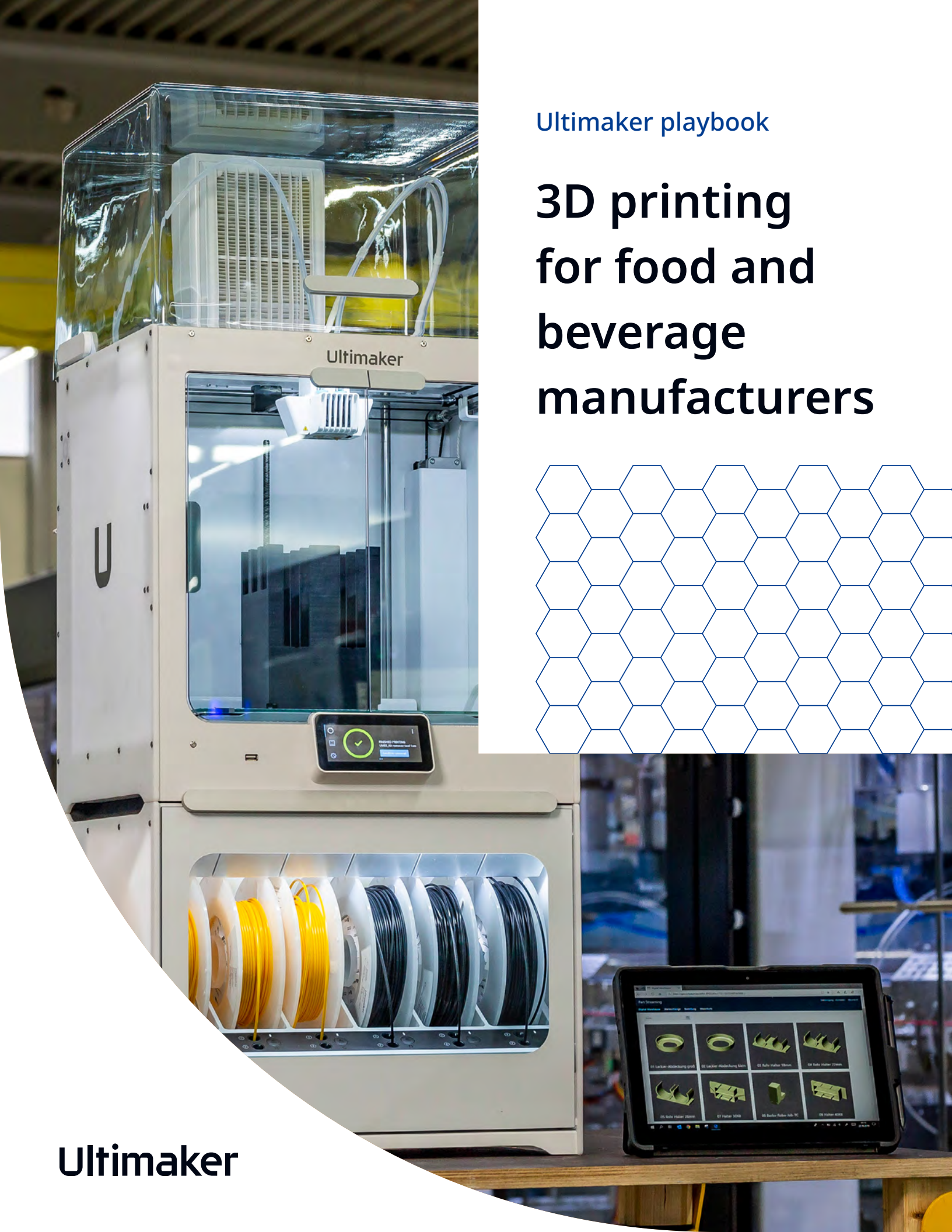
Ultimaker playbook

3D printing for food and beverage manufacturers



Ultimaker

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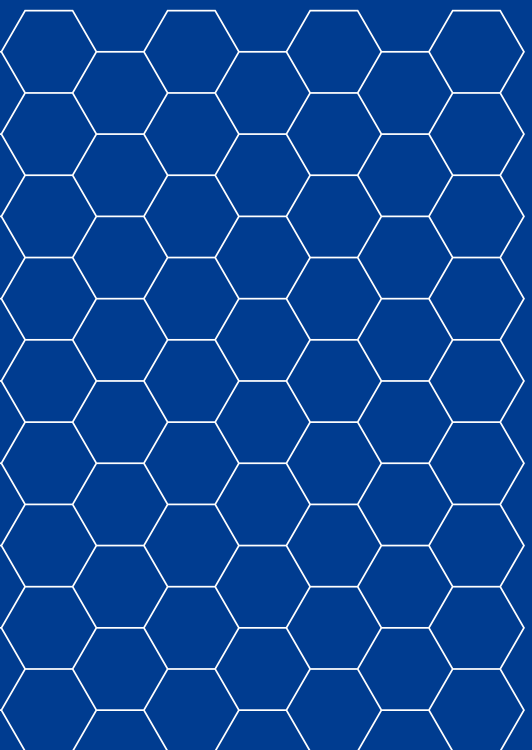

