Washboarding in all its aspects.

by koenverplancke

If i would have the cure to wash boarding i would be a rich guy……But unfortunately putting 250 grams liner on N flute is not daily business…:-) This is apparently too expensive for some people.

Finding a flexo plate system that has a perfect solid print, and can go up to 70 lines per cm in the screened process colours, with no dot gain on the flute-tip compared to the valley, and still be able to print at 10000 sheets per hour, is an illusion.

So OK, I think we all agree. I am personally convinced that the cure to stripyness is understanding what is causing it in a print.

We could say that a certain amount of stripyness is acceptable, but please be aware that on flexo preprint one does not have any stripyness in the print.

Neither when one prints in offset on solid board etc….. Also inkjet has this problem less. So there is a need to control and minimize the stripyness to prevent losing business.

The stripes one observes on flexo post printed material is often named wash boarding. I prefer to call it stripyness in print. I think one needs to make a distinction on the different mechanisms of wash boarding.

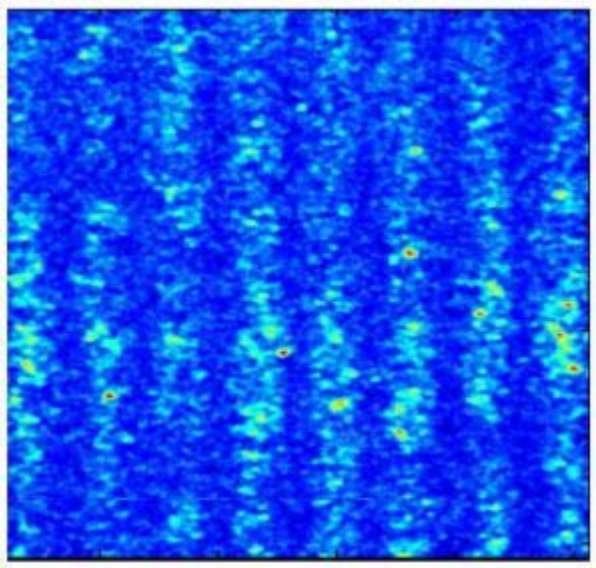
One can have a sheet of corrugated board with no visual wash boarding or severe height differences between flute tip and valley, but still have stripyness in print .

This could be caused by a wrong plate/mounting system (too hard) in combination with a rough paper surface and a relatively low anilox volume printing on bad quality white test.

One also needs to make a difference in approach between solid areas and screened areas.

Without trying to be posh, i would like to introduce some terminology, so we all talk about the same thing and can immediately visualize it.

Mechanical wash boarding: height difference between flute tip and flute valley expressed in microns. (I also would recommend to read my earlier post on 'a new device have been born').



Stripyness in print: uneven print on flute valleys compared to flute tips, this can be caused by mechanical wash boarding but also by other peripheral circumstances.

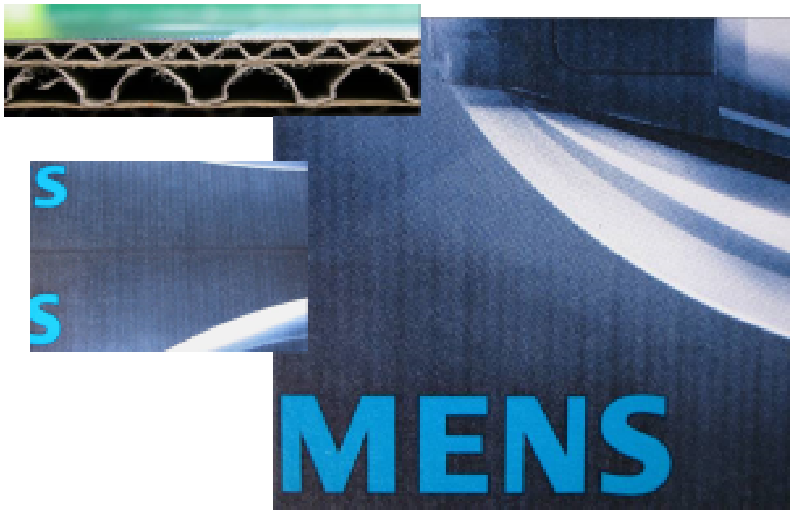
Typically one sees higher density (ink coverage) on flute tip then flute valley. In certain circumstances one can have negative stripyness, in these cases the ink coverage on the flute tip is lower than in the valley.

This negative stripyness can have different causes.

Cockling or honeycomb: too high moisture will cause the fibres to expand. This will happen in proportion a lot more in the width then in the length. The fibre direction of the liner is always perpendicular to the flutes.

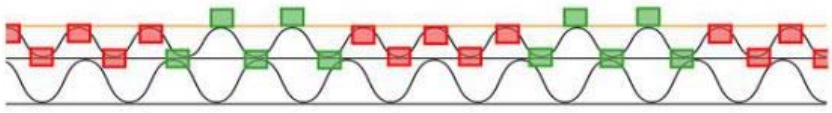
As the fibre groups are already fixed on the flute tips, the fibre expansion will cause an unevenness, also known as honeycomb or cockling. A simple test to create honeycomb is to take a sponge and wet the surface of a piece of corrugated board. Wait for a while, you will see the honycomb appearing. Later, after penetration of the water in the fibres and the evaporation of the surface water, the surface will not return to its initial state, it is irreversibly damaged.

