Flexo printing troubleshooting guide

Introduction

Flexographic printing is a highly specialized process and many parameters can affect the quality of the final product. To achieve best print quality, all components have to be coordinated.

If you are experiencing problems during printing, consult this guide for possible solutions. Here we share our view on common print issues that may affect your operation of the printing press, to ensure you continue to get the best quality print and most efficient processes.

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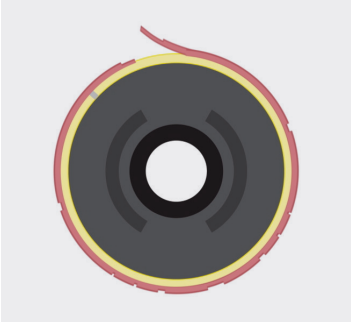
Plate edge lift



You might find a plate is trying to revert to its original, flat form after having been mounted on a round sleeve. This then results in the plate edge lifting off during storage of mounted plates or later during printing. Naturally, this causes machine downtime and production delays when plates must be re-mounted.

With a root cause during mounting

Problem

The plate edge is lifting after the plate has been mounted, especially when mounted plates are stored for a longer period of time. Or the plate edge lifts later during printing, even though the root cause lies in the mounting process.

Potential causes and solutions:

1. The back side of the plate is not sufficiently clean. Contaminants such as soap, oil, grease, and photopolymer residues reduce tape performance. Clean the plate thoroughly with a rag and clean solvent, dispensed from a spray or squeeze bottle. Wait until the solvent dries completely.

2. Sufficient pressure has not been applied to the plates during mounting. Use a rubber roller or lay-on roller – a lay-on roller should be checked to ensure it applies equal pressure across the whole width of the sleeve/cylinder.

3. Older, deformed plates tend to curl toward the image side. Store plates flat or curled to the PET side, and keep them in an air-conditioned room away from UV light and ozone, with a separator placed between each plate.

4. There may be wrinkling or creasing on the plate edge. If possible, trim the plate edge to reduce the effect. Or use an adhesive promoter to increase adhesion.

5. On the edges of PET backing of the plate, there may be burring. Use deburring knives to take out these defects.

6. Plate lift can be caused by a small repeat length of sleeve or cylinder when there is 100% coverage on the plate, fitted edge to edge with no gap. Use an adhesive promoter to increase the adhesion.

Other tips, especially for long-term storage of mounted plates before printing:

- Use an edge sealing tape on plate edges.
- Use an adhesive promoter on plate edges.
- Wrap the mounted sleeves with a stretch film or plastic film during storage.
- Use bevel cuts while trimming the plate, to reduce tension on the plate edge.

With a root cause during press run

Problem

Once a job has begun printing, the plate edge may start lifting from the tape, and transfer ink to the substrate. (The tape remains on the sleeve – only the plate is lifting.)

Potential causes and solutions:

1. Excess solvents used in in-machine plate cleaning can dissolve the adhesive on the plate side if the solvent sits on the adhesive for too long. Avoid using too much solvent when cleaning, and keep excess solvent from dripping onto the plate edge with a dry sponge or compressed air.

2. The in-unit dryer temperature is too high or blowing air towards the sleeve / cylinder. Check to see that dryer settings are correct and in-unit dryer seals are in place.

Other tips:

Ink splashes or dirty print which need excessive cleaning up could be an indicator of other issues such as ink viscosity or air flow in the press. Check carefully for these issues and avoid the need for in-machine plate cleaning.

- Check ink viscosity regularly
- Check for air flow in the press
- Reduce ink and web temperature
- Get the ink/solvent mixture right – contact your supplier if needed
- Check doctor blade life and blade unit calibration/pressure

Our recommendation:

Our assortment of plate mounting solutions features a variety of adhesives formulated to securely bond to all different types of plates. We also offer the perfect product for every print shop environment, taking factors like humidity, temperature, and cleanliness into account. Reach out to your local tesa representative to have your processes analyzed, resulting in a tailored plate mounting product recommendation.

