tna
packaging &
processing solutions

keeping up with confectionery demand

how to maximise productivity with flexible gummy processing technology

a tna white paper

About the author:

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With over 36 years of product development and sales support experience, within starch moulding, confectionery and allied food industries, Edward is responsible for NID mogul product line management at **tna**. He has extensive domain expertise to enable customers to meet their ever-evolving needs and oversee sustained improvements of confectionery equipment and process lines.

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introduction

Gummy candies, also known as gummies, are truly unique. Typically, a mixture of gelatin, corn syrup, sweeteners, flavourings, and colourings, it can be moulded into thousands of shapes, sizes and formats, making it one of the most versatile confections on the market. First developed by Hans Riegel (Haribo) in the early 1900s, gummies have gained immense popularity the world over. The global confectionery sector was valued at US$172.8 billion in 2018 and is forecast to record a CAGR of 4% during 2018–2023 to reach US$210.7 billion by 2023.[1] Given that confectionery purchases are often impulsive and driven by the desire for an indulgent treat, demand is likely to remain strong in the coming years. But as consumer demand grows, manufacturers must find innovative ways to stand out from competition. Manufacturers therefore need newer, faster, smarter and more versatile gummy processing technology that can cater to these demands.

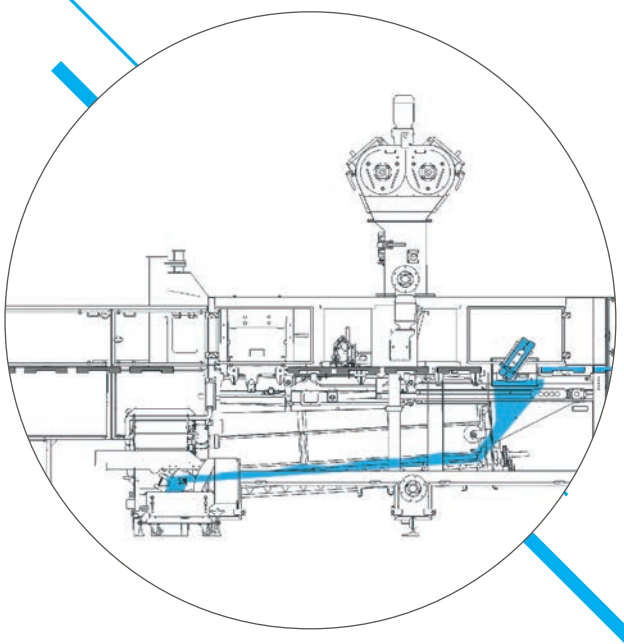
1 market overview

From hyper-indulgent products that offer a unique and highly enjoyable flavour experience, to exciting new flavours; a focus on guilt-free ingredients, to the war on sugar, product innovation is on the rise in the confectionery market.[1] We are seeing jellies made from fruit pulp or juices, gluten and gelatin-free candies and organic options emerging to cater to the latest breed of health enthusiasts. As an example, Haribo France has recently released new Sea Friends variety of its Confiserie Gelifee Aromatisee (Flavoured Gummy Candy), tagged as '30% less sugar'. The release targets both, young and adult consumers, by combining the sensory appeal with health-related claims. Also, among the innovative launches, chewable nutraceutical gummies are on the rise – between 2017 and 2021, the market is predicted to experience 2.7% year-on-year growth,[2] as nutrition-conscious individuals look for a convenient way to consume the vitamins their bodies require. With so many varying and constantly changing consumer demands, manufacturers require confectionery processing equipment that offers the flexibility to cater to different tastes and product types while ensuring a consistent product finish, as well as maximising productivity and providing ease of line maintenance.

2 the gummy processing line

The life of every gummy or jelly candy begins in the industrial 'kitchen'. Here the basic recipe (e.g. gelatine or starch, corn syrup and sugar) is combined and heated, to form a thick, syrupy mixture. It is then sent through pipes into vessels or tanks, where the separately prepared flavours, colours and citric acid are added. From here, the gummy hot liquid is transferred to a starch moulding equipment, commonly called a Mogul. This is a four-part loop system with a fully integrated feeder, starch buck, depositor and stacker where cured products are demoulded, trays are filled with starch, which then receive impressions of the candy shapes to be made. Depositing heads fill the impressions with the gummy mixture. The depositing components and accessories are usually interchangeable, so manufacturers can create a variety of products ranging from single colour to side-by-side colour articles of various ratios, centre-filled and striped gummies. The trays are then stacked and transferred to curing rooms for the product to 'set' or turn from liquid into a soft candy. Once the product is cured, the trays are returned to the Mogul plant, where the confections are de-moulded, separated from starch