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Don’t adapt. Change the game

We don’t yet know what this “new normal” will mean for the global economy.

But we do know that food and beverage manufacturers are facing bigger challenges than ever:

- Significantly reduced consumption
- Overall costs increasing
- Volatile market dynamics
- Supply chain instability
- Rapidly changing consumer behavior

Until now, you and your company have survived by adapting, by being creative, by weathering the storm – looking for ways to automate and optimize processes.

Your first priority is to keep people safe and healthy. But every other priority after that is to stay in business:

- Maintaining high overall production efficiency
- Keeping as much cash in the company as possible
- Building better operational resilience and flexibility

With all of these priorities and more, we believe that 3D printing doesn’t just help – **it changes the game.**

In this playbook, we will explore the potential impact of additive manufacturing and show you exactly how you can be a game-changer with 3D printing yourself.

Modern food and beverage packaging lines are full of optimization opportunities with 3D printing

What difference can 3D printing make?

Even before the pandemic, many leading food and beverage companies had invested in additive technology to optimize their production.

Here's a quick taste of the benefits of that our customers have experienced:

Provide safer working environments

Before COVID-19, 3D printing had a proven use case, creating anything from custom "lockout-tagout" (LOTO) devices and key systems, to safety covers, shields, and protectors.

But now with the risks even higher, some manufacturers have been 3D printing face shields for their own staff and others in the community. And as we go back to business with new social distancing rules, it's also possible to 3D print custom fixtures (such as door openers) to reduce risk in any workplace.

Decrease lead-times and costs

The traditional process to get a spare or replacement part can be time-consuming and expensive. With 3D printing, you can produce many parts in-house – at a fraction of the cost. This means you're less dependent on supplier lead times to get your line running efficiently again.

Increase factory line uptime

Production that meets KPIs requires high uptime. So it's a big deal if you can minimize short stops, speed up changeovers, and avoid unplanned downtime. 3D printing gives you a way to fabricate new applications that can have a massive impact on how efficiently operators can perform routine maintenance and changeovers. You can also 3D print custom parts that solve headache problems that are causing downtime or even full production stops.

Improve warehousing and stock management

Many manufacturers keep a stock of commonly replaced parts on-site or in a nearby warehouse. This is especially true in remote plant locations, where inbound logistics are challenging. However, this takes up space and inventory needs to be monitored. So instead of carefully managing stock, you can 3D print parts on demand, whenever they are needed.

Faster time to market

Today's rapidly changing consumer behavior requires responsive and agile production. Whether that means faster changeovers to manufacture products to meet changing demand. Or testing new products on the line itself. You can 3D print the parts you need to shortcut those processes.

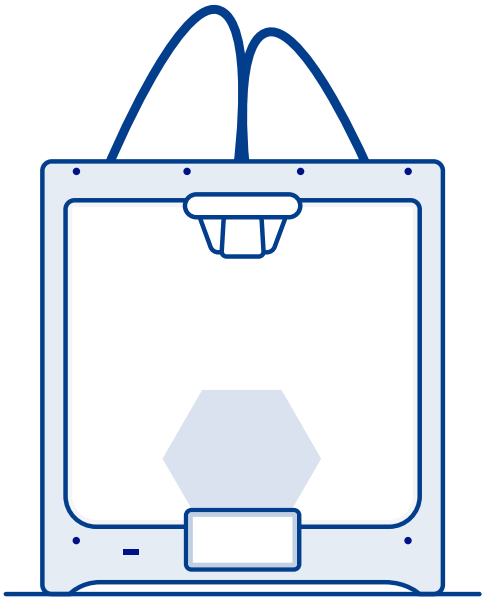
Increase overall equipment efficiency

Machines are great – until they break down. And while suppliers are always there to help, often that will result in lengthy delays before getting the parts you need. However, in-house 3D printers can output almost any design and any material. This means you gain a way to test new parts that – through iteration – eventually outperform OEM parts and lead to higher machine efficiency.

