flexo printing problems and solutions

Flexographic printing is widely used in packaging, labeling, flexible packaging, and other fields. Due to its environmental friendliness, high-speed printing, and other characteristics, it is favored by printing factories. However, in daily printing operations, some problems still occur. Here, based on years of experience in the printing industry, we summarize the common problems in flexographic printing and their solutions.

I. Unclear Printed Patterns (Smudging/Blurring)

Problem Manifestations

- Blurred edges of text and adhered dots.
- Loss of image details and poor sense of hierarchy.

Cause Analysis

1. Improper selection of the anilox roller: A too-low line count leads to an excessive ink amount.
2. Excessive printing pressure: The printing plate makes too tight contact with the substrate, causing the ink to squeeze and spread.
3. Abnormal ink viscosity: Too low viscosity results in poor leveling properties.

Solutions

- Adjust the anilox roller: Select an appropriate line count according to the pattern fineness (for example, 150 LPI for solid colors and 300 LPI for fine text).
- Optimize the printing pressure: Gradually reduce the pressure until the printing plate makes a slight contact with the substrate (the recommended pressure range is 0.1-0.3 MPa).
- Control the ink viscosity: Use a viscosity cup (such as Zahn #4) to adjust it to 30-40 seconds (at 25°C), and add a thickener if necessary.

II. Color Deviation and Color Difference

Problem Manifestations

- The printed product does not match the Pantone color card.
- Inconsistent colors between batches.

Cause Analysis

1. Errors in ink preparation: Inaccurate pigment ratios or uneven stirring.
2. Fluctuations in printing speed: Changes in speed lead to unstable ink application.

3. Differences in substrate ink absorption: Different batches of paper or film affect color development.

Solutions

- Standardize ink management: Use an electronic scale to accurately weigh the pigments (with an error of ≤0.5%) and adopt an automatic stirring system.
- Stabilize the printing speed: Set a constant speed mode (such as 120 meters per minute) and avoid frequent speed adjustments.
- Pre-treat the substrate: Conduct corona treatment (with a dyne value of ≥38 mN/m) on materials with poor ink absorption (such as PE film).
- Data support: After corona treatment, the ink adhesion of the PE film is increased by 50%, and the color difference ΔE≤1.5.

III. Dot Gain

Problem Manifestations

- Dots in the highlight areas are blocked, and the dark tone layers are lost.
- Reduced printing contrast.

Cause Analysis

1. Mismatch between the printing plate hardness and the substrate: A hard plate (such as 60 Shore A) is prone to extrusion deformation on a soft substrate.
2. Excessively high ink transfer rate: The anilox roller has a large ink-carrying capacity.
3. Uncontrolled environmental temperature and humidity: High temperatures increase the ink fluidity.

Solutions

- Match the printing plate hardness: Select a 45-50 Shore A printing plate for soft substrates (such as corrugated paper) and a 55-60 Shore A plate for films.
- Reduce the ink-carrying capacity: Replace it with a higher line count anilox roller or use a shallow engraved anilox roller (with a 20% reduction in the BCM value).
- Control the environment: Keep the workshop temperature stable at 22-25°C and the humidity at 50-60%.

IV. Poor Ink Adhesion

Problem Manifestations

- Ink peeling off and poor scratch resistance.
- Color fading after the printed product is rubbed.

Cause Analysis

1. Insufficient surface energy of the substrate: The dyne value of untreated PE/PP film is low.
2. Defects in the ink formula: Insufficient resin bonding force or incomplete curing.
3. Inadequate drying: Insufficient UV curing energy or too low hot air temperature.

Solutions

- Treat the substrate: Conduct corona treatment (with a dyne value of ⩾40 mN/m) or apply a base coat.
- Optimize the ink: Select a resin with high adhesion (such as polyurethane-modified acrylic acid).
- Strengthen drying: The UV curing energy should be ⩾300 mJ/cm², and the hot air drying temperature should be 80-100°C.
- Data support: After corona treatment, the adhesion test (ASTM D3359) of the BOPP film is improved from 2B to 5B.

V. Stripes or Streaks on the Printed Product

Problem Manifestations

- Vertical stripes appear in the printing direction.
- Uneven color distribution.

