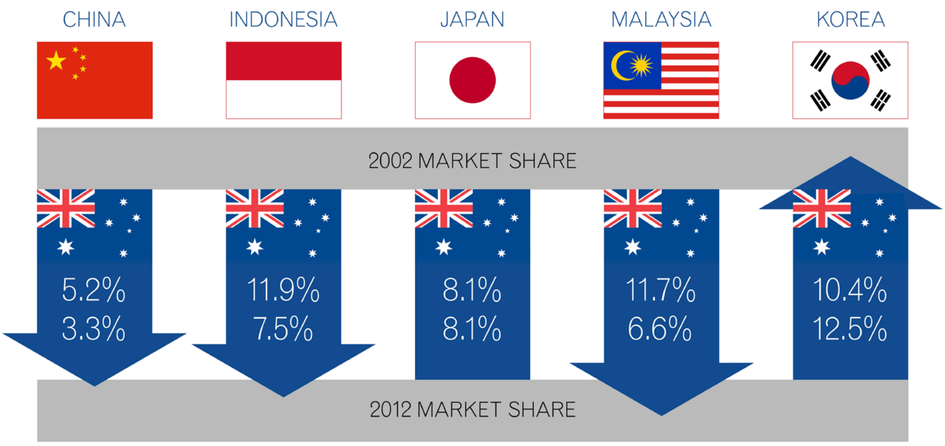
Avoid building a new old facility.

THINK DIFFERENT. DESIGN DIFFERENT. DELIVER PROGRESS.

Introduction

The latest catch phrases storming the media describe the ‘Dining Revolution’ and set Australia as the ‘Food bowl of Asia’, but the real story paints a different picture. The reality of the matter is that we import more food than we export. Looking at our competitive position in the food trade worldwide isn’t any more encouraging either. Statistics sourced from a 2014 KPMG report have indicated that in the decade 2002-2012 the Australian share in Asian food markets has dropped significantly. Similarly, Australia’s ranking as food supplier to these countries has slipped; in some cases dramatically so. This illustrates that Australia’s market share in Asia is being usurped by other nations as we fail to capitalise on the demands and opportunities that the food industry offers up.



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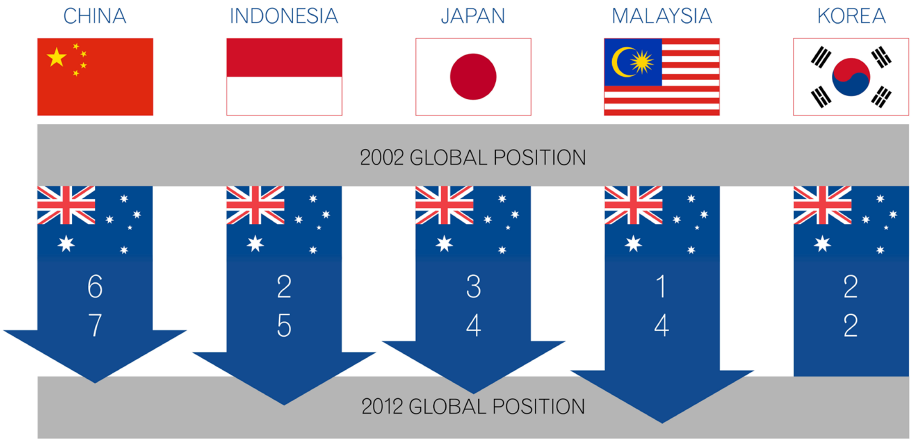
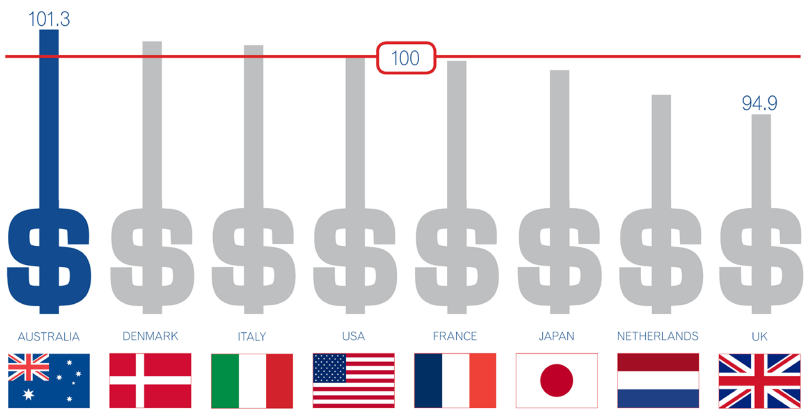


Further investigation has shown that while global profitability in the food industry has remained relatively constant since 2010, the same cannot be said for food industry profitability in Australia; with rates nearly halving since 2011.

