

The Changing World of POST PRINT CORRUGATED

Let's face it printing on corrugated media has been plagued by fluting problems from the very beginning. What is fluting you ask? Fluting is an area of print having higher gain along the tops of the flutes versus in the valleys between them. This print density differential gives the appearance of the printed piece of corduroy striping running along the flutes of the board. For those visual learners (we love visual learners!), the photo below shows heavy fluting on the left and minimal fluting on the right.



The Change to Digital
For years, analog printing plates performed acceptably with minimal fluting; however, in the early 2000's the print industry's workflow started changing... enter DIGITAL PREPRESS. This workflow lead to an increase in the use of digital flexo printing plates. Unfortunately, digital printing plates tend to flute worse than their analog counterparts due to the geometry of the

rounded printing plate dot and the edges of type and solids. This rounded surface and the contact angles with the uneven corrugated media contributed to the visual appearance of the printed flutes. As more companies embraced the digital workflow and use of digital printing plates increased, printing plate manufacturers and trade shops had to work closely to reduce the effects of fluting using this new digital process.



CHANGE IN MEASUREMENT

To better understand and measure the fluting effect, MacDermid Graphics Solutions created a device that could measure printed dot size across a wide portion of printed corrugated material. When these measured printed dot size readings are plotted, you can easily see the visual appearance of the printed flutes in a graphical chart. This use of a graphical measurement made it easy to identify and measure the difference between the average printed dot size from the top of the flute to the average printed dot size from the valley of the flute. The difference between these two numbers are what we called the Fluting Factor. The higher the number, the more noticeable the fluting is in a printed piece. If the number is small, it corresponds to a very smooth print appearance and

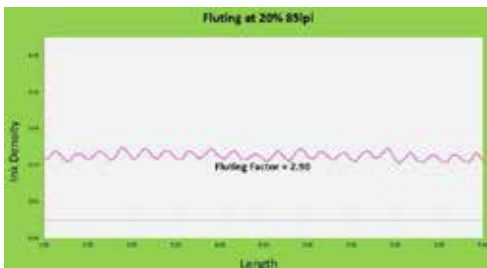
lower visual fluting within the printed piece. The following photos and corresponding Flute Factor readings will illustrate how this matches up with the visual appearance that is seen with the naked eye.

PLATE CHANGES

Using the information from a Fluting Factor Study, MacDermid Graphics Solutions engineered a solution for digital plates to address the fluting issue in 2010 with the introduction of the LUX® process. The LUX process helped printers minimize the fluting effect by laminating a thin coversheet to the digitally ablated printing plate which, after exposure, produced flat printing surfaces.

MacDermid then introduced the Digital MacDermid Anti Fluting (Digital MAF) plates in 2015. Digital MAF was the industry's first digital corrugated

Graph of a printed scan with a Fluting Factor of 2.90



Graph of a printed scan with a Fluting Factor of 4.13



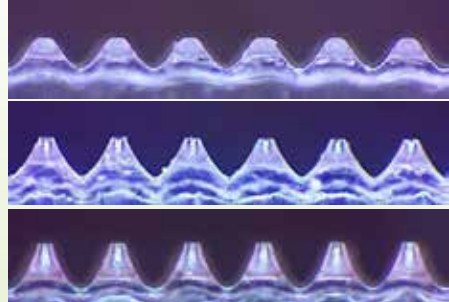
plate that provided a flat top printing surface right out-of-the-box. The proven results gave platemakers a digital plate with a flat printing surface without the need for additional procedures, equipment, or consumables. With a 32 Shore A hardness,

Digital MAF plates also offered a new dot shape optimized for even greater fluting reduction and dot gain performance against competing flat top technologies at the time. This engineered shoulder structure has an angle break in the sidewall of the print character which provided additional relief from the printing pressures to help lower the amount of impression provided to the printing dot. This pressure reduction helped decrease print gain and eliminate the distortions at the media interface while allowing for good surface contact to deliver excellent solid ink coverage.

CHANGES IN CORRUGATED BOARD

As the corrugated post print reproduction market continues to evolve, the industry is looking to save on raw materials without compromising quality. This created a trend to down-

Conventional Digital 85 lpi at 3%



gauge corrugated boards and use paper grades with increasing amounts of recycled content. At the same time, the industry is seeing increased graphic requirements as the flexo market attempts to grow at the expense of Litho labels. Printers and brand owners demand and expect high quality printing regardless of the board quality.

The conversion to higher recycled content and lower basis weight boards brings a new challenge to the corrugated printer...How do you retain smooth solid ink coverage, print crisp half tones and fine type while minimizing board crush? The higher recycled fiber content produces a different surface compared to the corresponding virgin liners of the same basis weight due to the additional processing

steps needed to prepare the recycled content for reuse. Attaining good ink coverage on recycled board many times results in the need for additional printing impression to obtain smooth laydown which, many times, could lead to board crush. Board crush, if excessive, could lead to structural changes in the printed sheet affecting structural integrity of the folded box. This shift in business conditions highlighted a need for softer plates that offer high graphic reproduction abilities and the ability to minimize board crush using these evolving types of corrugated media while providing good solid ink coverage.

