Knowledge Requirements for Task IV. The Blanket and Plate Cylinders Section 3. Blankets

Introduction

Offset printing blankets are rubber-surfaced, fabric-backed coverings that are mounted on the blanket cylinders of a printing press. They receive images from the plates and transfer them to the substrate (paper). Selecting the most appropriate blanket for the type of work to be printed is essential to good quality, as is proper installation and maintenance. This lesson will address details in those areas that are essential to the press operator

Objectives

The student/trainee will be able to identify two types of blankets and describe the appropriate use for each. In addition, the student will be able to describe blanket construction and characteristics and list procedures for blanket mounting and care. The student/trainee will also be able to identify and describe common blanket problems, their causes, and remedies.

Teaching Aids/Tools

Required:

- ✔ CD-ROM, Task IV, Section 3
- ✔ Offset Blanket Problems Worksheet
- ✔ Samples of various types of offset blankets, conventional and/or compressible
- ✔ Offset blankets, conventional and/or compressible

Optional:

- ✔ SIR Heatset Web Offset Training Simulator
- ✔ Torque wrench
- ✔ Machinist's micrometer
- ✔ Deadweight bench micrometer (Cady gauge)
- ✔ Blankets and printed sheets showing blanket-related printing problems
- ✔ Magnifying glass

Instructor/Teacher Ideas:

- ✔ _____
- ✔ _____
- ✔ _____
- ✔ _____

Suggested Problem-Solving Activities

1. Bring samples of blankets that have been part of recent problems at the facility. Discuss the characteristics of the blankets, and have the group brainstorm a list of possible reasons why problems developed.
2. If an SIR Heatset Web Offset Training Simulator is available, solve blanket-related problems both (a) as a group or as teams in the classroom and (b) as assigned problems for individuals during lab time outside the classroom. Use pre-programmed problems and create new problems related to: blanket tension, blanket packing; blankets tacky and/or dirty; dried ink on blankets; and smashed blankets.

Instructional Outline

Training Tip

☞ Show samples of various types of offset blankets when presenting the the information in these sections.

A. Purpose of Blankets

1. Explain that the purpose of the blanket is to transfer the inked image from the plate to the paper with minimum distortion to the original image.
2. Point out that most blankets are capable of receiving and transferring very fine images, up to 600-line/in. halftones.
3. Emphasize that selecting the most appropriate blanket for the type of work to be printed is essential to good quality as is proper installation and maintenance.

B. Blanket Types

1. Recognize compressible and noncompressible (conventional) blankets as the two categories of blankets available to the press operator. **(Figure 3-1; WOPO 157.)**
   a. The terms describe how the blanket behaves under the squeezing action of the printing nips—plate/blanket nip and blanket/substrate nip.
2. Explain that the ***conventional (noncompressible) blanket*** bulges out on either one or both sides of the nip when squeezed. **(Figure 3-2; WOPO 158.)**
   a. This bulging occurs because the blanket material cannot be compressed; it is displaced.
   b. Noncompressible blankets are often referred to as conventional blankets because the original design of lithographic blankets did not contain a compressible layer.
3. Understand that the conventional blanket usually has (1) lateral flow from gripper to tail around the cylinder and (2) better release properties that allow for printing better solids.
4. Explain that the ***compressible blanket*** will compress in the printing nip, allowing greater squeeze pressures and improved ink transfer. **(Figure 3-3; WOPO 158.)**
   a. Compressible blankets contain a cellular sponge-like layer that compresses and then recovers, regaining its original thickness. **(Figure 3-4; WOPO 159.)**
   b. Because the compressible layer must be fully compressed to work properly, more packing squeeze is required with a compressible blanket.
   c. Compressible blankets are capable of printing dots and finer tones best.
5. List the following as advantages of a compressible blanket compared to a conventional blanket:
   a. Better resistance to smashing.
      - Blankets are susceptible to damage when compressed too much.
      - A web break or a wrinkled sheet can damage a blanket, creating low spots that will not properly and evenly transfer ink.

- Compressible blankets are far more likely to recover from this kind of sudden trauma than conventional blankets.

b. More packing latitude.
- Excessive packing will create too much transfer pressure at the plate-to-blanket and blanket-to-paper nip.
- Dot gain, slur, and premature plate wear are just three problems that can result from overpacking.
- Compressible blankets allow a wider tolerance in packing, making the associated problems less likely.

c. Reduced plate wear.
- A conventional blanket has a "harder" surface and will compress less as it contacts the plate.
- The bulge created at the nip increases friction; over time the blanket will wear down the image on the plate.

d. Minimized vibration problems.
- As the cylinder gaps meet on press a slight vibration is created.
- Gears, particularly if worn from use, can also send unwanted vibrations through the press. It is possible for excessive vibrations to affect print quality, distorting large solids or tints with variations in print density. Compressible blankets help to absorb the shock of cylinder gap or gear vibrations.