Pinholing

Flexo printing can be susceptible to the pinholing effect, which describes the uneven or incomplete distribution of ink over a solid area, resulting in the appearance of small ‘holes’ in the print area. This can result in reduced dynamic range of color, and a loss of density.

Potential causes and solutions:

1. The ink dries on the anilox roller and does not transfer to the plate. Use solvents that take longer to evaporate; decrease the hot air dryer temperature; or increase the speed of the press.
2. The ink forms an uneven film or does not form on the substrate. The surface tension of the ink may be too high to flow into place on the substrate. Check the ink viscosity and adjust accordingly. It may also help to check the surface tension of the substrate and use a more suitable solvent for cleaning.
3. If the anilox is worn or plugged, it is unlikely to achieve a consistent, even ink film on the substrate. Examine the anilox and clean or replace if necessary – an anilox roller with higher volume could also be a solution.
4. There may be dirt on the impression cylinder. Clean the impression cylinder using the right solvent.
5. If there is insufficient pressure during printing, use a higher impression setting or use a tape with a harder form.

Our recommendation:
To eliminate pinholing effects, the right combination of anilox, plate, and plate mounting solution needs to be considered. Our assortment of tesa® Softprint plate mounting tapes offers six different hardness levels, so that the perfectly matching foam hardness can be found for each motif. Our tesa® Twinlock self-adhesive sleeves feature an especially thick foam layer and therefore have a larger print latitude than traditional tapes. Our tesa flexo experts will gladly help analyze your process to recommend the best fitting plate mounting solution.

Dot gain

Dot gain is when the dots that make up the image on the print become larger than they should be. The printed image then appears darker than intended, details become fuzzier, and there are changes in hue and saturation. Due to the pressure in the print process, you will always have some dot gain – only if there is too much does it become a problem.

Dot gain is a particular problem in soft vignettes down to zero. Here, the smallest still-printing dots are printing larger than intended. This causes a visible line before the non-printed area starts, meaning there is no smooth transition between the smallest dots and the non-printed area.

Potential causes and solutions:

1. Dot gain can be caused by excessive pressure within the settings of the print cylinder, impression cylinder, and anilox. Check your impression settings of the print cylinder to the substrate and anilox roller to the plate when encountering dot gain during printing.

2. There will always be pressure in flexo printing, resulting in dots increasing in size. To achieve the desired outcome and obtain a printed dot of the right size, apply “dot gain compensation”. This means the original dot on the plate is reduced in size to a certain extent during plate making.

3. Another cause for dot gain is when dots on the plate enter the cells of the anilox, picking up more ink than intended, which results in larger printed dots. This is also known as 'dot dipping'. Make sure that dots are larger than the cells of the anilox so that they cannot dip into the cells – the line screen of the anilox should be at least 5 times higher than the line screen of the plate. Too much anilox cell volume equals more ink being transferred from the anilox to the plate where it builds up and then transfers to the substrate, also resulting in dot gain. Use an anilox with a lower cell volume or higher cell count if this occurs.

4. If ink viscosity is too low, ink spreads too much across the substrate before drying. Monitor ink viscosity levels at all times.

5. A mounting tape that is too hard or a plate that is too thick means the contact pressure of halftone dots to substrate is too high. This can make a noticeable difference in dot gain. Plates also must be mounted correctly to avoid trapped air underneath, which would also result in a thicker build-up and increased pressure. Select the correct foam hardness level of your plate mounting solution and mount plates thoroughly. Also check if the thickness of your printing plate is correct, since swelling can be a side effect of solvent-based plate making processes.

6. Too much pressure can also occur due to press damage and wear, for example, of a gear, mandrel, or cylinder. This will impact how the plate contacts the substrate, which can again cause dot gain. Perform regular maintenance and cleaning of all machine components.

Our recommendation:
Besides the tips listed above, it can also make sense to adjust the foam hardness level of your plate mounting solution. Our tesa® Softprint assortment comes in six different hardness levels to match all requirements when it comes to pressure during printing. Our tesa® Twinlock self-adhesive sleeves feature an especially thick foam layer and have a larger print latitude than traditional tapes. Our tesa flexo experts will gladly help analyze your process to recommend the best fitting plate mounting solution.