Cause Analysis

1. Wear or incorrect angle of the doctor blade: Gaps in the doctor blade lead to uneven ink application.
2. Damage to the printing plate or roller: Surface scratches or foreign matter contamination.
3. Impurities in the ink: Unfiltered ink particles block the cells of the anilox roller.

Solutions

- Replace the doctor blade: Check the doctor blade every 8 hours, replace the blade with gaps, and set the angle at 55-65°.
- Clean the equipment: Use a non-woven fabric and a special cleaning agent to wipe the printing plate and the roller.
- Filter the ink: Filter the ink with a 100-mesh filter screen and clean the ink tank every 4 hours.

VI. Registration Misalignment

Problem Manifestations

- Pattern misalignment in multi-color printing.

- Ghosting at the edges or color overflow.

Cause Analysis

1. Improper tension control: The substrate is stretched or shrunk.
2. Eccentricity of the printing plate roller: Mechanical errors lead to circumferential deviations.
3. Fluctuations in temperature and humidity: Changes in the expansion and contraction rate of the material.

Solutions

- Closed-loop tension control: Install an electronic tension sensor with a fluctuation range of ±0.5 N.
- Calibrate the roller: Use a dial indicator to detect the concentricity of the roller (with an error of ≤0.02 mm).
- Constant environmental control: The temperature and humidity changes should not exceed ±2°C/±5%.
- Data support: The closed-loop tension system can reduce the registration error from 0.3 mm to 0.1 mm.

VII. Poor Ink Drying

Problem Manifestations

- Smudging and soiling of the printed product.
- Residual odor of the ink.

Cause Analysis

1. Insufficient drying temperature: The hot air temperature or UV energy does not meet the standard.
2. Excessively high printing speed: Exceeding the capacity of the drying equipment.
3. Problems with the ink formula: Slow solvent evaporation rate or 失效的 UV initiator.

Solutions

- Optimize the drying parameters: Increase the hot air temperature to 90-110°C, and the UV lamp power should be ≥200 W/cm.
- Match the speed with drying: Adjust the printing speed according to the drying capacity (for example, the speed limit for hot air drying is 80 meters per minute).
- Replace the ink: Select a fast-drying solvent or a highly active UV ink.

VIII. Equipment Wear and Maintenance

Common Problems

- Abnormal noise of gears and overheating of bearings.
- Fluctuations in printing pressure.

Prevention and Solutions

1. Regular lubrication: Apply high-temperature-resistant lubricating grease to the gears and guide rails every week.
2. Bearing replacement: Replace the bearings every 6,000 hours (such as SKF/FAG brands).
3. Pressure calibration: Use a pressure sensor to calibrate the system error every month.

- Cost-benefit: Regular maintenance can reduce unplanned downtime by 30%.

IX. Influence of Environmental Factors

Problem Manifestations

- A sharp increase in ink viscosity in winter.
- Ink skinning in summer.

Solutions

- Constant-temperature workshop: Install an air conditioning system (with a temperature of 22-25°C and a humidity of 50-60%).
- Ink insulation: Use a heated ink tank in winter (with a temperature control of ±2°C).
- Sealing management: Seal the ink barrels as they are used and add an anti-skinning agent (such as methyl ethyl ketoxime).

Most problems in flexographic printing are caused by three major factors: equipment settings, material adaptation, and environmental control. Through standardized operations, precise parameter adjustments, and preventive maintenance, production efficiency and the pass rate of finished products can be significantly improved.

Zhongzhixing's flexographic printing solution can provide comprehensive services and consultations for printing enterprises. In terms of ink selection, water-based and UV ink options are provided. The water-based ink, with its environmental protection feature of zero VOC emissions, not only conforms to the current concept of green production but is also suitable for absorbent substrates such as paper and dialysis paper, ensuring the safety of label printing. The UV ink, on the other hand, has the characteristics of instant curing and strong wear resistance, and can show excellent printing effects on non-absorbent substrates such as PET films, meeting the printing requirements of different

materials.

In terms of printing speed, Zhongzhixing's flexographic printing solution has significant advantages, reaching 150-300 meters per minute, and the high-efficiency printing speed greatly improves production efficiency.

Zhongzhixing also provides professional technical support and after-sales service. From the debugging of printing equipment and the selection and matching of inks to technical guidance during the printing process and later maintenance and problem-solving, Zhongzhixing's professional team can respond in a timely manner, leaving customers with no worries.

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