Empower staff to solve more problems

On our visits to production facilities, we've learned that duct tape and cable ties can go a long way when you're in a pinch and waiting for spare part delivery.

But this also demonstrates that you and your team are great at problem-solving. And it's the people on the factory floor who know best how challenges can be fixed on the fly. 3D printing offers a tool for them to do that more safely and professionally.



With 3D printing, you can produce many parts in-house – at a fraction of the cost

Is 3D printing worth the risk?

Now you may be thinking: If maintaining healthy working capital is more important than ever, why does it make sense to invest in a new technology?

Good questions. And we understand these concerns.

At Ultimaker, we're passionate about mitigating risk and helping you achieve a quick and easy return on investment (ROI). That's why, in the pages that follow, we'll explain how to identify 3D printing applications and highlight seven industry-proven application examples. Each on their own has already saved companies tens of thousands of dollars – far more than the annual cost of ownership of Ultimaker 3D printers.

But first, we need to understand what an ROI-achieving application looks like...

The anatomy of cost-effective 3D printing applications

With just two criteria, it's easy to evaluate any functional application for fused filament fabrication (FFF) 3D printing. You can then be more certain that the application will help to achieve ROI against your initial investment in a 3D printing system.

1. High gain

A "high-gain" application will make a big impact on your operations. It is likely to serve a key function by:

- Maintaining the efficiency of your packaging line
- Making it easier for operators to do their job
- Increasing staff safety

In any case, if this application breaks and needs replacement, it would cause a major delay in manufacturing. The potential gain of the application is further increased if it's a part that you often outsource or need to keep a stock of.

2. Low complexity

A "low-complexity" application is easy to 3D print with FFF technology and easy to implement. This is often because:

- Its geometry is simple – easy to design, print, and optimize with few iterations
- It's used in normal environmental conditions – simplifying material choice
- It does not have safety requirements – cutting down on testing

"Low-complexity" parts are quick to produce and implement in a production environment. Because of this time saving, they quickly help to achieve ROI against the cost of 3D printing technology.

This manual bottle opener is a great example of a high-gain, low-complexity 3D printing application

Combining high gain and low complexity

Here's a true story to demonstrate the power of these criteria combined in one application:

During his morning shift in 2019, a plant operator discovered a malfunctioning part on the gripper of a 4-pack boxing machine, causing multiple short stops in production. Because the part is low in complexity, he quickly modelled a replacement and started printing a full batch of these on an Ultimaker S5. After his shift was over, an evening-shift colleague mounted the finished 3D prints on the boxing machine and production could continue without interruption. And that original part is still used on the production line to this day.

If a potential application meets the two criteria of "high gain" and "low complexity", then it hits the sweet spot of what you can achieve with an in-house 3D printer. In other words, these applications are the "low-hanging fruit" and therefore should be prioritized. You can then say with confidence that a "high-gain, low-complexity" application will be your shortcut to achieving ROI.

Other hidden savings that add up for manufacturing

ROI is normally calculated by comparing profit against the cost of investment.

However, because high-gain, low-complexity 3D printing applications are so diverse, there are often ways that they contribute indirectly to your ROI.

These include applications that:

- Decrease production line downtime
- Shortcut logistics and distribution processes
- Minimize manual labor
- Reduce weight
- Improve ergonomics
- Improve health and safety
- Improve yield

By definition, these benefits are more difficult to measure and attribute to any single application. It's far easier to calculate profit minus expenditure. Nonetheless, they do exist and can quickly add up to achieve huge savings over time.

