

Sustainable Packaging Operations

→ A How-To Guide



FOODMACH

Automation | Robotics | Integration | Turnkey Projects

A guide to reducing waste

Recyclable packaging is only the first step in a transition to Net Zero.

With manufacturers under pressure to meet Net Zero targets, supply chains are being investigated for carbon reduction opportunities.

While changes to the physical product packaging offer some major gains, automation can reduce the environmental footprint of operations by streamlining processes and minimising waste.

This guide covers:

- Packaging materials
- Tips for introducing new packaging to your line
- The low down on waste
- Greener automation
- Why line efficiency is everything
- How to achieve line efficiency.

Who should **read it**

Manufacturers in the field of FMCG and OTC goods:
Food and beverage, household, personal care, healthcare,
contract packagers, industrial products, e-commerce and logistics.

Anyone who needs to increase the speed of their production
and to reduce waste across their entire packaging operation.

What makes us experts?

At Foodmach, we live and breathe packaging.

While...

- the sensor companies are experts in sensors,
- the drives companies are experts in drives,
- the software companies are experts in software,
- and OEMS are expert in their own equipment,

... Foodmach integrates all of them, so we have to be experts across the entire spectrum.

We're required to have a systems-thinking approach that can't be facilitated by expertise in just one area.

Our team has been working on packaging lines since their infancy.

We have a fundamental understanding of technology and how it works with materials and products.

The proof...

We deliver highly-efficient turnkey packaging lines—everything from depalletising, conveying, filling, inspection, coding, labelling, case packing, traceability and palletising to stretch wrapping, robotics and AGVs. Some we design and manufacture, others we supply from the world's best Original Equipment Manufacturers (OEMs).

Often, we do the commissioning for the OEM suppliers. The pandemic lockdowns have been a perfect demonstration of our team's ability to step into the shoes of OEM commissioning engineers with no discernable difference to our customers.

Foodmach's true speciality, however, is machine-to-machine communication and line control.

Our award-winning projects have been recognised by both industry and government.

We've won awards for delivering some of the world's most sustainable Industry 4.0 packaging lines.

Packaging materials

This guide is about the automation that handles packaging, but let's briefly review the packaging itself.

The transition to environmentally friendly packaging requires manufacturers to:

- Actively assess the carbon impact of packaging from cradle to grave.
- Review the sustainability of packaging materials.
- Reduce or eliminate plastics and virgin materials.
- Optimise the packaging design, tailoring packaging to fit the product perfectly. This not only promotes less waste, it's also a more protective and efficient way to transport goods.
- Reduce waste throughout the packaging process.
- Support end-user recycling through clear labelling and recycling information.
- Invest in reusable packaging solutions to create circular economy.

Design thinking along the entire packaging value chain is required.

The changeover to greener packaging is well underway as renewable materials evolve.

However, the transition process cannot detract from efforts to reduce excess on the factory floor.

Rather, the packaging line needs to be flexible enough to handle the changes as they happen and efficient enough to limit or eliminate waste.

