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SPECIAL REPORT: The Brand Owner's Approach to Cannabis Packaging

INCLUDING:

PMMI Business Intelligence Study: Cannabis Market Update

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Cannabis Market Update: Unique Packaging Challenges for THC and CBD Products

The Challenges Cultivators, Processors, and Packagers Face in Automating Manufacturing for Medical and Recreational THC and CBD Products



A review of how packaging in the cannabis market is evolving, highlighting the need for automated machinery in both processing and packaging.



SPECIAL REPORT CANNABIS MARKET

For the Umpteenth Time, Cannabis Market Hard to Define

The cannabis market remains fragmented and divisive.

There has never been a more of a demand for packaging information than there is now for cannabis packaging solutions. PMMI's special report on cannabis packaging, *Here to Stay or Up in Smoke? A Look at the U.S. Cannabis Market*, almost two years old now, remains its most popular download, month after month. Yet, raw numbers mean little in a landscape where state-by-state regulations and laws vary widely. Recent standing-room-only presentations at PACK EXPO Las Vegas only reinforced the phenomenon.

The market can be broken up into two major components—THC-based products promising some kind of buzz, and non-THC products based on extracted oils processed from hemp-CBD.

THC (buzz)

Tetrahydrocannabinol (THC) remains controversial, despite a growing number of states allowing both medicinal and recreational cannabis. Tax dollar revenue estimates have generally fallen short and some states have completely blown the launch of recreational cannabis by issuing too many licenses to grow, flooding the market and destroying price structure. California in particular battles a dynamic black market.

Some conservatives refuse to participate in the market citing that it's

“still illegal from a federal perspective,” while others see very little difference in selling into the THC market than packaging beer, cigarettes, hard spirits, and opioids.

Others participate but mask their efforts, even setting up new companies with different names so core customers do not know they are also supplying the cannabis market. Banking regulations are said to be improving.

Cannabis-infused beverages and foods remain illegal from the FDA's viewpoint—for now—but the agency admits it cannot police the flood of new companies and brands.

The FDA can only pay attention when problems rise to the surface. The recent vaping crisis a perfect example. Pause for a minute and think of a close friend who may have just sunk a life's savings into a new vape company with tons of flavors! Gulp.

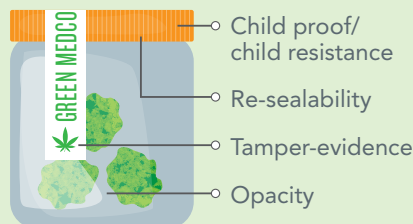
Edible cannabis poses particular problems with dosing, plus child-resistant reclosable options are hard to find, prohibitively expensive, or don't match sustainability goals. But many predict beer, wine, and spirits will get involved with low-dose cannabis social drinks, due to the recent “mindful drinking” movement resulting in declining beer sales.

Depending on the form the THC cannabis takes, packaging draws

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from popular categories like carbonated beverages, baked goods, confectionary, etc.

Flower for smoking can be packaged individually with pre-rolled joints in cheap, colorful plastic tubes from China, with larger amounts coming in beautiful glass jars and modified atmosphere metal cans. Edibles often come wrapped individually in a resealable flexible pouch. Some of these boast fantastic digital graphics. Many suppliers are clued-

in to social media and support local and regional sustainability initiatives or pet-friendly causes.

The medicinal market has been crippled by government's lack of issuing new applications for medicinal research in cannabis for three years!

The recreational market tends to have negative effects on an established medical market, with recreational selling up to 15X the medical market. Patients can now experiment with a variety of different products, strains, delivery systems, etc., and don't need to jump through the considerable hoops necessary to get a doctor's recommendation.

CBD (no buzz)

Cannabidiol (CBD), often misunderstood, comes in a variety of sophisticated branded packaging taking cues from beauty, health, and food markets. Celebrity endorsements abound, especially sports professionals who use CBD for pain relief. Glass vials with droppers are huge (often requiring outer cartons), as are jars, bottles, pumps, tubes, and test tubes.

Like the vitamin and nutritional supplement market, CBD oil can make broad claims about overall health, but must be careful not to make specific claims about outcomes. Read more in Eric Greenberg's column on page 18.

Indeed, a search in the comments section of any CBD supplier website will find as many people saying it did nothing for them as those saying it helps. But the people it helps are true converts. Note: It is not uncommon for some drugs to work differently on different people.

Recent announcements from major retailers who will carry CBD products really put CBD and CBD education in the spotlight. Young and old consumers, uncertain of the origins or reliability of products sold on the web, will see lotions, cosmetics, or oils in the same store where they get their prescriptions filled.

CBD + THC (buzz plus)

Some products combine the application benefits of CBD lotion or oil, but come with THC in the formula for the "entourage effect" which proposes that the parts of the plant work better in synergy rather than when isolated. Now it's a lotion with a buzz—same kind of packaging but labeling is critical.

There already have been winners in cannabis, certainly. But the market has also seen its share of lawsuits, mergers, acquisitions, and struggles to comply with rapidly changing regs. Canada is the first comparable federal model, much smaller in scale but still lucrative. Many companies are on their third or fourth level of investors. Early efforts to market entry saw heavy labor demands that could not be supported with human resources drowning in background checks, interviews, training, etc., only to have the employee leave in six weeks for a better job. Differences in

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In a brand new episode of PMMI's UnPACKed Podcast, PMMI's Sean Riley sits down with PMMI Media Group's Jim Chrzan to discuss trends in packaging for cannabis. Visit pwgo.to/5460 to listen for free.



the regulatory landscape in each state thwarted larger operations from scaling up in multiple states.

It is clear now that automation will be needed for production to supply a major retailer. General trends in nutrition, driven by both millennials and boomers, see people taking their health into their own hands with diet, exercise and mindfulness. This bodes well and time will tell which brands will emerge winners.

Larger players who can deliver process control for flavorings and extracts, and who can supply a growing supply chain, will emerge. —*Jim Chrzan*

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SPECIAL REPORT CANNABIS MARKET

Packaging is the Vehicle in Dogwalkers' Brand Journey

Cannabis brand gets a full redesign that results in a discreet, convenient packaging system with a distinguished, time-tested feel. It uniquely uses color to communicate not only to consumers, but also to stakeholders throughout the value chain.

WHAT
YOU'LL
LEARN

Universal packs for fragmented market

Color coding serves multiple functions

By Matt Reynolds, Editor

Green Thumb Industries (GTI) is a Chicago-based cannabis cultivator, processor, and dispensary operator, national in scope, that is dedicated to providing dignified access to safe and effective cannabis while giving back to the communities it serves. The company produces all-things cannabis offering brands in all the usual cannabis niches, including recreational edibles, vape cartridges, and pre-rolls, alongside the raw flower. It also operates retail locations for dispensing for medical and adult-use purposes.

In an industry that's known for upstart brands founded by career changers or cannabis hobbyists seeking to go pro and stake a claim in the "Green Rush," GTI stands out. It operates like any other CPG or food and beverage brand owner. In fact, the leadership structure is replete with CPG brand owner and retail expats, each with years of supply chain, logistics, and packaging experience. Such considerations can be perceived as mysterious dark arts to more novice would-be brand operators.

So as states slowly but inevitably lean toward legalizing the cannabis trade, and licenses for commerce become available, GTI plans to be there with the infrastructure to apply a mature, professional approach. It treats its brands in the same way you'd expect a P&G or Mondelēz to treat theirs.

"The approach has always been the CPG strategy," says David Bleicher, Brand Manager at GTI. "As cannabis becomes more commoditized, what consumers will gravitate toward in the future, and what will allow us to hold value, is the brand, the authenticity, and the story. That obviously entails the packaging and all communication platforms that go with it."

Dogwalkers' origin story

One such brand benefitting from GTI's professional brand-owner touch is Dogwalkers, also one of its first licensed brands. Dogwalkers was established in 2016 in Illinois to offer unique, small-format cannabis pre-rolls to consumers who value authenticity and convenience. Dogwalkers has since expanded to four states, rapidly earning customer loyalty as a result of the brand's consistent quality and ongoing



Primary packaging for the .75g Big Dog and .35g Mini Dog pre-rolls.

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ing donation partnerships with deserving animal shelters.

Leisurely strolls with his dog Bailey inspired GTI's founder to launch the Dogwalkers brand. Most pre-rolls available at the time averaged 1 g to 1.5 g, representing a sizable time and effort commitment for users—particularly light, occasional users. GTI sought a smaller size of pre-roll that might only last the length of one walk around the block with the dog.

With Dogwalkers, GTI launched a considerably downsized 0.35-g pre-roll format, called a Mini Dog, sold in five packs. GTI also launched larger—but still not onerously big—0.75-g Big Dogs, sold as singles.

Primary packaging consisted of five Mini Dogs in a hinged, tin-plated steel container, similar to the one used by the Altoids brand of mints. Big Dogs were packaged as singles in a plastic “J-tube”-style tube with a screw-top closure. Graphics for the original Dogwalkers tin pack were lighthearted and bright, with a white background on the top plate and a large, blue “D” and “W” logo communicating the Dogwalkers brand name (See photo on page 37).

Sit, stay, and play packs

The brand's pre-rolls come in three varieties, each designed to provide a different cannabis experience that ranges from tranquil to euphoric. In the original pack, an art element—a color-coded silhouette depicting a dog either sitting, staying, or playing—communicated which variety each pack contained. A sitting dog indicated Indica flower, meant for calmer experiences. A standing dog communicated “stay”



Within each redesigned Dogwalkers' tin, five small pre-rolls are nested into a paperboard insert folded into a five-pocket chevron pattern. Text underneath the lid reinforces the brand positioning.

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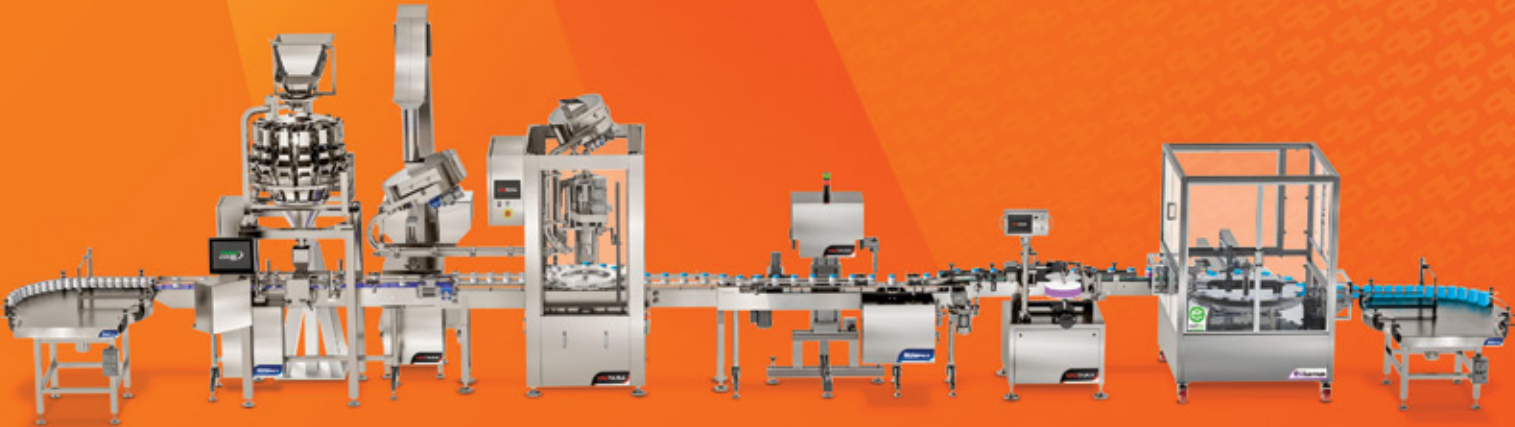
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A child-resistant paperboard carton saves space in transport and in retail compared to the incumbent pouch pack. Color coding throughout allows these primary/secondary packaging systems to be universal enough to work in many different markets. Market specific-informational labels, also following the color convention, are added within each market, and color prevents mixups as to variety.

denoting a mid-range Sativa-Indica flower hybrid. A boisterous, tail-wagging dog at “play” represented a Sativa-dominant blend, which lends itself to more active, euphoric experiences.

Each tin included a paper insert telling the walk-around-the-block origin story and alluding to dog shelters with which the brand is involved. Secondary packaging consisted of a similarly printed opaque white flexible pouch with child-resistant and tamper-evident properties. As a whole, this package treatment and brand position were quite serviceable in their first iteration.

Impetus for a rebrand, packaging change

The most common approach for pre-roll manufacturers is to use what’s called the shake or trim portion of the cannabis flower. These are portions of the plant that are cut away from the more valuable bud or flowering portion. Generally, the trimmed buds are reserved for separate, individual sales as a whole flower product.

But when Bleicher took over as Dogwalkers’ brand manager in 2018, he recognized that GTI manufacturers were allocating premium, popcorn-sized buds for pre-rolls. Not to mention, each pre-roll was hand-packed by a skilled artisan. These realizations suggested to him that the bright whimsy of a cartoon dog on a cheerful blue-on-white design wasn’t sufficiently conveying the premium quality of the main ingredient.

That’s why in 2019, the Dogwalkers brand underwent a comprehensive rebrand to elevate the packaging, logos, and communication pillars to further establish the brand as a leader in the cannabis and CPG space.

“We chose to rebrand the various elements of the Dogwalkers portfolio in order to better reflect a commitment to crafting premium, full flower pre-rolls while acknowledging the rich history of this authentic and timeless cannabis product category,” Bleicher says. “Dogwalkers sets itself apart from the pack through its tireless commitment to quality and humble respect for products made with a human touch.”

Research surrounding a potential package rebrand began by reaching out to patient care specialists (PCSs) throughout Illinois (recreational cannabis became legal in the state in 2020, but still required a medical script during the rebrand) to see what elements they had been missing.

It turned out that the pre-roll category as a whole carries vintage and ritual elements that aren't shared by edibles or vapes.

"In addition to premium quality, I wanted to communicate that vintage, timeless, classic vibe that the pre-roll category enjoys," Bleicher says.

Unique realities of cannabis

Given the fragmented, state-by-state nature of cannabis regulation, GTI and Dogwalkers wanted to create a universal container design that would scale into new markets and allow for bulk ordering.

"A new package design had to be something that we believed would be compliant in as many states as possible, so the full packaged component is flexible enough to go into other markets as we expand," Bleicher says. "Then the only piece that theoretically would be specific to each market would be state-specific information on a pressure-sensitive informational label."

