CRABLE ENGINEERING LLC

TECHNICAL BULLETIN

FWA AND DYE LINE CLEANING

Anionic Direct Dyes and Fluorescent Whitening Agents (FWA's) have finite solubility in water. The product chemistry and the manufacturing process determine the solubilities of these products. Some products may require the addition of stabilizers to enhance the stability when marketed as liquids. Producers of other materials run them through Reverse-Osmosis (R-O) technology. That manufacturing process removes inorganic salts that are detrimental to the solubility of most dyes. The results of R-O processing are more soluble and stable liquid dyes without requiring the addition of stabilizers that often have negative impact on wet-end chemistry in the papermaking process.

Dye Lines:

Dye Lines for Neat Dyes and FWA's

Modern dye delivery systems allow paper manufacturers to pump liquid dyes in the concentrated form. Improper "housekeeping" or pumping incompatible concentrated dyes in line without cleaning can cause major problems. The problems can range from scale build-up and sediment to complete line plugging. Therefore, we suggest flushing the lines with fresh water after each use. Periodic purging of the lines with a chelate, glycols, and/or caustic is a good "preventative maintenance" program.

Storage Tank and Dye Lines for Diluted Liquid Dyes and FWA's

The hardness of the water used for the "makedown" of liquid dyes and FWA's can have a negative impact on the stability of the products. (Whenever possible, the dyes and FWAs should be kept in “neat” [undiluted] form from the container to their injection point in the process.)

Hard water contains divalent and trivalent cations such as Mg++, Ca++, Fe++, Fe+++, etc. The cations will often complex with the dyes and FWA's to form insoluble salts. The cation-dye complexes are insoluble and will precipitate forming a sludge build-up in the lines. It is difficult to get cation-dye complexes back in solution. Periodically, the velocity of the flows cause the complexes to break loose from lines and pumps. The results are the rejection of the paper for color spots or streaks.

The use of Ethylenediaminetetraacetic acid (EDTA) based chelates can eliminate the formation of insoluble cation-dye complexes. EDTA sequesters the cations so they cannot react with the dyes. Chelate addition to the dye tank may improve operations when the proper amount is used.

As previously mentioned, many dyes and FWA's contain preservatives. Dilution of dyes and FWA's extend the performance of the preservative beyond its limit. It may be necessary to add additional preservative to the "makedown" tank to prevent bacteria growth in the system. We strongly suggest running compatibility tests on dyes and FWA's to ensure they are compatible with the preservative.

Dye Run Tank and Dye Lines:

1. Drain tank or container.
2. Remove any inline filters.
3. Fill tank with water at 140-150°F. Increasing the temperature increases the dissolving rate. Add enough sodium hypochlorite or calcium hypochlorite to give a solution of approximately 100 ppm as chlorine.
4. If agitation or recirculation is available, run for 30 minutes. Otherwise, leave the line filled with solution for 30 minutes and then purge. *(Note: In the absence of recirculation or agitation, the use of water soluble thickening agents, such as Acrysol GS from Rohm and Haas, to prevent rapid runoff is recommended. The addition rate of 0.5 lbs. per gallon is suggested.)*
5. Refill tank with water. Add enough EDTA to make a 3-5% solution by volume. If agitation or recirculation is available, run for 30 minutes. Otherwise, let the solution sit in the line. EDTA will help scour dye/FWA tank walls and lines. After 30 minutes, adjust pH with caustic to 9.5 or above and run for an additional 30 minutes. Longer times may be needed for heavy build-ups. *(Note: 0.05-0.1% of a very low foaming surfactant may increase cleaning and scale dissolution rate; concentration of reducing agents such as sodium sulfite or sodium hydrosulfite may also improve cleaning efficiency.)*
6. Flush tank well, making sure all traces of hypochlorite have been removed.
7. Fill tank with product and continue with normal operations.

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