C. Blanket Construction

1. Explain that blankets are constructed of two basic parts: the carcass and the surface layer.
   a. The carcass is made up of several fabric plies that are fused together with adhesive rubber cements.
   b. Compressible blankets contain a compressible layer, which varies somewhat among manufacturers, but this layer might consist of cork or a synthetic sponge-like material.
   c. The threads in fabric are woven at right angles to one another.
      - One direction is called the ***warp,*** and the other direction is called the ***weft.***
      - The thread structure is strongest and has the least stretch in the warp direction.
      - The blanket is mounted around the circumference of the cylinder in the direction of a fabric's warp, while the weft is run across the cylinder.
2. Explain that blankets used on most web presses (excluding newspaper presses) are manufactured in two primary thickness ranges.
   a. ***Three-ply blankets*** usually measure 0.064–0.070 in. (1.63–1.78 mm) thick.
   b. ***Four-ply blankets*** measure 0.075–0.080 in. (1.91–2.03 mm).
3. Point out that the ply designation was initially based on the number of fabric layers that comprised the carcass of a noncompressible blanket, but currently, ply ratings simply refer to the two thickness ranges.
   a. The introduction of better fabrics and the additional space required by the compressible layer of a compressible blanket have led to the manufacture of blankets that do not actually have three- or four-ply carcasses.
4. Stress that three-ply blankets generally are not run on cylinders with undercuts designed to accommodate a four-ply blanket because of the excessive amount of packing that would be required, which could result in packing creep.
5. Explain that the surface of the blanket, often called the ***blanket face,*** will affect print quality characteristics.

a. Synthetic elastomers have completely replaced the natural rubbers once used for the blanket surface.
b. Formulations are available to meet the special requirements of ink formulations and solvents, such as UV inks which have a tendency to swell rubber.

D. Blanket Characteristics

1. List the primary blanket characteristics as ***release, compressibility, tensile strength, stretch, caliper variability, squareness,*** and ***solvent resistance*** and briefly describe each characteristic, as described on pages 161–162 in WOPO.
2. Stress that proper size, squareness, and correct caliper should be checked before a blanket is used in printing. The blanket should also be free of obvious defects.
   a. Proper size is checked along the warp line or directional arrows (on back of the blanket) in the around-the-cylinder direction.
   b. Squareness is checked by examining the across-the-cylinder edges and the warp lines.
   c. The surface and back of the blanket should be checked for obvious defects.
   d. Correct caliper is checked best by using a blanket thickness gauge to take measurements over the entire surface of the blanket.
      - The Cady Gauge allows the press operator to measure the blanket or paper at the center, as well as the edges.
      - A machinist's micrometer should not be used to check the thickness of blankets because the blanket is too soft to get an accurate reading.

Training Tip

☞ Show trainees how to measure the thickness of a printing plate using a machinist's micrometer and a deadweight bench micrometer (Cady gauge), and ask them to identify why a machinist's micrometer should not be used to measure blanket thickness.

3. Remember that a rough blanket or a blanket that does not become soft and smooth by absorbing ink oils will provide better sheet release. Quick-release blankets are available for this purpose.
4. Define a smooth blanket as a blanket capable of producing better solids and halftone dots than a rough blanket.
5. Explain that a blanket with a smooth finish will transfer very sharp dots and fine lines, but will create more resistance with ink release, which could cause a higher incidence of paper picking, particularly with papers of weak surface strength.
6. Point out that rougher surfaced blankets produce rougher edged dots and fine lines.

Training Tip

☞ Show press sheets that illustrate the differences in dot structure when different blankets are used.

7. Explain that ***release*** is the ease with which a blanket allows the tacky ink film to break away from the blanket surface.
   a. Poor release properties can cause a host of printing problems including dot distortion, blanket piling, excessive sheet curl, and uneven solids.

b. Both mechanical and chemical factors affect the release characteristics of a blanket.
   - Rougher finishes release tacky ink more easily, while smoother finishes place more pulling force on the paper.
   - Chemical release properties are influenced by the chemical composition of the synthetic rubber face of the blanket.

> ***Training Tip***
> ☞ Show press sheets that illustrate printing problems related to poor release properties of the blankets.

E. Selecting the Offset Blanket

1. Always select the blanket best suited to the paper, ink, and press.
2. Stress that the press operator must select a blanket that offers a suitable compromise between paper release and print quality.
3. Explain that the material (usually rubber) in the blanket is formulated by the manufacturer to meet special printing requirements. Be sure to discuss any special requirements with the supplier ahead of time.