Bleicher was also cognizant of the brightly colored dog silhouettes on the original tin packs—in the wrong person's eyes, such a treatment could be perceived as cartoonish, thus a compliance concern as regs tighten up. Still, Dogwalkers had a lot of brand capital tied up in dogs, so the balancing act was to find a way to incorporate the canine parallels and origin story in a mature way that conserved the titular theme.



Dogwalkers' previous pack design was simple and bright. However, the brightly colored dog silhouettes on them could be perceived as cartoonish, thus a compliance concern as regs tighten up.

New package design

Working with Chicago boutique brand agency **High Dive**, Bleicher arrived at an all-new color scheme for the brand. It relies on deep forest green and aged metallic gold colors reminiscent of the classic Gilded-Age pairing of gold and green felt. The aim was to convey a vintage motif and to suggest timelessness and ritual.

The primary package remains a hinged tin container for the five-pack Mini Dog format. The body of the tin uses the weathered gold color, and the lid uses the dark green background with branding text embossed in the tin in gold. In addition to the brand name and description, an "Established" date reinforces the classic, historical theme. New to this version of the pack, the tin carries a paperboard insert folded into a five-pocket chevron pattern. This serves to provide each of the five pre-rolls a designated spot, holding each in place.

"One of the things that's been so critical in all of our packaging is making sure the presentation is premium. When a consumer opens up whatever it is that they receive from GTI, it needs to look pristine, clean, and full," Bleicher says. "The insert was a way to better organize pre-rolls in the tin to make sure they're not rolling around, they're staying clean, and they're staying separated."

Each tin contains a color-coded, circular "button" indicating the sit, stay, or play variety. The reoccurring and reinforced color coding on this button plays an important role in the entire package system, and not only for the end consumer, but more on that later.

Switch from pouch to carton

Secondary packaging represented more than just a cosmetic departure from the previous packaging iteration. Dogwalkers eschewed the pouch in favor of a child-resistant paperboard carton to help save space in transport and in retail.



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"The pouch took up a little bit more room than we'd like and was a little awkward," Bleicher says. "That impacts us and our dispensary partners since we're trying to stack as many units as possible in our approved shipping vans to go to dispensaries. Room is very tight, specifically in markets where you have to keep product in lockboxes. And dispensaries often need to keep product in a vault, so space is limited. We wanted to have a secondary package that was as compact and easy to stack as possible."

There wasn't a stock or off-the-shelf child-resistant carton that was small enough to hold the tin as snugly and compactly as Bleicher would have liked, so he worked with agency High Dive alongside packaging supply manufacturer **Sunshine Enclosures**, which also manufactured the tin, to arrive at a custom carton solution.

The child-resistant (via a proprietary interlocking flap mechanism) 1400g paperboard carton is printed in two colors, die-cut four-up, and erected by Sunshine Enclosures. The thickness of the paperboard not only conveys weight and quality, but it also allows for debossing. The cartoon dogs are gone, but more nuanced, subtle debossed dog shapes, with no ink fill, carry on the brand legacy in a way that won't risk an accusation of marketing to children.

Billboard space for a state-specific p-s informational label is reserved on the back of the carton.

Giveaway sticker serves logistical function

Onto the bottom-edge flap of each carton, Sunshine Enclosures applies a peelable sticker giveaway. Each sticker contains a randomized fact about dogs, and the end consumer is encouraged to slap the sticker on their computer, water bottle, or bike. Not only is this extremely on-trend—so many new outdoors product brands are doing some form of this—but it also serves a logistical purpose in matching the sit, stay, play variety indicator button on the tin enclosed within.

But we already said each carton will receive an informational label. Why couldn't that label accomplish the color coding?



The yellow-colored strip at the bottom of the paperboard carton alerts consumers and packagers alike as to the variety of the primary package's contents, while also serving as a tamper-evident band.

The answer is it could and does. But bear in mind, the pre-rolls themselves cannot be transported over state lines. That means the nearly completed packages, lacking only the pre-roll content and state-specific warning labels, are delivered to GTI's facilities in Illinois, Nevada, Maryland, and soon, Massachusetts (the runout location for the previous format's packaging stock, new format rollout in March 2020), where they will be hand packed. While the cartons themselves are universal, the labels are specific to each market and subject to change. As such, these labels must be hand applied at each GTI location.

The sticker giveaway, however, doesn't contain any state-specific information. It's as universal as the tin within the carton. So, it can be applied at the supplier, Sunshine Enclosures, and sent into any market.

To an operator at a GTI facility, it still functions as a clear, color-reinforced link between the variety (sit, stay, or play) of pre-roll going into each tin, the carton the tin is going into, and the state-specific informational label to be applied. Now, GTI could have Sunshine Enclosures print

Clio Award-Winning Design

The Clio Awards were established in 1959 as a way to honor and celebrate excellence in the advertising and marketing industries. Since its first year, the Clios have accepted submissions from a variety of industries, including fashion, sports, beauty, music, and health. 2019 was the first year that the Clios accepted submissions from the cannabis space, expanding on Clio's reputation for establishing best-in-class programs that honor creative ideas in a variety of specialized verticals. Dogwalkers was recognized in the inaugural cannabis edition, winning the Silver Award for the Brand Design in Packaging category. **PW**



this color coding directly onto the carton without the state-specific information. But the giveaway dog fact sticker is fun and, in dog parlance, scratches the itch of maintaining an unbroken color-coded chain of indicators describing the product within.

"For instance, Sativa [play] correlates with yellow," Bleicher says. "So we know when we put a Sativa product into the tin, there's going to be a yellow button on that tin and a yellow giveaway sticker on the bottom of the carton that's going to match the tin. Once the tin is filled and the carton closed, an operator applying the informational label can match the yellow giveaway sticker with the yellow on the label.

"The last piece applied at GTI is a tamper-evident label. This label also has the sit, stay, or play categorization. All of this allows that secondary package delivered to us to be completely universal to all markets."

As seen at dispensaries

Single-variety cartons are packed by hand into 20-unit retail-ready paperboard shipper cases, also by Sunshine Enclosures. These cases are printed and designed as an extension of Dogwalkers' branding, and of course, carry color-coded messaging in the sit, stay, play convention. The ability to display the Dogwalkers pre-roll packs in-store varies state by state, but for those that are allowed to do so, a perforation makes the case display-ready. And that's the point at which the consumers' journey with Dogwalkers begins.

"Dogwalkers provide consistent, convenient, high-quality products that deliver a euphoric break in the day," Bleicher says. "And they are presented in discreet, convenient packaging that allows consumers to take Dogwalkers wherever their journey takes them." **PW**



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SPECIAL REPORT CANNABIS MARKET

Harvest Health Automates Cannabis Pouch Filling

Adding automated weighing and pouch filling brought Harvest the consistency and filling speed needed to help continue to meet growing market demand and prepare for future market growth.

WHAT YOU'LL LEARN

Building in room for expansion

Automation boosts speed, consistency

By Matt Reynolds, Editor

Since it was founded in 2011, Harvest Health and Recreation Inc. has grown steadily to become one of the leading growers and producers of cannabis products in the U.S. Headquartered in Tempe, Ariz., it currently grows approximately 80% of the cannabis it sells, and has production facilities and retail outlets in eight states, with plans to be in 13 states by the end of 2020.

This strong growth has coincided with dramatic changes that have taken place in the cannabis products industry itself over the same time period. What is now viewed as a significant industry grew out of what was essentially a widespread loose collection of informal businesses. The industry now seems to stand at a turning point, waiting for federal regulatory approval on one hand and even more consistent social acceptance of both its medical and recreational products on the other.

Meanwhile, as happens when markets change dramatically, some companies rise faster than others, often due to their commitment to meeting the demand of the changing marketplace. Growing rather quickly from a small to a large operation meant Harvest had to make critical decisions, including about integrating automated systems to benefit from the advantages the new equipment could offer. Investments based on continuing growth can be risky. Harvest based its investment on considerable research into getting the equipment that would do exactly what it needed given the challenges of the products it was processing and packaging.

Cannabis handling and packaging challenges

Cannabis plants present specific handling challenges. The full plants come directly from growing fields or greenhouses to Harvest facilities. They have a high moisture content that prevent them being processed immediately, so the first stage in processing is to dry the plants. This is done much the way it was done at earlier home-based cannabis operations, by hanging the plants by their roots. After some degree of drying,

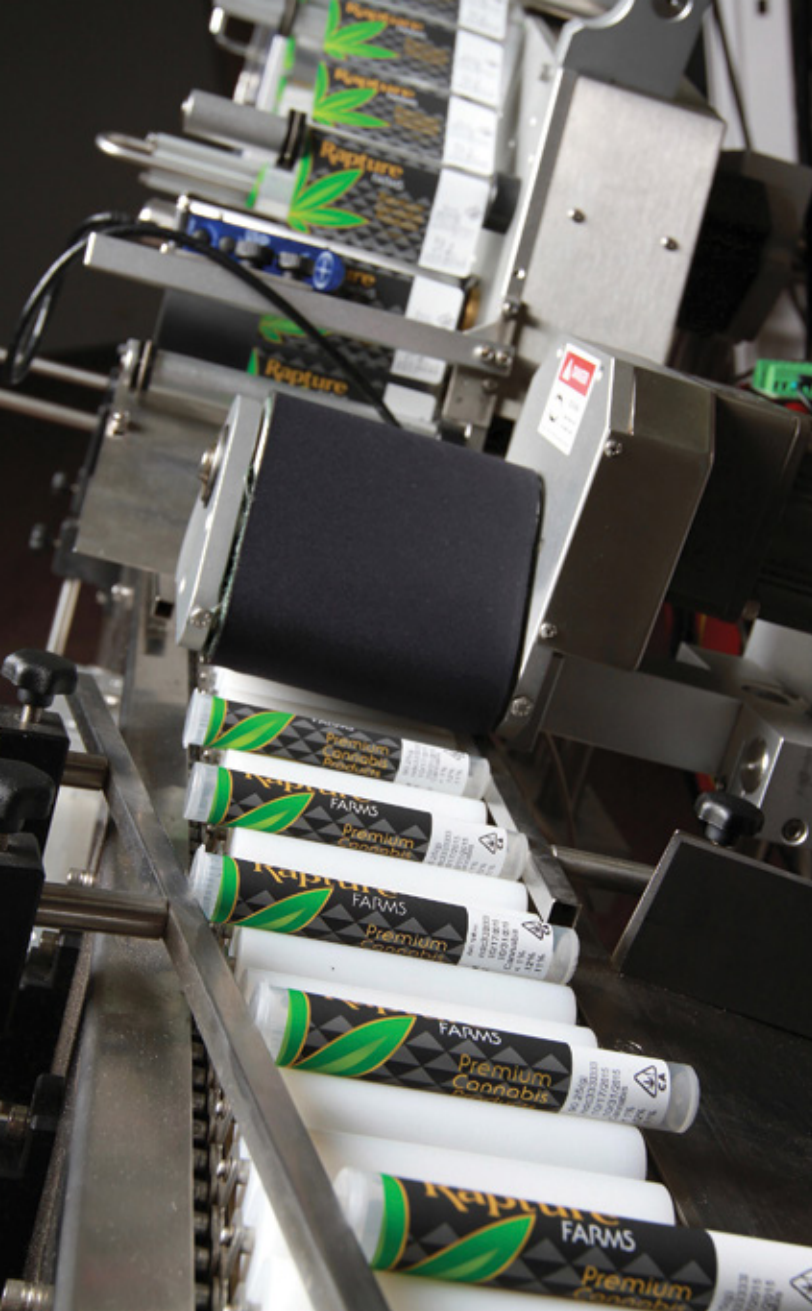


The packaging process begins with adding cannabis buds to the Eriez infeed conveyor to the weigher.

the flower, also called buds, are harvested from the plants and placed in food-grade 5-gallon buckets. They are kept in a dry environment to dry further, until they reach an acceptable level of moisture content.

The first step following harvesting the buds is to pass them through a trimming process to remove small leaves and create a more attractive-looking bud. Depending on product quality, volume, and other factors, this may be done by hand. But for the volume of buds that will be machine-packaged, Harvest uses a trimming machine.

Trimmed buds then go through an additional drying process, called a “perfering” step, once again in 5-gallon drums in a humidity-controlled room to achieve the exact desired level of moisture. It is at this point that another challenge arises: the dried buds are very light in weight

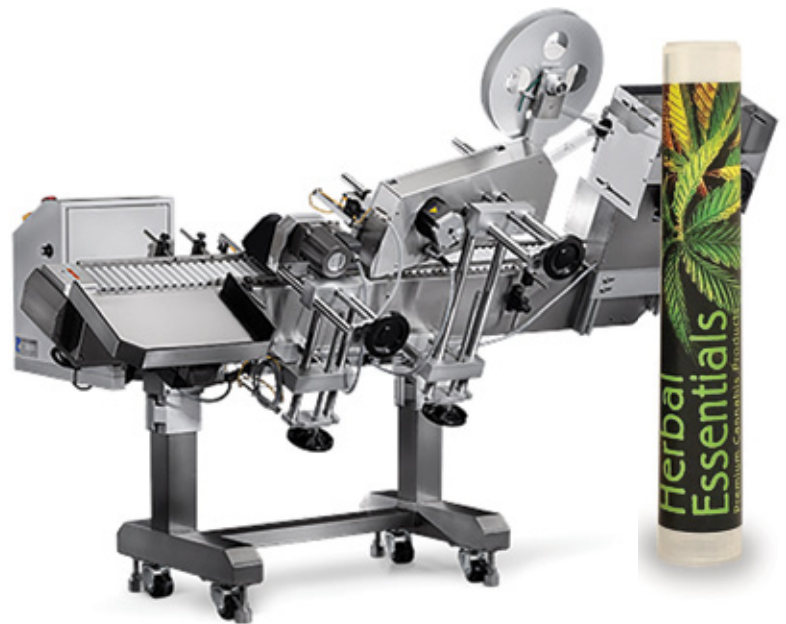


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and (as natural products often do) vary widely in size from plant to plant and even within each plant. Now, Harvest has to prepare them to be packaged in consistent weights from package to package.

The “processing” of the cannabis buds consists of sorting them by size and weight, and, when necessary, trimming the larger buds to obtain package consistency both in weight and number of buds. Once this is done, buds are packaged in pre-labeled transparent flexible plastic pouches, which means the buds will be visible to the customer and must look fresh and appealing, like any packaged natural product.

Finding an option to hand sorting and filling

Until 2019, these parts of the operation—sorting and weighing the buds, then packaging them in pouches—was done manually. From nine to 12 employees sitting around a large table would sort the buds, handling them gently, then weigh and place them in the pre-labeled flexible pouches for sealing and case packing. This process would go on five days a week to meet market demand. As demand varied, the number of workers might vary, but only slightly.