"The ingredients, the cooking and the curing parts of the process are largely responsible for achieving the desired texture of the product, whereas the starch moulding equipment is largely responsible for the shape, appearance and surface finish of the gummies and jellies"



1 1Global Markets – Category Innovation Update Q3 2019: Chocolate, Confectionery, and Deserts
2 Global Data, Medicated confectionery year-on-year growth (2017-2021)

and cleaned. The ingredients, the cooking and the curing parts of the process are largely responsible for achieving the desired texture of the product, whereas the starch moulding equipment is largely responsible for the shape, appearance and surface finish of the gummies and jellies.

Once the gummy has cured and demoulded, it is ready to be finished. One of the two traditional ways of finishing jellies, or gummies, is to coat them with sugar or citric acid powder. To do this, the gummies are passed through a steam bath to wet the surface slightly and aid the adhesion of sugar to the product. To ensure an all-round and even coating the gummies are tumbled in a drum, creating confections with a sweeter taste and frosting effect. Alternatively, the gummies are polished by lightly coating them in edible oil, beeswax or carnauba wax. This prevents the candies from sticking together in the pack, as well as providing a glaze and greater depth of colour to enhance the overall attractiveness of the product. The confections are then transferred for packaging.

3 processing equipment flexibility

Whatever the equipment or product, manufacturers require versatility to create lots of different jellies and gummies in a single plant. It is therefore important their processing equipment can cater to different formats, shapes, colours, flavours and recipes, while offering flexible product output and meeting the required hygiene and maintenance standards. Here, Edward Smagarinsky from **tna**, examines how key areas of the gummy processing line can provide manufacturers with advanced processing flexibility to create different product types and finishes, achieve optimum productivity and the highest hygiene and maintenance standards.

3.1 product type

Starch moulding technology offers manufacturers the flexibility to create jellies and gummies in all manner of formats, sizes and shapes, as well as being able to process other confectionery product, such as liquorice, fondant cream, marshmallow foam and similar items. The depositing process, for example, delivers multiple opportunities to accommodate various product types and colours. The depositing pumps are available in a range of piston diameters and configurations and are therefore suitable for handling different recipe types, from lightly aerated to heavy syrup based. Meanwhile, pump variations are designed to deposit single colour or side-by-side colour articles, as well as centre-fill, layered and striped confections (see figure 1). Popular multi-layer combinations include marshmallow, fruit drops and a fruit preparation or jelly, cream and foam products. This offers manufacturers the ability to create a wide array of product types and is ideal for those looking to continue creating new and exciting confectionery options.

Similarly, the nature of the starch moulding process allows production of many different shapes and sizes at a relatively low cost. With its inherently flexible

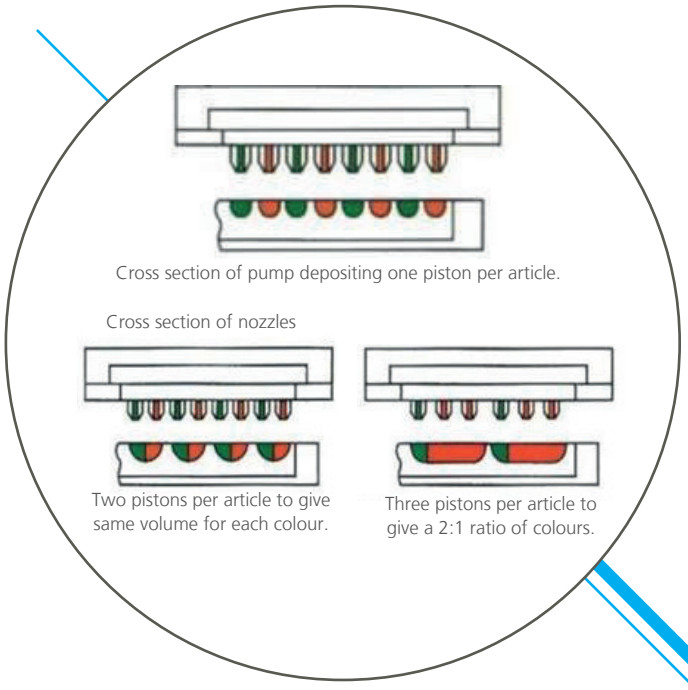


Figure 1 – demonstrates single layer depositing and double layer depositing

> "Starch moulding technology offers manufacturers the flexibility to create jellies and gummies in all manner of formats, sizes and shapes"

design, all the operator is required to change is the mould board used to compress the confectionery design in the tray.