The Sustainability Goal



→ Right Product



→ Right Package



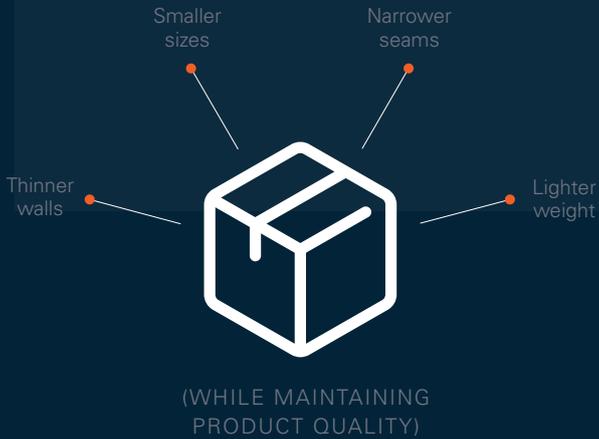
→ Right Labelling

100% OF THE TIME 

USING MINIMAL RESOURCES

7 STEPS TO SUSTAINABLE PACKAGING

1 Reduce packaging material
(primary, secondary and final)



2 Eliminate single-use packaging

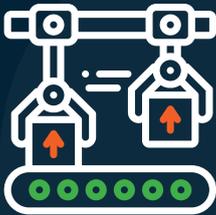


3 Reduce the amount of plastic
(especially virgin plastic)

- Increase the amount of recycled material
- Use of mono materials (ie. paper*, bio polymers)
- Eliminate tapes and minimise adhesives to increase recyclability

* Paper and cardboard can have a neutral carbon footprint if they are obtained in a way that is respectful to the environment.

4 Green automation and optimised packaging line efficiency



5 Develop collecting infrastructure



6 Facilitate behaviour change
(consumers, industry, retailers)

7 Transition to a circular economy

Introducing new packaging

Questions to ask of your current packaging line:

- 1 Will the existing automation handle the new materials?
- 2 Can the settings be adjusted to optimise the handling?
- 3 Is there enough inspection technology in place to ensure quality control?

Recycled materials won't necessarily behave the same way as their virgin counterparts.

They may have different levels of resistance to denting, folding, scuffing, tearing, stretching, breaking and puncturing that need to be taken into consideration.

The material may not be 100% consistent in thickness or finish, requiring greater accuracy and precision of handling.

Some equipment upgrades may be in order.

Examples:

- Recycled glass needs gentler conveyor handling.
- Recycled plastic shrink needs more accuracy of temperature control.
- Flexible films may be harder to apply labels to.
- Non-laminated or mono materials may not hold their shape as well, affecting label print quality.
- Recycled board may require improved pallet programming for better stack integrity.

To accommodate new packaging styles, you'll ideally have a combination of:

1. Highly-flexible, best-in-breed automation with green credentials,
2. an efficiently-designed packaging line, and
3. a line manufacturing execution system with integrated quality control.

The ultimate aim is **OLE**: Overall Line Efficiency, where all types of waste are minimised.

You need a Line Manufacturing Execution System



**I'm not
sustainable
unless your
factory is too.**

What is 'efficiency'?

In manufacturing, 'efficiency' is generally where:

- a** Repetitive tasks are given to machines
- b** Precious non-renewable resources reduced or eliminated
- c** Precious time resources are reduced
- d** Precious human resources are saved for higher-level critical thinking tasks and supervision.

What is 'OLE'?

'Overall Line Efficiency' is the holy grail of waste reduction and sustainability in complex packaging operations.

It's a metric that is used to analyse the current performance of a production line in contrast to its optimal performance*.

* For more about how to measure and achieve OLE, see our white paper on the topic:
<https://foodmach.com/resources/how-optimise-your-packaging-line/>

Dealing with Waste

Anyone that's been involved in a Lean Manufacturing effort will be familiar with waste in all its manifestations.

'Lean' is a system, method, or school of thought, and even a way of life, focused on reducing waste.

Although usually applied to manufacturing, the methods to achieve Lean can be used to reduce costs while maintaining quality for every aspect of business.

Any production process contains some element of waste, unless it has had lean principles applied to it (possibly several times). When successful, this process can offer significant improvements in efficiency, productivity and material and resource use.

Lean prioritises simple, small and continuous improvements.

As these small improvements are added together, they can lead to a higher level of efficiency throughout the whole system.

There are five key Lean manufacturing principles: value, value stream, flow, pull, and perfection.

They combine to deliver:

- Waste reduction
- Continuous improvement
- Respect for human elements
- Level production
- JIT (Just In Time) production
- Continuous flow
- Built-in product quality
- Mistake-proofing
- Detection of defects.

A truly efficient production line is designed and integrated by applying the principles of Lean Manufacturing.