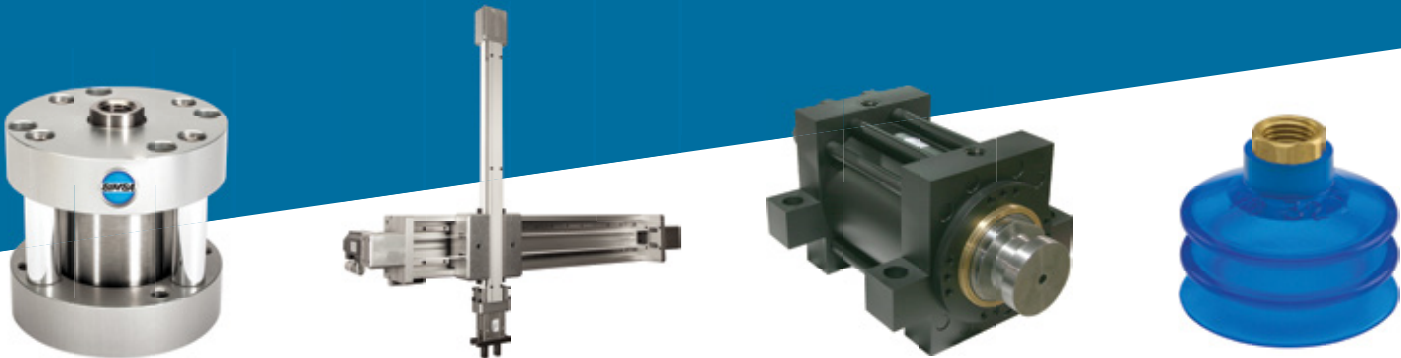
As the wider packaging industry had experienced early in its own development, manual labor has two critical limitations: it is slow and produces inconsistent packaging results.

Over the years it was in business, the cannabis industry began to evolve from a diverse, small-producer collection of operations into a more centralized industry. This has magnified manual labor’s limitations for Harvest. New forces came into play as demand grew and pro-



The multi-head Ishida weigher accurately weighs buds before dropping them to the pouch filler.

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ductivity became more essential. It became clear, for example, that a mature cannabis industry would face stricter regulation, especially with potential federal involvement.

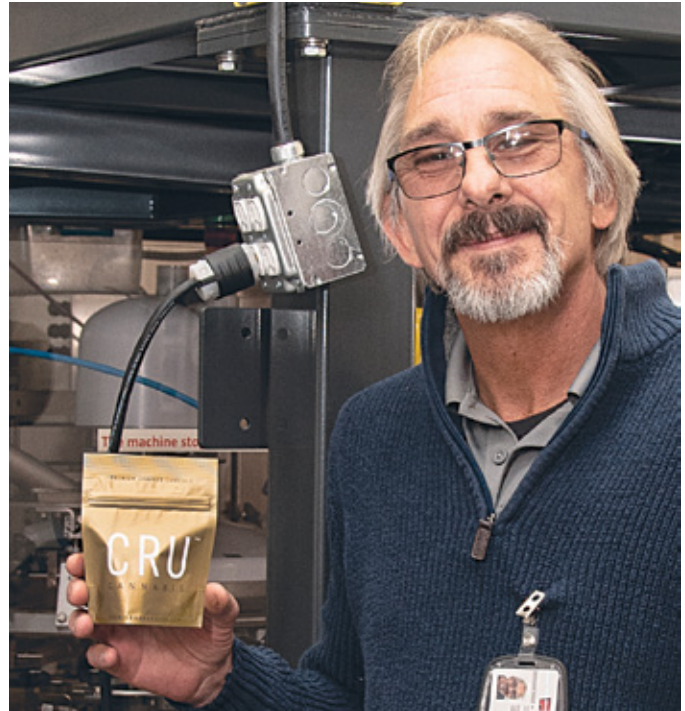
In the summer of 2019, Shawn Sabo, Harvest Vice President of Manufacturing, began putting Harvest's plan to automate its production operation into action by exploring equipment options for parts or all of its sorting and packaging process.

"We shared a detailed brief of what we wanted to accomplish with Denver-based equipment supplier and integrator **Right Stuff Equipment**, who we had worked with previously and who knows our operation well. They researched a variety of the types of equipment we would need and identified the systems they thought would offer the most effective solutions. Then we visited a number of packaging facilities where we could see that equipment in real-time action. From those systems, we chose what we felt would work best for our specific needs."

Automating the pouching operation

The resulting automated system, now operating at the Harvest facility in Flagstaff, Ariz., consists of an **Eriez** infeed conveyor and an **Ishida** multihead weighing system positioned on a mezzanine above a **General Packer** GP-M3000 automatic pouch filling and sealing system provided by **Massman Automation Designs LLC**, General Packer's exclusive distributor in the U.S.

"The advantage that the Ishida weigher gives us," says Dennis Schum, Harvest's Senior Director of Extractions, "is that its 14 weighing



Dennis Schum, Harvest Houses engineer, with a sealed branded pouch of buds.

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Pre-labeled pouches, seen here from their transparent backs, are being opened and filled in the GP-M3000 before being vibrated to settle the buds, then heat-sealed.

filling system can fill from 15 to 65 pouches/min, depending on bag size and product volume.

A Harvest full color brand label has been applied to each pouch before it enters the system, covering the front face of the pouch and carrying the brand identity, individual product flavor, and weight for the product. As Arizona regulations allow, the back of the pouch remains clear, letting shoppers see the buds.

Once filled, pouches go to an off-line **ADCO** case packer, where they are packed in paperboard cartons

heads can handle the variability of the bud weights more quickly and more accurately than our manual workers, and deliver more consistent weights to each pouch, all while handling the buds gently.”

Once weighed, the buds are dropped into open pouches held in the GP-M3000 system below, which indexes through ten steps as it fills and seals the pouches.

“This is the heart of the system,” Sabo says. “The GP-M3000 packages the buds smoothly and quickly, and gives us the package weight consistency we need.”

Preprinted branded pouches enter the system, are opened, filled, and then shaken by vibrators to settle the lightweight buds into the pouches. In the final steps, air is Nitrogen-flushed from the pouches and they are heat-sealed, cooled, and discharged from the system. The 10 stages of the GP-M3000 include several “spare” steps that provide for future production expansion or the addition of new functions. The

that are pre-labeled with brand identity and have windows that enable the product pouches to be seen. Cartons then go into corrugated cases that convert to displays in Harvest’s retail outlets.

This automated operation has now been operating successfully at the Harvest Flagstaff facility for approximately six months. Sabo has been doing a comparative analysis to determine the benefit of investing in the machine system versus continuing to fill pouches by hand.

“I am continuing to weigh the relative costs,” he says, “but what the numbers show so far is that running the automated system only one day a week with three employees is more cost-effective than doing manual filling with an average of nine people working five days a week, even when we include machine operating costs and maintenance.”

“And,” he adds, “while the investment in the machinery is a finite cost, the labor cost is open-ended and would be likely to increase as volume increases.”

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The mezzanine above the GP-M3000 was designed to be wide enough to also weigh and deliver product to a future adjacent jar filling line.

Future growth

The efficiency of the automated production line operating in Flagstaff provides significant room for increased production. In addition, Schum points out that the system was designed with an oversized mezzanine, allowing space to fill a future jar packaging line that would sit beside the current GP-M3000, increasing the capacity for jar packaging. Harvest has also installed a similar GP-M3000 pouch filling line in its Maryland facility to replicate the Flagstaff packaging benefits there. That line is not yet commissioned, but is expected to come online in 2020.

Watch a video of the newly automated packaging process at Harvest House in action by visiting pwgo.to/5457.

The cannabis products industry is still early in its evolution into an established, thriving industry. There is an air of expectancy in the plans and investments that many companies are making. Should federal regulatory approval be forthcoming, for example, the entire industry structure could change virtually overnight.

But in the meantime, as with Harvest, individual companies in the industry cannot stand idle as current product demand increases and more efficient automated product handling and packaging systems are clearly going to be required to meet new production quotas. Those that will thrive in this changing industry will likely be those that decide to invest in equipment that will both enable them to meet current demand and simultaneously lay the groundwork for a successful future in a mature industry. **PW**

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SPECIAL REPORT CANNABIS MARKET

Cannabis Packs Check Recyclability, Child-Resistance Boxes

When upgrading its packaging for California compliance, cannabis brand Garden Society found tamper-evident stickers and child-resistant cartons that maintain the botanical aesthetic.

WHAT
YOU'LL
LEARN

Coping with evolving regulations

Women-owned businesses thrive in cannabis

By Keren Sookne, Director of Editorial Content, *Healthcare Packaging*

Garden Society launched in Sonoma County, Ca., in 2016 with the mission of delivering high-quality cannabis edibles, such as chocolates and candies, plus pre-rolls, to women looking to relieve pain and stress and live life more fully. The company emphasizes the use of biodynamic farming methods, fair trade, and locally sourced ingredients, and conveys a natural, sophisticated feel through their botanical graphics and packaging.

California's Proposition 65 requiring child-resistant packaging for cannabis products went into effect in July 2018. The startup sought a sustainable child-resistant box, but Karli Warner, Garden Society's Co-Founder, says many were hard to use or didn't have the desired materials.

"Cannabis packaging is really challenging. Right now, there aren't great sustainable options," she says. At the time, the only sustainable box option was too costly for a small startup. "We bootstrapped the



For the company's pre-rolls, Garden Society uses the AssurPACK MarBox-CR, a recyclable plastic box with a lid that flips open when a button is pressed.

company until September of 2018. We already use high-quality ingredients in the edibles, so we didn't want to price ourselves out of the market by using extremely expensive packaging."

Adding to the complication, Warner and her co-founder, Erin Gore, wanted to offer individual chocolates in a formed tray, meaning that the tray had to fit both the chocolates and the ASTM-approved box.

Interim solution, and PSL challenges

To stay in the market in 2018 as it worked toward more permanent packaging, Garden Society incorporated child-resistant mylar bags. "Mylar bags have gotten us through the gap while packaging companies have had time to form new box configurations. While the bag is not necessarily on point with our brand, it was about getting the product out to our consumers," explains Warner.

Jan. 1, 2019 marked the release of the state's final regulations, while testing requirements began six months prior—both dates signified changes for cannabis brands. Garden Society had been testing its products all along, but as the labs came onboard with the new regulations for content and contaminant testing, the preparation methods were in flux.

"Because of all of this change, we were having to regularly re-label cannabinoid content levels. You'd print an entire roll of [pressure sensitive labels] and end up having to throw them away because a piece of information was missing," says Warner. She found ways to repurpose some of the materials as case stickers to avoid waste. "It was definitely an adventure," she adds.



Garden Society is working with Hippo Premium Packaging and is incorporating the Duallok child-resistant folding carton for their edible products.



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Retailer specificity

Another challenge the team faced is that each dispensary or retail partner has its own interpretation of the regulations. “Some retailers accept the labels as we have them printed. We had to make a decision internally about what we were going to print, and we make small adjustments for certain retailers as needed,” Warner says.

Now that operations and testing methods have stabilized—their Certificates of Analysis (CoA) return as expected—the company is not re-labeling much anymore. But that’s one reason why Warner and Gore opted to use labels instead of custom-printed bags, which can take at least six weeks to print and require large-quantity orders to make them cost-effective. The company is now moving toward custom-printed packaging.

Tamper-evidence

It took time to find the right tamper evident (TE) stickers for paperboard carton pre-roll boxes. “We were advised to use a TE wafer sticker. We didn’t want a metallic sticker as that’s not really on brand for us,” Warner says.

But the clear wafer stickers they ordered ended up opening on the perforation as they were applied to the boxes. “Then we had custom clear sticker samples made, but those didn’t adhere strongly enough. Now we’re moving to a custom paper sticker that has our printing on it to keep the aesthetic. I can laugh about it now, but in the moment, it wasn’t quite as funny.”

Pre-roll packaging

Initially Garden Society began using **AssurPACK’s** slider box, but the pre-rolls weren’t fitting optimally. After some research, they found the AssurPACK MarBox-CR, a recyclable BPA-free, food-grade polypropylene box (recycle code 5) with a lid that flips open when a button is pressed. “It’s unique in the market for pre-rolls. It locks, and people like it because it’s so structured that it keeps everything intact.”

Once empty, MarBox is reusable by the consumer for candies, home-rolled (cannabis) flower, and more. Warner notes that many of Garden Society’s customers use the products for relief of symptoms from conditions like arthritis, joint pain, and fibromyalgia.



As Warner worked toward more permanent packaging, Garden Society incorporated child-resistant mylar bags as a temporary solution.

“Some are using our products for medicinal purposes,” she says. “They don’t have the strength to open some of these child-resistant packages. MarBox is not complicated for arthritic hands to open.”

Working with AssurPACK’s Nancy Warner (no relation) was a natural fit. “Not only did the MarBox feel like the perfect product for our brand—it was easy to open for tired hands—but I also really liked supporting this company and appreciated Nancy’s customer service,” says Karli Warner.

New product packaging for edibles

Garden Society is working with **Hippo Premium Packaging** and is in the process of incorporating the **Duallok** child-resistant folding carton for their edible products.

Duallok is a patented CR packaging system developed by **Burgopak** that consists of a tray and sleeve that lock, providing a reliable barrier to entry by children, but remaining easy to open for adults. The system recently won a 2019 PAC Global Leadership Award for its innovative design.

“It’s been fun because Hippo’s founders are two women who launched their company in 2016 out of the need for quality, sustainable packaging

for cannabis products. Erin [Gore] and I founded our company in 2016 out of a need for quality, women-centric edible products,” Warner explains. “It’s been really fun to work with these women and their team who launched at the same time with the same reasoning, and the packaging is beautiful and priced competitively.”

Warner and Gore knew how they wanted the graphics to look, and they collaborated with Hippo on creating iterations for various products in different colors and patterns.

Most packaging is handled in-house by manual processes currently. “We do work with co-manufacturers, but by packaging in-house, we’re able to control what goes into the package,” says Warner. **PW**

Women Sculpting Packaging for Emerging Brands like Garden Society

As the many leading women in the value chain surrounding Garden Society demonstrate, women are increasingly putting their stamp on all levels of the supply chain around packaging and processing, from controls to equipment, from materials to packaging design to the product itself. In recognition of this growing trend, and to help recruit, retain, and advance women’s careers in packaging and processing, PMMI create the Packaging & Processing Women’s Leadership Network, a series of online and in-person events learning from the experiences of female titans of industry or NASA astronauts. Women and men alike can learn more about the network, and how to participate, at pwgo.to/5004. **PW**



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Embossed Wallet for Sublingual Strip

A recurring theme when it comes to packaging of cannabis is the transition from having an army of people in manual mode to an operation where automated or semi-automated systems reduce the amount of packaging that's done by hand. That transition took place recently at San Francisco-based Kin Slips. Now operating at the firm is a semi-automated pouch packaging system that lets one or two operators perform the tasks for which several were required in the recent past. Says CEO Josh Kirby, "We're very glad that's over with."

