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REFRACTOMETERS—FACT VS FICTION

The use of refractometers in the pressroom for analyzing fountain solutions is becoming more common. Ink and Coating vendors will use them to “prove” that the fountain solution is the cause of whatever problem their product is afflicted with. Customers sometimes use them to troubleshoot problems in the reservoir that stem from either incorrect dosage or excessive contamination. However, the improper use of refractometers can lead to incorrect conclusions regarding fountain solution and its relationship to press problems.

When light enters a liquid it changes direction; this is called refraction. Refractometers measure the degree to which the light changes direction; this is called the angle of refraction. Refractometers correlate these refraction angles to refractive index (nD) values that have been established. Normally, refractometers are used to determine the concentration of solutions of solids that are dissolved in water (e.g. brine, sugar solutions). This can also include the solids dissolved in a mixed fountain solution, many of which make up the conductivity that we measure with a conductivity meter.

The type of instrument which has been adopted for use in press rooms is a specialized refractometer designed for the wine industry called a saccharometer. Saccharometers do not read refractive indices but rather are calibrated to read out in the Brix scale, which indicates the percentage of fermentable sugar in solution. They are rugged and portable and lend themselves to use in the pressroom.

None of the following discussion relates to the use of refractometers for measuring the concentration of mixed silicone, which is a separate subject entirely. Since a refractometer reacts to anything dissolved in the solution being measured, fountain concentrate and alcohol substitute solvents and dissolved solids have the ability to alter the angle of refraction and therefore the refractometer reading (%brix).



**ANALOG
REFRACTOMETER**

POCKET DIGITAL REFRACTOMETER



Since refractometer readings are temperature dependent, the measurement is only valid for the temperature of the liquid as it is being measured. Once any variable—water, concentrate/sub batch, or temperature—is changed, the brix reading is no longer a valid one.

Normally we calibrate the alcohol substitute doser in a two-step setup by either (1) a "drawup" method or (2) by calibration with fountain concentrate followed by rinsing prior to putting the doser back into substitute service. A refractometer can be used, but only under strictly limited conditions.

All fountain concentrate and alcohol substitute products are batch-type products, which means that their composition varies slightly from batch to batch. A refractometer can be used to *roughly estimate* the concentration, or dosage, of either a fountain or alcohol sub when it is being blended with water via some type of doser. However, this reading is only valid for the water and specific batch of fountain or sub being measured.

For two-step situations, composition of either the concentrate or the sub may vary slightly with time. Since ingredients in both have the ability to affect the angle of refraction up or down, it would be possible to have a situation where the refractometer reading remained constant with time (assuming constant temperature) even though the composition and/or dosage of individual batches had changed. That said, using a refractometer to measure concentration or dosage of a single product over time is risky for the aforementioned reasons.

Regarding used mixed solutions, all bets are off because any contaminant that has been dissolved into the mixed solution will affect the angle of refraction. This includes wash, plate cleaner, ink ingredients, calcium from paper and ink, etc. For these reasons, we have consistently maintained that the use of refractometers for accurate control of fountain concentrates and alcohol substitutes is an invalid concept that can lead to false conclusions. There are no published studies which prove that one fountain solution % brix reading is any better, or worse, than any other when diagnosing ink, coating or paper-related performance issues on press.

In conclusion, we do not condone the use of refractometers except for *unused fresh mixed fountain solution*, either one or two step type, or for a separately metered alcohol substitute, and then only when the temperature is the same for the readings being compared.

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