INX COATINGS & ADHESIVES

TECHNICAL RESOURCE INFORMATION

Energy-Cured Coatings

Grit Texture Coating v25.1

Grit texture coatings can bring depth, contrast and tactile enhancement to a printed piece, but is a specialized technique that requires proper planning, application equipment/materials and execution to make it an achievable and repeatable process. The result of a properly produced grit texture piece is a roughly textured coating-film with a 'gritty and toothy' tactile feel and the appearance of sandpaper while maintaining clean edges when applied for modestly detailed graphics.

Energy-Cured Coatings - Grit Texture Application Considerations

Design/Layout	- Placement of grit texture coating image areas on a printed piece should not be positioned in areas that will include scoring, folding or cutting:
	  • Due to the hardness/abrasiveness of the grit particles in texture coatings, scoring rules and cutting blades/dies may become damaged when contacting the coating-film.
	  • Due to the inability of the grit particles to flex/stretch/bend, texture coating applied along folded edges may result in cracking occurrence.
	- Grit texture coatings are very abrasive, so this should be considered for the overall scope of the job.

Adhesion	- Testing/verifying the adhesion properties of the grit texture coating over beneath inks, coatings and substrate should be conducted prior to production. - When applying a grit texture coating in a spot-application in a separate pass, care should be taken as not to cause the paper to become excessively dry/brittle, the ink film to shrink or the ink to soften due to the repeated heat exposure of the press drying/curing systems - in each scenario, adhesion impairment can result.
Substrate	- Heavy basis-weight papers are most desirable to maintain the integrity of the paper and prevent distortion/curl or embossing that can be caused when using grit texture coatings, particularly in spot-applications – grit texture coatings are applied in a heavier than typical coat-weight which can cause distortion of light-weight substrates. - Substrate distortion/curl can be related to the texture image graphics and the grain direction of the paper.

Energy-Cured Coatings - Grit Texture Process Materials

Coating Product	- Grit texture energy-cured coating products are specialized formulations that enable a high coat-weight to be applied while maintaining good characteristics for coating-film cure-response, flexibility and adhesion. - Grit texture coatings are generally much higher in viscosity compared to general-use energy-cured coating products due to using higher volume anilox rolls for transferring of the grit particles – the coating viscosity needs to be paired with the grit texture size and anilox volume to ensure a proper transfer-efficiency. - Grit texture coatings can be supplied as 'press-ready' formulations from INXCAC, or the grit particles can be supplied as a separate 'dry' material to be added to the base coating immediately prior to use – grit particles can slowly fall from suspension and settle on the bottom of the coating container if left static for a period of time. - The grit particles are available in various sizes depending on the desired result and/or equipment capabilities. - Grit texture coatings can be supplied in different gloss levels depending on the desired result.
Anilox Engraving	- Due to the size of the grit particles and associated transfer requirements, an anilox with a much higher engraving volume/cell size will be required compared to a general-use coating product – a general-use coating product may use an anilox volume of 12 - 14 bcm, a grit texture coating can require an anilox volume of 25 - 65 bcm to achieve the desired results. - To optimize the tactile result, an anilox engraving should be large enough to facilitate transfer of the grit particles but not too large as transferring too much base coating can 'drown' out the particles on the sheet creating a more 'regular' result with less tactile texture – the grit particle size and anilox engraving specifications should be paired to create the most desirable tactile results. - An alternative engraving pattern may need to be considered such as Trihelical or Reverse/'Pins-Up' – these 'open' engravings create the necessary transfer/release potential for the grit particles to achieve the desired results.

