

Water-based fixes for foam control

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In most pulp and paper mills, you'll see evidence of foam bubbling over a chest or popping on the surface of a whitewater tray. That's because pulp and paper making systems are foam generating systems and to achieve quality, production and cost goals, foam and air must be controlled. Undue amounts of foam inhibit equipment efficiency and negatively affect retention and drainage. Entrained air in coatings and residual gas bubbles that pop on the wire can hurt sheet quality. In an age where quality is the factor that distinguishes one paper manufacturer from another, air and foam control are vital.

As mills increase their use of secondary fiber, foaming problems will intensify. The same materials that foamed in the original process—such as strength additives, latex and calcium carbonate—are present in higher concentrations. And as mills close their whitewater systems, the foam stabilizers that once troubled only wastewater streams are now being recirculated back to the machine.

A deculator is a piece of equipment designed specifically for the removal of air. However, more often than not, it works less efficiently than desired. Foam generated through the cascading and aeration of stock, violent agitation and whitewater recirculation cannot be completely avoided by mechanical means. In order to break up the bubbles that cause entrained air, a mechanical or chemical force must be present.

Papermakers can choose among many antifoam programs. Extensive research and field work have produced foam control chemistry that has improved antifoam cost performance, effectiveness and process compatibility. Most are liquids and are usually classified according to their water content. (See Table 1.)

Over the years, antifoam suppliers have developed programs to meet both environmental and customer needs. As concerns regarding dioxin precursors and finished product quality increased, foam control chemists began looking for ways to reduce or eliminate oils that were thought to contain dioxin precursors.

Table 1 — Types of foam control chemistry

▶ Water-based, oil free	100 percent water and actives, no oil
▶ Water based	More than 50 percent water
▶ Water-extended, oil-based	Less than 50 percent water
▶ Oil-based	100 percent oil and actives, no water
▶ Concentrates	100 percent active, no oil or water

Researchers sought to develop products with active ingredients that would be more compatible with water-basing than traditional actives such as amides and silica. The first attempts led to products that were merely dilute versions of the original oil-based products. Though they did contain less oil and were less expensive, they were not cost- or performance-effective. Usage increased proportionally to the reduction of oil content. However, new actives were developed that proved to be more active, economic and less prone to deposition.

In the mid-1970s, the first truly water-based defoamers were successfully introduced to the paper industry and continue to positively impact pulp and paper making systems. These products do not contain oil or other traditional ingredients that have a high affinity for pitch and slime deposits, leaving pulp and paper makers with much cleaner machines.

Another benefit of water-based antifoams is the ability to use them in sized grades. Field experience has proven that these products do not affect sizing—even in high dosages. In addition, numerous laboratory experiments show that today's water-based products, unlike traditional antifoams that contain hydrocarbon oils and powerful surface-active agents, do not adversely affect the retention and efficiency of many sizing agents (this "desizing" occurs when the resinate particles are solubilized and their precipitation onto the fibers is inhibited). Figure 1 illustrates the effect various antifoam chemistries have on sizing response. The water-based product's oil-free chemistry further reduces the potential to affect other sheet properties such as strength, brightness and opacity.

(Continued on Reverse Side)

Table 2 — Paper mill antifoam applications and benefits

Applications	Benefits
Wet end foam and air control	Increases production and quality
Elimination of entrained air in coatings	Enhances printability
Control of Dandy Throw	Eliminates sheet spotting and improves formation
Increased absorbency	Provides opportunity for expanded grade structure
Yankee release agents	Prolongs Yankee surface life, improves sheet quality
Screen room foam and air control	Increases screening efficiencies

In addition, water-based products can dramatically improve drainage and eliminate sheet defects such as holes and water spots. The chemical make-up of water-based products makes them more effective on entrained air as well as surface foam. They are more miscible in water, allowing them to mix more intimately below the surface of the furnish or coating to eliminate entrained air.

Water-based antifoams control foam and air both in the pulp and paper mill. Table 2 lists paper mill antifoam applications and benefits.

As shown in the wet end, water-based antifoams enhance the efficiency of operating equipment and improve formation and drainage. Eliminating excessive foam in primary screening operations prevents the loss of good fiber from the system. Better consistency control can also be obtained by using a water-based antifoam to eliminate entrained air in and before the headbox.

The following case study provides an example of how the successful implementation of a water-based foam control program can eliminate dandy throw and improve sheet quality. A fine paper mill producing bond grades was experiencing dandy throw and foaming on the wire, which impeded machine speed and caused water spots on the paper. By applying 0.5#/T of a water-based antifoam to the primary cleaners reject tray, the foam in the whitewater tray was eliminated as well as the dandy throw. In addition, the mill estimates they were able to increase machine speed and manufacture an additional 0.3 tons/hour of paper.

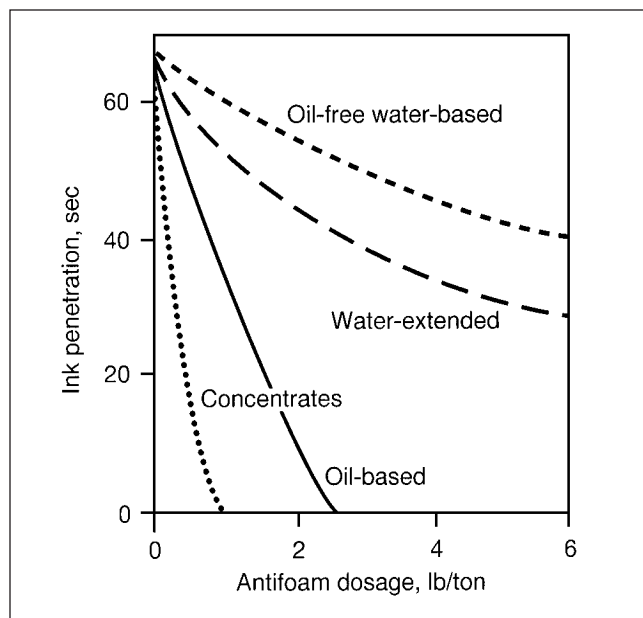


Figure 1

Water-based (as well as concentrated) foam controllers are very effective in coatings to prevent and eliminate entrained air. These products discourage such defects as fish eyes and cratering, have a minimal effect on the specific gravity and viscosity of the coating itself, and improve the quality of the finished sheet.

In the pulp mill, water-based defoamers and wash aids are being used to increase the capacity of brown stock and bleach washing systems by improving drainage. Improved-washing efficiency with water-based wash aids translates into cleaner pulp and the following savings:

- lower evaporator costs resulting from reduced shower demand
- reduced soda losses
- reduced bleaching chemical demand
- elimination of costly pitch control programs

Today's foam control chemicals, especially water-based chemistries, provide effective control of foam and entrained air in all types of paper and board mills throughout the world. When applied correctly, they provide the mill with additional capacity, higher quality pulp and paper, and cleaner systems.

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