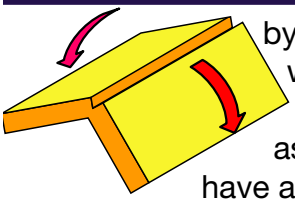
WERCSolutions

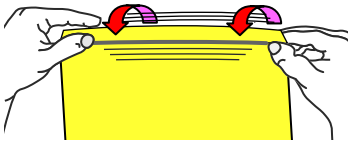
Problem - Cause - Solution - Innovation

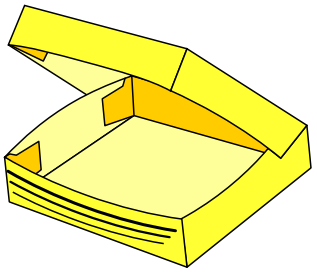
Category: Converting Problem Title: Poor Scoring Performance

PROBLEM



One of the six (6) disciplines of Converting is Scoring, or the partial penetration of a material by a cutting knife, to enable the material to fold or hinge, with a specific degree of force. ***See left***. In principle this should be a straightforward discipline, however, the bowing of narrow panels as they are folded, ***see right***, causes the finished carton to have an unacceptable degree of distortion. ***See right***.

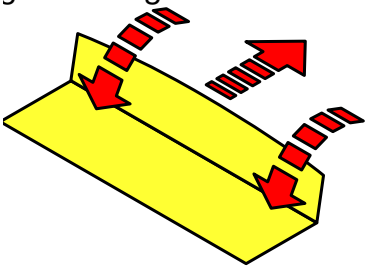


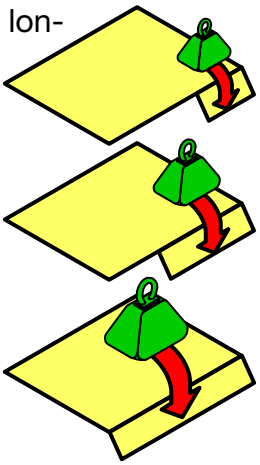


Compounding this problem is the difficulty of setting the degree of knife penetration or the degree of applied cutting pressure, to cause the material to fold with a specific degree of force. Scored narrow panels are often too difficult to fold or they fold too easily. What is the reason for this perennial problem?

CAUSE

The primary cause of both folding force problems and panel bowing is the principle of ***Leverage in Folding***. As a narrow panel gets longer the degree of force required to fold that panel increases proportionately. ***See right***. When a long narrow panel is folded, the center of the panel inevitably bows outward as it resists the pressure to fold or to hinge. ***See left***.

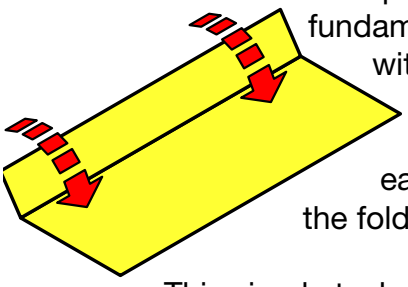


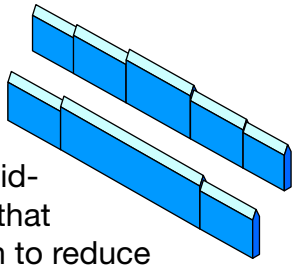


There is obviously a relationship between the length of the panel and the degree of force applied, and the degree of scoring penetration by the cutting knife. If you look at the illustration to the left, your natural instinct would be to apply more force to the center of the narrow panel, to push it inward. Therefore, the key question is, how can we reduce the degree of folding force toward the center of the narrow panel?

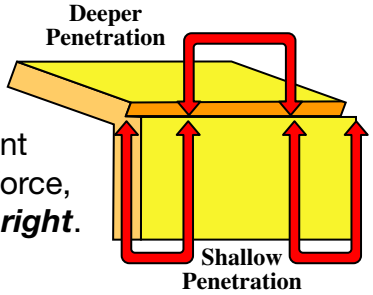
SOLUTION

The solution is remarkable simple, however, it does requires us to think about how we crease and score in a fundamentally different way. Our goal is to be able to fold with perfect squareness, ***see left***, and with a specific degree of force. The solution simply requires subdividing the fold into different sections, and recognizing that each section requires a different degree of penetration to reduce the folding force at that point. ***See right***.





This simple technique, which requires integrating different heights of cutting knives, and sometimes different pointages and different cutting edge types, enables us to control the depth of penetration at different points along the folding panel, and therefore, control the degree of folding force, and the degree of bowing or distortion of the panel caused by folding. ***See right***. This will also eliminate on-press patching and adjustment.



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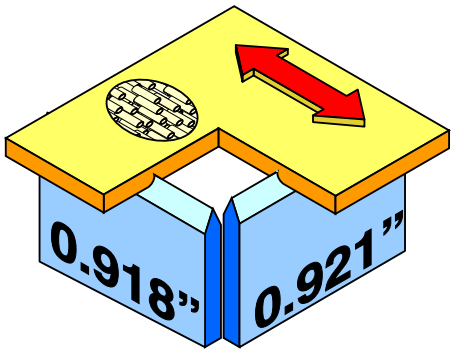
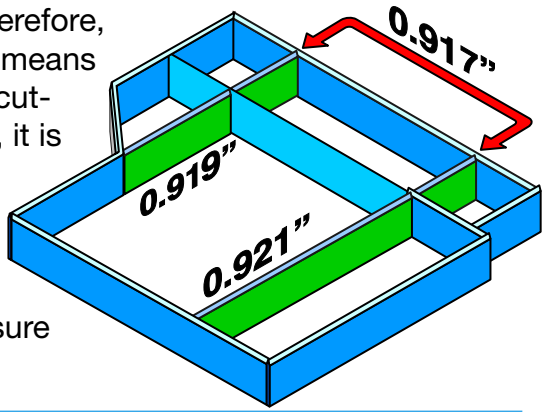
INNOVATION

There are two further key factors to consider when scoring paperboard material. The first is obviously ***Paperboard Grain Direction***. When cutting, creasing or scoring a paperboard material it takes more pressure or force to cut, crease, or score at right angles to the paperboard grain than it does parallel to the paperboard grain. How does that impact our choice of scoring knives?



To compensate for the grain direction of a material, it is necessary to make the scoring knife, which is cutting at right angles to the grain, higher than the scoring knife, which is cutting parallel to the paperboard grain. ***See right***.

A similar principle is related to the pressure required to cut. Every inch of knife requires a specific degree of pressure to cut or to penetrate a material, and it is therefore, obvious the longer the knife the greater the pressure. This also means the greater the resistance of the material to penetration by the cutting knife in use. To overcome this potential problem in scoring, it is necessary to adjust the height of the knives, based upon their length. ***See right***.



By manipulating the height, the pointage and the edge type of cutting knives used in scoring paperboard material, we can ensure optimal folding performance, and exceptional folding quality.

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