The greatest areas which need to be addressed by food manufacturers are blatantly obvious; as Australian labour and energy costs skyrocket in comparison to the rest of the world. However, the solution is not nearly as visible as the problem. While the newly-developed Emissions Reduction Fund (ERF) will make government funds available to companies to reduce and improve their energy consumption and efficiency, labour cost is a significant issue that requires careful consideration. Thinking differently and designing differently to maximise labour productivity and best utilise technological innovations is just one of the many ways food processors can deliver progress in their facilities. As Gary Helou, Managing Director of Australian company Murray Goulburn, has put it, ‘We are high cost, but you build around that. You automate. You take that factor into your design calculus. You don’t design heavy manualised operating plants’ (Lynch , 2014).



COMPARATIVE COST TO PRODUCE FOOD

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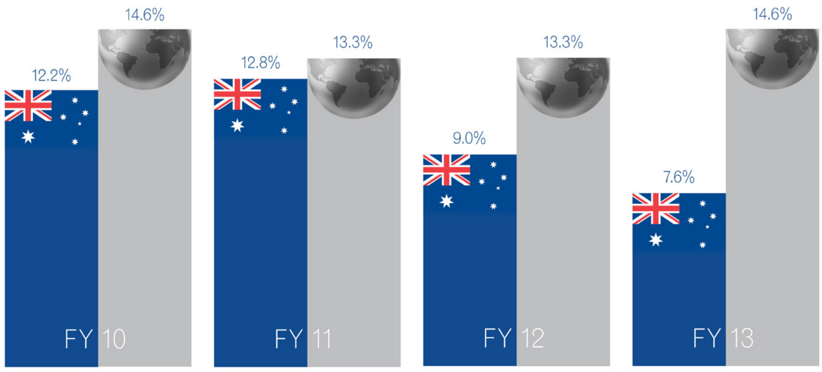
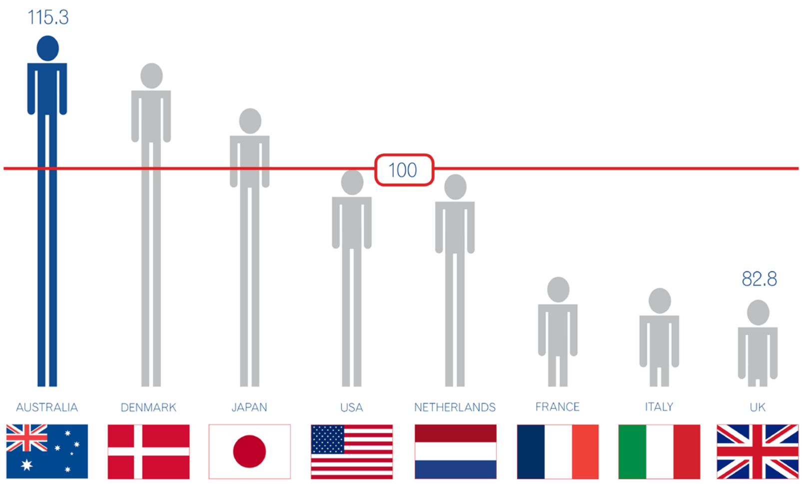
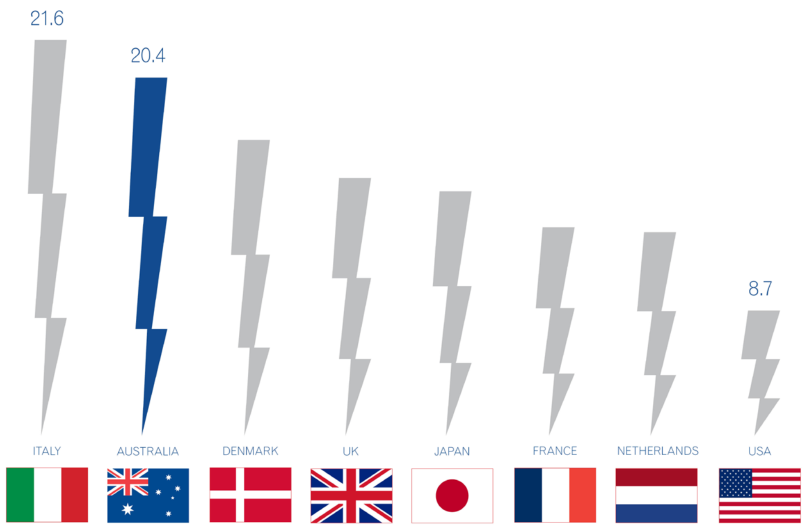