3.2 product finish

Product finish is a key attribute that influences consumer acceptance of a product. For instance, if confectionery products have a poor appearance (e.g. they look sticky and clump together in the packet or are unevenly coated) or possess an unappealing texture, consumers are unlikely to purchase a product. A key trend we are seeing is "photo-friendly" foods, where younger customers are engaged. Nestle Smarties Candy Unicorn Edition, UK, capitalizes on the current craze among customers about the mythical creature.[3] There are multiple steps within the gummy processing line that offer manufacturers the extra flexibility over how the gummy is formed, flavoured and finished.

3.2.1 attributes

Starch moulding technology offers manufacturers the versatility to create a range of different product attributes. For example, the presence of starch allows manufacturers to achieve a longer or shorter bite, depending on how long the product is left to cure. This is particularly important for manufacturers looking to satisfy regional preferences for texture and bite. In some regions, such as Russia and Eastern Europe for instance, consumers tend to prefer specialty jellies and fondant creams, while around Northern Europe harder gummies are popular. Besides the recipe used, the starch drying process allows manufacturers to create a range of gummies with varying textures and bites to cater for regional favourites. This process also results in the gummy hardening on the outside, which protects it from damage to maintain overall product quality.

3.2.2 sugar coating

A finishing step that can offer manufacturers greater flexibility is sugar coating. The conventional techniques involve passing a moulded jelly through a steam bath and then running it through a curtain of sugar in a tumble drum, can often result in degradation of the gummy shape. This is because its outer coating melts when it is heated. Innovation across the industry, however, is leading to a more automated, recipe-driven approach. Promising early experiments are demonstrating that tacking agents, applied at a very specific rate via specialised coating equipment, allow the coating of a gummy without steaming. A controlled delivery can then be used to bring the sugar or citric acid powder into a small tumble drum. The result is a shorter retention time with improved product quality. The process also gives manufacturers greater options in flavour application, since dry ingredients, or even flavoured tacking agents, can be added at a specific rate to cater for different consumer and regional preferences. In Mexico, for example, spicy sweet candy with infused chili and a lime centre is often used to flavour confectionery products, while across the market sour candy continues an upward trajectory. Acid blends are increasingly used to coat jellies and gummies to meet growing consumer demand ranging from an extreme flavour play to a more balanced approach. Such innovations could potentially lead to the development of very new and different confectionery products.[4]

3.2.3 gummy polishing

A similar approach is also being taken towards oil polishing. Currently, oil application is often measured by the operator eye, which can easily result in gummies being over- or under-coated. Accurate oil application and controlled spray allows manufacturers to ensure reliable and repeatable gummy coating, while also maintaining overall product quality and appearance. Furthermore, amid growing consumer demand for healthier confectionery products, manufacturers can easily control the type and quantity of oil used in a

3 Global Markets – Category Innovation Update Q3 2019: Chocolate, Confectionery, and Deserts
4 Candy & Snack Today July/Aug 2019

recipe for a better nutritional profile.

3.3 productivity / throughput

Flexibility is not purely limited to the product. Today's manufacturers also need the flexibility to scale production up or down as required to meet changing market trends. Over time, starch moulding equipment has evolved to allow manufacturers to reach high throughput levels and stay competitive in an increasingly crowded market. For instance, early starch moulding lines required the trays to be stacked manually or using hand jacks. Modern machines, however, stack their own trays, with some system designs incorporating robotic technology to achieve this.

A key advantage of starch moulding is its ability to simultaneously produce a large quantity and variety of gummies in a short amount of time. The most innovative equipment designs offer the ultimate combination of productivity and versatility, by fully integrating the feeder, starch buck, depositor, stacker and pallet transport to efficiently and seamlessly move product through the mogul line. Furthermore, systems that incorporate a rotary dumping station allow for the highest de-moulding speeds with a wider range of starch moisture content. This permits high production speeds, only needing to stop for routine maintenance..

With such high productivity in one area of the line, it is important to ensure both up and downstream equipment can perform at the same level for optimum throughput across the entire confectionery line. Continuous on-machine finishing systems, for example, will provide a perfect match for modern moguls, since product is continually moved from the infeed conveyor, into the drum and onto the outfeed conveyor, while achieving the gummy coatings that are precise and even.

