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Reducing resource consumption

SUSTAINABILITY BEYOND RECYCLABILITY

Simon Copley, senior manufacturing consultant at 42 Technology, looks at reducing resource consumption in manufacturing.

BY SIMON COPLEY, SENIOR MANUFACTURING CONSULTANT

Sustainable manufacturing has never been more important for FMCG brands, not least because of soaring energy costs. But also as consumers are becoming increasingly aware that a brand's environmental impact goes beyond the recyclability of its product packaging.

As a result, more manufacturers than ever are now actively looking for new ways to reduce their consumption of natural resources used during manufacturing, such as electricity, gas or water, and without impacting product quality. But it isn't trivial and it needs a structured approach to first understand what resources are used, and why, before looking for potential savings.

Resource costs and sustainability initiatives

The motivation for manufacturers to increase sustainability is generally for two reasons:

- To help minimise their environmental impact by reducing either carbon emissions or by-products



such as wastewater

- To counteract rising operating costs for energy, water, or other consumables

Although some manufacturers have already set themselves tough targets to reduce natural resource consumption, it is not always clear whether they should target a series of small improvements or a significant process change.

As a manufacturing consultant, 42T has seen clients revisit sustainability initiatives with changing motivations over time. For example, the focus several years ago for one widely successful consumer product was to achieve a purely environmental improvement but without any investment. Whereas today's more urgent consumer pressures coupled with rising energy prices has made more significant process alterations justifiable, even if they require investment.

When it comes to identifying where reductions can be made, then tweaking the process parameters for mature technologies generally only gives minor savings. To unlock major savings requires a different mindset, a more structured approach and a broader view.

First you need to know exactly where and how resources

are used. It's important to acknowledge any preconceptions you may have about how your manufacturing process operates, how resources are used and what parts of the process can and can't be changed. An open-minded approach is essential, otherwise you might overlook good solutions.

The next step is to work through the process from start to end, noting where, and crucially how, resources are used. For example using:

- Electricity for heating, cooling, machinery operation, and transport
- Gas for more cost-effective, high-power heating and for increased humidity when burned
- Water for heat transfer, washing, dilution, and transporting solids in pipes
- Steam for heating, especially for sensitive products like caramel
- Air which may need to be controlled for temperature and humidity, in some cases

Be wary that when reviewing each process step, ideas for obvious process changes might jump out. But while these can seem like a great local solution, thinking at the system level might uncover the opportunity for





Top tips

While these issues might seem fairly obvious, we have often seen otherwise well-intentioned sustainability initiatives miss key solutions and deliver limited results for entirely avoidable reasons.

If you are planning a sustainability initiative, it's worth considering the following top tips:

- 1 Clarify the business case for reducing resource consumption. Is it for environmental or cost reasons?
- 2 Understand exactly how resources are being 'used' in your current process as there may be a surprising number of 'uses', especially for gas and water
- 3 Generate a selection of optimisation ideas, and analyse their benefits. Which ones best suit your business case: inexpensive small mitigations or high development redesigns with huge potential?

Although the steps outlined above won't take you all the way to meeting your sustainability goals, they will put you in a stronger position to unlock some genuine sustainability improvements.

Even more impressive gains. For example, in a recent food processing project where the product was cooled then subsequently heated we found the best option was at the system level: using a heat exchanger to link both steps.

To avoid missing these system-level gains, especially for areas such as heating and cooling, construct a flow diagram of the entire process to show the resource flows at each process step. For resources like water or controlled air, this diagram makes a great springboard for inspiring powerful ideas such as rerouting flows of waste air/water to other process steps where requirements are looser.

Understanding resource usage

It may appear obvious how a resource is used, but if you overlook any secondary functions then you risk unanticipated consequences with any work to reduce resource consumption.

Two examples of 'dual purpose' resources we have experienced are:

Gas – heat and humidity

If you're using gas for direct heating in an enclosed area, then the combustion adds water vapour to the air. If you switch to electrical heating, you may need to adjust the humidity, although on a recent fuel-switching project for baked goods we found the humidity was not critical to product quality.

Water – washing and thermal transfer

If water is used to wash ingredients then it also acts as a heat exchanger, heating or cooling ingredients as it flows. This action may go unnoticed, but it could be vital for achieving a suitable temperature for downstream processing. So if you're looking to improve cleaning efficiency, you need to ensure the process can handle temperature changes in

ingredients or additional water may need to be added back in.

Generate ideas

Once you understand the resource use throughout your process, you can build a menu of ideas with a range of potential savings and use initial analysis or lab testing to assign estimated costs and benefits.

The list may include inexpensive optimisations, like adding insulation or reducing heating power, through to complex redesigns such as upgrading inefficient parts or linking separate steps for reusing waste heat/water.

Selecting the right ideas

Few improvement initiatives can be made without securing budget or buy-in from within the business. A sensible development plan is crucial to getting this buy-in, including an estimation of the risks of the leading ideas, and how they will benefit the manufacturer's sustainability objectives (of either reducing operating costs or environmental impact).

The circumstances will dictate which ideas are seen as being best for development, with often less risky ideas being preferred over those with higher potential, risks and obvious obstacles. 

