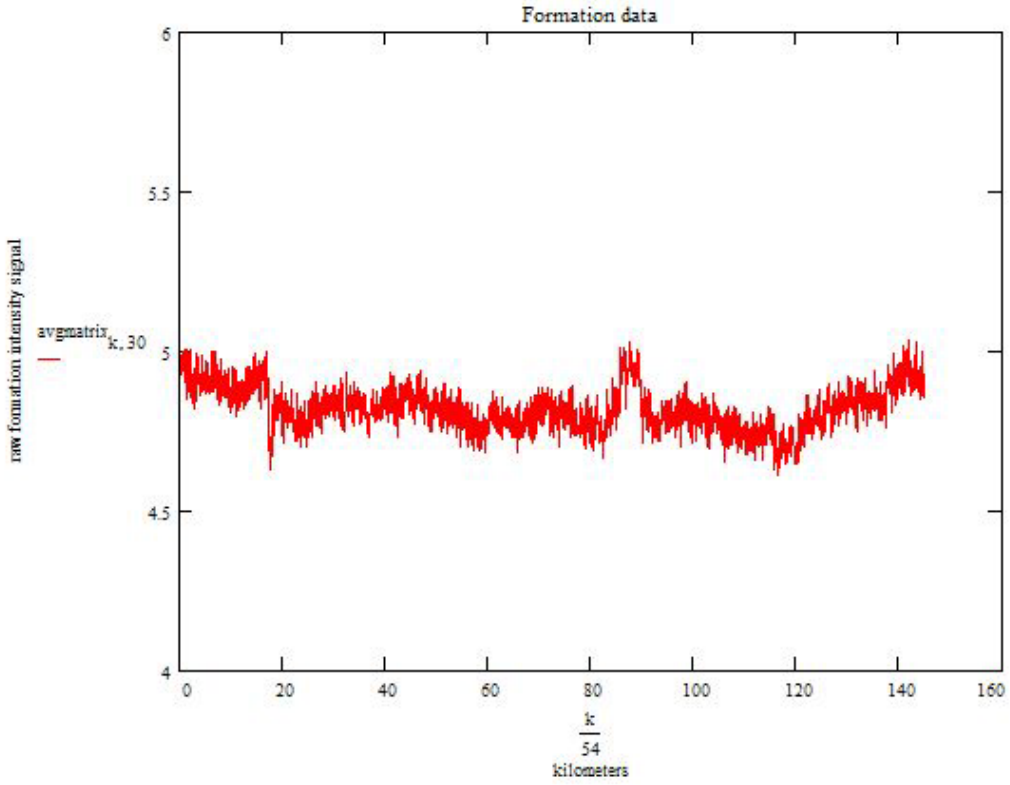
Detmaster system measures on-line at paper and board machines brightness and gloss profiles covering the entire web area in MD and CD at the highest line speeds. Brightness and gloss profiles are presented as defect map's background colours on the Detmaster system's graphical user interface (the background colour will darken in a defect map when brightness or gloss grade deteriorates on paper or board surface). Furthermore, the graphical user interface provides the traditional CD profile graph for brightness and gloss (as the brightness measurement results are presented on Detmaster system's graphical user interface in the user interface picture on page 2), which MD position the process operator can select manually.

Formation measurement

Detmaster system measured additionally on-line utilising transmission light source the formation profile of the web covering the entire web area in both CD and MD. One example of the measurement results is presented with the following picture and signal graph:



In the picture above can be seen in the middle of the picture a steep and clear change in the formation profile over the whole width of the web and the same phenomenon can be seen from the below signal graph at the position of around 20 on the X-axis scale. Both illustration versions have been calculated and received from the data provided by the on-line Detmaster system installation.



Conclusions

The aforesaid describes some of the benefits, which the Detmaster P-series web inspection systems are able to provide with concurrent on-line critical surface quality parameter measurement and defect detection especially for the coated paper and board applications. Naturally there is a lot of other quality parameters and defect types, which the Detmaster system measures and detects from coated and / or uncoated paper and board products like 0.1 mm^2 size through holes and even core ply holes from multi-ply board products but those are subjects of the other documents.