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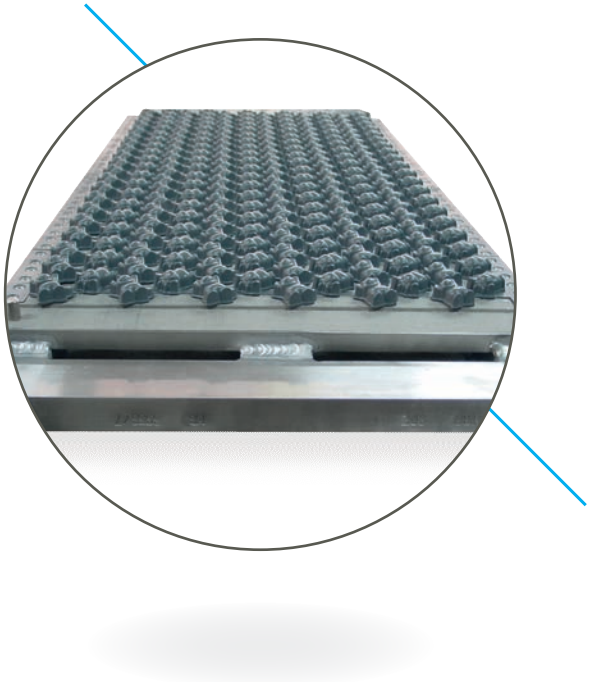
3.4 hygiene / maintenance

As with many food applications, food hygiene is paramount in the confectionery industry and processors need to prevent potential product buildup and contamination to reduce any potential risks to the product or consumer. Confectionery manufacturers must therefore implement as many measures as possible to ensure maximum safety and performance of their processes.

Regular operating procedures, such as cleaning and system inspections, are critical to ensuring food safety. Hygienically designed confectionery processing equipment is one of the best ways to optimise food safety and quality. Equipment providers are increasingly offering several options to enhance the hygienic design of gummy processing equipment. In a mogul line, a flexible system design that allows easy access for cleaning and maintenance is vital. For this reason, most gummy processing equipment is constructed from food grade stainless steel. In addition to facilitating easier cleaning, such materials offer a smooth, defect-free surface to prevent product residue buildup.

To maintain high levels of food safety, equipment cleaning should be carried out at least once a day, at the end of a shift, when operators are processing the same product. More frequent cleaning might be required when carrying out product changeovers to prevent contamination between different products. In particular, the depositors require regular cleaning, especially when a recipe is changed. Made of



stainless steel to avoid rusting, hot water is pumped through the system to fill the hoppers of the depositing pumps. The pumps are activated to clean the pistons and all internal channels, without removal of components. The sugary jelly mixture simply dissolves in the hot water to ensure there is no jelly mass left behind at the end of the procedure, for simple cleaning. Depending on the use of specific ingredients, for instance dairy fats, mild caustic detergents may occasionally be needed to remove protein buildup on the metal surfaces, followed by ample rinsing with hot water.

Confectionery processing equipment should be regularly maintained and examined is to avoid equipment failure and, in some cases, contamination. Planned maintenance and monitoring systems' power usage can ensure potential equipment failure is identified before it impacts production, as well as operator and consumer safety. As the costliest maintenance item on the equipment, depositor heads are regularly refurbished and replaced. Leading mogul equipment suppliers, however, are currently reviewing depositor head designs to reduce capital investment and ongoing maintenance costs for a more flexible, easy-to-maintain solution.

3.5 operator / plant safety

Aside from hygiene requirements, there are hazards associated with the handling of dry, uncontained starch due to its combustible nature. As a result, over the last decade, far more stringent explosion safety requirements have been demanded by users of starch moulding plants, particularly larger companies.

Manufacturers must therefore comply with strict operator safety standards. In some parts of the world, these are mandated by government bodies and form part of any permit to operate such equipment. New moguls supplied within European Union, for example, are required to comply with ATEX zones for explosive dusts. In fact, the CE label can only be applied to a mogul (the starch moulding system) if it is certified as compliant with ATEX directive for dedicated equipment operating in the defined dust explosive zones 20, 21 and 22. In other parts of the world adherence with IECEx or HAZLOC (North America) standards are required.