EBIT MARGIN (FY10-13)



COMPARATIVE COST OF WAGES & SALARIES



COMPARATIVE COST TO PRODUCE ELECTRICITY (US CENTS PER kWh)

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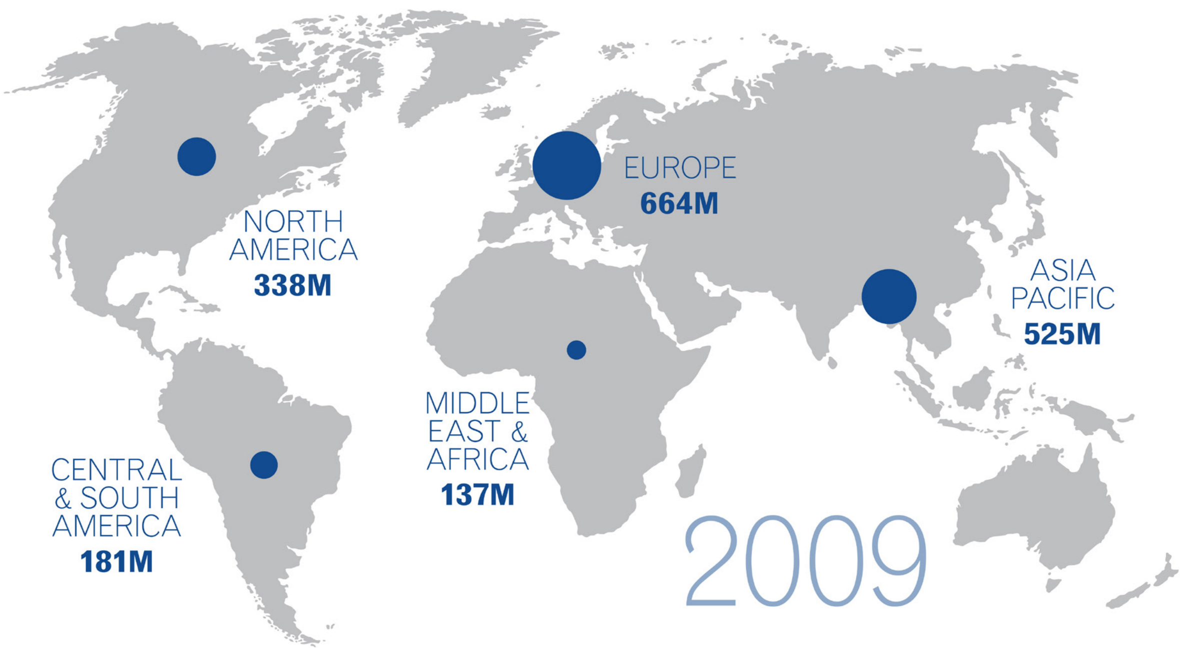
With the profitability of the food industry quickly dissipating it is high time we turn our attention to what is driving this fall and how we can work to improve profitability.

Working in the modern food processing industry is about delivering value; value to the supplier, value to the consumer and value to the market. Being the centre of that value equation, food processors must learn to adhere to the old adage and work smarter, not harder; think differently and design differently.

Within our current operations, with our current level of technology, with our current investment, and procurement and implementation strategies, food producers are not succeeding in balancing market demands with productivity and profitability.