Anilox/Coating Viscosity Correlation	- The use of a high volume anilox roll for grit texture coating application creates a very 'open' engraving structure – the cell cavity is very large and does not have the closed/surrounding wall structure of a traditional hexagonal engraving. - To compensate for the 'open' cell engraving structure, the coating viscosity needs to be high enough to maintain containment as the anilox rotates – centrifugal forces are trying to release the coating from the anilox cells. - Coating that is too low in viscosity relative to the anilox engraving can result in: • Grit particle 'settling' in the coating container – grit falls to quickly from suspension. • Coating slinging/spitting. • Insufficient grit particle transfer – the coating viscosity must be high enough to 'push' the grit particles into the anilox cells and to 'pull' the particles out onto the blanket/plate surface. • Grit particle build-up inside of the chamber. • Grit particle build-up inside of the chamber recovery – can cause damming/obstruction to coating draining • Chamber containment-blade reverse-doctoring/build-up. • Excessive/over-application to the coating blanket/plate causing flooding/beading, loss of texture and loss of image fidelity – the transfer-efficiency of coating from the anilox to the blanket/plate is too high. - Coating that is too high in viscosity relative to the anilox engraving can result in: • Poor pumping/circulation – chamber starvation • Poor flow – build-up/stagnation and damming/obstruction in the chamber recovery-pan • Reduced coating transfer-efficiency from the anilox to the blanket/plate – coating/grit does not properly release from anilox cell resulting in a starved result on sheet. - To avoid potential problems caused by low/high viscosity relative to the anilox engraving, it is necessary to match the coating viscosity to the anilox roll engraving to ensure acceptable results are achieved – contact your INXCAC Technical Sales Representative to discuss further.
Metering-Blade Selection	- The anilox roll surface must be cleanly metered prior to transferring to the coating blanket/plate to avoid spitting/ slinging, containment blade reverse-doctoring and excessive coating transfer to the blanket/plate. - Due to the abrasive nature of grit texture coatings and the coarseness of the anilox engraving, it is necessary to use a wear-resistance metering-blade material – this may include: • Ceramic coated steel blade materials • Low COF reinforced composite blade materials • Specialty coated metal blade materials - To preserve the integrity of the metering-blade and extend blade-life, it is recommended to stop the anilox from rotating during extended periods of non-production – only when using energy-cured coatings.
Containment-Blade Selection	- Unlike the metering-blade, the containment-blade requires a very flexible blade that can flex/bend and allow any residual coating on the surface of the anilox to pass through and re-enter the chamber cavity. - If the containment blade is too rigid, any coating on the roll surface will become reverse-doctored and build-up on the outside containment blade surface and drip into the chamber recovery-pan. - A flexible polyester blade material is most suitable for use as containment-blade.
Coating Plate Material	- Generally, grit texture coatings are applied to create coarsely detailed 'spot' images which may require an analog or digitally imaged polymer relief coating plate or cad-cut strippable coating blanket/plate. - Coating plates that provide a very smooth and hard surface for coating transfer from the anilox roll to the substrate may experience transfer deficiencies as the grit particulate may become vacuum-locked to the coating plate surface. - In this case, for proper coating transfer/release from the plate surface to the substrate, the coating plate may require a slightly irregular/refined surface to ensure that coating liquid is between the grit particle and plate surface during transfer to facilitate release – a refined surface or shallow screen image on the coating plate surface may be necessary if transfer problems are encountered. - To ensure proper and repeatable registration/'fit' for precise spot coating applications, performing a print-length/ distortion test is advised by the plate material supplier to account for any print-length variance that is inherent in the coating process using a relief plate. - When performing a distortion test, it is important to confirm and document all materials/settings – always

	measure/ verify the actual material thickness: • Coating relief plate/thickness – overall thickness, relief depth thickness, floor thickness • Under-lay material/thickness/durometer • Tension/torque - The coating-plate should be imaged with support areas/'bearer bars' to provide continuous contact/support of the anilox and substrate: • Support/'bearer' bars run circumferentially/grip-tail within the paper margin but outside of the job image area – typically on the outside GS/OS edges of the sheet. • Provides continuous contact of the anilox to the coating-plate surface in areas where there is no job image area – prevents any image gaps over the length of the sheet. • The contact pressure of the anilox to coating plate is consistent/constant over the entire sheet length. • Eliminates any abrupt pressure changes at the lead/rear edges (roll-on/roll-off) of the job image areas that could contribute to beading, variance in coating film thickness or poor image quality. • Impression – maintains constant/even coating-plate contact to the substrate which prevents the substrate from being unsupported or unevenly supported on the impression cylinder surface – maintains substrate integrity on the impression cylinder and optimizes registration.
Coating Pumping System	- Grit textured coatings are generally higher in viscosity compared to general-use coating products, it may be necessary to use a more capable specialized coating pump to avoid insufficient pumping/circulation which can contribute to chamber starvation – this can be dependent on the coating area of coverage and press-speed which will determine the actual coating consumption-rate. - Diaphragm pumping systems may be unable to efficiently pump a high viscosity coating at the needed rate to keep the chamber filled – an alternative pumping system type such as peristaltic may be required for pumping high viscosity liquids. - Segregated coating circuits are recommended for specialty coatings for ease of change-over and clean-up – separate pumps and hoses/connections.
Mixing System	- Grit texture coatings should be pre-mixed thoroughly prior to pumping/circulation as the grit particles can settle to the bottom of the coating container over time – it is a good practice to remove the container lid and survey the bottom with a paddle to ensure there has been no 'hard-settling' of the grit particles. - 'Soft-settled' grit particles on the container bottom can be stirred off the bottom and re-incorporated into the coating by thorough mixing. - Use of a dedicated lid-mounted mixing system is ideal for pre-mixing the coating and continuous agitation during use – continuous agitation will keep the grit particles in suspension during use.
Manual Addition of Grit Material	- When adding/mixing dry grit material press-side into a base coating, first ensure that the base coating is suitable for use with the grit particulate – consult your INXCAC Technical Sale Representative. - Use PPE - protective respiratory mask and eye protection are recommended as the dry grit material is very fine and can become air-borne during handling. - Use of a mixing system is necessary to sufficiently blend the grit material completely into the base coating – a drill with mixing-blade attachment used for joint compound is suitable. **Instructions** 1) Prior to adding the grit material, begin mixing the base coating to create a small surface vortex in the coating container. 2) Begin adding small amounts of the grit material into the surface vortex to blend and distribute evenly throughout the coating, taking care not to allow the grit material to collect on the coating surface as it may become air-borne and contaminate the surrounding area. 3) Slowly add and blend all grit material until the desired concentration has been achieved – for questions on the proper amount of grit material to add, contact your INXCAC Technical Sales Representative.
Energy-Cured Coatings - Grit Texture Process Considerations	
Press Speed	- Grit texture coatings should be expected to run at a reduced press speed compared to general-use coatings. - Using a high volume anilox roll can necessitate a reduced press-speed to maintain coating containment in the

