

Web Heatset Ink Chill-Pick and Solvent Streaking



Sappi Printer Technical Service

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Problem

The printed web signatures exhibit sporadic print voids and/or streaks in localized areas of heavy ink coverage appearing as ink pick or ink smear without any disturbance to the paper coating.

Description

This type of ink-pick, better known as chill-pick, and ink solvent streaking, both of which typically originate on the lead chill-rolls, can be more of a challenge on gloss coated papers because of the potentially high residual ink solvent remaining on the surface of the printed ink film after the dryer. Therefore, ink holdout in conjunction with press speed, dryer heat/efficiency, and chill-stand chill/efficiency are the primary contributing factors of these undesirable web heatset print defects.

Web dryers are designed to flash-off excess moisture and ink solvent at high box temperatures in the 350–375 ° F. (177–191° C.) range. Before the web dryer can adequately flash-off ink solvents, it must first evaporate excess moisture from the web in the form of ink water pick-up and absorbed plate moisture from the fountain solution. If moisture and ink solvents are adequately evaporated as the web exits the dryer, the printed ink film then enters the chill rolls in the proper semi-fluid state. The chill rolls, pre-set to internally flow chilled water in the temp range of 55° F. (13° C.), harden and set the ink by solidifying the non-volatile resins which bind the ink pigments.

If too much residual ink solvent remains in the ink film after solvent-flash in the dryer, or if the lead chill-roll is too hot or inefficient in setting the ink, a condition of localized ink-pick may develop on the lead chill-rolls. Since the press cut-off and chill-roll circumference are non-matching, depending upon position of web-up or chill-roll size, the ink-pick will probably change position around the web while maintaining the same position across the web.

A condition closely related to chill-pick is chill-roll solvent streaking. At high press speeds, a thin layer of solvent-laden air follows and rides the web as it exits the dryer into the chill-stand. As the web hits the first chill-roll, this air film intrudes upon the nip-point between the web and the chill-roll trapping an insulating film of solvent which disturbs the soft ink film causing a “streaky” or smeared appearance. Unlike chill-pick, which is multi-faceted in cause, solvent streaking is more a nuance of high press speed in conjunction with heavy ink coverage and typically demands the implementation of auxiliary chill-stand equipment to manage the condition.

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Causes

- Insufficient flashing of ink solvents in the web dryer either due to low heat, excessive moisture, and/or high press speed in relation to dwell time and dryer length.
- Web exit temp too hot due to lack of cool-down in the final zone resulting in overheat of the lead chill-rolls; primarily the #1 and sometimes the #2 chill-roll.
- Chill-rolls running too hot either because the incoming water is not cold enough or not circulating properly causing hot spots on the first and possibly the 2nd chill-roll. Internal water veins may be plugged, restricted, or circulating in the wrong direction.
- Chill-roll surface is pitted.
- Low pigment inks are demanding heavier than normal ink films.
- Ink water pick-up is too high.
- Inks may be too high in solvent content or contain unusually low-evaporative solvents.
- Over-coating with wax-free varnishes may negatively affect web release off the chill-rolls due to the absence of Teflon wax from the formulation.
- Solvent vapors are tracking the surface of the web and trapping between the web and the chill rolls at high speed. Solvent condensation on the lead chill-rolls can soften and smear the ink film resulting in a “streaky” ink film disturbance or actual ink-pick.

Options and Solutions

- Increase and track actual dryer web temp and/or decrease press speed as necessary. This will efficiently flash more ink solvents but watch for lead chill-roll overheating or paper blistering.
- Adjust zone controls to cool the web down as much as possible before exiting the dryer. For example, the 1st zone should run hotter than the 2nd zone.
- Check if the lead chill-roll surfaces are running too hot and note incoming and exiting chill-water temperature. Adjust water temps to adequately return the web to room temperature or approximately 72–75° F. upon exit from the chill-stand. Incoming chill-water temp into the 1st chill-roll is usually preset at 55° F., but if too cold, condensation can occur, especially if the chill-water continues to flow when the press goes down.

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- Insure that the incoming chill-water is properly plumbed and circulating through all the water veins of the lead chill-rolls in proper sequence and flow direction. Be sure that the closed-loop chill-water supply contains an adequate mix of rust and corrosion inhibitors.
- Check for chill-roll surface pitting in the areas of ink pick.
- Run less ink or consult with ink supplier to increase ink pigment strength. Check maximum ink density and options for under-color removal. SWOP recommendation is 300%, but high-end commercial may run up to 340%.
- Test ink for excessively high water pick-up; consult with ink supplier.
- Consult with ink supplier; explore options for low-solvent or higher evaporative solvent inks.
- For short run consideration thoroughly clean and wax the lead chill rolls especially in areas of ink pick.

There is a variety of auxiliary equipment designed to manage the tendency of chill-pick and/or solvent streaking on high-speed web heatset. Some industry-accepted options include:

- Installation of a cool water mister to help cool the surface temp of the lead chill rolls focusing on hot-spots and/or areas of ink-pick.
- Installation of an auxiliary electrostatic chill-roll web-tacker to uniformly tack the web down on the lead chill-roll by static charge. This will prevent solvent trap between the web and chill-roll surface at high press speeds.
- Installation of an automatic chill-roll wipe to keep solvent deposits and ink-pick from building on the lead chill-roll.