

# M-RULE SHELF-LIFE MANAGEMENT



For use with carbonated soft drinks, water and juice containers

## PROTECT YOUR BRAND IMAGE

Agr testing and measurement systems with M-RULE shelf-life management are available to help you protect your brand by making it possible to measure bottle shelf-life performance during production.

### The M-RULE® Container Performance Model for Beverages

The M-RULE model is a proven, powerful web-based predictive tool that operates by integrating the fundamentals of permeation with critically evaluated physical data for the component materials and other pertinent data affecting the permeability of a container.

As part of shelf-life determination, the M-RULE model takes into account parameters and bottle attributes such as surface area, material distribution (wall thickness), base design, filling conditions, storage and distribution conditions, closure, etc. The impact of material properties such as construction of the sidewall, resin, orientation of the material, crystallinity, the modulus of the resin and scavenging activity can also be tested. The model simultaneously predicts CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, and H<sub>2</sub>O permeation based on first-principles calculation of the diffusion and solubility of these gases, along with the impact of stress, temperature, crystallinity and modulus on these parameters.

### Save time and money over traditional shelf-life tests plus. . .

- Determine CO<sub>2</sub> or O<sub>2</sub> shelf-life or water-loss potential of production bottles without long-term tests
- Immediate results make it possible to manage shelf-life performance on production bottles
- Identify changes in shelf-life performance from bottle to bottle due to process variation
- Light weight bottles successfully, while maintaining shelf-life properties
- Realize significant savings in labor and laboratory testing costs

### Prevent claims related to:

- CO<sub>2</sub> loss and related flat product
- Oxygen ingress that can compromise product look, taste and viability
- Water loss that leads to paneling and deviation from stated label weight and volume

### Agr Products with M-RULE®

Agr incorporates an embedded version of the M-RULE model, with the design-related parameters, into the laboratory-based **PPT3000™** and the on-line **Pilot Profiler®**. These Agr products measure the bottle specific parameters (volume expansion or thickness), enter the measurements into the M-RULE model and predict the shelf-life for each bottle.

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# M-Rule Shelf-life Measurement

## Agr products with M-RULE®

The incorporation of the M-RULE model in the Agr PPT3000 and Pilot Profiler makes it possible to monitor and manage bottle shelf-life, at the time of production.

Agr products with M-RULE work on the premise that if material distribution (wall thickness) on every bottle were identical, the shelf-life would be identical. However, if one critical parameter changes (material distribution) then the shelf-life performance would also change. In reality, changing conditions in the blowing process will cause variations in bottle distribution attributes. Agr systems with M-RULE provide the means to monitor how these changing conditions affect shelf-life performance and the opportunity to take the corrective action necessary to ensure that all production meets defined shelf-life goals.

**Agr products equipped with M-RULE offer the most accurate, convenient and cost-effective method for monitoring CO<sub>2</sub>, O<sub>2</sub> or water-loss shelf-life, compared to all other testing methods.**

## Pilot Profiler®

### Measuring shelf-life on-line, on every product

Agr's Pilot Profiler system with M-RULE allows you to non-destructively monitor bottle production on a continuous basis for changes in bottle shelf-life performance. The Pilot Profiler system, installed within the blowmolder, measures thickness distribution on every bottle produced. Unique M-RULE bottle profiles are imbedded in the Pilot Profiler and the thickness data captured by the system is automatically entered into the M-RULE model. Shelf-life performance and material utilization, whether for CO<sub>2</sub>, O<sub>2</sub> or water loss, are continuously calculated and presented for individual bottles or user-defined subgroups.

## PPT3000™

### Measuring shelf-life in the laboratory or near the line

Agr's PPT3000 system gives you the means to test individual bottles for shelf-life performance through a simple and fast pressure test. The PPT3000 can be located in the laboratory or near a production line to give you the flexibility to test bottles from a variety of sources. With the PPT3000, shelf-life can be determined for individual bottles in less than 60 seconds. During a test, the bottle is pressurized to a pre-defined level. The volume expansion and corresponding material thickness data is captured then entered seamlessly into the embedded M-RULE model. Test results are presented on the PPT3000 user interface immediately following a test. Routine tests with the PPT3000 will identify any corresponding changes in shelf-life.

## The Value of Shelf-life Management

Changes in shelf-life performance can occur quickly on today's high-speed production lines. Whether process changes have a minimal or a major effect on shelf-life is only a guessing game, unless regular testing is performed. Having visibility of the effect these variables have on shelf-life, at the point when bottles are blown, gives you better ability to control shelf-life for your finished product.

The feedback gained can be used in multiple ways, including:

- Manage your process to maintain consistent shelf-life, particularly during production startup and/or during any change in the process
- Light weight successfully while maintaining shelf-life targets
- Manage inventory and warehousing to make sure that bottle shelf-life performance matches the needs and conditions at the point of sale
- Manage customer perceptions of quality of the brand

With continuous testing and monitoring of shelf-life performance of the ongoing production run, it is possible to proactively manage your blowmolder to maintain optimal utilization and maximize shelf-life for your production, and ultimately, maintain the high standards of your brand.