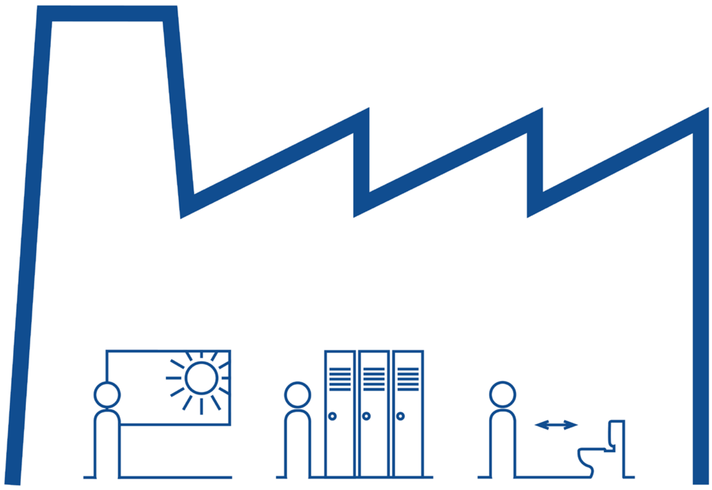
The picture seems overly gloomy, really, but the food market provides a huge opportunity for producers and processors if we can increase our ability to compete within the world market. This opportunity lies in the rapid growth of the Asian market and the growing middle class, in particular. The next 15 years seem to offer up a plethora of opportunities as the Asia Pacific region is set to grow exponentially. OECD research suggests that the Asian middle class will reach 3,228 million people by 2030; roughly 140 times the current Australian population (Kharas, 2010). With this surge in affluence comes greater purchasing power in those middle classes. Given Australia's prime geographic position in this region and its reputation for quality food production this population growth is only our opportunity to lose.



The task is clear. The factory of the future must be competitive on a world standard; our labour will always be expensive, so we must seek ways to minimise these costs using technology and improving the productivity of remaining labour positions.

Design (human-centred)

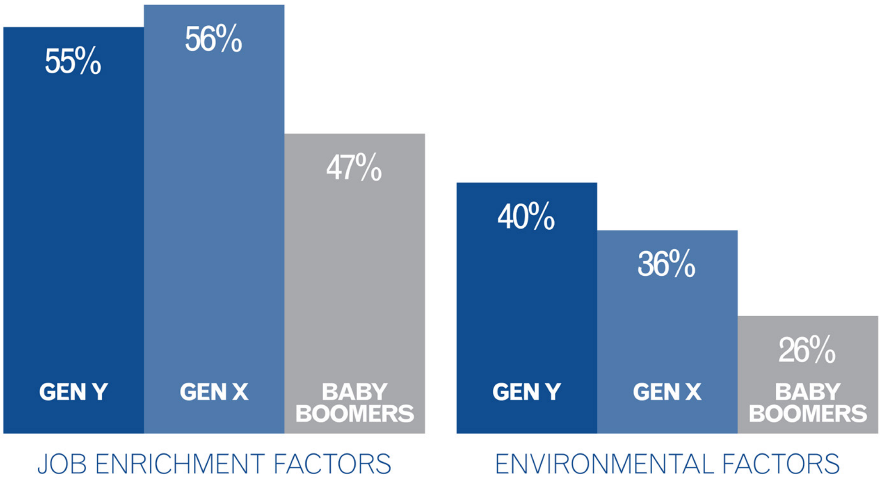
Human-centred design is a term that speaks to efficient design practices between people and technology; giving attention to the psychological needs of humans (Jackson, 2009). Arguably, the greatest proponents of human-centred design are the Apples and Googles of the world; however it's not to say that these levels of innovation can't be implemented across all areas of industry. The rapid growth of industrial technologies has seen the implementation of robotics across most industries; however, this has been practiced with little regard to the human condition. Human-centred design seeks to overturn that by prioritising people over machine efficiency. When processing is your core business it is critical to your success that these practices are optimised for the operator, robotics and automation, and the end user.



Human-centred design offers a tangible opportunity and philosophy by which these processes can be optimised. It's about considering what is required to maintain our humanity within our working environment. For those of us who work in offices this process is easy, we have photos of our family, our favourite football team colours adorning our desks and often comfortable chairs to sit in, to name a few luxuries; considerable effort is put into making workspaces desirable. The question is - what can we do to improve the way human processors work within and relate to the technological environment of food processing? At the Wiley FoodPro stand that is the question we tried and continue to try to answer, some of our results have shed light on interesting trends. Using a 3-point value system the three most important food facility environmental factors are:

- Recognition of performance (12.87%)
- Easy internal communication (8.51%) and
- Sustainable workplace (8.39%)

While the data is skewed differently according to industry, roles and managerial positions, what we can see is that psychological requirements have dominated. In effect, we must start thinking about satisfying the psychological needs of the humans that run our technologically state-of-the-art plants. Why? Because the intangible benefits of a happy workforce is a revolutionary asset to the food facility of the future.