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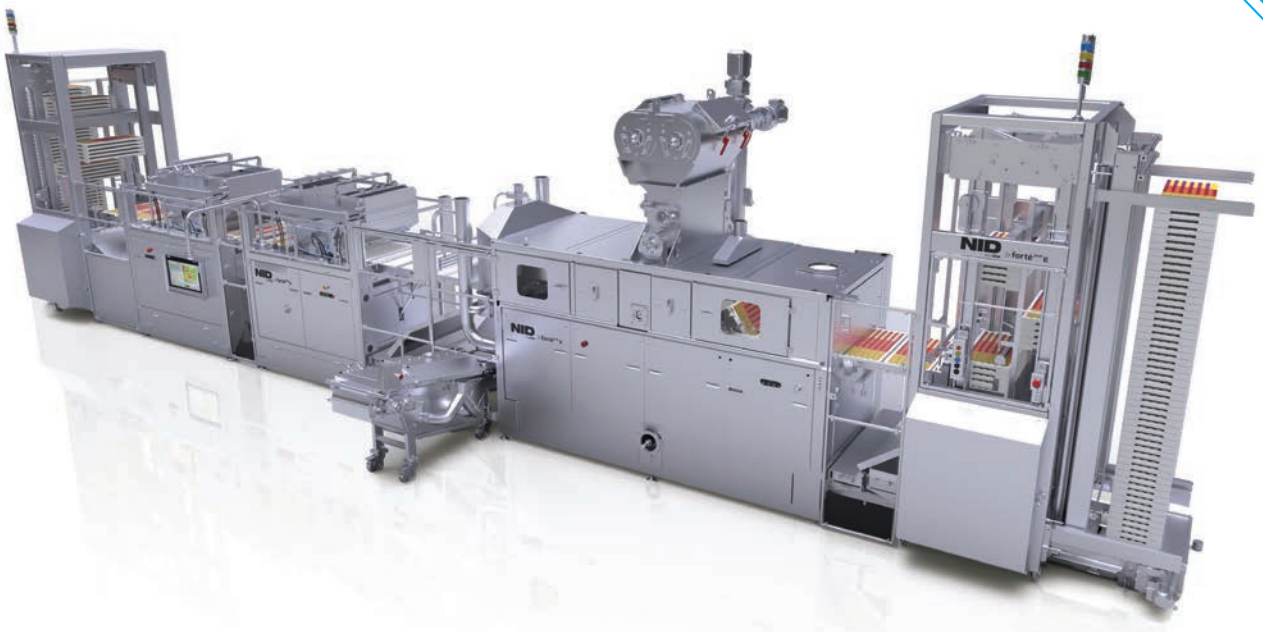

summary

As the confectionery market continues to grow, there is a greater need than ever for manufacturers to create products that deliver a memorable sensory experience and that stand out amongst competitor products. Experimenting with new textures, ingredient combinations and flavours is showing great market return for leading manufacturers. This, however, is having an impact on the processing plant. Manufacturers increasingly require more innovative, smarter and versatile gummy processing technology that can help them cater to constantly evolving consumer demands.

Working with a confectionery specialist like NID from **tna** can help confectioners do just that. Renowned across the food industry as a pioneer in the development of starch moulding equipment, NID has been supplying complete mogul lines for the confectionery industry for over 60 years. Its latest generation of high-speed NID forté® MHP 3 Mogul is the result of more than six decades of innovation and development and capable of production speeds of up to 35 trays per minute. Accommodating a wide range of depositing pumps, the NID forté® MHP 3 is a fully integrated solution that is suitable for a multitude of starch-moulded products, including gums, jellies, marshmallows and liquorice. Now, **tna** is working towards meeting gummy processing with a new eye. Combining NID's extensive knowledge of the confectionery market with tna's capabilities in innovation the group is focused on flexible system designs for better productivity, maximum uptime, safety and reliability across the entire confectionery line to offer manufacturers complete turnkey solutions from a single source.

About **tna**

tna is a leading global supplier of integrated food packaging and processing solutions with over 14,000 systems installed across more than 120 countries. The company provides a comprehensive range of products including materials handling, processing, coating, distribution, seasoning, weighing, packaging, cooling, freezing, metal detection, verification and end of line solutions. **tna** also offers a variety of production line controls integration & SCADA reporting options, project management and training. **tna**'s unique combination of innovative technologies, extensive project management experience and 24 /7 global support ensures customers achieve faster, more reliable and flexible food products at the lowest cost of ownership.

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