The rotary system for filling and sealing premade pouches that Kin State fills was installed in the summer of 2019. Before exploring how it works, it's important to point out that the product being packaged is a sublingual strip. As for the premade pouch that serves as the primary package, it comes from **Fortis Solutions Group**. The pouch is a three-side-sealed pouch made from a three-layer lamination consisting of reverse-printed matte polypropylene/metallized polyester/polyethylene. These pouches arrive in 2,500-count corrugated cases. An operator puts the pouches into four magazines in a Pouchmaster ABS system supplied by **About Packaging Robotics Inc.** . A vacuum cup picker picks pouches



four pouches at a time from the four magazines and rotates to the station at which two operators sit. The operators put a slip into each pouch and then one of them hits a foot pedal to advance the four pouches to a station where the ambient air is pressed out and a heat-seal bar seals the pouches closed. Then the pouches drop into a bin. All that's left is for the operator

to place the pouches into the secondary packaging, which Kirby refers to as a "wallet." The wallet is closed and then a pressure-sensitive paper label is applied. Applied to the bottom is a second pressure-sensitive label that has all of the specific batch information that is required.

The paperboard secondary packaging, or wallet, comes from **Studio on Fire**. "They have this amazing letterpress studio where they've been able to refurbish these old letter

press machines that lets them make a beautiful package for us," says Kirby. "By its very nature, it's a relatively slow process, which is why you don't see it used for packages that are produced in huge volumes. But for us it produces a beautiful and precise embossing effect. And when you're in a business like ours where you can't sell outside your own state lines, large volumes are never an issue." —*Pat Reynolds*

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SPECIAL REPORT CANNABIS MARKET

Integrated Labeling Strategy Helps Cannabis Company Grow

Medical marijuana startup Grow Ohio employs a combination of label software, printing systems, and label materials to meet compliance regulations and branding for six different packaging formats.

WHAT YOU'LL LEARN

Marijuana packaging

Compliance labeling

By Anne Marie Mohan, Senior Editor



For its lozenges, Grow Ohio uses a plastic snap case, decorated by the manufacturer.

When Grow Ohio of Zanesville, Ohio, prepared to become one of the first companies to bring licensed medical marijuana products to that state in 2019, it discovered that packaging for cannabis is just like that for any other product, and yet very different. While functionally the same in many ways, packaging for marijuana must meet much more stringent pharmaceutical requirements—one of the most challenging being the inclusion of compliance data. But unlike pharmaceutical regulations, those for medical marijuana are in their nascent stages, with requirements continuously being reinterpreted, making compliance labeling a moving target.

In mid-2016, the Ohio legislature legalized the use of medical marijuana in that state. In November 2017, it handed out a relatively small number of provisional licenses to those startups having solid business plans. Grow Ohio was among 40 companies to be awarded with one. Just over a year later, the company put its first marijuana plants “in the ground,” in a new \$20 million facility.

Grow Ohio is a dual-licensed Level 1 marijuana cultivator and processor, with the Level 1 distinction meaning it falls into the category of facilities that are 25,000 sq ft or larger—Grow Ohio’s plant is 60,000 sq ft. Within its walls—and its full-perimeter, chain-link security fence—100 employees, including a team of experienced cultivation and processing experts, work together to produce a range of products. Among them are flower, tinctures, lozenges, capsules, gummies, oil syringes, and vape cartridges.

In preparation for the opening of the first medical marijuana dispensaries in Ohio in January 2019 and the subsequent release of its first product, a tincture, in April 2019, Grow Ohio was focused on marketing, packaging, and product distribution. As is the case with many new product launches—both Consumer Packaged Goods and pharmaceutical—labeling was an afterthought. But as the delivery date drew near, the company realized it needed a consistent way to ensure it complied

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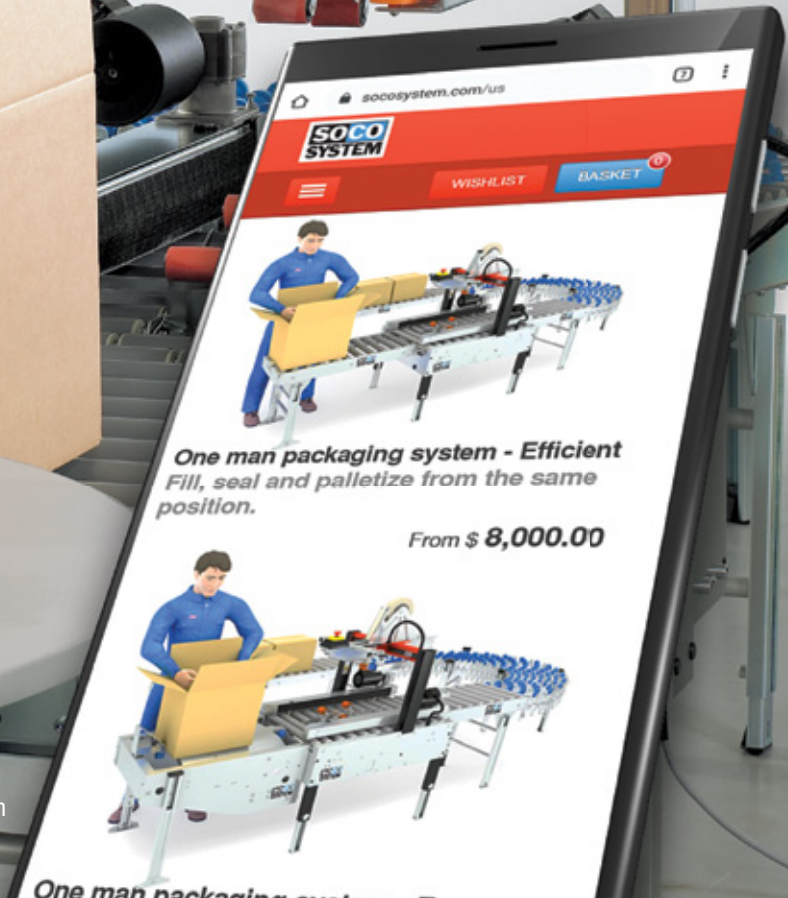
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with state law across its varied range of products and packaging while at the same time satisfying its own brand standards. As the first to market, Grow Ohio found itself navigating a complicated process.

A brand with ripple effects

Grow Ohio was established with a dual purpose that is reflected in its name. Literally, the company is in the business of growing marijuana, in a grow facility, in Ohio. But beyond the financial opportunity presented by the legalization of medical marijuana, its founders—three Ohio business experts with experience in startup enterprises, including a food processing company—were motivated by a more altruistic goal: the wellbeing of Ohioans.

“The big idea was that, in Ohio—one of the areas hit hardest by the opioid crisis—if this is an alternative way to get people medicine and to help them, why not, as Ohioans, come together and put together a proposal that will give us one of the best grows in this part of the state,” says Justin Hunt, Executive Vice President of Grow Ohio. Hunt was formerly the Chief Legal Counsel at the Ohio Department of Commerce, where the majority of the medical marijuana program is housed.

Grow Ohio is also looking after the wellbeing of Ohioans by providing growth opportunities for the local community—an aspect of its

The back of the lozenge case holds a compliance label that is printed by Grow Ohio during the packaging process and manually applied.



business that Hunt says differentiates it from other cannabis companies. “Roughly ninety-six percent of our staff is from the Muskingum County, Zanesville, area,” he says. “When we built this place, all of our contractors were local, with the exception of one. So, everything we do and the events we continue to be involved with are about giving back to the community. That’s been a big focus we’ve highlighted in our marketing efforts and something we’ve committed to as part of our mission and our vision.”

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Another differentiator, he adds, is Grow Ohio's strict production and quality control measures, which result in a safe and consistent supply of high-quality medical marijuana products. The company markets its products under the Butterfly Effect brand, which is described as "a premier boutique brand for the patient and connoisseur focusing on quality."

Due to the range of product types under the Butterfly Effect brand, Grow Ohio requires a number of different packaging formats as well. These are sourced from suppliers specializing in cannabis packaging, such as **Kush Supply Co.** and **eBottles.com**, as well as from traditional packaging suppliers such as **JohnsByrne** and **Stephen Gould**.

Among the package types used by Grow Ohio are:

- A 30-mL/1-oz frosted glass bottle with 1-mil dropper, packed in a secondary paperboard carton, for tinctures.
- A 75-cc round, high-density polyethylene "packer" bottle with a child-resistant, induction-sealed cap that holds gummies and capsules.
- A plastic CR snap case—described as being similar to an Altoids package—for lozenges.
- An aluminum can in 2.83-, 5.66-, and 14.15-g sizes with a CR reclosable cap for cannabis flower.
- A vape cartridge held in a snap case with a custom foam insert to hold the vape parts in place.
- An oral syringe for raw cannabis oil, packed in a Secure Sack tamper-evident, CR pouch from **Dymapak**.

A number of considerations went into selecting each package format, based on state regulations, functionality, product protection, and

consumer convenience. For regulatory purposes, the primary marijuana packaging has to be tamper-evident and CR. If not, a secondary package is required, e.g., the pouch for the oral syringe. At the same time, Grow Ohio needed to consider ease of use for patients in terms of opening and dosing.

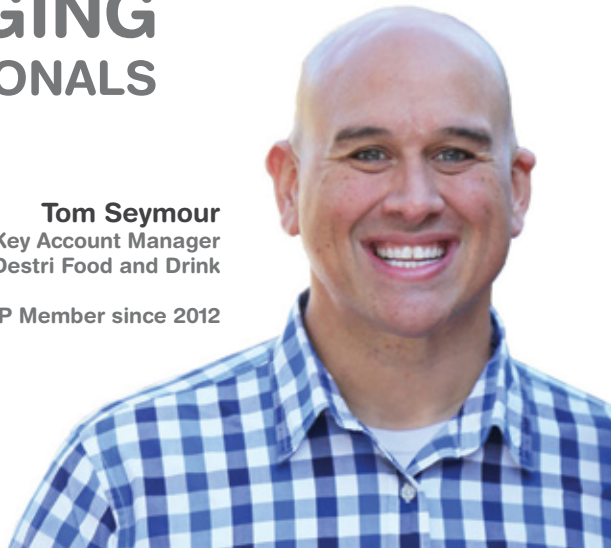


Butterfly Effect cannabis flower is packaged in an aluminum can with a child-resistant reclosable cap.

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"I started my packaging career in 2012. My father, a packaging industry veteran, recommended that I get involved with the Institute of Packaging Professionals' (IoPP) Western New York Chapter. We attended my first board meeting together at RIT in Aug. of 2012.

I immediately felt a sense of community and fellowship. I was hooked.

As a nontraditional packaging professional, I did not attend a formal university program in the packaging field, leaving me with a significant learning curve to account for when beginning my career. I utilized IoPP's educational offerings and their powerful member network of packaging professionals to help answer any questions I had. I spent the next five years highly engaged with IoPP and attribute my rapid growth, knowledge and reputation to their services and network."

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"In a medical market, the consumers may be elderly patients with arthritis," says Hunt. "It can be hard to find something that's child-resistant but simple for an elderly patient or someone who doesn't have full use of their thumbs to open.

"You also have to be aware that some patients are younger and have a caregiver. And so, from a tincture standpoint, you have to ensure the caregiver can easily determine the dose that needs to be administered."

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Grow Ohio also had to consider the properties of each product when picking out the best package. For liquids, such as the tinctures, light-resistant packaging must be used to preserve the integrity of the product. Hence the tincture's frosted glass bottle. For gummies, their stickiness required a package that would make it easy to break them apart for consumption.

"We're constantly revisiting our packaging solutions," says Hunt. "We're looking at customer complaints, if there are any, to see how we can get better."

Compliance versus branding

One of packaging's primary jobs is to market the product inside, with graphics that help it stand out on shelf. Displayed within a dispensary full of competing brands, medical marijuana packaging is no different. What is different is the amount of compliance data that needs to be added to the package at the time of filling to meet state regulations. This can limit the space available for branding and can make branding across multiple products and packaging challenging. And, when the regulations around compliance labeling change, it means medical marijuana packagers must quickly alter their labeling strategy.



Aluminum cans for flower products are manually filled before being fed to an N2 nitrogen dosing and can seaming system.

Says Hunt, while Ohio's regulations around medical marijuana haven't changed, the interpretation of the regulations have. "Everything in this market needs to be approved by the State of Ohio Board of Pharmacy [which operates the dispensaries], even though they aren't a regulator, or else we can't deliver it to a dis-

pensary,” he explains. “So a good example is the THC logo. They may require it to be on every unit, whereas before they were happy with it being on the label itself or on the compliance label. So you always need to be keeping an eye on that.”

The Board of Pharmacy requires that compliance labels for medical marijuana in Ohio must contain very specific information and must be prominently visible and clearly legible. Information required includes the lot number, in case of a recall; a product ID number assigned to each product—for example, one ID number for a blue raspberry gummy, another for a strawberry gummy; the potency in milligrams of THC (the main psychoactive compound in marijuana) and CBD, or cannabidiol, along with the dosage; the company’s license number; the testing lab name and ID number; product ingredients; the expiration date; and a 2D barcode. In addition, as mentioned, the red, diamond-shaped THC logo must also be used on the package.

Compliance labeling presented Grow Ohio with two challenges: first, how to properly format the compliance data and get it onto a label at the point of packaging, and second, how to add the label to the packaging while preserving the brand’s upscale image and keeping a consistent look across all package formats.

Partnering with barcode and labeling systems supplier **Adaptive Data Inc. (ADI)**, Grow Ohio found solutions to their challenges. ADI helped the company execute its labeling requirements by supplying it with label printers, label design software, and label stock, as well as strategizing on how to approach the branding and compliance labels for each package type to minimize costs and waste.

The right labeling solution for each package

The partnership between Grow Ohio and ADI began in January 2019. “The benefit of working with Adaptive Data was that it made us aware that cannabis isn’t different from a compliance label or packaging standpoint,” says Hunt. “It’s just finding the right solutions that have worked in other industries and applying them in the cannabis space.”

For the challenge of formatting data for the label, ADI provided Grow Ohio with BarTender label design software from **Seagull Scientific** combined with a user interface that provides drop-down lists, date pickers, and calculated results. This means Grow Ohio only has to enter data in five to 10 fields, depending on the product, which reduces the amount of potential “fat finger” errors, says Hunt.