Slur

You can recognize “slur” by the smearing of the trailing edge of your printed image or by the appearance of a double image. You will tend to see elongated oval shapes instead of round dots, the dots are distorted in printing direction.

Potential causes and solutions:

1. During printing, the surface of plate, substrate, and anilox must run at the same speed. If they do not, the surface of the plate (with the ink) will slur over the substrate and the anilox.
2. Reasons can include mechanical problems such as tension control or machine wear, or an incorrect undercut.
3. The plate being “too fast” can be caused by too thick or too hard plates or mounting tapes, or by a sleeve with a too large diameter. All this affects the actual circumference of the printing repeat. If the plate runs slower than the other surface, the causes are vice versa (e.g. the plate being too thin or soft).
4. Solutions would be to check sleeve diameters, and the thickness of plate and tape as well as the substrate caliper. The anilox-plate and plate-substrate impressions should also be checked.

Our recommendation:
We produce our plate mounting products with a focus on thickness tolerances. Contact your local tesa representative and arrange a visit to analyze your processes, resulting in a tailored plate mounting product recommendation.

Air collection

Air collection leads to bubbles forming either between the sleeve and tape, or between tape and plate. Depending on where the air collects, there are different procedures used for dealing with it.

Air bubble forms between sleeve/cylinder and tape

Potential causes and solutions:

1. Leftover solvents from cleaning agents used to clean the sleeve are evaporating under the tape. Give the sleeve sufficient time to dry before mounting the tape.
2. Differences in temperature between the tape and sleeve/cylinder could cause trapped humidity. Make sure the tape and sleeve/cylinder are all at the same temperature before mounting.
3. High pressure on the mandrel can cause thin-walled sleeves to expand and therefore stretch the applied tape. When the sleeve returns to its original diameter, the tape might lift from the sleeve in some places. Keep air pressure on the mandrel within recommended levels and as low as possible. Use a tape that is more flexible and will therefore expand and contract with the sleeve if needed.
4. The plate mounting tape has not been applied with enough pressure, thus creating a weaker bond. Apply tape with a squeegee to ensure sufficient pressure and better wetting properties compared to application by hand. Use a lay-on roller, when available, on mounting machines for a balanced, fast, and high-pressure application.
5. When a plate needs to be repositioned during mounting and the adhesion to plate is higher than adhesion to sleeve, the repositioned plate might pull off the tape from the sleeve and leave an air pocket underneath. Make sure to use a plate mounting tape with adhesion levels fitting your requirements and be careful when repositioning plates.

Other tips:

- Avoid using steel blades to cut on sleeves, to reduce damage to the surface. Any scratches in the sleeve surface will lead to less contact area between sleeve and tape, and bubbles will form more easily. Also, cleaning agents can collect in the scratches and cause bubbles when they evaporate.
- When using a mounting machine with a lay-on roller, make sure it is firm enough to supply sufficient pressure and that the lay-on roller is applying pressure equally across the sleeve or cylinder.
- If you are struggling with air bubbles, it is a good time to review whether your adhesives and your plate mounting tape product design fit to the sleeves you are using, and your ways of working.

Air bubble forms between tape and plate during application and storage

Potential causes and solutions:

1. Smaller air pockets trapped between plate and tape are pushed together when applying pressure during plate mounting, forming a visible bubble. Applying pressure in smooth movements, line by line, can avoid this, as can structured adhesives / tape liners.

2. If the plate is not applied with enough pressure, the bond between tape and plate is not sufficient, causing the plate to come back off. Use a rubber roller for manual plate mounting, and apply consistent and slow pressure. For mounting machines, make sure that the lay-on roller provides enough pressure and reduces the rotation speed of sleeves if needed. Also check for any damaged or other low spots in the sleeve.

