

KODAK RELIABLE IMAGE TIP # 14

PROCEDURE TO QUANTIFY DIAZO PROCESSING

1. Evaluate the quality of the Diazo print film at normal machine speed. This will be your baseline at the current customer duplicator settings.

- ★ Measure background density or D-Max
- ★ Measure D-Min
- ★ Evaluate character quality
- ★ Evaluate background color

For Black and Tonal Black Diazo films:

- ★ Blue appearance = temperature too high
- ★ Brown/sepia appearance = temperature too low
- ★ Green/yellow appearance = not getting enough ammonia in developer chamber

(Blue Diazo is less susceptible to developer conditions and color shifts)

2. Measure the true D-Max of the diazo film. Cut a 6-8" piece of diazo film from a fresh roll and feed 4-6" into the developer chamber. Allow this film to sit in the developer chamber 1-2 minutes. Record the D-Max value.

The measured background density or D-Max from the baseline sample in step 1 should be within 90% of the true D-Max of the film (value measured in step 2). If the density is less than 90%, the film is not reaching full development. At this point the temperature should be verified (color of duplicate will also be an indication of a temperature problem) and the ammonia flow in the developer chamber should be checked. Aqueous (liquid) ammonia flow can be checked by opening the developer chamber (after the duplicator has been turned off and the ammonia in the chamber has dissipated) and replacing the bottle of aqueous ammonia with a bottle of water. Turn the machine on, run the duplicator with the chamber door open and you should see steady drips

of water onto the heat sink in the chamber. If the flow is not steady, check the supply line for obstruction or vapor lock.

3. Quantify the machine speed. Using a known length of film, record the time required to duplicate the known length. The result will be the machine speed in terms of feet per second, which can be compared, to the machine setting or digital readout.

4. Determine the optimal machine speed. The optimal speed is determined by duplicating a silver step wedge with known densities at various duplicator speeds. The step wedge should have a density range from .05 to at least 2.0 in increments of .15. Determine the optimal machine speed by looking at a step with a density of about .35. The optimal duplicator speed is the speed that best reproduces the .35 density on the diazo duplicate.

5. Quantify the temperature in the developer chamber. 150° F-180° F is the usable temperature range to achieve a neutral diazo color. Do not assume the temperature readout on the machine is accurate.

If the background density or D-Max of the film (value measured in step 1) is within 90% of the true D-Max of the film (value measured in step 2) and the color of the diazo looks neutral, the exact processing temperature does not need to be verified. One method to measure the developer temperature is to purchase temperature sensitive strips from the Paper Thermometer Company. These strips are spliced to the diazo film. Upon exiting the developer chamber read the darkened temperature box with the greatest indicated temperature. The value associated with this box is the temperature in the developer chamber.

These strips can be purchased from:

- ★ Paper Thermometer Company in Greenfield, NH
- ★ Phone - 603-547-2034. Ask for Set #2, 140° F-180° F temperature range
- ★ There are 16 strips/packet. The minimum order quantity is six packets.

6. Quantify the image quality. Duplicate resolution targets at the customer baseline machine speed and at the optimum speed as determined in steps 3 and 4 if different from the baseline speed. Evaluate a minimum of 30 targets (chosen randomly) to ensure no double imaging, blurring or ghosting is occurring. You should be able to resolve a target on the duplicate equal to the original film or one or at most two targets less than the original film. If you are unable to achieve this resolution, the duplicator needs to be checked for slippage, vibration, and alignment....

The resolution of diazo film is 1200 lines/mm so this film is capable of achieving the same resolution as the master if the duplicator is running properly.

7. When the optimal conditions are determined, duplicate enough film to prove to yourself and your customer that the new duplicator settings do in fact meet the customer's needs. In many cases, there will be trade-offs (machine speed, ammonia usage, developer temperature...). To ensure the proper ammonia and temperature settings, evaluate the duplicated film. The film should not be damp or contain water spots. If water spots are observed, the ammonia needs to be decreased and or the temperature increased.

8. D-Min is determined by the intensity of the ultra-violet exposure and the speed of the machine. D-Min can be decreased the reducing the duplicator speed (not many people will want to do this) or by replacing the light source. As a rule of thumb the UV light source will lose 5% of its output per 100 hours of operation. If a shop leaves their duplicators on (with the UV source on) 24 hours per day, 5 days per week, the bulbs

are losing 5% of their output per week. Therefore, to reduce D-Min instead of slowing the machine down, the other option is to replace the light source.

9. D-Max is determined by ammonia, heat and time in the developing chamber. Diazo film cannot be overdeveloped. Once full development is achieved with the correct combination of ammonia, temperature and dwell time in the developing chamber, any additional time in the developer chamber will not cause the film to overdevelop.

10. A note on Tonal Black Diazo film. This diazo film was specifically designed to duplicate high-speed check sorter film (however it is also used in a variety of other applications). It has a lower contrast than our traditional black or blue diazo films so it will capture more of the fine line detail and gray scale from the original. It also has less coverage (thinner emulsion pack) so it takes less time for the UV exposing light source to achieve D-Min. This results in faster duplicator speeds. Depending on the condition and type of duplicator, machine speed can be increased 10-15%.

The D-Max of Tonal Black Diazo film is also lower than our traditional black and blue diazo films (1.6 for black/blue diazo vs. 1.15 for Tonal Black). This is very apparent in a reader and some customers may object to this. However this is cosmetic only and can be overcome by making paper prints from the traditional black or blue diazo films and comparing it to paper prints made from the tonal black films. The paper print quality from the tonal black film will equal that of the traditional black and blue diazo films. If the customer can ignore the visual appearance in the reader, (this is difficult for some who are accustomed to seeing a dark, crisp image from our traditional black or blue diazo films) they will achieve a productivity improvement as well as maintaining the quality paper prints in the retrieval area.

11. There are two types of ammonia used with diazo duplicators. Aqueous ammonia is a liquid mixture of ammonia and water. The concentration of ammonia is measured in degree of Baume. Most duplicators use 24 degree Baume or less. Aqueous ammonia greater than 24 degree Baume can result in vapor lock occurring in the supply line from the bottle of ammonia to the developer chamber.

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Anhydrous ammonia is a gas that is pure ammonia. In duplicators where anhydrous ammonia is used there is a separate water supply. The water and ammonia gas meet in the heated developer chamber to form a mist. There are independent controls for ammonia and water levels. These need to be adjusted to achieve the correct mixture of water and ammonia. Typically diazo film will achieve full development in anhydrous ammonia faster than aqueous ammonia because anhydrous is pure ammonia.