“Until there is a direct API [application programming interface] through the state system and an affordable way to use that system, you’re always going to have some sort of manual input,” he adds. “So we have operators trained on each product who go in and pull the compliance information that doesn’t populate and

finalize all that information, and then it’s QC checked.”

As the system evolves, the compliance data will be taken from METRC, the state-approved inventory system that tracks all medical marijuana plants and products grown or produced in Ohio.

The next step is labeling, which may involve adding a preprinted brand label and printing and applying a separate compliance label, or printing and applying a compliance label onto a preprinted package,



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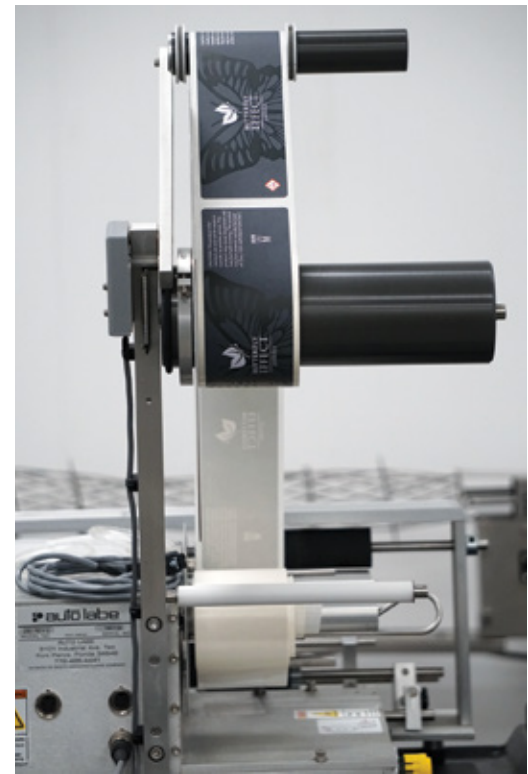
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depending on the package type. In the future, Grow Ohio is looking at the possibility of using a preprinted label that has white space where the compliance information can be added at the point of packaging. Another option being evaluated is the use of an extended-content label.

Branding labels feature the Grow Ohio logo, along with the Butterfly Effect brand name and a stylized graphic of a butterfly with two leaves for wings. Lozenge containers, cans, and cartons have a ghosted

image of a butterfly in the background. Brand colors are black, blue, and white, with graphics printed flexographically or digitally on paper labels. According to Mike Barker, Manager – Client Solutions for ADI, the decision to use flexo or digital is based on how quickly the labels are needed and the run length, with digital better suited to quick-turn-around, short-run jobs and flexo being more economic for longer runs.

Compliance information is printed on either direct-thermal or thermal-transfer label stock and includes the compliance data, a 2D barcode that will later be used to connect with dispensaries' point-of-sale systems, and the red THC logo.



An Auto Labe label applicator applies preprinted, wraparound labels to the large, 14.15-g can holding flower product.

The labeling strategy for each package format is different, with some having gone through several iterations. One prime example is the frosted glass tincture bottle. Originally Grow Ohio was using blank bottles. ADI supplied the branding labels with the Grow Ohio and THC logos preprinted. The compliance data was then added using a **Zebra ZT620** thermal-transfer label printer, configured to work with an **Auto Labe** wraparound label applicator that added the labels to the bottles.

Now, the bottles are preprinted with the Grow Ohio branding, and compliance labels are printed on-demand using a Zebra ZD420 desktop thermal printer and a Zebra ZT230 direct-thermal/thermal-transfer desktop printer. Label application is done by hand to ensure the labels don't cover the logo when applied.

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Cannabis Market Update: Unique Packaging Challenges for THC and CBD Products

The Challenges Cultivators, Processors, and Packagers Face in Automating Manufacturing for Medical and Recreational THC and CBD Products



A review of how packaging in the cannabis market is evolving, highlighting the need for automated machinery in both processing and packaging.



Free Report: All New Cannabis Market Update

From PMMI's Business Intelligence, the new report *Cannabis Market Update: Unique Challenges for THC and CBD Products* shows how packaging in the cannabis market is evolving, highlighting the need for automated machinery in both processing and packaging.

The full report can be found on page 34, or a digital edition can be downloaded for free at pwgo.to/5501.

"The point here is that when starting up new production and labeling, things change and evolve," says Barker. "Labels are part of that, so the ability to be flexible and fast with label changes is key."

In another application, aluminum cans are filled manually and are then run through an **N2 Packaging Systems LLC** machine that weighs the can, doses it with nitrogen for freshness, and then seams it. Two label applicators from N2 are integrated into the system: One adds a preprinted label to the top of the can, and one adds a preprinted wraparound label to the can body. Compliance labels are printed on-demand using a Zebra printer and are added to the bottom of the can manually. Taller cans are wrapped with a preprinted labels using the Auto Labe applicator formerly used for the tincture bottles.

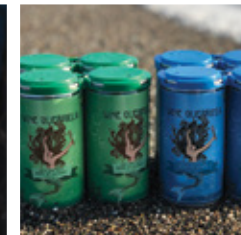
The round plastic packer bottles for gummies and capsules are preprinted and manually filled. Compliance labels are printed using two Zebra ZD420T printers with peelers, two Zebra ZT230s, also with peelers, and one Zebra ZT620 with an I/O interface, so it can be used with the Auto Labe applicator, if required. Currently the compliance labels are hand applied.

The plastic snap cases for lozenges are also supplied decorated by the manufacturer, and compliance labels are printed at the point of packaging using a Zebra ZD420, after which they are manually applied to the bottom of the case. A ZD420 label printer is also used to print the labels for the cannabis oil, which is packaged in syringes and then in pouches. The label is applied to the outer pouch by hand. The same process is used for the vape cartridges as well, where the label is printed on the ZD420 and applied manually on the outer case.

Eventually Grow Ohio plans to bring all label printing in-house. "We had a meeting with a couple of our partners to figure out when's the right time to get equipment for in-house printing capabilities," says Hunt. "I personally think we'll know by the numbers. We're monitoring sales, we're looking at our costs of goods sold, we know what it costs for some of these higher-quality labels. So what is the break-even point of bringing label printing in-house? We're not there yet. My guess is probably within 2020 we'll look to ADI and some of our other partners and say, 'Okay, we're doing this in house. What do we need?'"



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Medical Marijuana Stats: 2017-2022

The numbers are in—from online medical marijuana resource AmericanMarijuana.org—and what they show is a rapidly-growing market for medical marijuana in the U.S. According to numbers shared by the organization from Marijuana Business Daily (2018), it was estimated that medical marijuana retail sales generated up to \$4.5 billion in 2018. By 2022, that number is expected to grow substantially, amounting to \$7.3 billion, up from the estimated \$6.1 billion in 2020.

Among the other stats collected by AmericanMarijuana.org on medical marijuana in the U.S.:

- The price per pound of medical cannabis in New York in 2018 was \$5,600—the most expensive among select states in the U.S. (GMP Securities; New Leaf Data Services; Various sources, 2018)
- In 2017, 29% of cannabis users stated that their favorite aspect of CBD products was that they provided the best medical relief. (HelloMD; Brightfield Group, 2017)
- In 2018, California had the highest number of legal medical marijuana patients, with 915,845 patients recorded, followed by Michigan, with 269,553 confirmed counts. (ProCon; Various sources, 2018)
- Eighty-six percent of adults in the U.S. agree that cannabis has valid medical uses, while 28% of adults in the U.S. think that cannabis is a dangerous drug. (Marijuana.com; New Frontier Data, 2017)
- Among cancer patients, 49% believe their symptoms are managed “somewhat well” by medical marijuana, compared to 6% who say “not very well.” (American Society of Clinical Oncology; Harris Poll, 2018)
- As of July 2019, it was found that 3.71% of the population in Oklahoma were medical marijuana patients. (Marijuana Policy Project, 2018)
- In 2017, 72% of U.S. cannabis and opioid patients “strongly agreed” that they would use cannabis more in conjunction with or as a substitute for opiate use if available, compared to 21% that “agreed.” (Expert(s); Cannabis and Cannabinoid Research, 2017)
- Data from 2018 revealed that among prescription medical marijuana users, 52% did not have any trouble accessing their medical marijuana medication, while 48% were having trouble accessing their medication. (American Society of Clinical Oncology; Harris Poll, 2018) **PW**



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When that time comes, Hunt says Grow Ohio will be looking for equipment that is flexible enough to print six different label sizes, dimensions, and types on one unit. Adaptability to print both compliance information and high-quality brand labels will also be vital.

Anticipating exponential growth

Likewise, Grow Ohio is watching the numbers to determine how and when to automate other packaging processes that are now being done manually. Hunt says the company has six packaging lines, for gummies, flower, lozenges, tinctures, syringes, and vape cartridges. However, the only things currently automated are liquid filling of tinctures, can dosing/seaming, and label printing and application.

"It's so easy when you're early on in a new operation to make a bad decision on packaging and labeling equipment before you really know what it is you're fully going to be doing," says Barker. "You can spend a whole lot of money and then regret it. So I think Grow Ohio chose the right path by easing into it. Plus, their demand starting out was in small batches that needed to turn quickly—so it really didn't lend itself to automated machinery."



Grow Ohio Executive Vice President Justin Hunt

Hunt is optimistic about the future growth of the medical marijuana market in Ohio. "Sales to date have been right around \$50 million since the program started, which is about one year, but the potential is much higher," he says.

"In year one, for any medical market, you're going to see a very slow rollout. It's what people in the industry refer to as 'hockey-stick growth.' So think of a hockey stick position: In the first and second year, you're going to see a little bit of growth. And then it typically just takes off year three. The reason for that is, the first year you're getting the licensees operational. The second year, patients are getting a feel for the market. Prices might be a little bit high, so the patient numbers aren't quite as high. But then as prices come down, patients will start to explore this as an alternative medicine. You're going to see more people buying, you're going to see more people producing, that com-

petition will help regulate the pricing, and you will ultimately see much higher sales numbers in that third year," Hunt explains.

With the ability to harvest from 5,000 to 7,000 lb of flower per year, with only half the facility utilized, Grow Ohio is well positioned to supply the market when it does begin its exponential growth. And, with its labeling strategies in place, it is also very well equipped to adapt as the market evolves. **PW**

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Cannabis Market Update: Unique Packaging Challenges for THC and CBD Products

The Challenges Cultivators, Processors, and Packagers Face in Automating Manufacturing for Medical and Recreational THC and CBD Products



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METHODOLOGY

When conducting interviews, we had in-depth discussions with cultivators, processors, packagers, and contractors of cannabis-derived THC and CBD products. We explored cannabis products such as flowers, concentrates, edibles, and other novel formats to learn which market segments are growing the fastest. We examined the legalized Canadian market as well as the fragmented U.S. medical and recreational markets. The participants shared their viewpoints on which manual operations are moving toward automation, their expectations from industry suppliers, and the regulatory and financial constraints that continue to hinder growth.

Within the next decade, some form of cannabis will be a part of many consumers' daily routines, either as a functional ingredient in foods, beverages, and beauty products, or as a wellness mood enhancer in health.

Cannabis markets predicting growth:

- ① Food and Beverage
- ② Health and Wellness Products
- ③ Cosmetics
- ④ Skin Care /Topicals
- ⑤ Pet Supplements
- ⑥ Pharmaceuticals



Our industry is not familiar with capital equipment purchases and we are relying on the partnership with OEMs to provide their manufacturing expertise.

— *Director of Packaging, Cultivator, Processor, and Packager of Medical and Recreational Cannabis.*



Most are small cannabis operations:

92.9%

of CBD manufacturing companies are categorized as “low tier”

SALES UNDER

\$1 M

or availability in less than

100 stores

Source: Brightfield

Throughout the report, all monetary figures are reported in U.S. dollars and only reflect the size of legal cannabis markets, unless otherwise noted.

▶ THERE IS INTEREST IN MACHINERY AND WHAT IT MIGHT BE ABLE TO DO

Cannabis is a rapidly growing industry that is quickly becoming a major economic force. The market is primed for OEM players to partner with the cannabis industry to offer specialty machinery and forge industry-wide standards and practices.

Every participating company interviewed for this white paper, whether they are growers, processors, or packagers, is looking toward a future of automated operations to meet demand.

The majority of cannabis companies are looking for a bundled solution to achieve a fully integrated line. Much like the CPG industry, companies manufacturing cannabis products are searching for recyclable materials that address the consumer's desire for sustainable packaging.

Cannabis companies are looking for OEMs to provide flexible, reliable machines that will adapt to a number of different product types and packaging formats. Machine size and price will need to be tailored to fit an operation's specific requirements.



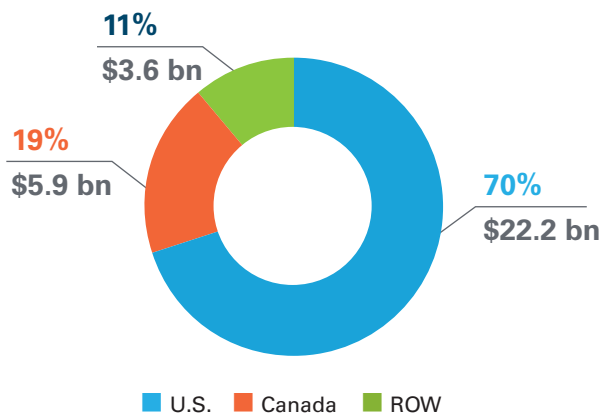
We prefer a bundled solution to speed up the entire process of moving toward more automation.

— General Manager, Medical and Recreational THC.



▶ Global Cannabis Market Prediction*

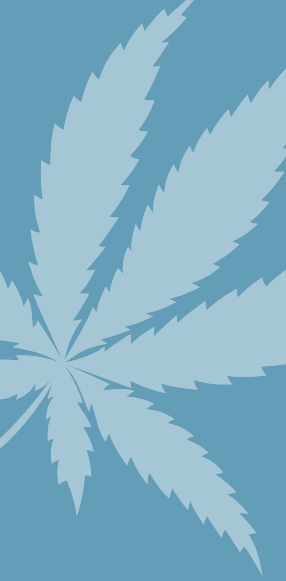
\$32 bn by 2024; 28% CAGR



*Multiple sources for size of market

The Market Conditions:

- Recreational growth will rapidly outpace medical.
- Flower will continue to lose share as a product format.
- Packaging has become a major concern now for producers, primarily; sustainability, regulations, and branding.
- The regulatory landscapes for both CBD and THC are expected to continue to become more relaxed, especially restrictions on retail CBD.
- Public support for the cannabis industry, particularly CBD use, continues to increase.



