

Success Story

Automation Roadmap for One Planet Pizza, UK

Assess production methods and provide an automation roadmap to underpin future sales growth



Automation Roadmap

Company description

One Planet Pizza produce frozen plant-based pizzas from a small manufacturing facility near Norwich in the UK. The One Planet Pizza ethos is to “help create better planet” and this is reflected in business practices such as the choice of plant-based ingredients with lower environmental impact, a tree planting scheme, waste upcycling, recyclable or compostable packaging, etc. Currently there is a product range of 11 pizzas, with new recipes constantly in development. The family owned and run business started in 2014 and has 10 staff. The core customers are individuals who order directly online, however other online retailers, and in store retailers are also supplied. Business is growing and larger volumes are required to meet demand. The business needs to retain its bespoke and agile supply chain but ensure that it is cost effective and profitable.

Motivation/Starting Point

Historically One Planet Pizza production has been manually performed as a batch process. Pizza bases are laid out on worktables and the toppings are added sequentially with staff members following round the room each placing one topping component on successive pizzas (Figure 1). The daily production is 350-600 pizzas per day dependent on the pizza type. As sales volumes increase, One Planet Pizza engaged with the COTEMACO SME support programme with the aim to improve production capacity, efficiency and productivity.

The COTEMACO support has assessed the current production processes and provided an automation roadmap to support the growth of the enterprise.



Figure 1: Manual sequential pizza topping process

Automating the entire pizza process poses substantial technical challenges;

- removal of interleaves from between supplied bases,
- consistently applying sauce topping to within 15mm of edge pizza bases that are not consistently round
- the inconsistent, soft, pliable, delicate nature of the toppings. This manifests in:
 - ◇ identification of topping components in supply bins
 - ◇ determination of bin picking order
 - ◇ grasping
 - ◇ accurate placement and release of toppings once grasped
- swapping between pizza types.

SME Support Activities

It was clear from the outset that a step change immediately to a cobotic / robotic automation manufacturing solution would not be suitable for this SME at this point in time. There were restricted technical automation skills within the business, capital investment funding was limited, and beneficial automation gains could be achieved with simpler lower cost equipment as initial phases of a staged automation roadmap.

An initial assessment of the production operations at One Planet Pizza was carried out to identify bottlenecks, common processes, effort intensive operations, and process flow issues where automation would provide business benefit. These assessments determined;

- A common process for all pizzas was the initial preparation before the specific toppings were applied. Automation to remove the of base interleaves, apply tomato sauce and grated cheese could give benefits to all pizzas produced. Taken together the removal of interleaf, laying the base on the worktable, then sauce and cheese applications took 20.6s (SD=0.5s) and accounted for an overall mean of 22% of the production time for each pizza. Use of dedicated automation; a depositor (potentially with showerhead nozzle) for applying the tomato sauce, and a recirculating cheese waterfall for the cheese, would be better solutions than co/robotic automation for this task. However, a cobotic solution for removal of interleaves could save staff from a tedious and repetitive task, with risk of RSI. However, with a mean operation time for interleaf removal of 2.7s (SD=0.2s) accounting for a mean of only 3% of the production time per pizza this operation was not be an effective use of resource for an initial automation target.
- Once bases were prepared, application of toppings was performed by staff moving around the production space applying the topping to stationary pizzas. This could lead to ‘traffic jams’ and ‘dead’ corners of the workspace where access to pizzas was difficult. Introduction of a simple conveyor to move pizzas to the topping staff would reduce the distance walked, keep production flowing, and improve access to all pizzas for ease and consistency of applying toppings manually. Whilst cobotic automation of the toppings application would be an interesting project (due to the challenges mentioned in the previous section) and once completed, be a prime example of what could be possible with technology, the timescales to develop and costs involved were not attractive to the owners for an initial foray in automation. Furthermore, the hand applied toppings were deemed a distinctive aspect of the finished pizzas and One planet were keen to retain this feature.
- Manually wrapping each pizza in film was the major operation in the production, occurring for every pizza and taking a mean of 34.3s (SD=2.1s). This occupied a mean of 38% of the total production time across the range of pizza types produced. As this was a common operation for every pizza, speeding this with automation would be of benefit for all production.

- The final boxing operation was another potential target for robotic type automation accounting for a mean 14.8s (SD=5.5s), and 16% of production time.

Based on these findings a series of options were produced (Figure 2), along with associated projected cost-benefit (Figure 3). These proposals were discussed and honed with One Planet Pizza and a priority sequence agreed. This formed the basis for the sequenced automation roadmap.

