



Function of silicone anti-marking solution in web off-set printing.

For heat-set web printing, silicone emulsion is used as a slip agent applied to the web after the printing units to facilitate the folding, delivery and binding of the printed web and signature books. The silicone is provided as a concentrate which is typically diluted in water at 5-10% for use on the press. The dilution is often performed by a dosing meter. The concentration of the silicone concentrate can vary in concentration and composition and there are a range of proprietary technologies offered by the manufacturers. The silicone is applied by a chrome roller which may be adjusted for speed and direction to apply more or less silicone solution as required to achieve the optimum performance for the silicone used.

Need for Silicone

The primary objective of the silicone is to provide some slip to the web so that the ink will not rub off on the angle bars, pipe rollers and former board which can then redeposit to leave “marks” on the printed sheet. Some slip is also required so that signature books will deliver and stack properly by the conveyor and collection system and also in bindery equipment.

- **Marking** - The most significant potential for marking occurs on the inside sheet at the fold from ink build-up on the “nose” of the former board. Since there is more pressure on the sheet at this location, the potential for ink to build up here is the greatest. Build-up on angle bars and on fans in the folder are also common sources for marking. The silicone concentration and applicator speed are adjusted to prevent this marking.
- **Slip**- The folded books coming out of the folder are delivered on to a conveyer. The conveyer may be a very short straight run of may be a long run with turns to arrive at the stacker. The books must have some slip to “shingle” and easily slide into the stacker. The silicone must be regulated to provide the right amount of slip. Too little, and books will stick together. Too much slip can be a problem as books can slide out of alignment on the conveyor and slip out of a stacker.
- **Static control** – Electro-static charge build-up on the web occurs from the hot air in the dryer and friction of the web with the metal surfaces. The positive and negative charges can cause the pages and books to stick together and interfere with the delivery process. Static conditions will vary with conditions of the press, dryer, paper, and relative humidity. Static may not be an issue at all or can be very significant. Antistatic agent is often incorporated in the silicone product to neutralize the static charges. Antistatic additives are also available. For high static conditions additional anti-stat can be added to the dilute silicone solution.

High levels of anti-stat can interfere with the performance of the silicone and its' ability to wet out more evenly on the silicone applicator. We recommend only using additional anti-stat as needed.

Silicone Products – All silicone is not alike

- Web silicone products are actually emulsions, which means that small particles of the silicone fluid are suspended and dispersed in water. The amount of silicone in the concentrate can vary and typical concentrations are from 30-60% silicone fluid. The higher concentration silicone emulsion products are more expensive but would require a relatively lower dilution rate. Typical silicone dosage pump setting is 5-10% dilution of silicone concentrate(30-60% silicone) to provide a working dilute silicone concentration of 3-5%. The effective amount can vary with the type of silicone fluid and additives. Other than silicone, formulators may substitute other slip additives and add anti-static agents.

Factors that affect Silicone Performance

- Product formula- The amount and type of silicone fluid, silicone concentration, silicone substitutes, antistatic additives
- Paper stock-
- Ink coverage
- Condition of rollers, angle bars and former board, folder and air flow
- Oven temperature and drying of the ink
- Static conditions in press
- Applicator speed, direction, and condition.

The above factors all enter into the performance of the silicone emulsion. We can make some generalizations of these affects, but because of all the variables, it is not always possible to predict relative performance of a silicone. In general heavy ink coverage and heavier stocks and higher web speed typically require more silicone. Lighter stocks, more absorbent stock, lighter ink coverage will require less silicone.

Other Silicone Related Problems

- **Emulsion separation** – Silicone is an oil. The silicone oil and water inherently do not mix together well and emulsions by definition have a limited stability. There are a number of reasons that can cause silicone emulsions to separate prematurely which we will not delve into here. When this happens the oil comes out of suspension and will not perform properly. If any kind of separation is observed, contact the manufacturer for technical support.
- **Silicone spots** – Silicone does not apply to the web in a smooth film. The web picks silicone off of the applicator roller in a spotty fashion which is usually visible on the sheet in the delivery. The spots are more visible on heavy ink coverage. In most all normal cases the silicone spots should absorb into the ink/paper and become unnoticeable after a period of time. If it remains visible, the cause is that the silicone concentration is too high from over

dosing or some silicone additive is being used that does not absorb. Over use of silicone and/or antistatic additive is probably the most common mistake made, and the cause for silicone spots.

- **Paper Fluting, and expansion** – Both of these are caused by absorption of water by the paper. The silicone solution applied is around 95% water so most of the solution is absorbed into the paper. Fluting is the wavy appearance that occurs more so on light weight stocks. Some paper stocks will absorb water and expand to alter the dimensions of the page. The best fix to reduce water absorption is to reduce the applicator speed to reduce the amount of solution applied. It may be necessary to increase the silicone dilution rate to offset the reduction of the solution applied.
- **Bacteria-** Silicone circulation tanks are susceptible to contamination and growing bacteria. The preservatives in the silicone products can be overwhelmed if the conditions allow for bacterial growth. The bacteria can accumulate to appear as a gloppy solid in the tanks, lines and trays. Regular cleaning and maintenance is recommended to prevent the growth. If bacteria growth is suspected a special clean out procedure is necessary. Consult Technical support for instructions.

Silicone Sale Opportunity

The reasons for a customer to change to a new silicone:

- **Lower sale price** - This is the first obvious factor. However since there is such a range of silicone product formulations, concentrations and non-silicone additives, this may be comparing apples and oranges. The real cost savings is in the actual usage cost.
- **Lower usage cost** - The usage cost is the real cost to use the product based on the product price and the consumption. This value can only be compared with some long term usage comparison data. This is difficult to quantify accurately, if products perform similarly. Most printers will go by the relative applicator speeds and dilution rates. For example a reduction of dilution rate from 8% to 7% correlates to a 12.5% reduction in usage if applicator speeds are the same. Being able to reduce applicator speed also results in significant lower consumption and usage cost.
- **Better performance-** This can include any of the factors previously described. There may be a certain paper stock or ink that is problematic, or marking or delivery issues that an improved product may resolve. Speaking directly with press and folder operators can give you insight to any problems that they may have.

Silicone Testing

- **Start-Up** - It is always best to test on the worst case, problematic job and press. Press side tanks should be cleaned and drained. If that is not convenient, allow tanks to run down as low as possible before switching over. Being present for the initial period for observation is highly recommended. It may be necessary to make adjustments early and if you are not there, products may be pulled off where a simple adjustment could have been made. Listening to the observations of the press operators will give you the best feed-back on the performance. Unless a product experiences problems immediately, a valid test of silicone requires 2-4 weeks of monitoring to run on a variety of press conditions.
- **Set up** - If the test product is similar in concentration to the incumbent product, I recommend starting up with the same dosage and press settings as usual. (Make note of the dosage, applicator speeds and direction (forward / reverse) for each applicator.) If all is good, gradually see if first the dosage and later the applicator settings can be reduced. Contact your silicone Technical support person for assistance if any problems are observed.

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