3. If the back side of a plate is not thoroughly cleaned, contaminants such as soap, oil, grease, and photopolymer residues can affect tape performance. The back side of the plate needs to be cleaned with a rag and cleaning solvent dispensed from a spray or squeeze bottle. Wait until the solvent is completely dry before plate mounting.

4. Wrinkles on a plate can cause the plate to pull away from the tape. Try using heat to smooth out wrinkles, or adhesion promoters to increase the bond in the affected area.

Other tips:

- Do a thumb test to check pressure: press your thumb firmly on an image area after mounting the plate. If the area under the thumb gets too visible and too dark in color, not enough pressure was applied. Increase application pressure or slow down the roller during mounting.

Air bubble forms between tape and plate during printing

Potential causes and solutions:

1. High impression settings can squeeze small pockets of air together to a non-image area on the plate. This causes the non-image area to print as well. Try to adjust the impression settings.

Our recommendation:
Available within our tesa® Softprint plate mounting tape assortment, our structured easy-application ‘EA’ liner creates microchannels in the adhesives on both the sleeve and plate side. These channels prevent air from accumulating underneath the plate, allowing for simpler mounting and printing.

Foam delamination when demounting tape

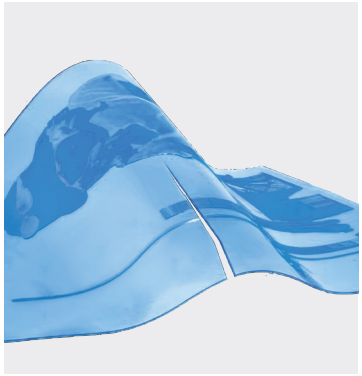
After printing, the tape is removed from the sleeve or cylinder. If the adhesion between tape and sleeve is too high, tape removal becomes extremely hard and the tape's foam could split, leaving damaged tape on the sleeve. Softer foam hardness levels are more susceptible to being damaged.

Potential causes and solutions:

1. Ink residues on the sleeve during tape mounting can react with the tape's adhesive and create a stronger bond. Always make sure to clean the sleeve with a suitable solvent before applying the tape.
2. When having a combination of long press runs, high impression settings, and long storage time after printing, the adhesion of tape to sleeve might increase over time. So if possible, it is good to demount the tape shortly after use.
3. Different sleeves have different surface characteristics and different surface energies, and they all react differently to pressure-sensitive adhesives. Make sure that the tape you use and the sleeve are suitable for each other, and that the sleeve's surface is not damaged.
4. In order to not apply too much stress to the tape, try pulling it off in a different angle. For example a 90° instead of a 180° angle can help to protect the tape.

Our recommendation:
Our tesa® Softprint 'Flex' design protects the tape's foam on both sides with a PE layer. This way, no delamination of the foam will occur.

Plate damage upon demounting



A flexo photopolymer printing plate can be damaged if excessive force is used to remove it during the demounting process. Damaged plates result in production disruption and additional costs for replacement plates. There is also the environmental cost to consider of a plate going to waste and having to be replaced.

Potential causes and solutions:

1. Not every plate mounting tape fits every printer. Individual requirements, operating procedures, plates, and inks can affect the performance of a tape's adhesive. The wrong combination can lead to hard plate demounting after printing, and can even lead to plate damage. Consult with your plate mounting tape supplier for your ideal tape solution.

2. Ink residues on the back side of the plate can act like an adhesive promoter, causing the bond between tape and plate to become too strong, resulting in hard plate demounting and possible damage. Check for the following:

- Manual plate cleaning: Cleaning the plates properly on the sleeves/cylinders will limit ink contamination. Allow the cleaning solvent to dry before demounting. Clean the back of the plate with a suitable solvent on the surface dedicated to cleaning. If the plates are cleaned after demounting, use two different stations to clean the front and back side of the plate. After cleaning the front side, dry off excessive dirty solvent with a rag before placing the plate on the other station to clean the back side.