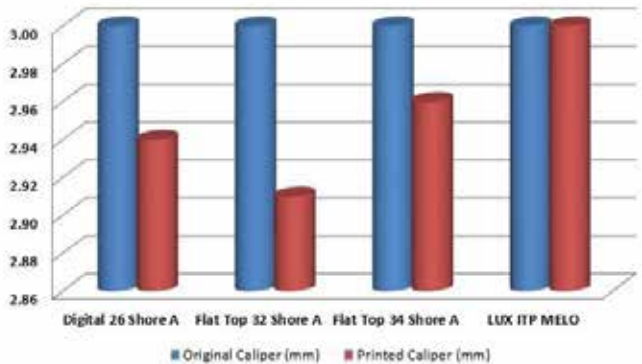
CHANGES TO AVOID THE CRUSH

Never satisfied, MacDermid Graphics Solutions answered this need by expanding our digital plate technology to include the new LUX® In-The-Plate™ (ITP) MELO. This plate is specifically engineered as a super soft, digital

photopolymer sheet plate for use with post print corrugated board. With out-of-the-box flat-top plate technology and a 25 Shore A hardness, LUX ITP™ MELO produces printed results with excellent tonal reproduction and extremely smooth solid in coverage.

LUX ITP MELO is the only commercial 25 durometer plate that offers out-of-the-box flat-top dot capabilities with outstanding imaging capabilities. This plate was designed to hold 1-2% dots at 133 line and consistently hold open the 95% shadow dots which eliminates the printer's need to split out plates that have combinations of large solids and fine type or process color within a plate. This allows for additional savings in plating jobs and a

Board Crush Comparison



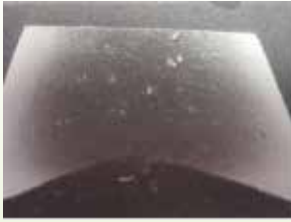
reduction in the number of print decks used. With the unique engineered dot geometry introduced with the Digital MAF plate and now the LUX ITP MELO plate, printers are seeing excellent results printing high line process color using such a soft plate. The dot's unique sidewall construction eliminates the typical bulge near the print surface that contributes to excessive print gain or doughnut dots and small type. The softer 25 Shore A durometer has also demonstrated improvements in the amount of board crush measured after printing compared to the typical 32 Shore A printing plates, the industry standard for the corrugated market.

DON'T FORGET ABOUT LIQUID

While there has been a significant amount of work and research completed to improve digital plate technology, liquid photopolymer plates are still widely used in the corrugated market and continue to print extremely well with minimal fluting. To compliment the advancements of LUX ITP MELO, we added LTS, a new liquid photopolymer to our industry leading M System™ portfolio. LTS is a 25 Shore A hardness photopolymer featuring the

same attributes as our flagship liquid photopolymer, LTL, a 32 Shore A hardness material.

These two liquid corrugated photopolymers are designed to offer top protection from the conditions that are typically faced in a corrugated box house such as ambient UV Exposure, Heat & Humidity Resistance, and Ozone Exposure while in storage. While both deliver excellent ink transfer on all types of corrugated board, LTS offers the same benefits as LUX ITP MELO for use with lighter basis weight boards and those with higher content of recycled fibers. For those liquid manufacturers that have not moved into the digital platemaking process, we also introduced another new photopolymer, M Cap 45. This 45 Shore A durometer photopolymer was developed for use with the softer LTS or LTL photopolymer to provide the ultimate straight side-walled, flat topped printing plate for use with process color and fine type. M Cap 45 is cast as a thin layer of photopolymer against the photographic negative so that it becomes the printing surface and LTL or LTS is the softer base material forming the lower shoulders and floor of the printing plate.



Uncapped liquid plate



Capped liquid plate



Capped liquid plate under load



Printed Board using a Capped Liquid Plate



Printed Board using an Uncapped Liquid Plate

Capped liquid plates have always demonstrated the least amount of fluting of any photopolymer plate due to the flat top printing surface, nearly vertical shoulders, and the dual durometer construction of the printing plate. Any distortion from excessive impression caused by press setup or an uneven board surface is handled down the print wall, far away from the printing surface as demonstrated in the attached photos.

changing. Using soft sheet or liquid photopolymer plates developed for these challenges is key to meeting the demands of brand owners. As the market moves to create savings using lighter basis weight boards with more recycled content and an increasing expectation of higher and higher print quality demands, flexo printers and plate manufacturers must continue to evolve to meet requirements in corrugated print.

THE TAKEAWAY

With old challenges (fluting) and new challenges (board crush and high graphic requirements) the world of corrugated post print reproduction is continually

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