Side note about sensors: Critical but not a quick fix

An obvious solution to the need for better handling, quality control and waste reduction is to add sensors to a packaging line.

And certainly, smart sensors and cameras are a necessary part of production efficiency.

They can offer:

- Quality control
- Identification of problems/issues
- Understanding lags
- Measuring yield
- Tracking resource use:
 - temperature
 - time
 - pressure
- Predictive maintenance
- Safety

But again, they're only part of the picture.

Retrofitting sensing technology to an existing line without completely digitalising the line can be done.

The question is: At what cost in terms of lost opportunities to reduce excess use of resources?

To be able to deliver a truly sustainable packaging operation, we need more than just data.

We need control: Control of every single aspect of a line that has been designed for Overall Line Efficiency.

Benefits of Line Efficiency

Line efficiency offers waste reduction at every stage of the packaging process.

It can offer:

- Reduced energy, water consumption
- Reduced product and packaging waste (spares, landfill)
- Reduced time waste (and downtime)
- Reduced overheads (a well designed line uses less space)
- Reduce menial labour hours so they can be spent in value-adding activities
- Reduced risks: safety, human error, product recalls, risks to profit
- Seamless production
- Fully automated lines with automated monitoring
- Supply chain integration

- Durability and longevity of products during transit
- Increased interaction with stakeholders
- Optimised logistics schedules

Automation is the key to achieving line efficiency and our carbon goals. It can provide improved flexibility, safer working conditions, quality control, waste reduction and lower costs.

Elimination of poor or excessive use of packaging as a whole needs to work hand in hand with automation to maximise its potential.

It's worth looking at the options for carbon reduction of the machines themselves, while remembering that:

Only automation integrated with a comprehensive line manufacturing execution system can deliver optimised performance on a packaging line (OLE).

Greener Automation

There are all kinds of ways packaging machines can be made more efficient and improve their green credentials.

They can be mechanically designed for energy efficiency, using energy-efficient drive motors.

You can add smart pneumatics with performance assessment, air monitoring and air leak detection.

Proportional valve technology can be used to reduce blow molding waste, ultrasonic welding instead of heat sealing will save a significant amount of energy.

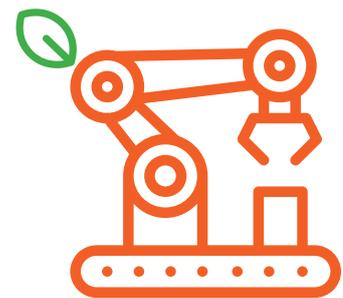
The list of possibilities is extensive.

We like to offer pay-as-you-go enviro upgrades to make it more economical for customers to take advantage of the possibilities.

Consideration given to the equipment being fit-for-purpose is crucial. Choosing best-of-

breed will mean you get exactly the right equipment for your exact requirements without compromises and loss of potential line efficiency.

You probably also want to ensure the Original Equipment Manufacturers' own sustainability efforts are obvious and documented in order to support your supply chain decarbonisation.



Line efficiency needs line control ++

Line efficiency is without doubt dependent on equipment selection and arrangement.

However, only a comprehensive central control module and Manufacturing Execution System (MES) can provide the full suite of efficiency benefits on offer.

Line control requires integration. Machine-to-machine information is needed for the line performance to be completely controllable.

Sufficient connectivity between machine control systems enables the use of sensors to work in tandem with automated and AI-based control algorithms to maximise performance and accommodate inconsistencies of materials.

Connectivity also provides uninterrupted production despite faults. While there are software products around that offer overall line control or measure simplified OEE (Overall Equipment Effectiveness), they have limitations.

As integrators, we work with all of them, so we see what's missing.

Our observations led us to develop the ultimate line control and MES package.

WHAT YOU NEED FOR LINE EFFICIENCY



Best of Breed
Equipment



Line Design



i4.0 Integration



Line Control + OEE



Overall Line Efficiency

Foodmach

Line MES

A solution to waste reduction throughout the entire packaging line.