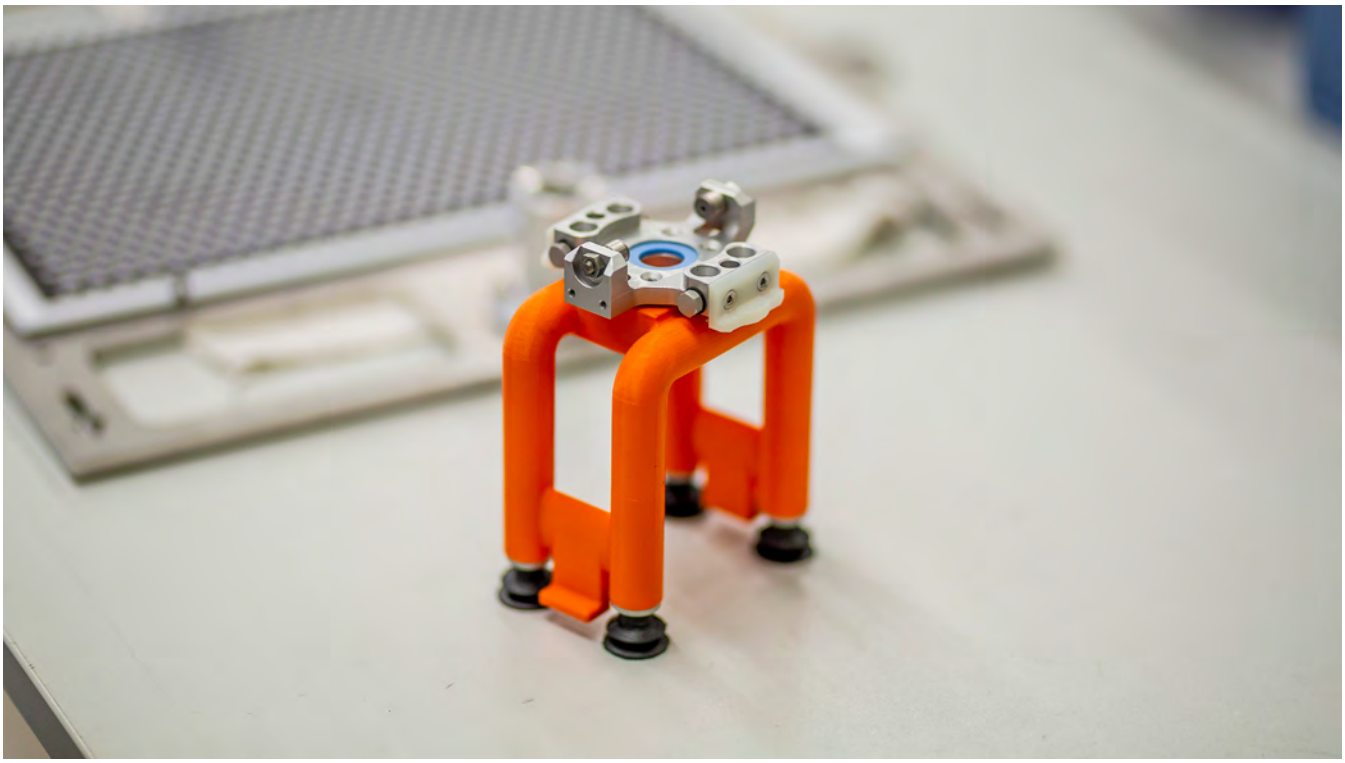
What difference can these applications make?

You can replace metal with plastic

After working with hundreds of companies, we've noticed that applications made of metal are often overkill for a part's mechanical needs. And because 3D printing is an additive manufacturing technology (parts are built up layer by layer), you can 3D print geometries that cannot be machined in metal. This means it's possible to light-weight parts and even print in two different materials. And with the huge number of polymer materials available, the mechanical properties that can be achieved can be 100% fit for purpose.

You can replace assemblies

Building a part layer by layer, 3D printing gives you the freedom to easily create more complex, custom geometries. This means that multi-part assemblies can be replaced by a single, stronger part, that is less likely to break or leak. For example, this can be especially useful for top-loading machine (TLM) suction assemblies.



Complex suction assemblies can often be 3D printed with fewer parts and at a lower cost

You can iterate quickly

3D printing in-house is fast and affordable. For example, you can design a part in the evening, 3D print it overnight, and begin testing it by the morning – all for a couple of dollars of material. This rapid iteration means you can quickly test and perfect designs.

You can improve ergonomics

The convenience of having an end-to-end production method so close to your line means you can easily customize tools for your operators. Often, they know exactly what could be improved for their workflow or their tools. With any design improvements or part suggestions, 3D printing gives you a way to create and test them quickly so ergonomics can be optimized. This is especially important if it allows routine tasks to be performed more efficiently with reduced health risks.