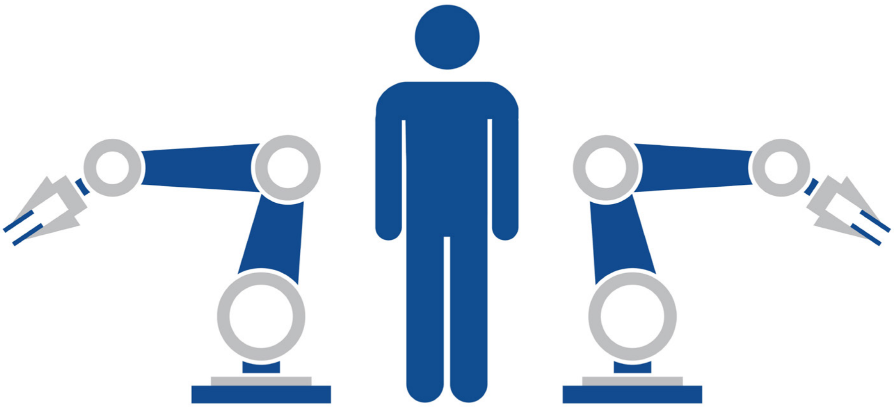


This will affect businesses as generational changes realise shifts in workforce disposition towards working conditions. While the baby boomers were reluctant to sacrifice the stability of employment due to job enrichment or environmental factors, both of these areas are ones in which greater emphasis is placed by both generations X and Y.

One principle of human-centred design suggests that greater autonomy over tasks and production methods should be allowed to encourage the implementation of human ingenuity, experience and intelligence (traits of which we are yet to automate). While engineers like to design straight lines to satisfy best practice for equipment placement, this is not necessarily the best configuration to improve human interaction; in fact it is isolating, and discourages operator cooperation and internal communications.

A further critical element to the successful implementation of sociotechnical system design is feedback. Providing employees with feedback allows them to actively amend or improve practices. Positive, negative and statistical feedback provides staff with a rationale for their work, a why; thereby satisfying a number of their psychological needs (Niepce & Molleman, 1998). While consideration is often given to the safety and operational issues through processes like HAZOPs, there has been little done to design for operator satisfaction. This allows operators access to the top tiers of Maslow's hierarchy of needs, ensuring that operators not only have the ability but the opportunity to perform at their peak (Montana & Charnov, 2008).

Sociotechnical design also lends itself to giving consideration to and understanding of how humans, in their day to day work operations, will interact and or work with the technology and automation of their work environment.



Advancements in robotics, automation and machinery have led to designers increasingly working to satisfy sociotechnical design aspects in order to develop 'smart' devices and systems. Serge Rijsdijk, Assistant Professor of Innovation Management at the Rotterdam School of Management has highlighted that seven dimensions are required of smart products to bring value to processes:

1. Ability to cooperate with other devices
2. Adaptability
3. Autonomy
4. Human-like interaction
5. Multifunctionality
6. Personality
7. Reactivity (van Wylick, 2009)

We can begin to see the effects of these innovations in the development of technologies like Baxter and Kuka products; robots capable of performing repetitive tasks with the same efficiency as current manufacturing robots with the added ability of working safely and intelligently next to people (http://www.rethinkrobotics.com/products/baxter/). Baxter is intuitive, requires no safety cages and minimal programming thanks to an intuitive sensor system and a design that allows line operators to manually 'train' Baxter to perform tasks. These collaborative robots offer a level of human-plant interaction that is unprecedented in manufacturing facilities. It is a boon to the industry to see the efficiency and productivity of robots working beside the ingenuity and creativity of humans.