Foodmach's LMES is the culmination of over 10 years of design, development and refinement.

What if you could:

- Reset the entire packaging line for changeovers at the push of a button: recipes, conveyor speeds and machine settings; even have raw materials and packaging delivered automatically.
- Easily run multiple product changeovers in a single shift and even flying changeovers (where a new product enters the line before the previous product run has finished).
- Be absolutely certain that the right product was going into the right container with the right label, coding and packaging—100% of the time.
- Have all the production run information sent from the ERP to your line control without the need for any paper. All the line

manager needs to do is decide which products to run first.

- Be certain that the OEE data you're receiving is 100% accurate.

Our software team has taken its decades of learnings from high-speed FMCG lines and low-speed complex lines and poured them into a line control that does all this.

Line MES meets all functionalities required by ISA-S88, an international standard for best practice in developing an automated interface between enterprise and batch control systems. It integrates seamlessly with any ERP or legacy system.

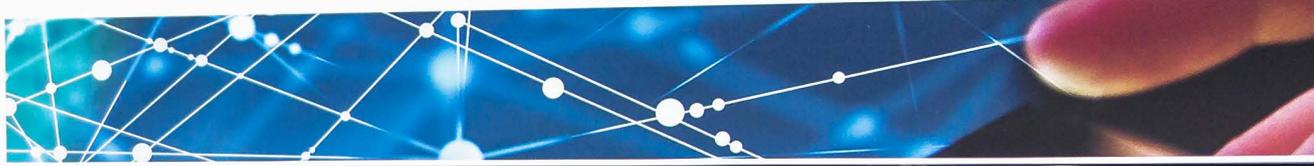
The lean philosophy behind Line MES ultimately ensures that:

The right product goes into the right pack with the right identification, using minimal resources.

If every large manufacturer in the world used Line MES, untold amounts of product and packaging waste could be reduced at every step of the FMCG and industrial packaging process.

LINE MES

Line Control / Software



The screenshot displays the LINE MES software interface, specifically the 'Conveyor PopUp' window. The interface is divided into several sections:

- Header:** Shows 'LMES - Home', the date '18-May-2022 - 15:10:34', and 'PLC Connected: ✓' with a 'Sign In' button.
- Left Panel:** Contains navigation options: 'Overview', 'Dynac Control', 'Vision Control', and 'Labellers Control'. Below these are status indicators for sensors (SC17, SC18, SC19) and a 'FP1F' indicator.
- Main Area:** A complex control logic diagram for a conveyor. It includes:
 - Control Logic:** A central logic block with 'Auto/Man' and 'Manual' modes. It has 'Start/Stop' and 'Auto Run' buttons.
 - RecipeConfig:** A yellow box with 'Active' and 'Storage' fields, both set to '7', and a 'Save' button.
 - Speed Parameters:** 'Manual Speed' (15 M/min), 'LeadSpeed' (12.6 M/min), and 'RefSpd' (12.6 M/min).
 - SpeedLimits:** A table for 'Ramps (ms)' and 'SpeedLimits' (Min, Max, Max Collision).
 - OffsetSpdRatio:** A field set to '0'.
 - RefSpdRatio:** A field set to '12.6'.
 - GapBoostRatio:** A field set to '0'.
 - AccumSpdMmin:** A field set to '0'.
 - Front Sensor:** 'On' (0 ms) and 'Off' (0 ms) fields.
 - GapBoost:** 'On' (0 Qty) and 'Off' (0 ms) fields.
 - Rear Sensor:** 'On' (0 ms) and 'Off' (0 ms) fields.
 - Follow:** A 'Follow' button and 'L', 'C', 'R' indicators.
- Right Panel:** A 'Running' status section for 'SEW Motor ac LTPB'. It includes:
 - Input:** 'Forward', 'Reverse', 'Reset', and 'Auto' buttons.
 - Control Logic:** A 'Healthy' status indicator and a 'Reset' button.
 - SpeedLimits:** 'Min' (5) and 'Max' (50) fields.
 - Start Ramps:** 'Up' (1000 ms) and 'Down' (100 ms) fields.
 - Run Ramps:** 'Up' (1000 ms) and 'Down' (100 ms) fields.
 - Calibration:** 'Min Raw' (0), 'Max Raw' (16383), 'Min Scaled' (0), and 'Max Scaled' (58.4) fields.
 - Output:** 'Fault' (0), 'Run' (checked), 'STO' (unchecked), 'No Enable' (unchecked), and 'Limit Speed' (unchecked) indicators.
 - Actual Current:** 0.7
 - Actual Speed:** 13
 - Ref Speed Raw Out:** 3535

At the bottom of the screen, there is a 'Home' button and a 'Line 1' section with icons for 'CZ01', 'CZ02', 'Filler', 'Labeller', and 'Packer'. A scrolling alarm banner at the very bottom reads: 'Line 1 - Scrolling Alarm Banner - Running Recipe 1A'.

Line MES

features

Line MES is an essential tool for a sustainable packaging operation.

Line MES provides:

- Advanced control of every machine on the line in unison or individually
- A consistent, intuitive user experience across an entire packaging line with consistent data from all the machines on the line
- Seamless interfacing between machines
- Rapid, automated recipe-driven changeovers and optionally, automatic sourcing of materials
- Automated line optimisation, where machine learning algorithms use standardised data in real-time to automatically make adjustments for OEE
- End-to-end integrated quality control monitoring
- Customisable integration with any ERP system
- True, paperless manufacturing

- Authentic OEE: Line MES eliminates opportunities for operators to exert influence over delay accounting.

Recipe-driven controls take all the human error out of the equation, providing full traceability over all aspects of production.

Recipe, setup information, raw material quantities, quality checks and validation etc. can be pre-scheduled from an ERP system and sent to each machine while the Line MES keeps conveyors and machines optimised.

The system ensures the correct materials and packaging are used for every SKU and made available at the right time. Line MES enables end-to-end integrated quality control monitoring.

It can be further integrated with warehouse automation, ensuring that the right type and number of packaging medium, say, closures and case blanks, are brought to the factory floor.

Automated changeovers

Production managers can change the product on a line at the push of a button, which automatically adjusts the control settings and production data on everything from depalletising, conveying, filling, inspection, coding, labelling, case packing, traceability and palletising to stretch wrapping, robotics and AGVs*.

The entire line may be put into product changeover in one action, either by stopping or by phasing in the new product. Each equipment module may be individually switched into manual mode without affecting the entire unit.

Time savings on some changeovers can amount to hours per shift.

It's the ultimate line integration tool and line control experience.

*Mechanical settings for changeover still need to be done manually, for example, change parts.

How a Foodmach solution can help you

Foodmach is Australia's largest advanced engineering-to-order and packaging systems integrator, based in Echuca, Victoria. We offer turnkey packaging lines integrated for genuine Industry 4.0



In the half a century that we've been working with the world's FMCG manufacturers, we've redefined the term 'integrator'.

Not only do we physically connect the machines on packaging lines using our whole-of-plant expertise, we've revolutionised machine-to-machine interfacing and communication. Our work is recognised by industry and government awards.

Foodmach's mission is to put managers behind the wheel of the fastest, most powerful production line possible, with a digital dashboard and full control, so you know where you've been, where you're going; and have all the data you need to guide decision-making—at your fingertips. This is the essence of Industry 4.0.

We offer the perfect blend of machinery design, manufacturing, controls, service and safety expertise combined with a comprehensive range of smart systems, agencies and partners to provide as much or as little as is required.

The aim is to make it simple for our customers to undergo their digital transformation through one, accountable supplier.