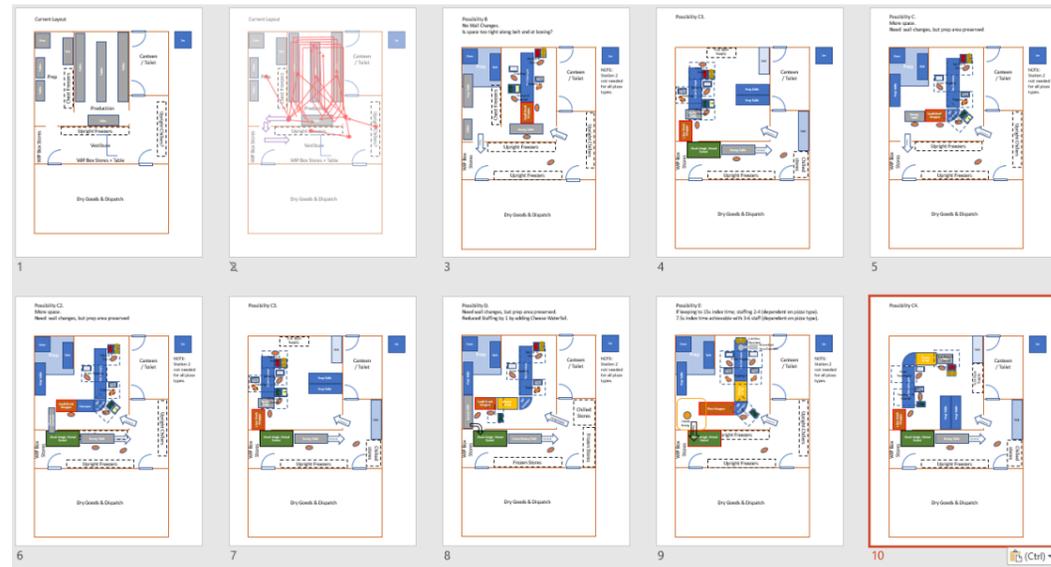


Figure 2: Layout Options

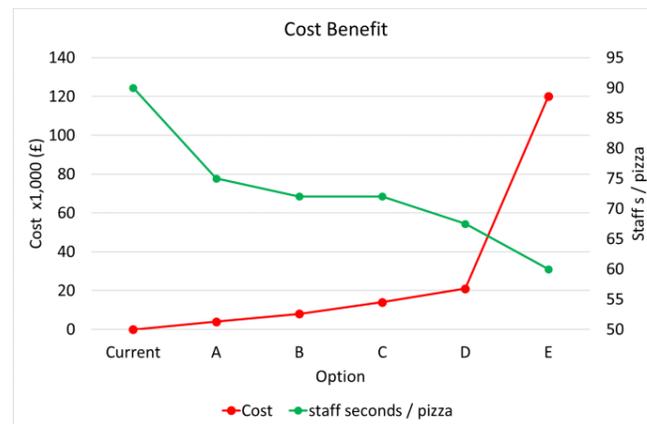


Figure 3: Cost Benefit Relationship

Implementation

As can be seen from the roadmap cost benefit relationship (Figure 3) there are substantial productivity rate improvements to be gained with relatively small investments in the early steps of the automation roadmap. One Planet Pizza have implemented the initial stages and will subsequently progress to the later stages involving co/robotic automation in due course.

To date (June 2021) the first steps along the roadmap have been taken with a reorganisation of the workflow and the introduction of a conveyor and semi-automated shrink wrapper machine to address the primary bottleneck(s). These simple measures have already resulted in a >30% improvement in productivity dependent on pizza type. Further steps will be reviewed and implemented as time progresses and the enterprise

grows. One Planet Pizza business growth will be both the driver and financial enabler for adoption of further automation including co/robotic cells.

The main opportunity for co/robotics at One Planet Pizza occurs later in the automation roadmap for the boxing of individual pizzas. This is the 2nd most time-consuming operation after the wrapping. Shrink wrapped pizzas are aligned and slid edgewise into a preformed box. The operation takes place after the final checkweigher and metal detect process. In the automated system, pizzas would travel into the boxing area on the outfeed conveyor from the checkweigher, and be guided into a single lane, thus avoiding the complexity and cost of visual identification of pizza position on the belt. A simple light beam sensor would trigger action on pizza arrival. A flat scoop end effector would collect the pizza from this fixed location and transfer it into a waiting box in known location. Some practical trials would be required to identify whether pizzas could be loaded into boxes already in the outer case as this would remove the need for the subsequent operation to stack 10 boxes into each outer case.

Result

The initial steps along the road map taken so far has more than halved the mean time spent wrapping pizzas from c.34s to <15s and this removes a tedious part of the process for the production staff. This allows for productivity increases, and frees up more time for the value adding parts of the process... applying the toppings. This can now be done with more care and the need for rework/adjustments is reduced.

Interview

Were your expectations fulfilled – technical implementation and support through COTEMACO?

Mike Hill, Managing Director, One Planet Pizza

“With COTEMACO’s help, we’ve redesigned our kitchen, knocked down a dividing wall and reorganised the production flow. With the new conveyor belt system and simple wrap machine we’ve already improved our productivity by 30%.”

How could COTEMACO support you?

Via the SME support programme, COTEMACO engages with SMEs from the automotive and food sectors through field labs. These regional field labs in the UK, the Netherlands, Belgium and Germany are showcasing key production steps in the automotive and food industries, in order to tackle current low sectorial awareness and knowledge gaps. The field labs will exchange knowledge on different manufacturing tasks, such as handling and (un)loading.

With the COTEMACO programme, manufacturing SMEs are guided through the process of adopting collaborative robotic and shop floor digitalisation technologies, from the exploration of technological opportunities to the detailed definition of a business plan.



What is COTEMACO?

The project, which is an initiative of Interreg North-West Europe, aims to support around 60 SMEs in the automotive and food manufacturing industries with so-called „test environments“ and to encourage them to integrate collaborative robotic systems and digital technologies into their business. Accordingly, in addition to increasing production flexibility, the relocation of production abroad will be curbed and the number of jobs in manufacturing increased, which will generally lead to an improvement in the competitiveness of the companies involved.

In the project new technologies are implemented in application examples - the aim is to move from the prototype in the laboratory environment to the transfer to production, taking into account the legal situation and certifications.

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Then visit our website at:

www.robot-hub.org/cotemaco

Implementation partner:

