

Ink adhesion SOP: film contact angle before printing, then tape and rub tests

Check plastic film surface energy by contact angle before printing, record ink wetting on the film, and link both to your tape and rub results.

How to use this template. Fill in every field marked [] for your film, ink and end use. Gates must come from your own tape and rub results (section 4). This SOP supports, and does not replace, ASTM F2252, ASTM D3359 or ASTM D5264.

1. Scope

- Applies to: film (PE, PP, PET, PVC, vinyl) [], ink system (water based, solvent, UV) [], print process [].
- Purpose: catch low surface energy, contamination or additive bloom before ink goes on, and explain tape and rub failures.
- Out of scope: the adhesion rating itself, ink cure and rub cycles. Use your tape and rub tests.

2. Equipment and materials

- Dropometer with sessile drop and pendant drop setup.
- Ultrapure water; diiodomethane for surface energy; your ink for wetting checks.
- Clean gloves and a flat fixture for film.
- Reference film and record sheet (section 6).

3. Method lock (fill in once, then do not change)

Setting	Value	Setting	Value
Drop volume	[] μL	Read time	[] s after landing
Room temperature	[] $^{\circ}\text{C}$	Humidity	[] %
Spots per sample	[]	Liquids	water, diiodomethane, ink []
Time since treatment	[] h	Reference film	[]

4. Set your gate (once per film and ink)

1. Measure film lots that passed and failed your tape or rub test.
2. Find the water contact angle or surface energy that separates them.
3. Set the gate and review it after any change of film, additive, ink or cure.

Result	Water angle or surface energy	Ink on film	Action
Pass	at or below [] $^{\circ}$ or above [] mN/m	spreads evenly	Print
Watch	[] to [] $^{\circ}$	edges pull back	Remeasure; check treatment age
Hold	above [] $^{\circ}$	beads or crawls	Hold; retreat film or change ink

5. Routine check

1. Reference.

Measure the reference film and confirm it reads as before.

2. Film.

Measure water contact angle on each film lot, and diiodomethane if you report surface energy.

3. Ink.

Measure ink surface tension by pendant drop if the ink lot changed.

4. Wetting.

Place an ink drop on the film and record whether it spreads or beads.

5. Print and test.

Print, cure, then run your tape and rub tests at the agreed time.

6. Decide.

Record film, ink and test results together and compare with the gate.

If adhesion fails: find the cause

What you see	Likely cause	What to do
High water angle on film	Low or decayed treatment	Retreat film; shorten storage
Angle rises over weeks	Slip additive bloom	Check additive level and storage temperature
Good film angle, tape fails	Ink cure or ink choice	Check UV dose or drying; check ink lot
Rub fails, tape passes	Soft or thin ink film	Check cure, coat weight and rub test settings
Patchy failures	Contamination or uneven treatment	Map the web; handle by the edges

6. Record sheet

Date	Film lot	Ink lot	Water angle (°)	Ink wets?	Tape result	Rub result	Operator

Background and help

Background: ASTM D2578 notes that wetting tension alone is not a complete measure of adhesion, so link film readings to your own tape and rub results. Related: ASTM F2252 (tape test for inks on flexible packaging), ASTM D3359, ASTM D5264, ASTM D5946. Full use case: dropletlab.com/use-cases/ink-adhesion-and-abrasion-testing-on-film/
 Questions about this SOP or the Dropometer: [Abhi Bhandankar, abhandankar@dropletlab.com](mailto:abhandankar@dropletlab.com). Book a 15 minute demo at dropletlab.com.