F. Treating the Blanket

1. Stress that it is not good practice to use a blanket continuously until it is worn out.
   a. Blankets should be checked periodically for wear.
   b. If a blanket is run too long, concentrations of ink, vehicle, and solvent build, leading to embossing.
2. Explain how a "rested" blanket's position should be reversed when it is remounted on the press.
3. Stress that every pressroom should have at least one extra blanket for each press size. This extra blanket should be in perfect condition and fastened in its bars ready for immediate use.
4. Review specific procedures related to blanket changes at your facility.

G. Blanket Mounting Considerations

1. Explain that are several types of blanket mounting designs.
   a. Many modern web offset presses are equipped to lock blankets without premounted bars into blanket clamps that are built into the blanket reel bars.
   b. Some web offset presses require blankets that have some form of a metal bar mounted on each end to fit into the blanket lockup mechanism in the blanket cylinder gap.
      - Over two dozen bar styles available for use on different makes and models of presses.
      - The blanket manufacturer should be able to premount the appropriate bars for use on a specific press.
   c. Prepunched blankets, which are not typically used on larger presses, have holes that match the bolt pattern of specific mounting bars. **(Figure 3-5; not shown in any reference book.)**
      - Unless otherwise specified, two parallel rows of holes are punched across both ends of the blanket, at a right angle to the warp lines.
      - Bars for prepunched blankets consist of two metal bands with interlocking surfaces that grip the edge of the blanket from each side, and bolts connect the metal bands through holes in the blanket's edge.

d. Gapless presses are designed without blanket gaps and associated lockup mechanisms.
   - These presses have cylindrical blanket sleeves that slide onto the cylinders with the aid of air pressure that slightly expands the sleeve diameter.
   - Because the blankets are slipped over the cylinders as sleeves, the presses are bearerless, so control of printing pressure is accomplished with adjustable wedge blocks that control the space between the cylinders.
   - The gapless blanket is made of a compressible carcass laminated to a rigid inner sleeve made of seamless nickel; the surface layer is the same as that used on conventional flat blankets.

2. Stress that the proper mounting of blankets is important to quality printing, make-ready, and production time.
3. Emphasize that blanket mounting tension is more critical than plate mounting tension, due to the elasticity of the blankets.
   a. Excessively tightening the lockup can slightly decrease the blanket thickness, or even damage and compress the compressible layers.
   b. Blanket characteristics and varying strength among press operators make it difficult to pack a blanket to the proper torque without a mechanical aid.
      - A micrometer-adjustable torque wrench can be used to apply a prescribed tension to the mounted blanket. **(Figure 3-6; WOPO 164.)**
      - The torque wrench can be set to a specific torque value, and the wrench will click when the press operator tightens the blanket to that value.
      - Consult the blanket manufacturer's recommended torque.

Training Tip

☞ Show a torque wrench to the students and discuss its proper use. Discuss the torque recommended by the manufacturers of blankets used by your facility.

4. Explain that blanket thickness will decrease slightly, due to running compaction, requiring the press operator to retighten each new blanket with a torque wrench after the first 3,000–4,000 impressions.
5. List the following as the proper steps and procedures for mounting a blanket, and explain to the trainees that they will learn to mount blankets in operation B of task IV, "Mounting/Removing Blankets." (**Note:** This general procedure is applicable in most instances.)
   a. Prepare the blanket for mounting. Clean blanket cylinder with approved solvent. Attach blanket clamps. Clean and inspect the blanket. "Mike" the blanket thickness with a Cady gauge. Verify the thickness indicated on the back of the blanket. Determine the type of blanket: compressible or conventional.
   b. Mount the lead edge of the blanket on the press. Warp lines on the blanket back must go around the cylinder body.
   c. Insert the blanket packing underneath and work it slightly into the cylinder gap. The blanket packing should extend all the way around the cylinder, from leading edge to trailing edge. Packing can be cut to web width or slightly less. Cutting the packing materials slightly undersize will prevent ink from building up on the edge of the blanket. Packing may consist of specially manufactured paper or Mylar plastic. Mylar may be glued to the cylinder or the back of the blanket.
   d. Inch the blanket forward, slowly, around the cylinder while gently stretching the blanket by the tail edge. It is not necessary to put a blanket in under impression.

e. Use a torque wrench to achieve truly consistent results in blanket tightening.
f. Check the blanket-to-bearer height with a packing gauge. A reading of 0.002–0.004 in. over bearer height usually works best, but always check your manufacturer's specifications.
g. Retorque or check the blanket tension after a short initial run on the press.

6. Explain that, after mounting, the blanket-to-bearer relationship needs to be verified with a packing gauge.
   a. This measurement should be taken in three points on the blanket cylinder: (1) at the lead edge, (2) at the trailing edge, and (3) at the center between the lead and trailing edge (180° from the lead edge).
   b. If the readings vary by more than 0.001 in. (0.25 mm), the blanket is probably overtightened.