Commonly used tools can be ergonomically optimized in-house using 3D printing to make routine tasks more efficient

Game-changing application categories

When it comes to identifying these “high-gain, low-complexity” 3D printing applications, where do you start? To give you an idea, below we’ve mapped out common machines and processes, against potential application categories that will solve a range of potential challenges:

Machines and processes:

- Picker lines
- Flow-wrapping machines
- Top-loading machines
- Process machines
- Filling machines
- Labeling machines
- Inspection
- Conveyors
- Primary packaging
- Secondary packaging
- Recycling

Application categories:

- Maintenance tools
- Safety tools
- Transport tools
- Production tools
- (Dis)assembly tools
- Ergonomic tools
- Quality assurance tools
- Spacer and alignment tools
- Tool organizers and holders
- Covers, buttons, trays
- Shock absorbers
- Protection covers
- Cushioning devices
- Labels, tags
- Hooks, brackets, hangers
- Tubes, connectors, clips
- Cable management

Potential challenges:

- Weight
- Ergonomics
- Time (manufacturing, assembling, usage, etc.)
- Cost
- Functionality
- Material property
- Size / volume (fitting)
- Wasted materials, products
- Safety concern / hazard
- Productivity opportunities

5 useful questions to ask when looking for applications

- What difficulties are operators facing as part of their job?
- What common task interactions could be more efficient?
- Which parts need to be frequently replaced?
- Which outsourced parts have long lead times?
- Do you have any recurring production headaches?

Although we hope these lists are helpful, sometimes it can be tricky to imagine exactly how a new application might be realized. So let’s take a look at some...

Real-life application examples

Each of the applications below have been developed to solve challenges in working food and beverage packaging plants. And (as described above) they all have high-gain and low-complexity characteristics. While some are the result of a quick design and print, others have been iterated upon multiple times to perfect their geometry and discover the ideal 3D printing material for use.

Ready for the big news? All of the applications below achieve between **70 - 90% cost and lead-time savings** compared to an outsourced alternative**.**

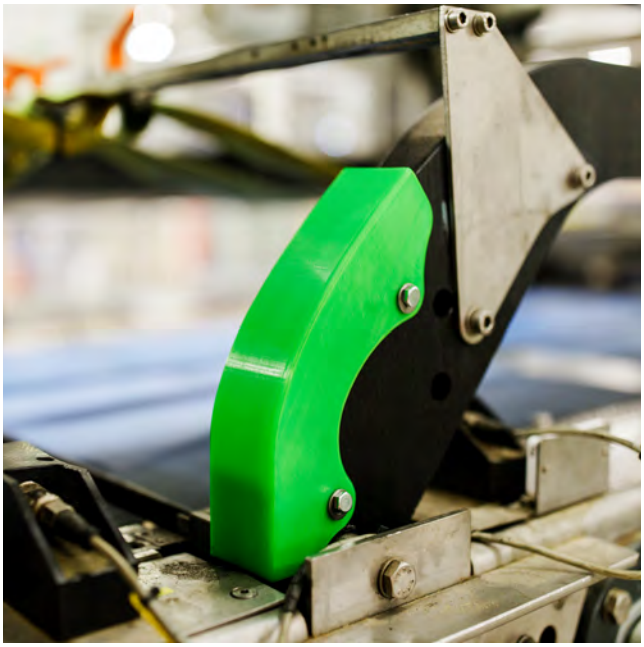
LOTO safety tool

Red material not only increases visibility, but can also increase awareness of 3D printing in use on the plant floor

Benefits at a glance

- Safety optimization
- Bright visual color
- Customizable for any machine setup

To keep operators safe during maintenance, these custom mechanisms follow a "lockout-tagout" or LOTO methodology and key system. This ensures that any machine being worked on is properly shut off and impossible to turn on while maintenance is performed – dramatically reducing the chance of accidents at work. 3D printing is ideal for this system, because it creates an affordable and adaptable safety procedure for any valve, switch, latch, connector on any type of machine.



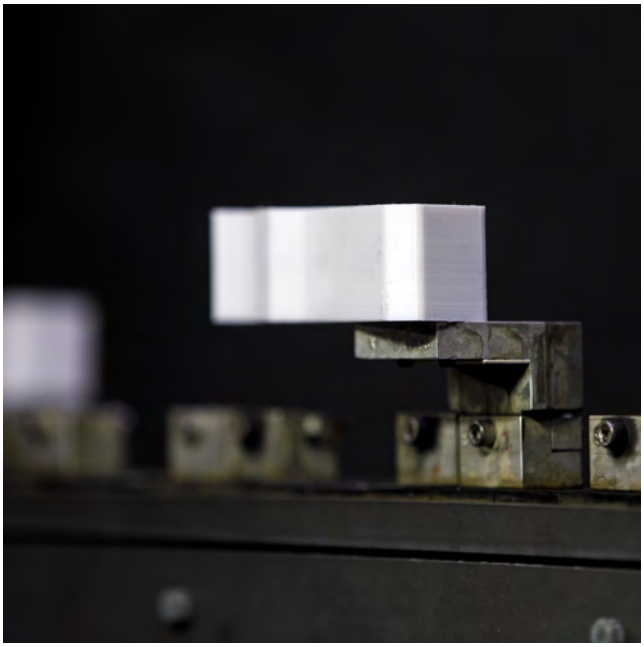
This simple part reduces the risk of snagging hair or clothing in the chain

