

# The Defects in Duplex Board and Their Remedy

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The duplex board is used mostly for the manufacture of cartons. The attraction or detraction towards the carton, by the customer, mainly depends on the quality of the carton, printing and its appearance. Therefore, quality control both at the board mill and at the printer-cum-converter-end, should be carefully followed and should be so designed as to get the desired quality and appearance in the carton. It is correct to consider that duplex board with all the desired qualities can not be manufactured by using non-conventional short fibred pulpable materials. Nevertheless it is possible to produce a duplex board of the desired quality and properties by exercising proper care, precaution and control. In the article an attempt has been made to enumerate the defects observed, in the duplex board and possibilities of their control. The following are some of the defects observed in the duplex board:-

1. Curl and waviness,

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*Defects commonly observed in duplex boards have been given. Causes of the defects studied and remedy suggested.*

2. Variation in Caliper and G.S.M.
3. Poor stiffness,
4. Poor creasing quality,
5. Poor smoothness,
6. Poor Gloss,
7. Burn mark and streaks,
8. High or low bulk density,
9. Fluff.
10. High or low ink absorbency.
11. Low brightness,
12. Delamination,
13. Shade variation,
14. Poor Physical strength properties,
15. Poor Glueability
16. poor varnishability
17. Colour reversion,
18. Poor waxing and high wax absorbency,
19. Poor dimension and stability.

Most of these defects can be controlled by proper precautions and control at the time of the manufacture of the board on the paper machines, as well as by proper controls during the pulping, bleaching and beating of the stuff.

## Curl and waviness

This defect in the duplex board is caused due to uneven drying of the board. The uneven drying of the board can be avoided by the proper control of temperature of the dryers, if the board is of uniform thickness and weight. Efforts

are, also to be made to ensure that the board is uniformly dried at a moisture content from 4.5-7.5%, so that, when the board is allowed to come in contact with the atmosphere, it either picks up or loses moisture only marginally. It has been observed that the board reaches moisture equilibrium at 5-7% moisture content in it. If the board is to take or loose moisture, it does so without uniformity from top and back side, as the top and back are of different compositions. The top is mostly of bleached virgin pulp, whereas the back liner consists of pulps of waste paper and ground wood, The contraction-expansion properties of virgin bleached pulp differ from the waste paper pulp, mixed ground wood pulp. The condensate removal from dryer should be efficient in order to have maximum efficiency and uniform temperature of the dryer. In case of M.G. dryer, the pre-dryer temperature should be properly controlled, the moisture in top and back side should be properly adjusted, so that the board leaving M.G. dryer should not have much variation in moisture content in top and back side.

Both over-drying and under-drying of the board should be avoided as it may give both curling as waviness in the board. Uniform thickness and G.S.M. of the board along and across the machine direction should be maintained to avoid the waviness of the board.

#### **Variation in Caliper and G.S.M.**

The G.S.M. of the board should be controlled by maintaining the uniform consistency at the head boxes and at the cylinder moulds. The pick up of the stuff should be uniform across and along the machine direction at the cylinder. The wire of the mould and paper machine should be kept perfectly cleaned by high pressure oscillating water showers.

The moisture content in the web should be uniformly maintained. The crowing of the press rolls and cylinder, M.G. dryer press roll should be properly maintained, in order to have uniform pressure across the machine on the web at the presses and at the calenders. The moisture contents of the board should be properly controlled before calendering in order to have desired bulk of the board.

#### **Poor Stiffness**

The stiffness in the board can be improved by increasing percentage of ground wood, but proper care should be taken to avoid poor creasing and brittleness in the board by the use of high percentage of ground wood. The board can be made more compact and stiff if it is squeezed and

pressed at the wet end avoiding crushing action on the board. Excessive calendering should be avoided to reduce the stiffness of the board. Very high moisture content in the board may also give rise to low stiffness. Increased number of cylinder moulds would also help to improve the stiffness. Sometimes stiffness in board is improved by adding certain beater additives like sodium silicate.