All Markers Point to Building Strong Supplier Partnerships

1. The majority of the industry still relies on manual labor for processing and packaging.
2. Producers and packagers struggle with maintaining volume and often experience labor shortages.
3. There are specific regulations for labeling and packaging that producers must adhere to carefully, especially child-resistant packaging.
4. There is interest in automating processes and acquiring more equipment; many industry players are not fully aware of the possibility and potential benefits of adding machines.

Common Ground

To discuss the diverse and rapidly evolving cannabis market, it is helpful to first begin with a set of common terms. All forms of cannabis contain cannabinoids, the active chemical compounds that bind with cannabinoid receptors located all over the body that comprise the endocannabinoid system. There are numerous types of cannabinoids, but for the purpose of this discussion, cannabinoids can be divided into two main groups: Cannabidiol (CBD) and Tetrahydrocannabinol (THC). THC is the psychoactive cannabinoid that is responsible for the “high” from cannabis use. CBD, on the other hand, is a non-psychoactive cannabinoid.

Two Different Plants – Hemp and Marijuana

The cannabis plant itself comes in two main varieties. The first major variation of cannabis, hemp, is a non-flowering plant that contains less than 0.3% THC. The second major variation of cannabis, which we will call flowering marijuana, contains much higher concentrations of THC and yields the flowers that are most often associated with the cannabis industry. While there are numerous nuances within the hemp and flowering marijuana categories, the key differences that define these two segments are the levels of THC and the production of actual flowers on the plant.



THC

All cannabis products are produced from the two main varieties of cannabis, hemp and flowering marijuana, and contain different levels of CBD and THC depending on the type of plant used. All products containing THC at levels above 0.3% are produced from flowering marijuana, which is bred and selected to contain much higher concentrations of THC.

All products containing THC at levels **ABOVE 0.3%** are produced from flowering marijuana and are only available at dispensaries.

CBD ~ All products containing **LESS THAN 0.3%** THC are produced from hemp plants and are available at retail locations.

CBD

CBD can be produced from either hemp or flowering marijuana plants, but there are important differences between the two. CBD derived from hemp plants contains less than 0.3% THC and is significantly less regulated than CBD derived from flowering marijuana plants, which contains varying levels of THC above 0.3%. For this analysis of the market, CBD derived from hemp (containing less than 0.3% THC) will be referred to as retail CBD, while CBD derived from flowering marijuana (containing more than 0.3% THC) will be referred to as dispensary CBD.

► Canada – The First Nation to Fully Legalize Recreational THC and CBD Products

Canadian Cannabis Market has Grown Slower than Predicted

The most significant development in the cannabis industry in the last decade has been Canada's decision to nationally legalize adult recreational cannabis use in October of 2018. Canada's decision sets it apart in the world as the only nation to fully legalize the growth, consumption, and sale of cannabis (Uruguay, Georgia, and South Africa have similar but significantly more restrictive national legalization models in place).

The specifics of Canada's legalization rollout have had a major impact on the development of the Canadian market in general. During the first year of sales, cannabis products were restricted to only flower and lower concentration oils intended for sublingual consumption. This effectively banned other formats of cannabis for one year, including concentrates, edibles, and vape cartridges. In addition, on-site sales at physical locations were banned for the first six months in favor of an online shipping system. It has only been since October of 2019 that all formats of cannabis, including concentrates, have been legal for sale at dispensaries with physical storefronts.

Licensing Constraints Hinder Product Availability

The licensing system for both growing cannabis and establishing dispensary locations has generated frustration for players in the Canadian cannabis industry. The process of approval for growing licenses has been slow and highly restrictive, creating a large backlog of applications that are taking over a year to process. This, in turn, created supply problems in the first year of legalization, although this problem seems to be correcting itself in the last quarter of 2019. Alterations to the application process have boosted backstock of dried cannabis in the fourth quarter of 2019 to three times what it was the previous year in October of 2018.¹

Licensing has also been an issue on the dispensary side, where a slow and burdensome process has all but stalled dispensary openings in some provinces. Each province is responsible for dispensary licensing within their territory, resulting in a patchwork of regulations that has created a shortage of physical dispensaries in the most populated provinces. For instance, at the end of 2019, there were only 24 dispensary licenses approved in Ontario to service a province containing 14.5 million people.² While the Canadian market allows online ordering to supplement physical dispensary sales, the lack of storefronts has been an obstacle for cannabis companies working to grow their operations.

In 2019, legal cannabis sales accounted for slightly more than one-fourth of sales in the Canadian market.



LEGAL MARKET

29%

of all cannabis sales

BLACK MARKET

71%

of all cannabis sales

Black Market Prevails in the Short Term

Illegal sales of cannabis have also proved difficult to eliminate in Canada, despite a maximum tax of 10% on cannabis products that was designed to thwart the continuation of a large tax-free black market. In 2019, legal cannabis sales accounted for only 29% of the Canadian market, meaning that the black market still held a 71% share of all cannabis sales. While the share of the black market is expected to be slashed in half to about 35% in 2020, the outsized share of illegal cannabis sales in 2019 significantly hampered the growth of legal cannabis sales.³

“

Our greatest obstacle in advancing automation to meet growing demand is budgeting for the cost of equipment.

— *Project Manager,
Leading Canadian Cannabis
Producer for Medical and
Recreational THC
and CBD.*

”

Difficulties in Legalization Rollout Slowed Market Growth in Canada

- Product availability has been limited.
- Applications and permits for growing and selling marijuana are taking more than a year.
- The kinds of products that are legal to consume — flower and oils — are not nearly enough to lure consumers away from the black market when the cost is nearly twice as much (edibles and concentrates have been approved for sale as of October 2019).
- Medical market growth has slowed to essentially flat.
- Confusion and cost are the two most commonly cited reasons for not buying in the legal market among the 60% of Canadians who participate in cannabis use.⁴
- Lack of brand awareness and preference.
- Advertising will continue to be almost as restrictive as tobacco.

These difficulties in the rollout of legalization have ultimately resulted in the Canadian cannabis market growing at a slower rate than was initially expected. While growth has not been as explosive as first predicted, it has been healthy: monthly cannabis sales have more than doubled in less than a year, growing from about \$41 million in October of 2018 to about \$97.3 million in August of 2019.⁵ Currently, the Canadian cannabis market is on track to reach nearly \$6 billion in revenue by 2024.⁶

Canada Cannabis Market Revenue:

\$97.3m  **\$6bn**
2018 2024

Canadian Packaging Regulations Demand a Uniform Look and Label

With full legalization, Health Canada has established a national, comprehensive guide to packaging and labeling requirements. All cannabis products are regulated to be uniform, regardless of province. The Canadian guidelines first lay out a number of general packaging requirements for all types and formats of cannabis.

Health Canada packaging guidelines for cannabis products include:

- A single uniform color
- Smooth texture
- No hidden features
- No features that can change surface area
- Cannot emit scent or sound
- No cut out windows
- No brand element
- No image or extraneous information
- No inserts or leaflets

The Canadian regulations require that the package:

- Not contain more than one class of cannabis
- Be opaque or translucent
- Be child resistant
- Have a security feature
- Not exceed the maximum quantity of THC
- Have control measures [dosing controls] for cannabis extracts not in discreet units

The procurement specialist at a leading Canadian THC and CBD producer for both medical and recreational products reiterates the importance of adhering to child resistance packaging and says, “We test all packages for child-resistance and are open to innovative improvements in the future.”

Canada’s Labeling Guidelines

Labeling has also been very clearly laid out for the Canadian market, with strict requirements for what can and cannot be included on cannabis labeling. Depending on the format of the cannabis product, labels for cannabis products in Canada may be required to follow uniform content details.

Cannabis labelling requirements:

- Contact information of the license holder
- Class of cannabis
- Lot number
- Recommended storage conditions
- Packaging date
- Expiry date
- Net weight of cannabis
- Net volume of edible cannabis
- Number or discrete units, if applicable
- Net weight per discrete unit, if applicable
- A “cannabis possession statement”
- The warning statement
- Identity by common name of products or its function
- Intended use of cannabis product
- Durable life date
- List of ingredients and constituents
- Sources of food allergen or gluten, and added sulphites
- Include a nutrition facts label

► U.S. THC and CBD Market is Fragmented and Complicated

State-by-State Legalization

The cannabis market in the United States is a patchwork system where legality is determined on an individual state-by-state basis. It is important to note that under federal regulation, flowering marijuana remains a Schedule I controlled substance, meaning that it is entirely illegal at the federal level. Since the 2013 Cole Memo, the federal government has taken a “hands-off” approach to marijuana enforcement, effectively leaving the decision of legality to the states. As it currently stands, legal marijuana markets are allowed to operate at the state level without federal interference, but any interstate commerce is still strictly forbidden.

Three Main Categories of Cannabis Legality in the U.S.: Full Legalization, Medical Legalization, and Decriminalization

In fully legalized states, adults over the age of 21 can legally purchase cannabis products at licensed dispensaries for recreational use. In medical states, adults over 21 with a doctor’s prescription can legally purchase cannabis products at a dispensary. In decriminalized states (and cities within states), the possession of small amounts of cannabis has been removed as a criminal offense, but the possession of large quantities, sale, and cultivation of cannabis are still fully illegal.

Full Legalization As of January 2020, there are 11 states that have approved full cannabis legalization to enable recreational sales at licensed dispensaries, including: Alaska, California, Colorado, Illinois, Maine, Massachusetts, Michigan, Nevada, Oregon, Vermont, and Washington. In addition to the previously listed states, the District of Columbia, the Northern Mariana Islands, and Guam have also fully legalized the sale of recreational cannabis.

Medical Legalization In addition to the 11 fully legalized states, 33 states have also approved medical legalization, enabling the sale of cannabis to adults with an appropriate doctor’s prescription.

Decriminalization A total of 15 states have also decriminalized the possession of small quantities of marijuana, including some states that have also approved medical legalization.



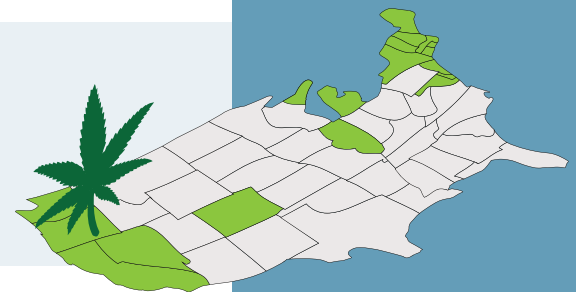
Legal Across the U.S.

Federal legalization of recreational cannabis in the U.S. is predicted within the next 10 years.

*Expert View,
Euromonitor*

As of January 2020,
11 states approved
full cannabis
legalization

Alaska • California • Colorado • Illinois •
Maine • Massachusetts • Michigan
Nevada • Oregon • Vermont • Washington



Financial Hurdle for U.S. Cannabis Companies

One of the major hurdles to the expansion of the cannabis market in the U.S. is the lack of access to financial support. As a result of the classification of marijuana as a Schedule I drug by the federal government, cannabis businesses operating in legalized states do not have the same access to financial institutions and federal tax breaks. The illegality of cannabis at the federal level proves to be a major financial hurdle for cannabis companies as banks and financial institutions have declined to do business with companies in the cannabis industry. In addition to this, because the sale of cannabis is recognized as the trafficking of a Schedule I substance by the federal government, companies engaged in the cannabis industry are not allowed the most lucrative federal tax incentives. Specifically, cannabis companies are unable to claim 280E deductions, which means they are unable to deduct normal business expenditures from their federal taxes.

“

The cost of automation is our biggest hurdle since suppliers want full payment upfront for equipment; even though investors are supplying a revenue stream, it remains a cash business.

— *Sr. Process Engineer,
Provider of Medical THC and CBD Products.*

”

Banking Legislation is Up For Vote

The lack of access to financial institutions and the penalties to business deductions resulting from the federal tax code have significantly hampered cannabis companies' ability to expand their operations and sales. Some states are addressing this hurdle on their own, allowing operations such as cannabis credit co-operatives to boost investment in the industry. In addition to individual state measures, there is also a larger banking bill for the cannabis industry winding its way through the U.S. Congress. The Secure and Fair Enforcement Banking Act (SAFE Act) passed the House in September of 2019 with bipartisan support and is currently awaiting a vote in the U.S. Senate. The Senate had previously stated they would vote on the bill in 2019, but no further action has occurred as of January 2020.

The bill is designed to allow cannabis businesses access to banking and financial institutions and allows insurers to extend services to cannabis companies without fear of legal reprisal. It should be noted, however, that the current version of the bill does not include language to explicitly protect U.S. capital market activity for cannabis companies, a point of contention for businesses and investors. While its future is far from certain, the bipartisan support from the House is encouraging and the industry is watching the future of this legislation closely.

Wild West of Forecasted Growth in the U.S. Cannabis Market

With so much uncertainty surrounding the cannabis industry in the U.S., from the continued federal illegality of cannabis to the patchwork system of varying degrees of cannabis legalization on a state-by-state basis, forecasts of future growth for cannabis in the U.S. vary drastically. In 2018, cannabis revenue in the U.S. totaled about \$10 billion dollars; by 2024, this number is expected to surge to about \$30 billion in revenue, representing a CAGR of around 20%.⁷

The \$30 billion forecast in revenue represents the entire cannabis industry, spanning recreational sales, medical sales, prescription drug sales, and retail-legal CBD sales. These numbers could change drastically in the coming years however, depending on the pace of legalization and the stance of the federal government on cannabis.

In 2018, cannabis revenue in the U.S. totaled about } **\$10 bn** ▶ By 2024, revenue is expected to surge to about } **\$30 bn**

U.S. Packaging is Regulated by the State, With Some Uniform Requirements

Unlike Canada, cannabis is not legal on the national level in the U.S. As a result, individual states have been left to determine what the packaging requirements will be for cannabis. While these regulations and requirements are drastically different from state to state and evolving on a monthly basis as legislation addresses concerns from producers, vendors, and consumers alike, there are a handful of packaging features that are ubiquitous. For instance, all states selling cannabis have requirements that the package be child-resistant, according to the standards set by the Consumer Product Safety Commission.

In addition to the packaging being child resistant, states selling legal cannabis also require a clear warning and some level of informative text on the label. While the symbols vary from state to state, they all contain the basic elements of a triangular or diamond-shaped warning label, in bright colors such as yellow or orange, that clearly indicates the product contains cannabis.



We follow all regulations which vary by state for medical cannabis; zipper pouches and caps are already child-resistant.

— Project Engineer, Medical and Recreational THC Products.