Foodmach is so committed to this end, we've introduced a new concept in packaging: Line as a Machine (LaaM), where we deliver a turnkey packaging line as a single, Industry 4.0-enabled machine with ongoing performance warranty.

A smart factory puts you in control and makes sustainable packaging possible.

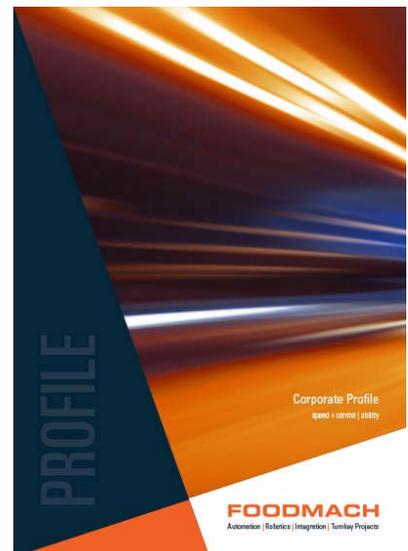
We have a portfolio of successful projects, with some latest notable greenfield installations at natural beauty business BWX Ltd (four complete filling lines, \$33M), the southern hemisphere’s most complex series of filling lines at Pernod Ricard Wines and DuluxGroup’s \$165M Factory of the Future, currently one of the world’s most advanced Industry 4.0 sites.

It’s both our promise and our guarantee that Foodmach is the fastest way to take control of your packaging line.

Read a case study on [Industry 4.0 in action at Dulux](#).

If you’d like to consider the opportunities for your production line:

→ **Just ask us**



‘Industry 4.0 is the future. Foodmach are a great partner to take you on that journey.’

Project Manager – Dulux

WHAT CAN WE DO FOR YOU?



PALLETISING

Our Award-winning Range

Robomatrix® High Speed

Compact Robomatrix®

Pick & Place

Robot Pick & Place Depalletiser

Mechanical High Level Depalletiser

Mechanical Low Level Depalletiser



CONVEYING

The latest in conveyor technologies, custom-built to handle any type of product or packaging:

Container Conveying
(PET bottles, glass and cans)

Case & Tray Conveying
(cartons, multi-packs,
shrink-packs, open trays)

Pallet Conveying



ENGINEERING & PROJECTS

Engineering Diagnostics & Design

System Design 3D Simulation

Automation & Control Systems

Equipment Manufacture

Installation & Commissioning
(mechanical, electrical & software)

Total Project Management

Line Efficiency Audits



TECHNOLOGY PRODUCTS

Fillers

Rotary Labelling

Pallet Wrappers

Case Packers/Cartoners/Multipackers

Inspection Systems

Labelling and Coding

Collaborative/Conventional Robots

AGVs/AMRs



SAFETY

Risk Assessments

Safety Upgrades

Compliance

Reporting



CUSTOMER SUPPORT

Maintenance Support
(major service, system audit, robotics)

Operator & Maintenance Training

Remote Phone Support

Spare Parts Service

24/7 Support Programs
(mechanical, electrical & software)



LINE INTEGRATION

Line as a Machine

Industry 4.0

Systems Integration

Line Control

Line MES

OMAC PackML



RELOCATION SERVICES

Factory

Equipment

End to End Service

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**At Foodmach,
our challenge is to put you
behind the wheel of the fastest, most
powerful production line solution possible.**

One that gives you real time information and gets you to the finish line first. We guarantee you speed – speed of service and delivery because we're local manufacturers and do everything in house, and higher operational speeds through better technology tailored to your exact requirements.

And we guarantee control – better project management control through a single point of contact and better machine control through the industry's most user-focused operation and software solutions. We integrate all the equipment on your line and give you Industry 4.0, with more live data than ever before.

Control over operational safety too, because we're the safety experts and we make the safest machines in the business. We'll even relocate your entire factory and get you safety compliant.

Foodmach is **the fastest way to get control
of your packaging line.**

speed + control | ability