Table 2

Form of interaction	*Practical disturbance*
Water-in-ink emulsification	Tinting (if excessive) Filling-in
Water films on ink surfaces	Water marking
Adsorption (by ink pigment) or dissolving of water additives into ink	Print density and gloss reduction, colour hue shifts
Adsorption or precipitation of water additives onto image areas	Sharp printing, blinding, blanket glazing
Ink droplets in water (low content emulsion)	Dampener contamination, tinting, scumming, piling
Ink component films spreading on water surfaces	Scumming, dampener contamination
Elution and dissolution of ink components into water and reprecipitation	Dampener contamination, piling

WATER–INK INTERACTION

The principal forms of water–ink interaction is classified in Table 2.

The difficulty in the test procedures is that there is hardly a way of controlling the various forms of interaction in a running press. To estimate the degree of interaction, two central mechanisms leading to water-in-ink emulsification are illustrated in Figure 1.

(1) The first mechanism occurs in the inker form-roller/plate nips in the image areas. A thin ink film (left in the image areas in the plate/blanket nip) is covered with the fountain solution in the dampener/plate nips and comes in the nip against a thick ink layer and some surface water. Water is pressed between two very unequally thick ink layers and thus the emulsified water tends to remain in the image areas. The same happens in every forme roller nip, but there the surface water films are probably thinner and their emulsification effect remains smaller than that at the first nip. In the latter forme roller nip the ink films are more nearly equal in thickness. This may cause surface water formation of the already

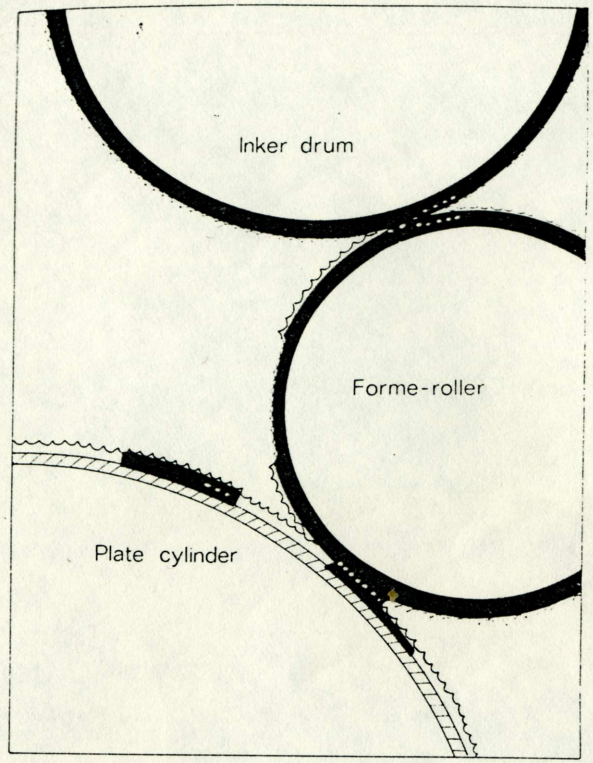

Figure 1 *Two mechanisms of water-in-ink emulsification* (1) *on image areas, lower nip, and* (2) *on non-image areas, upper nip*

emulsified water which is now closer to the central line of the splitting ink film.

(2) The second mechanism occurs in the inker forme-roller/drum nips in the non-image areas. The ink films on the forme-rollers pick up water from the well dampened non-image areas and come against the ink film on the inker drum and its surface water (probably a very thin water film). Because there is much more of the non-image area on the plate, this second mechanism may dominate. This is also the mechanism that feeds water into the inker.

These two mechanisms in the press determine the emulsification, and consequently influence the surface water formation, other water–ink interactions, and water evaporation rates. The stronger the emulsification tendency, the slower the evaporation of water. Some breakdown of the already formed but very unstable emulsion occurs at the outlets of all nips where water is present.

The proposed mechanisms help us to understand what are the decisive physical and chemical phenomena in the formation and break down of