Chain cover

Benefits at a glance

- Safety optimization
- Maintenance reduction

An exposed high-speed chain on a shrink wrap machine could pose a health and safety risk to plant operators. And because a custom outsourced part required nearly a month's delivery time, a 3D printed alternative was created made from a rigid material. Not only were workers more quickly protected, but also less dust mixed with the chain grease.



This pusher outperforms its metal OEM predecessor thanks to built-in wear notification

Can-pusher

Benefits at a glance

- Significant time and cost savings
- Production line enhancement
- Wear indication
- Metal part replaced with Igus i150 and Ultimaker PC

Automating the alignment of packaged beverages, this machine used to have can-pushers milled from metal. But now that these are 3D printed, they have a larger surface area in contact with the packaging while maintaining similar rigidity and fatigue resistance. Plus, they are made with two materials – a stiff inner shape in one color and a low-friction outer wall in another. This means that – on top of the cost-saving of replacing a metal part – as the part wears down the internal color begins to show, indicating to operators that they need replacement.

Operators can adjust dampening levels by changing the infill percentage of the 3D printed part (on the left)

Pack spinner

Benefits at a glance

- Uptime and yield improvement
- Allows custom dampening
- Replaces metal

These buffers lower automatically on a palletizing machine. On a high-volume production line, they undergo thousands of small bumps in their lifetime. Therefore they need to be impact-resistant, but also be soft enough not to damage any product packaging. The original part was an expensive combination of an aluminum inner core with a rubber jacket. Now the whole part can be 3D printed in one material – TPU 95A – with a solid core and a low-percentage infill for optimal compression that damages fewer products. This is a good example of a geometry that's only possible with additive manufacturing.

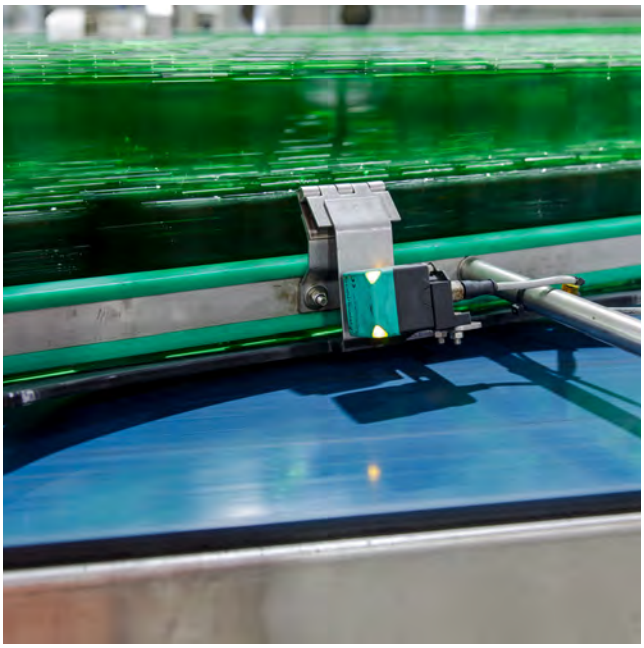
This ergonomically optimized tool works by interfacing with a 3D printed collar

Ring wrench (dis)assembly tool

Benefits at a glance

- Ergonomics improvement
- Speeds up maintenance
- Replaces metal

The original version of this tool was made of stamped stainless steel and required the use of a hammer to loosen and tighten corking modules on a filling machine. The new tool is stiff and durable, and dramatically improves ergonomics and increases leverage. This allows the action to be performed one-handed and only ever in one rotational plane.