Crushed board/damaged board surface: in-feed-systems in flexo postprint presses can damage the sheets even before print and that damage will mostly be more severe on the flute tip then on the valley. Also this can cause a stripy structure in the print. In some cases I have seen this caused by a transport roller in the corrugator (i.e. MHI dry end) which has been roughened to have grip on the board. The surface of the roller looks a bit like sanding paper and will damage the coating on the flute tips.

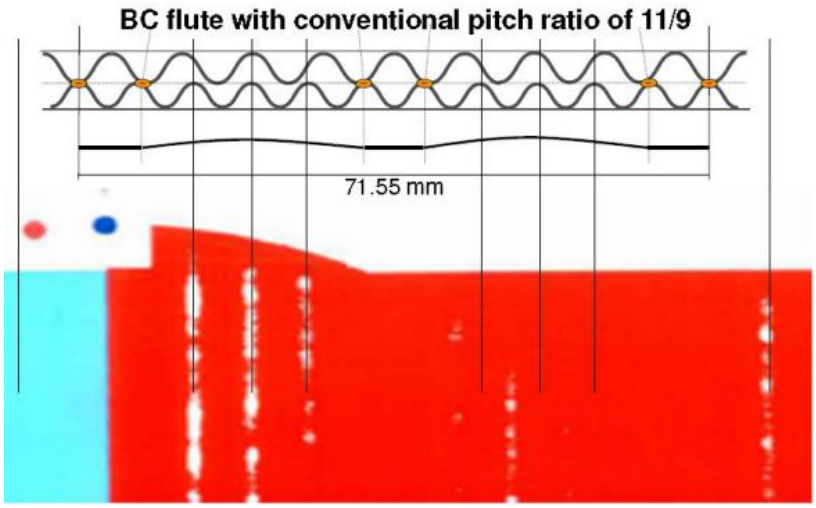


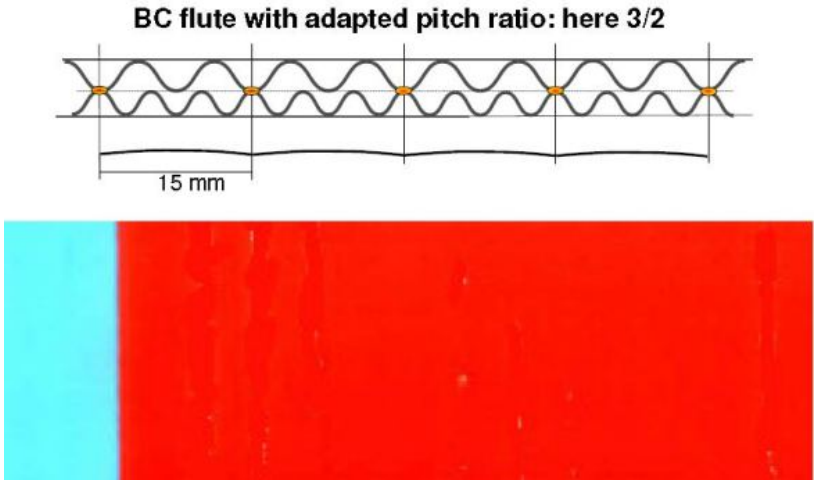
The in feed systems from flexo postprint presses mostly have a rough metal roller and a rubber roller. This rubber roller will lose its grip after many prints. To still have the sheets transported, the operators increase the pressure or reduce the gap and start to damage the flute tips. In these cases one should replace the rubber roller or interchange the rubber roller with the metal roller. (i.e. metal rough roller only touching the inner liner and not the coated top liner).

Banding stripyness: In double wall one can notice some repetitive bands on the board which are caused by the frequency differences between different flute types. i.e. BC flute.



Please notice that the flutes are sometimes supporting each other (green in the image) and sometimes not (red). This happens with every flute combination that has not been mathematically sequenced. One solution is for instance to run EE. If the profile of the two E is identical no banding will occur. Another solution is to adapt the flute profiles so they are a mathematical multitude of each other.





Stripyness caused by post glazing: the corrugating process is a physically very rough process. Take a coated liner, moisten it, heat it and then drag it for about 15 meters under high pressure on metal heated plates. This can and will change the coating structure on the flute tips and will result in a different way how inks are settling or penetrating. You can compare post glazing with what happens if you iron the pants of your best suit too warm…your pants start to shine.

Stripyness in print can also be caused by too hard fluting. You can perform the following test. Make a composition with a high grammage semichemical fluting and one with a softer recycled fluting. Optimize printing pressure in the flexo press and compare the results.

Even the so called econoflutes (with lower take up factor) are not helping us as the flute tip starts to become a knife.

Mechanical wash boarding finds its root cause in the mechanism of the drying of the starch. When the starch dries it has the tendency to retract and it pulls down the liner. It is able to do so as the top liner is humidified by the condensation of the vapour on the backside of the top liner. Also the sheets in a pallet communicate with each other and the inner liner transfers moisture to the top liner of the next sheet.

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Pictures of BC flute with conventional and adapted ratio: courtesy BHS.