

Do You Need Desiccants and How Much? STABLUS® Uses Real Science to Solve the Desiccant Mystery for Nutraceutical Market

Technical Data Sheet

Research and development formulators, brand owners and contract manufacturers (CMOs) in the nutraceutical industry often face a familiar challenge:

- Do we need a desiccant for this product?
- If yes, how much do we need?
- What type of desiccant should we use?

These considerations are critical because moisture ingress can compromise product stability, degrade active ingredients, and shorten shelf life, especially for hygroscopic materials like probiotics, vitamins, and botanicals. Historically, resolving these uncertainties required costly stability studies and conservative packaging decisions. Too often, choices rely on guess work and experience.

Colorcon's proven expertise in controlled atmosphere packaging has expanded with STABLUS®, a predictive simulation service designed to deliver accurate, data-backed recommendations for desiccant selection and optimal sizing. As part of Colorcon's commitment to innovative packaging, this unique complimentary service is provided for qualified projects.

Key Issues Encountered

Providing packaging solutions that align with brand requirements for shelf life and global compliance is a common responsibility, often under strict timeframes. In the absence of predictive tools, decisions depend on estimation, prior experience, or additional engineering, which can lead to significant challenges. Stability and aesthetic issues may arise, such as:

- Degradation of the Active Nutraceutical Ingredient (ANI), requiring overages in order to assure label claim
- Brittle capsules caused by moisture transfer from shell to fill
- Clear capsules revealing solid slugs
- Tablet softening, spotting or bleeding
- Peeling coatings
- Ingredient degradation accompanied by a foul odor
- Softgels sticking together

These problems not only affect product quality but also create cost-related implications, including failed products or recalls, unnecessary costs from oversized desiccant packs, and the risk of under-protection in humid climates.

The STABLUS® Edge

STABLUS® is a proprietary predictive simulation tool developed by Colorcon to model relative humidity (RH) inside a package over its shelf life. By analyzing product properties, packaging specifications, and environmental conditions, STABLUS® helps predict whether a desiccant is required, identifies the optimal type (silica gel or molecular sieve) and simulates the quantity needed to maintain target RH levels. This approach eliminates guesswork, accelerates time-to-market, and ensures decisions are based on science-backed data rather than assumptions.

How STABLUS® Works

The process begins with a customer inquiry, such as "Do we need a desiccant?" or "How much desiccant do I need?" Colorcon then collaborates with customers to collect essential data, including the type of drug (e.g., coated or uncoated tablets, capsules, softgels, gummies, effervescent tablets), the type of protection required (humidity, oxygen, odors/gases), and any other details about packaging properties, product attributes, and climatic conditions. Table 1 shows the data gathered to conduct a STABLUS® simulation.

Table 1: Data Gathered for STABLUS® Simulation

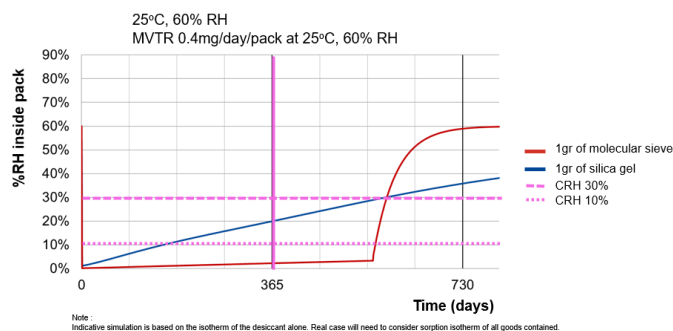
Packaging Properties	Actives Properties	Climatic and Storage Conditions
Type of container	Number of dosage units per bottle	Climatic and storage conditions
Moisture Vapor Transmission Rate (MVTR)	Weight of each dosage unit	ICH conditions
Overflow volume	Volume of one dosage unit	Ambient conditions during packaging
Type of closure	Free headspace inside the pack	Maximum RH allowable inside the pack (i.e. Critical Relative Humidity)
Material composition and drawings (if MVTR is not available)	Residual moisture at time of packaging	
	Moisture Sorption Isotherm	

Once the STABLUS® simulation is completed, a report is issued with a recommendation.

With the recommendation, the number of stability tests can be narrowed down significantly.

The example in Figure 1 assumes a critical relative humidity (CRH) of 30% RH and a desired shelf life of one year. CRH is the relative humidity level at which the nutraceutical product begins to degrade, so the humidity inside the package must remain below this limit throughout the product's shelf life. Both 1g of silica gel and 1g of molecular sieve maintain conditions below the CRH of 30%. While 1g of silica gel does not maintain the same low humidity levels as molecular sieve, which provides exceedingly dry conditions throughout the first year. One gram of silica gel remains sufficient for this scenario, and stability testing could potentially start with this quantity in lieu of others. If in another case the CRH is only 10%, 1g of silica gel is no longer sufficient, whereas 1g of molecular sieve meets the requirement. These STABLUS® results are instrumental in driving proper desiccant selection and establishing an appropriate stability test protocol.

Figure 1: Comparative Analysis of Critical Humidity Levels and Desiccant Recommendations



Along with the recommendation of the desiccant type and quantity of desiccant, the optimal desiccant configuration can also be considered, for example Colorcon's DryGuard™ Desiccant Packet or DryGuard™ Desiccant Canister as seen in Image 1 or an integration solution such as plastic tube and desiccant stopper for effervescent tablets as seen in Image 2.

Image 1: 1g DryGuard™ Desiccant Packet and DryGuard™ Desiccant Canister



Image 2: Plastic Tube and Desiccant Stopper



Let the Real Science Behind STABLUS® Meet Your Packaging Needs

Leveraging STABLUS® provides data-driven answers for desiccant selection, improving reliability in product performance and reducing unnecessary stability or aesthetic issues that often lead to costly rework. By optimizing desiccant usage and packaging specifications, this approach lowers overall costs while accelerating time-to-market through streamlined stability testing. Ultimately, it strengthens confidence in product integrity across global supply chains, ensuring consistent quality and brand protection. Colorcon offers STABLUS® as a complimentary service for qualified projects.

In addition to packaging solutions, the STABLUS® simulation can also guide decision making on how to better protect the product formulation itself. Several solutions from Colorcon's core-to-coating range could be considered, including Nutracore™ Label-Friendly Filler and Lubricant, that provide low water activity and Opadry® PVA-based coating systems that provide superior MVTR properties.

Initiate a simulation by contacting a Colorcon representative or visiting colorcon.com. Through collaboration with our experienced Technical and Formulation Technology Managers, you can make informed packaging decisions that safeguard your brand and bottom line.

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