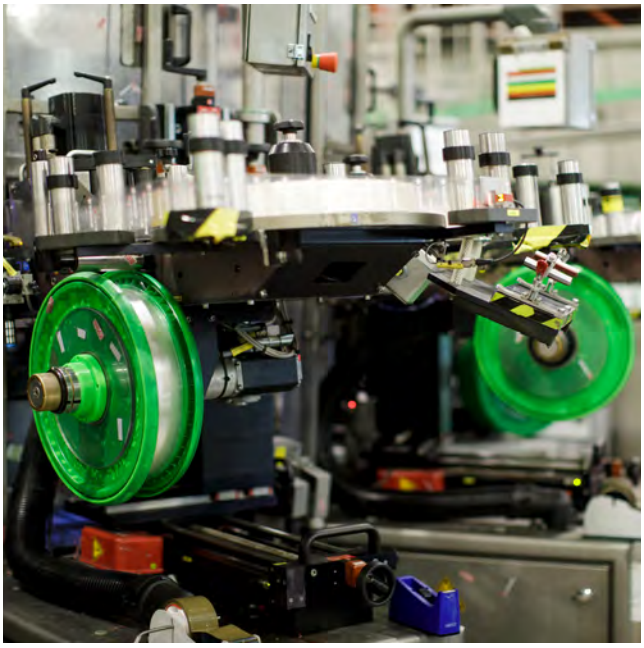
A simple part for more accurate data feedback – without disrupting production

Line sensor extension

Benefits at a glance

- Transportation improvement
- Reduces short stops
- Expandable solution

Sensors are vital across high-speed transportation lines to monitor flow and notify operators of any problem. Without this extension, bottles would often tip over and get stuck in the sensor so it could not return to its original position, resulting in inaccurate data feedback. Printed using a stiff and wear-resistant material, it has an optimized curved geometry to prevent jams and increase uptime.



This light-green fastener can be more quickly and affordably replaced

PSL labeling fastener

Benefits at a glance

- Significant time and cost savings
- Widely applicable
- Replaces metal

Often the best solutions are the simplest. Printed in Ultimaker CPE, this part prints quickly at low cost and replaces steel. It is used to secure rolls of film labels as they quickly rotate on a pressure-sensitive labeling machine.

Our hope is that these application examples help you realize just how game-changing 3D printing could be for your plant's production processes.

Each goes straight to the heart of a problem and solves it. You need only to adjust your mindset to spot the applications made possible with 3D printing.

What should you look for in a 3D printing system?

We believe that there should be no barriers to using additive manufacturing to change the game at your plant and drive the success of your business. Whether you're an expert or novice at 3D printing, Ultimaker is the ideal solution for the food and beverage industry.

That may sound like a big claim. But here's why...

Our recipe for a great 3D printing experience:

Reliable
Our 3D printers have been designed and tested to run overnight and for days on end, making the Ultimaker system sufficiently robust to deliver consistent results, time and again.

Easy to use
3D printing should be a tool for your innovation. That's why we designed our hardware, software, and materials to provide a "click and print" experience. This allows for fast and easy adoption – without the hassle.

Open system
More materials make more applications possible. We offer the freedom to easily print with the widest choice of third-party materials on the market – thanks to our Material Alliance with leading chemical companies.

Wide integration
Go from digital model to physical part using your choice of CAD software. And avoid fiddling with settings by leveraging the world's largest library of third-party material print profiles.

Affordable
Just one of the applications shown above makes it easy to achieve ROI on an Ultimaker 3D printer within a few months. Our system's low total cost of ownership gives you a highly affordable and disruptive in-house solution.

Scalable
Compared to many industrial 3D printers, an Ultimaker unit is small. This size means it's easy to scale up production in one location, or deploy printers globally to leverage distributed manufacturing.