#### **Poor creasing quality**

The strength properties of the top liner is of great importance to avoid cracking of the front liner during the creasing. The front liner cracking occurs due to tensions developed in it as the rib is formed on the inside and is compressed during folding. To avoid cracking of the front liner, the following precautions may be taken—

- a) Using stronger and extensible pulp,
  - b) Reducing ash content in pulp,
  - c) Increasing G.S.M. of front liner,
  - d) Avoiding over drying of the board,
  - e) Avoiding low moisture content, and, the cracking of back liner may be avoided by following the precautions as given under—
- a) Using low percentage of poor quality of waste paper.
  - b) Keeping the limited usage of ground wood,
  - c) Making board with better ply adhesion, and,

- d) Avoiding over drying of the board.

Beside above factors the converters should also use proper groove width and crease depth. The usage of excessive varnish should also be avoided to have creasing without cracking.

#### **Poor smoothness and gloss**

The surface of M.G. dryer should be kept well polished and the moisture content on the front side (top liner) should be around 40% or more so as to get maximum finish provided by M.G. dryer. Enough pressure should be provided by M.G. Press roll to the board in touch with M.G. cylinder to have high smoothness. The temperature of M.G. cylinder should be properly controlled as overheated surface of M.G. cylinder does not dry the board properly. The crowning of M.G. press roll should be correct.

#### **Burn marks and streaks**

As mentioned above the surface of M.G. dryer should be kept perfectly cleaned. No air should be allowed to be entrapped between the board and M.G. dryer.

#### **High and Low bulk**

The bulk of the board can be controlled by having proper control on the furnish of the board, by controlling nip pressures at various wet pressing stages, and calendering.

#### **Fluff**

The fluff at the front liner can be avoided by proper beating

and by addition of proper chemical additives. Fluff can also be avoided by surface sizing with proper chemicals.

#### **High or low ink absorbency**

This can be controlled by addition of certain chemicals to the stock and surface sizing. It has been observed that if the boards are made more compact, their ink absorption property is lowered.

#### **Low Brightness**

It is controlled by initial brightness of the pulp used and overdrying should be avoided which reduces the brightness of the board.

#### **Delamination**

Proper moisture contents in the wet sheet should be maintained when it joins the other wet sheets, and no air is allowed to be entrapped, between two sheets. The moisture profile throughout cross and machine should be uniform.

#### **Shade variation**

It is controlled by maintaining the initial brightness of pulp, pH of the stock, chemicals and dye addition.

#### **Poor physical strength properties**

It can be avoided by controlling initial physical strength properties of the various furnishes used and beating.

#### **Poor Glucability**

The quality of glue plays an important part for satisfactory or unsatisfactory quality. The quantity of glue to be added should be properly adjusted

according to the condition of glueing operation and properties of board surface in view.

#### **Poor varnishability**

The varnishability of the board can be improved by making the board more compact and giving surface sizing and usage of certain beater additives. By having more hydration of the stuff during the beating stage, the varnishability can be improved.

#### **Colour reversion**

It can be avoided by having proper control of pulp bleaching, use of excessive chemicals including optical bleaching agents and dyes and avoiding over drying.

#### **Poor and high wax absorption and colour reversion**

This can be controlled by controlling the bulk of the board, use of certain chemicals either in beaters or surface sizing. Use of tetanium dioxide not only helps to avoid the loss of brightness but also improves brightness to a high degree.

#### **Poor dimension stability**

This can be avoided by proper control of the furnishes, beating, machine conditions, drying and moisture control of the board.

There should be close co-operation between the board manufacturers, converters and Research Institutes to formulate the production of duplex board of

required quality, so that the printers and converters can manufacture cartons of desired appearance and durability for trouble-free packing. The board manufacturers may use expensive furnish or have high percentage of board rejection to produce the board of desired quality. The converters on their part should exercise proper care to get the desired effect in the end product.

Research institutes should work as an independent body and should be well equipped in both testing equipments and laboratory equipments to conduct experiments either on the furnishes available to the manufacturers of board or board being manufactured by them. Research Institutes should be able to handle and meet the new problems being faced by the converters as well as the board manufacturers and able to take new challenge for improving the quality of packing and reduce the cost at both board manufactures and converters end. They should be able to give informations how and where a board can be manufactured or used in best possible manner under existing conditions. With co-ordination of efforts of all concerned the country will be able to produce duplex board of desired quality at a reasonable cost to solve the packaging problem. There is no denying that the packages do play an important role to help the sale of consumer items as well as to protect the material during transit and storage.

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