

THE ART OF AN AQUEOUS COATING IS IN ITS ADDITIVES PACKAGE

When you go to a coating supplier for a specific end use aqueous coating you wouldn't think that "ART" would come into play, but it does. "ART" comes into play because the formulation of coatings is an "ART". There is no place to go to find a scientific formula or recipe to follow in order to formulate an aqueous coating with a particular set of final performance properties. Oh, there is a scientific basis for assembling the fundamentals, but not the complete formulation. The successful formulation of a specific property yielding aqueous coating is dependent on the experience of the formulator, and especially the "ART" of incorporating functional additives.

When we look at the composition of an aqueous coating or varnish used in the graphic arts industry, we find that a formula consists of water, resins, and additives. The end products may be thermoplastic or thermosetting. The thermoplastic type accounts for the majority of formulated coatings being used. These are blends of polymers, either solution or emulsion forms, in water, with the coatings water component usually finalizing around 40%. The water and resin components might make up to 95%+ of a typical formula with **additives** making up the remainder.

At first glance this composition might seem rather simple, and one might jump to the conclusion that just about anyone can formulate and make an effective aqueous coating; however, this is far from the truth.

When we look at a formulated coating's expected performance, we find that the smaller **additives** portion contributes greatly to the coatings final properties. It can be truly said that **additives**, their selection and combination incorporated, are critical to the formulated performance properties of a coating.

Let's look at some of the additives used and the specific properties of an aqueous coating they can affect.

Adhesion promoters: These materials are used to improve the adhesion or sticking of an aqueous coating to printing inks, primers and substrates.

Alkaline materials: Strictly speaking these materials do not make up the typical additives package of an aqueous coating, but they are worth mentioning. Materials such as ammonia hydroxide and other amines are used in small quantities to fundamentally produce some of the basic aqueous resin solutions and emulsions that are used. These alkaline

materials maintain a systems pH and help keep a coating open on press during use. Their evaporation in the drying process is necessary for a coating to effectively dry after being coated onto a substrate.

Anti-foam agents: This type of additive is a material that breaks forming bubbles. The action is to aggressively prevent bubbles from forming in liquids that tend to readily want to form bubbles and foam as they are agitated, pumped, released from anilox cells, etc.

Biocides: Almost all aqueous coatings require the addition of small amounts of fungus fighting materials to prevent the growth of fungus during the storage and shipping of liquid coating.

Coalescent aids: The word coalesce means to unite or merge into a single body or mass. Some selected additives can be used to cause certain coating resin components to mass and form a film as the coating's volatile components are driven off during the drying process.

Deodorizers: These additives, also called masking agents, are used to mask or replace a sometimes-undesirable odor present in a liquid coating. The resultant odor is chosen to improve the coating's acceptability in a pressroom user environment.

Cross-linkers: These chemically active additives are used to increase the cross-link density of a dry/cured coatings resins system. They are occasionally used when it is desirable to improve a particular coating's chemical, blocking, and/or heat resistance.

Lubricants: Materials that include PE (polyethylene), PP (polypropylene) and PTFE (polytetrafluoroethylene) waxes, paraffin, silicones and fatty acid amides are used to control the slip or COF of a dry coating. By their nature, they also are used to improve the mar and rub resistance of a coating. The lubricant types listed above can differ across a wide range in the effect imparted, temperature resistance and rate of migration to surface of a dried coating. Often several of these materials are used in combination to produce a specific set of final properties.

Optical Brighteners: These materials are fluorescent organic compounds that function by absorbing UV light, which is then emitted as a visible blue light. This blue emission gives a viewer the impression that a dry coating film is whiter. O.B.s are sometimes used to mask an undesirable yellowness in a coating.

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Oxidizing agents: Resin components of some aqueous coating formulations can be polymerized by small additions of an oxidizing agent. These specific formulations are tailored to provide alkaline resistance.

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Plasticizers: These additives are used to improve the flexibility of a dry aqueous coating film. Some of these materials are high boilers and as such remain in the coating after drying. They can migrate to the surface of a dry coating film and can raise COF and decrease rub resistance. Migrating to a coating's dry film surface, they can additionally lower surface energy and produce adhesion issues.

Release agents: This class of additives is used to improve the release of a product from a dry coating film. They are typically materials in the lubricants group, which bloom to a dry coating's surface such that they can influence slip and release properties.

Surfactants: Surfactants are materials that improve the wettability characteristics of a coating. They function by lowering a coating's surface tension allowing it to better wet a surface to be coated. The affinity of a liquid to wet a surface is measured by the contact angle formed between a liquid and a surface. Complete wettability = zero contact angle. Non-wettability = +90 degrees contact angle.

Wetting agents: Another term to describe surfactant additives used to reduce the surface tension of a liquid and improve its surface wetting property.

In conclusion, it can be said that the formulation of a successfully performing aqueous coating is no accident. It may in fact be said that it is an "ART" and mainly the "ART" is in the selection and makeup of a formulated coating's **additive** package. The experienced individual formulator supplies the "ART" that must be applied. This is why you'll want to: **LOOK TO CORK!**

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