- Plate cleaning machines: With any plate cleaning machine, the back side of the plate will come in contact with the cleaning solvent during cleaning. The cleaning solvent is gradually contaminated with more ink over time, which can settle on the back side of the plates during plate storage. It will be hard to remove as ink tends to bond to filmic substrate. After the machine cleans the plates, dry any excess solvent from the front and back sides of the plate first, then immediately clean with a suitable solvent to remove any ink residues.

- Cleaning before mounting: Clean the back side of the plate with a suitable solvent directly before mounting and let it dry. Plate storage or handling plates during mounting can leave oil or dirt residue on the back side of the plates, which may increase or decrease adhesion to the plates.

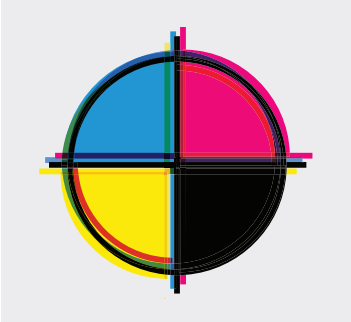
Our recommendation:
Make use of our expertise to analyze your processes and recommend a suitable plate mounting solution.

Other tips:

- More aggressive solvent: If needed, clean the back of used or improperly cleaned plates with a more aggressive solvent before mounting. To remove ink residues (especially after storage), multiple applications of 100% IPA might be required.
- Use spray or squirt bottles: To keep the cleaning solvent clean and reduce contamination, avoid using plunger cans. Every time solvent is dispensed on to a dirty rag, residues might transfer to the solvent in the plunger can, potentially contaminating the solvent.
- Separators: Use a separator in between each plate to avoid cross contamination of the front and back side of the plate.
- Separate rags: Use separate rags for cleaning sleeves and plates. Sleeves contain a lot of dried ink residue due to ink spills in the press. Using the same rag can create cross-contamination between sleeves and plates.

Misregister

In flexographic printing, “misregister” describes a printing defect in which the separate colors of the print image are not correctly positioned, resulting in a blurred image because the dots did not print in the position they were intended to.



For high-quality prints, all separately printed colors need to be aligned perfectly. Today’s multi-color and demanding print designs call for special attention to the topic of print register. Misregister by even the tiniest fraction will result in waste, machine downtimes, re-prints of jobs, and delays in delivering the orders to the end customer.

Potential causes and solutions:

1. Plates: The printing plates might not be mounted in register, or feature an imprecise repeat length. Remount with special attention to the register. “Differential stretch” of the plate, a wrong distortion factor, or mistakes in the production process will directly affect the print repeat length and the separate colors will print out of register. Check all processes for precise results.
2. Circumference: The buildup of sleeve, tape, and plate needs to be consistent in thicknesses for consistent circumferences and therefore repeat length. Check the condition of your sleeves, and measure plate thickness and relief depth, as well as tape thickness, to find the root cause.
3. Machine settings: Make sure that impression settings between printing units are equal to ensure printing in register. Also check web tension, temperature (reduce if necessary), drive gears, and settings of a variety of rollers.

Our recommendation:
When you use our self-adhesive tesa® Twinlock sleeves, you can delete “tape” from the equation of circumference buildup - printing plates are directly mounted on the self-adhesive sleeve, no tape needed. One factor which could lead to deviations from the required repeat length is therefore eliminated.

Bouncing

Bounce or resonance effects can occur when different roller speeds and print images hit hard leading edges, causing part of the printing unit to vibrate. In most cases, the print quality is affected, but often there are also complete print failures.

Potential causes and solutions:

1. The standard measure is a reduction in press speed, which often improves the quality of the run, but will of course slow down the job production, affecting deadlines and productivity.
2. The printing form design can also cause bounce. Staggering the design might help to avoid hard leading edges.
3. Bounce can also occur from machine mechanical wear or cylinder balance. All machine parameters and conditions should be carefully monitored.

Other tips:

- Check for excess wear on the sleeve, plate, and tape. Replace as needed.
- Check for the correct hardness levels.

Thank you for reading

If you have any questions or want to book a consultation, please visit:
tesa.com/print/consultation

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