Case study: Heineken

150+	300	No.1	70-90%
breweries	global brands	brewer in Europe	cost reduction

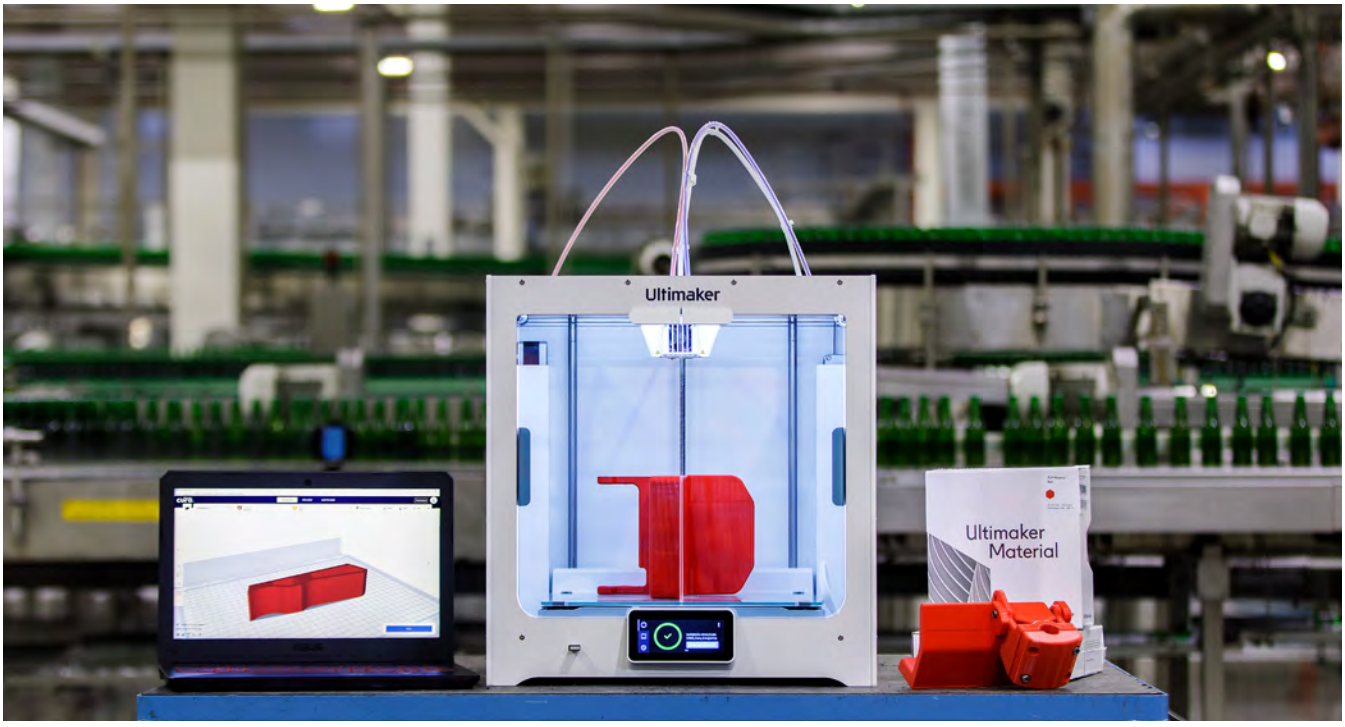
"3D printing has proven to be a technology that helps us, brings value to us, and enables our people to work more efficiently."

– Isabelle Haenen, Manager of Global Supply Chain Procurement at Heineken

By 3D printing functional end-use parts for the manufacturing line, Heineken was able to optimize part functionality and on-time availability. The team also increased line efficiency by adjusting the design of functional machine parts. These custom tools have made performing maintenance and production changeovers easier and faster for employees.

Since this initial success, Heineken is scaling the benefits of 3D printing across many more of its breweries. Designs and solutions can be easily shared digitally. And this accelerates the global deployment of new applications because parts don't need to be sent physically. It also avoids international freight costs and reduces transportation movement, softening environmental impact.

Want to learn more? Read the full case study.



With an additive mindset, Heineken engineers and operators can more easily identify potential 3D printing applications

Conclusion:
What does the future look like?

None of us can predict the long-term effects of our “new normal”. But there are plenty of clues to give us some idea.

And the same is true with the future of 3D printing adoption:

As multiple market leaders seek to stay profitable and ahead of the competition, they are choosing to standardize with Ultimaker 3D printers. This has also caught the attention of other global OEM parts suppliers that we’re working with – including Gerhard Schubert GmbH, ERIKS, and others – who are now leveraging the benefits of 3D printing higher up the manufacturing supply chain.

These clues suggest that the game is already changing.
Step by step, we’re moving toward a reality of Industry 4.0 – a future where local manufacturing and digital distribution has the built-in resilience to help your company stay competitive and the world economy get back on its feet.

Watch the Schubert case study

Want to be a game-changer?

At Ultimaker, we’re passionate about giving manufacturers the 3D printing tools they need to optimize their production efficiency, increase uptime, and get to market faster.

So if you’re interested in learning more or have any questions about:

- How your business could benefit from 3D printing
- Building a business case for a pilot
- Which Ultimaker solution could be right for you
- Or anything else...

Why not schedule a call with one of our 3D printing experts?

(This link will take you to a page where you can confirm your phone number. A certified Ultimaker expert will then call you back for a brief consultation – not a high-pressure sales pitch!)

Book a call

About Ultimaker

Since 2011, Ultimaker has built an open and easy-to-use solution of 3D printers, software, and materials that enable professional designers and engineers to innovate every day.
Today, Ultimaker is the market leader in desktop 3D printing. From offices in the Netherlands, New York, Boston, and Singapore – plus production facilities in Europe and the US – its global team of over 400 employees work together to accelerate the world's transition to local, digital manufacturing.

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