Common state-wide packaging guidelines for cannabis products include:



Child-resistant closure and re-closure



Clear indication and warning of cannabis content



Ingredient list of cannabinoid concentrations per serving



Suggested dosage and use guidelines

Beyond identifying the product as containing cannabis, many states also require a breakdown of the cannabinoid concentrations of the product in the package. This information typically denotes quantities of THC and CBD contained in the product, and when appropriate will highlight the concentrations of cannabinoids for individually portioned servings.

Another universal aspect of cannabis packaging in the U.S. is the inclusion of a warning statement that is clearly visible on the outside of the package, similar to warnings on alcohol and tobacco. These warnings vary by state, but typically include guidance regarding the use of cannabis products while pregnant and the dangers of operating vehicles and machinery while under the influence of cannabis products.

Cannabis Packaging is Adopting Guidelines Similar to CPGs

Cannabis products in the U.S. are following guidelines similar to food, beverage, personal care, and health products. Depending on the format of the cannabis product, packaging labels must display:

- Tracking information like lot number
- A packaging date
- An expiry date
- The net weight of the product
- Net volume of edible cannabis
- Number or discrete units, if applicable
- Net weight per discrete unit, if applicable
- The warning statement
- List of ingredients and constituents
- Sources of food allergen or gluten
- Include a nutrition facts label

▶ Investing in Cannabis Needs Major Reform to Instill Confidence

One of the important markers in the cannabis industry is the valuation and level of capital available at the largest publicly traded cannabis companies. Since the beginning of 2019, cannabis companies have been steadily bleeding market value, seeing their valuations slide as the market continues to mature. According to the New Cannabis Ventures' Global Cannabis Stock Index, the total value of cannabis companies in the index has declined by over 50% in the last year, with many companies taking larger valuation hits in the second half of 2019. Notably, the 15 largest publicly traded cannabis companies have seen a total of \$35 billion erased from their collective valuations from April to November of 2019.⁸

Adjusting growth projections to reflect reality

While these numbers are alarming on their face, the reality may not be as extreme as the numbers reflect. A large portion of the declining valuations can be attributed to the aggressively optimistic projections of cannabis growth that were laid out only a few years ago. Most models projected rapid, expansive recreational legalization of cannabis across the U.S. and eventually at the federal level, which so far has not panned out. States are still legalizing for recreational use, but the pace has not necessarily increased, and despite whispers from some potential 2020 presidential candidates that federal cannabis legalization will be a priority, no U.S. government, past or present, has seriously pursued a policy of national legalization.

On the Canadian side, the delayed rollout of physical dispensaries, the delay on concentrates, and the slow licensing approval process have also resulted in the Canadian market growing at a slower pace than was predicted a year ago. As a result, analysts are now having to revise their projections down to more realistic levels, causing a drop in valuation of companies operating in that industry.

Cannabis companies continue to pull in investment and capital, despite dropping market projections and valuations. While some companies' quarterly reports showcased cash flow issues, capital investment in the cannabis industry grew overall in 2018. According to Viridian Capital Investors, investment in the cannabis industry reached \$14 billion in 2018, representing a four-fold increase from 2017. While this is an encouraging statistic for the cannabis industry, it should be noted that capital investment is still a risk while cannabis remains a Schedule I substance under federal law in the U.S.

"We are hesitant to invest much in capital equipment until there is a market shift financially and we can actually have a bank account; it's a Catch 22 situation being restricted from traditional funding." *Business Systems Consultant, Processor and Packager of Hemp CBD.*

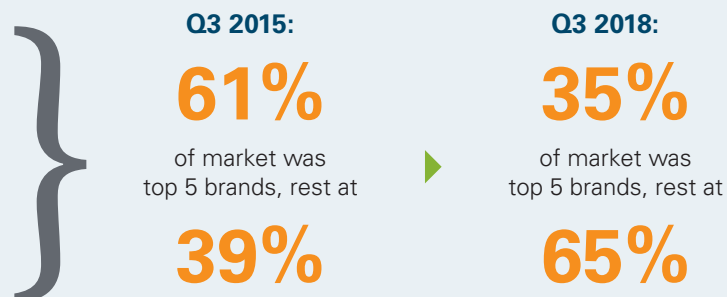
A Market Ripe for Acquisitions

The end result of these financial bumps in the road for the cannabis industry may be an environment conducive to the future expansion of mergers and acquisitions. While M&A's have slowed in the last half of 2019, this is likely due to rapidly shifting financial realities as cannabis companies sort through valuation and capital fluctuations. Once this market correction settles, it is likely that capital-rich cannabis companies will be in a prime position to acquire struggling cannabis operations.

Competition Brings New Brands at a Staggering Rate

Brand competition is rapidly increasing. For instance, the Colorado concentrates market has seen significant new competition:

Source: BDS Analytics



► Complexities of CBD as an Ingredient are Being Evaluated Now in the U.S. and Canada

Perhaps one of the most confusing aspects of the cannabis market for consumers is CBD. There are two main variations of CBD, retail CBD and dispensary CBD, as explained previously. Recent and projected explosive growth in CBD is attributed to the former, retail CBD, mostly as a result of U.S. legislation in 2018.

The 2018 Farm Bill and its follow-up legislation established the growth, processing, transportation, and sale of hemp as fully legal. As a result of this declaration, hemp-derived CBD became legal in all fifty states. This legislation brought the U.S. into line with Canadian law, where hemp had already been legal for decades.

Ingested CBD products remain illegal in Canada and the U.S.

There are nuances of legality within the CBD market that still cause confusion, however. In both Canada and the U.S., there is currently no legal pathway for producers to sell hemp-derived CBD products intended for ingestion outside of dispensaries. While formats such as creams, salves, and balms are safely legal and have seen rapid growth, neither the FDA nor Health Canada has approved CBD as an ingredient for food or beverage (this stipulation also applies to pet food). As a result, any CBD being sold in the retail setting as an ingredient in food and beverages is technically still illegal. In the U.S., the FDA recently reiterated this stance, although it is widely expected that congressional pressure will expedite the FDA's review process of CBD. In Canada, Health Canada is currently reviewing the use of CBD in food and beverages and is widely expected to release guidelines legalizing and regulating the practice once they are completed, although a timeline has not been discussed.

Health benefit claims are illegal

The FDA has also reiterated that health claims being made on cannabis packaging of any kind will not be tolerated. Since cannabis has not been evaluated by the FDA, it is illegal to make claims of health benefits on the packaging of cannabis products attributed to the use of cannabis. This does not make cannabis unique, as any unevaluated substance is barred from making unproven health claims under FDA regulations, but it is an important reminder of the fine line of legality that cannabis producers in the U.S. must adhere to.



Our greatest concerns are the uncertainty of the FDA regulations on CBD in the United States.

Global Product Specialist, CBD Cultivator and Ingredient Supplier.

Retail CBD sales continue to show growth

The confusion over the different types of CBD and their legality does not appear to have significantly hampered growth. In the U.S. alone, sales of CBD products encompassing all channels are projected to reach about \$20 billion by 2024.⁹ The vast majority of this growth will occur in the retail-CBD market at large chain establishments, which accounted for 57% of all CBD sales in 2018.¹⁰ If we assume the 57% number will hold relatively steady for the next five years, it would result in sales of CBD at chain retailers of about \$11.4 billion in the U.S. With only 4% of total CBD sales in 2018 being attributed to dispensaries, it appears that the future of retail CBD is bright.¹¹



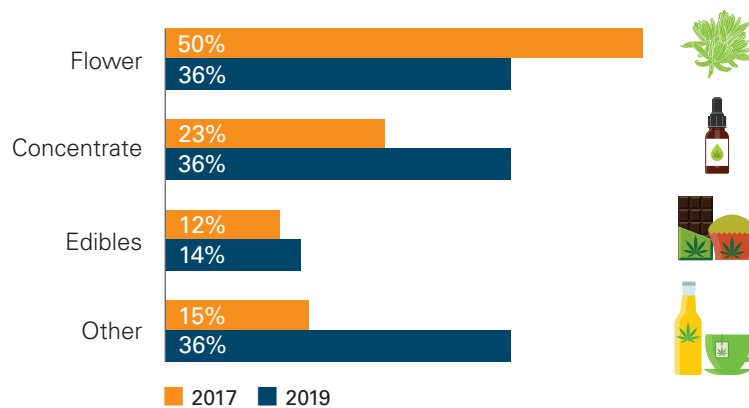
► Trends in Cannabis Formats Moving Away from Dried Flowers to Concentrates, Edibles, and a Diverse Variety of Other Products

When selecting cannabis packaging, the first factor to consider is the format of the cannabis product. Cannabis products come in a wide variety of formats, from dried flower to oils and the format of cannabis plays a large role in what type of packaging is most suitable.

The trending for cannabis formats has seen a steady shift away from the traditional dried flowers that have dominated the market for decades. In the U.S. in 2017, dried flower represented a full 50% of the entire cannabis market; by 2019, this share had dropped to 36%. The decline in dried flower coincided with significant gains in other formats of cannabis. From 2017 to 2019, concentrates expanded their market share by 13% to reach 36% market share. Edibles also grew slightly in the same time period, from 12% market share to 14%. The largest increase was observed in the “Other” category of cannabis products, which includes a diverse set of formats such as creams, gels, dried teas/powders, and inhalers. This category more than doubled, from 15% in 2017 to 36% in 2019.¹²



U.S. Product Formats of Cannabis Products (purchased at dispensaries-CBD and THC)



Source: BDS Analytics

Some of the expansion in the “Other” category can also be attributed to the explosive growth of retail CBD, particularly creams, salves, and balms. The edibles segment of the cannabis market could see a similar significant boost should the FDA declare CBD legal as a food and beverage additive.

In general, consumers in the U.S. are moving away from dried flowers in favor of either more concentrated forms of cannabis, novel and unique delivery formats such as THC inhalers, or discrete application methods such as creams and balms. These numbers are difficult to translate to the Canadian market, since the sale of concentrates and edibles has only been legal for one month at the time of this writing. With the similarities between the two markets and the congruency of general consumer trends in the cannabis market between the U.S. and Canada however, it appears very likely that the Canadian market will reflect similar product format trends in the coming year.



► Cannabis Packaging Largely Depends on the Product Format; Rigid and Flexible Are Both Solutions

The type of packaging used for cannabis products is most heavily influenced by the format of the cannabis. From dried flower to sublingual tongue strips, cannabis is now available in a staggering variety of formats, each with its preferred packaging style. While data for packaging formats of cannabis products is spotty at best, there are a few basic styles that are preferred over others for some of the largest cannabis categories.

“We envision automation for primary packaging using fillers for oils and robotics to place flower into a jar or bottle.” *Project Engineer, Canadian Cultivator, Processor, and Packager of Medical and Recreational Cannabis.*

Dried Flower Packaging

For instance, dried flower is most commonly placed by hand into a plastic jar with a child resistant lid, be it screw-top or push-top. The style and shape of these containers varies from state to state and from producer to producer, but they are most commonly made from HDPE. Premium brands of dried flower can also be found in glass jars, mylar bags with a child resistant resealable zipper closure, or tin cans. Premium-look glass jars are also commonly packaged within a paperboard box. Some brands are even using pre-decorated or etched jars and premium labels as a tactic to differentiate themselves on the shelf.

“We are constantly changing our packaging formats; they are all over the place now.” *Manager, Medical Cannabis Cultivator, Processor, and Packager.*

Concentrates Packaging

For concentrates, small cups are the preferred packaging format. These cups are lidded with child-resistant caps and are sometimes packaged in a secondary covering, such as a paperboard box. While plastic cups were popular in the early days of cannabis sales, many producers have migrated to small glass cups. In addition to cups, concentrates are also commonly packaged in syringes (*sans* needle), which allows for easy metering of doses without the mess. Some concentrates, particularly those intended to be used as additives to food and beverage, are packaged in small glass bottles with a dropper top. Many brands in the concentrate market are also placing vape cartridges into a blister, pill bottle, or a pop-top container to meet regulatory requirements.

Topicals Packaging

Creams, balms, and salves also have a few packaging formats that are greatly preferred by the cannabis industry. The vast majority of these types of cannabis products are packaged in either plastic or glass child-resistant jars, with secondary packaging consisting of a paperboard box. Flexible tubes have also proven to be a popular packaging style for these cannabis formats, particularly in the retail setting for CBD products.

“Lots of hand packaging remains and automation is still down the road.” *President, Grower Supplier of Cannabis and Hemp.*





Edibles Packaging

When it comes to edibles, there really is no set standard for packaging. Since edibles now span just about every type of snack food and beverage imaginable, the packaging formats that they come in are just as varied and diverse: conventional glass, plastic jars, flexible pouches, aluminum bottles, and other innovative packaging. In general, the edibles market has seen growth in flexible packaging for both convenience and environmental concerns. Packaging such as flexible bags also helps cannabis brands stand out from the competition by conveying a more premium aesthetic look to customers.

“Packaging varies greatly; the packaging of edibles depends on the type of edible - it's very broad.” *Procurement Specialist, Producer and Packager of Medical and Recreational CBD and THC.*



Medical Packaging

The medical cannabis market, which has been in operation since 1996 in the U.S. and 2001 in Canada, has slightly different packaging needs. The standard push-and-twist amber pill bottle ubiquitous in the pharmaceutical industry is still a popular format for medical cannabis packaging, as branding and shelf appeal are less of a concern. While more colorful and premium styles of bottle packaging have seen use in the medical cannabis market, there is growing concern about the environmental impact of plastic bottles in general. As a result, many medical cannabis packagers are exploring flexible pouches and bags made from environmentally friendly materials.

Peel-and-push blisters, which originated in the pharma industry, have also proved to be a ready-made packaging solution for the medical cannabis market, as they have already been designed to meet requirements for child-resistant packaging. While effective, these blisters are also more expensive per unit and require investing in a machine capable of producing them or the use of a contract packager.

► Packaging Machines for Cannabis Products

Cannabis companies face a number of challenges when it comes to packaging. First and foremost, they struggle with the wide variety of packaging options and packaging types. Packaging format choices must also be considered in conjunction with required labeling regulations, which can also be different for each market in which cannabis is legal. Perhaps the largest, overarching challenge for cannabis packagers is designing and adapting processes and machines that are specific to cannabis. Cannabis packaging companies must forge new ground and innovate new solutions for an industry where few shared standards for packaging exist.



After reviewing our processes, OEMs need to help us design equipment for our industry and suggest proven technology; we need machines to automate manual operations that are highly adaptable to handle both flexible and rigid packaging.