	anilox cells and avoid issues of coating spitting, slinging and misting. - Reduced press-speed will increase the interface/dwell time of the anilox cell to the blanket/plate surface to improve grit particle transfer-efficiency. - Reduced press-speed will increase the dwell time of the anilox cell to the chamber cavity for cell replenishment with grit particles. - Press-speed can directly impact the overall texture results on the sheet – adjustments in press-speed should be explored to determine optimum results. - Reducing press speed should improve the overall results for grit particle transfer.
Chamber-Anilox Contact Pressure	- Chamber contact pressure to the anilox should be minimized to optimize metering while reducing blade wear. - Excessive chamber contact pressure to the anilox can result in the metering blade flexing inward and lifting which can contribute to insufficient metering of the roll surface and heavy coating application. - Good practice is to incrementally reduce overall chamber contact pressure to the anilox until the roll surface is visibly heavy with coating, then incrementally increase chamber contact pressure to the anilox until good metering is observed resulting in a clean anilox surface. - If the contact pressure to the anilox appears uneven/nonparallel, it is important to re-establish the chamber contact to the anilox using the method/settings prescribed by the chamber/press manufacturer.
Anilox-Coating Plate Contact	- Anilox to blanket/plate (application) contact pressure should be minimized to achieve complete coating transfer to the coating blanket/plate surface while avoiding excessive pressure which can contribute to quality-issues related to coating/grit displacement. - Observation of a visible coating-stripe of the anilox to the blanket/plate can be an acceptable method to determine proper/parallel application contact, setting a minimum stripe recommended by the press manufacturer – this would be a good starting point and can be incrementally reduced if necessary. - Using a high volume anilox can make creating a visually accurate coating-stripe impossible – in this case, use of a 'break-away' method by incrementally reducing anilox to blanket/plate contact pressure until an incomplete coating image is achieved, then incrementally increasing the contact pressure until the coating image area is complete. - Insufficient anilox to blanket/plate contact pressure can result in an incomplete coating image or insufficient grit transfer. - Excessive anilox to blanket/plate contact pressure can result in coating/grit displacement/beading along the image area relief edges, in particular the lead and rear edges and uneven distribution of the grit particles over the image areas.
Coating Plate-Substrate Contact	- Blanket/plate to substrate (impression) contact pressure should be minimized to provide sufficient coating/grit transfer to the substrate while avoiding excessive pressure which can contribute to quality-issues related to coating/grit displacement. - Use of a 'break-away' method by incrementally reducing impression contact pressure until an incomplete coating image is achieved, then incrementally increasing impression contact pressure until the coating image area is complete. - Insufficient impression pressure can result in an incomplete coating image or insufficient grit transfer. - Excessive impression pressure can result in coating/grit displacement/beading along the image area relief edges, in particular the lead and rear edges and uneven distribution of the grit particles over the image and loss of image detail/fidelity. - Excessive impression pressure can result in poor grit particle distribution over the image areas and concentrated areas of grit along the image relief areas in heavy coating beads – this would be particularly evident at the image areas rear edges.
EOP-UV Curing	- Cure-response for grit texture energy-cured coatings is formulated to account for reduced press-speeds and increased dwell of the EOP-UV curing system. - Typical EOP-UV settings for general-use energy-cured coating can be employed without over-curing of the grit texture coating despite reduced press-speed/increase curing system dwell. - Grit texture energy-cured coatings are formulated with improved coating-film flexibility to prevent a fragile/brittle film if over-cure does occur.

Cleaning	- Removal of any residual grit particles after use may require several cleaning cycles of the coating system and removal/cleaning of the chamber, recovery pan and hoses. - It is best to utilize separate coating pumps/hoses for specialty coating products to segregate from general-use products to minimize cross-contamination when moving from specialty coating products – this enables quick changeovers to minimize down-time and allows for cleaning of the specialty coating system to be done off-line from the press. - Cleaning the residual grit particles from the anilox may involve using an anilox brush and cleaning paste.