— *Director of Operations, Producer and Packager of Cannabis Products, Medical and Recreational.*



Educate Packagers on Automation Options

In terms of machines, cannabis packaging companies are a mixed bag of automated, semi-automated, and manual processes. While some of the larger operations have fully automated processes for applications such as labeling, primary packaging, and secondary packaging, the majority of packagers employ a combination of manual and semi-automated packaging solutions. Labor-intensive tasks such as manually placing flower into jars and hand-labeling are slowly being replaced by automation and machines, but many packagers still rely on manual labor for these processes. One of the biggest challenges when it comes to equipment is educating cannabis packagers about what their options are. While cannabis companies are aware that manual processes are cumbersome and labor-intensive, they often do not know what automation and machine solutions are available to them. Cannabis packagers are looking for OEMs to provide suggestions and solutions to their bottlenecks that packagers may not even be aware of.

“We would expect machine builders to be part of our team, visit our facility to understand our needs, and offer recommendations and improvements to our operations.” *Sr. Pharmaceutical Process Engineer, Cultivator, Processor, and Packager of Medical Cannabis Products.*

Labeling

One of the first processes to be automated at cannabis packaging companies is labeling. Labelers are affordable, compact, and make a measurable impact on output speed for their required capital investment.

“We are mostly manual now and plan to automate starting with small labelers and add more as we grow.” *Manager, Cultivator, Processor, and Packager, Medical Cannabis.*

Primary and Secondary Packaging

Many cannabis companies seek to add automation to the filling and primary packaging operations. From placing flower into jars to filling concentrate vials, cannabis packagers are seeking machine and automation additions to make primary packaging either semi- or fully automated. Some larger cannabis companies are also adding automation to their secondary packaging processes with machines such as case packers, case sealers, and palletizers, utilized to improve production speed and cut down on labor requirements.

“We are sourcing secondary packaging automation equipment currently, like case packers, case erectors, labelers, coding machines for track and trace, and possibly palletizers.” *Project Engineer, Cultivator, Processor, and Packager, Medical and Recreational Cannabis.*

With cannabis being such a new industry, there is a lot of room for design innovation and development from OEMs. While machines and processes can be adapted from other, similar industries to a certain extent, at the end of the day cannabis is a unique industry with its own set of operational requirements and goals. More than anything else, cannabis packagers are looking for machines that are flexible and adaptable to the rapidly evolving nature of cannabis packaging. Cannabis packagers desire machines that are capable of handling both rigid and flexible packaging in a variety of different formats and material types. Cannabis companies are also looking for options when it comes to packaging machine purchases; in many cases, capital is tight and space is at a premium, meaning that cannabis packagers must carefully weigh the benefits and returns of purchasing a packaging machine.

“Our processing operations are all manual now and we will first look to automate primary packaging and need a machine to put flowers into jars and a machine for pre-rolling dried cannabis; next we’ll automate case erecting, case packing, and palletizing.” *Purchasing, Processor and Packager of Medical Cannabis Products.*

List of packaging equipment cannabis operations will be looking for:

- Coding and marking
- Unscramblers
- Bottle filling
- Sealers / cappers
- Check weighers
- Labelers
- Visual inspection
- Heat tunnel
- Shrink wrappers
- Tablet presses
- Tablet counters
- Rolling machines
- Form, fill and seal (FFS)
- Conveyors
- Case erectors
- Case packers
- Palletizers



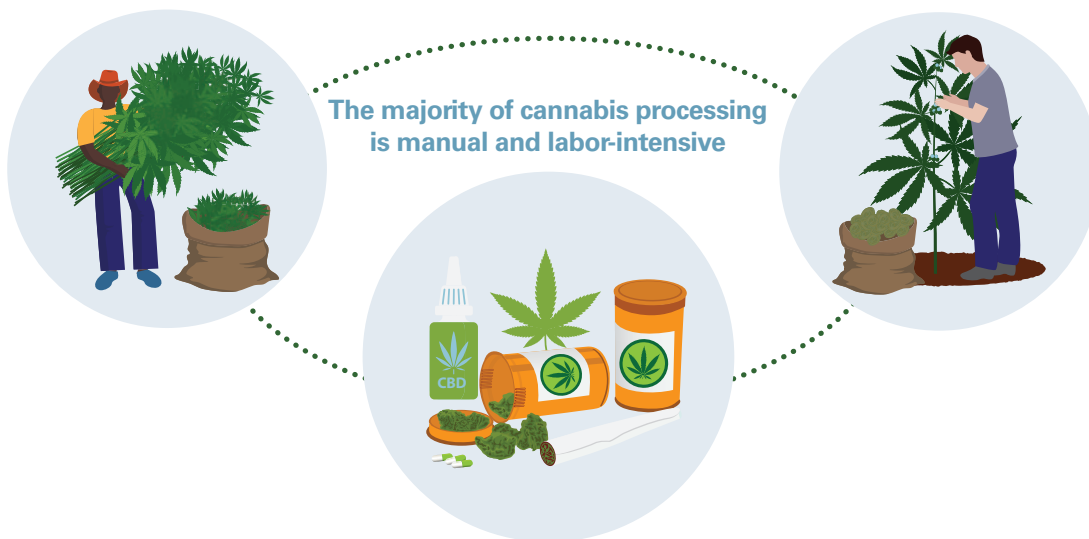
► Cannabis Processing is Mostly Manual and Needs Automated Ingenuity to Flourish

The cannabis processing industry represents a new frontier, as a historically illegal industry now has the opportunity to scale up and expand in legally approved markets. The production and packaging of cannabis on a larger scale has proved challenging for cannabis companies, as they must pioneer new techniques and processes to prosper. While inspiration can be drawn from general CPG industries such as tobacco manufacturing, confectionery, and baked goods, many cannabis companies must devise and deploy new and novel production methods in an effort to streamline their operations.

“Edibles will be automated first to put a label on a twist bottle; we’ll need weighers, labelers, case packers, and sealers . . . we will also be looking for one machine that can cook multiple products: gummies, hard candies, and other edibles.” *Executive Production Manager, Medical and Recreational Cannabis Products.*

Labor is one of the largest hurdles cannabis companies face when demand requires they ramp up production. The majority of cannabis processing is manual labor-intensive: processes such as harvesting plants and trimming flowers are delicate, complicated tasks that require both precision and patience to accomplish. With only limited automated machinery specifically designed for these tasks, the cannabis industry has had to rely on manual labor to keep up with production demands. This presents a problem to cannabis companies, who are faced with a constantly revolving door of employees. The menial nature of the work, a lack of formalized benefits such as insurance, an all cash system, and a typically young labor pool has resulted in an industry that has extremely high turnover, even on a month-to-month basis.

“Flower processing is very labor intensive and could use automation to help defoliate and strip buds.” *Director of Packaging, Cultivator, Processor, and Packager of Medical and Recreational Cannabis Products.*



“

It would be beneficial if OEMs could offer a payment plan since this still remains a cash business.

— *General Manager, Cultivator, Processor, and Packager of Medical and Recreational Cannabis Products.*

”

Lower Labor – Increase Output With Automation

With staffing being a challenge, cannabis companies have begun seeking out automation as a way to alleviate labor woes and increase their production efficiency. Cannabis companies are specifically looking for machine solutions that will lower their labor needs while increasing their output speeds. Because cannabis processing is such a new industry, the goal of automating processes can be particularly tricky. While some applications, such as rolling joints, can be co-opted from the tobacco industry with little to no alterations to the traditional cigarette rolling machines, other processes prove vexing. For instance, the removal and trimming of cannabis flowers is a tedious process requiring significant manual labor. As it stands, there is no universally accepted solution to automating this process and no single machine has emerged as the go-to answer for flower processing.

“OEMs need to provide machines that perform tedious tasks, are mid-range in price and speed, and are multi-functional.” *Manufacturing Facilities and Equipment Manager, Cultivator, Processor, and Packager of Medical and Recreational Cannabis Products.*

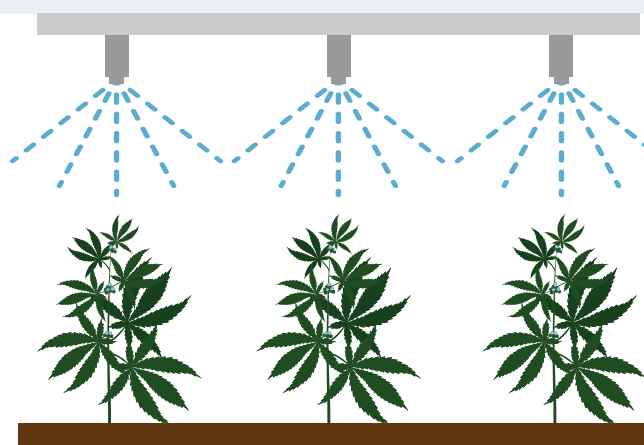
Machine Design Innovation and Development

For cannabis producers, this lack of ready-made solutions presents a hurdle when trying to automate. Cannabis producers are typically less familiar with automation applications in general, especially those needed for processes in the cannabis industry that don't yet have a machine or automation option previously used as a solution. This means that cannabis companies rely heavily on OEMs for suggestions and advice when it comes to automating their processes. OEMs will need to work with cannabis companies to alter existing processes and innovate new machine and automation formulations specifically suited to the tasks required by the cannabis industry. New machine designs will need to be both flexible and adaptable, especially when it comes to the size and cost of the machine. Cannabis companies range from small outfits with little capital and room to spare to large production operations capable of making an investment in multiple machines at one time. OEMs will need to be aware of this range and work with cannabis companies to understand their needs and means and tailor machines to meet specifications.

“The industry needs cost-effective equipment for smaller operations and will look to the OEM for education to help companies get started with automating packaging, date coding, and tracking.” *President, Grower Supplier of Cannabis and Hemp.*

List of processing equipment cannabis operations will be looking for:

- Trimmers for wet and dry flowers
- CO2 extracting machine
- Cookers for edibles
- Grinders to pulverize flowers
- Sifters to remove sticks and stems
- Contaminant detection and removal
- Plant watering that adds nutrients automatically



► Role of Contracting

As the cannabis industry continues to mature, companies are gaining the capacity and specialization required to begin offering contract services to other industry players. While no standard business model for cannabis contracting has emerged, the cannabis contracting industry has followed in the footsteps of other CPG contractors, with larger cannabis industry players acquiring enough capacity and expertise to offer contracting services.

Labeling is first

One of the early applications to be contracted out in the cannabis industry was labeling. With complicated, intricate labeling requirements in both Canada and the U.S., cannabis labeling requires extra attention to the composition, content, and placement of labels. Companies that have become experts at navigating the requirements of cannabis labeling have begun offering those services to other producers, alleviating the need for smaller producers to keep up with changes to labeling requirements. Contracting label services not only eliminates the need for producers to become labeling experts, it also moves a vital process out of the production facility, freeing up labor and capital to be deployed elsewhere in the operation.

“Our contractors purchase the equipment, but if I were purchasing, I’d want a turnkey packaging system.” *Global Product Specialist, CBD Cultivator and Ingredient Supplier.*

Packaging outsourced

Along with labeling, the cannabis industry is also seeing its first applications of contract packaging. While not necessarily widespread, there are companies now specializing in contract packaging services for the cannabis industry. The bulk of contract packaging services involve the two most popular formats, flower and concentrates, but services are also offered for other formats such as edibles and dry goods like tea.

“We use third party packaging suppliers that do manual packaging using plastic and glass jars.” *Director of Operations, Producer and Packager of Cannabis Products, Medical and Recreational.*

No crossing any borders

The illegality of cannabis commerce between the U.S. and Canada and across state lines in the U.S. has hindered the development of contract services within the cannabis industry. However, as regulations relax in the U.S. over time and the Canadian market matures, contract packaging and labeling could be a natural fit for the cannabis industry. With a large number of ever-changing regulations to keep track of, a plethora of product formats, and a staggering variety of packaging formulations, packaging in the cannabis industry can be an expensive operation for producers to navigate.



Cannabis packaging specialists, offering full-service contract packaging solutions, may have an opportunity to emerge as indispensable industry partners in the future.

► Proactive Steps for OEMs and Suppliers

Cannabis is a new, dynamic industry that is only just beginning to take shape with more widespread legalization in the U.S. and the development of a national market in Canada. As cannabis companies feel their way through this new market space, there is ample opportunity for OEMs and suppliers to assist cannabis industry players in establishing and improving their operations.

► Cannabis Companies' Recommendations to OEMs

- Understand the complexities of a totally new business
- Offer recommendations and expertise on automating procedures
- Provide customer service technicians for troubleshooting
- Design cost effective equipment for smaller operations
- Educate and train the industry on lean manufacturing practices

Communicate

OEMs and suppliers should first aim to fully understand the intricacies of the cannabis industry, from its state-by-state network of regulations to the challenges faced by cannabis processors and packagers on a daily basis. With such a young industry, there are no standard best-practices guides for cannabis, meaning that OEMs, suppliers, and cannabis companies will need to work together to intimately understand production and packaging processes in order to craft a set of guidelines and suggestions.

Innovate

By better understanding the scope and intricacy of the cannabis industry, OEMs and suppliers can become true partners to individual cannabis operations. With operations varying significantly in size and available capital, OEMs and suppliers will need to recognize that each solution for each cannabis company will need to be specifically tailored. OEMs and suppliers will need to learn and understand a cannabis company's specific needs and limitations when crafting a machine or automation solution, keeping in mind that they may need to innovate an entirely new process.

Educate

When it comes to machines, OEMs and suppliers will need to draw on the well of knowledge they have built up when examining and working within the cannabis industry. OEMs and suppliers will have to consider the space and financial capabilities of a cannabis company against their desired production and labor goals, carefully balancing cost, machine flexibility, and machine size. In many instances, OEMs and suppliers will encounter challenges that will require working with a specific cannabis company to custom design a new machine or automation process to address a production challenge where no solution currently exists. OEMs and suppliers will need a deep level of knowledge about both the general cannabis industry and their customers' specific operations in order to innovate new, customized solutions for the cannabis industry's challenges.



Provide easy-to-operate equipment and customer service like troubleshooting services and have technicians available with web cam communication.

— *Purchasing, Medical Cannabis Testing.*

We need the OEMs to provide affordable machinery that is reliable and has parts availability, which isn't always attainable with equipment from China.

— *Manager, Cultivator, Processor, and Packager, Medical Cannabis.*



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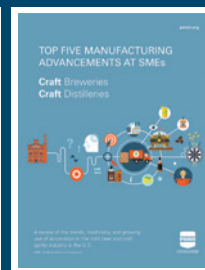
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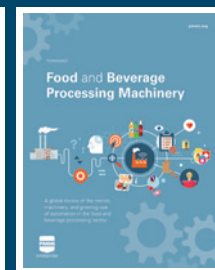
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