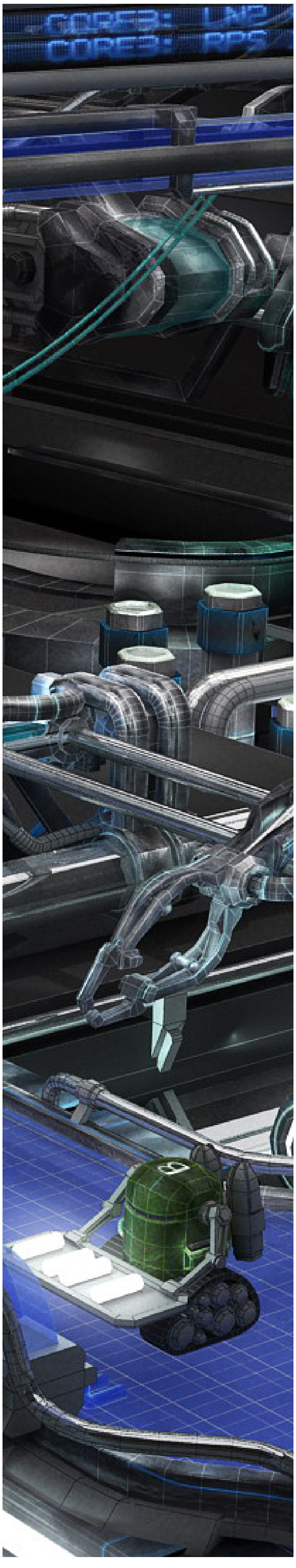
The technological level of Automated Guided Vehicles (AGVs) has grown significantly over the past few years particularly with the advent of Google electric driverless cars. With the growth in technology the application within manufacturing facilities becomes more achievable as systems adapt to the infinite variables of working with humans (Ottens, Franssen, Kroes, & van de Poel, 2005). Similar to Baxter, the increased sensitivity of sensors and control methods has led to the widespread use of AGVs as safer alternatives to forklifts. The safety standards of smart devices utilising such sensor technology has opened the door for the integration of human and robotic logistics systems.

Lately, there has been much hype about the mining and analysis of big data within businesses. While this affects not only the manufacturing industry the benefits of such data collection offers an opportunity for food processors to truly bring their facilities into the technological age of the 4th Industrial Revolution.

The biggest limitation for accessing data and utilising it to improve production processes and procedures is the wide array of operating systems that are currently utilised in manufacturing. In most facilities there is limited capability for these systems to interact, let alone work together. This inability to cooperate complicates the process wherein food manufacturers can access, analyse and interpret data supplied by their production facility. Currently, most food manufacturers have an extensive range of datasets that detail anything from packaging line equipment performance to raw material input to human resources and finished goods data. It is imperative that manufacturers learn how to manipulate this data into usable sets that deliver qualitative information for ready analysis and interpretation. By collating data and implementing a methodology of reporting food manufacturers have the opportunity to gain significant insight into their entire process on both the macro and micro scales; which represents an invaluable opportunity for improving efficiency, operations, and subsequently profitability.

The real-world application of this data collation sees the emergence of great opportunities for operators and engineers to access numerous aspects of plant operations in real-time through single user interfaces such as iPads or Google Glass. This data has the potential to be linked back to operators or machinery; this interconnectivity is referred to as a Cyber-Physical System wherein networks feed back to physical machinery. Taking this one step further, implementing self-management protocols could allow equipment to auto-correct itself based on the data that is supplied to your facility management system.

The careful and considered integration of plant operations, humans and equipment must be a prevalent driving force for innovative food production businesses. It is imperative that sociotechnical design notions be, if not implemented, at least given consideration in order to optimise processes within facilities. The decreasing value margin of food production makes the industry a highly competitive sector; however the implementation of robust production methodologies and effective technology investment can deliver excellent bottom line results for food processors.



Automation/Technology/Innovation/BIM

Automation may be a bit of a no brainer when it comes to delivering progress for food manufacturers, but there is certainly a fine art to designing automation processes. It is critical that manufacturers know and understand what processes and systems can be automated within their sector. However the cross-pollination of automation innovations can see potential benefits also. Recently, Wiley discovered that the implementation of a meat slicer, using technologies developed specifically for meat, would work better for specialty cake products than current slicing technologies. This innovation significantly reduced waste product, rework and increased product yield.

In the food processing industry automation and sensors are often used to move and track product across the processing line, but with advances in sensor technology there is room for so much more. The latest in vision systems and x-ray imaging offer food processors the ability to monitor almost any aspect of their product possible.

Want to check out what the marbling rate across a specific cut of beef is? Not a problem. Want to ensure that the colour across your juice lines is consistent? Not a problem. Vision systems and x-ray are capable of completing these tasks at high rates of production and the implementation of reject and rework lines is only par for the course. These systems make the lives of food manufacturers attempting to fit in with the myriad regulations of the industry exponentially simpler, they have been proven to offer:

- The correct classification of 96% of pregraded baked goods based on an algorithm for separating dark and light samples
- Image analysis in indicating meat tenderness and identifying: muscle type, breed and age of bovine meat
- Classification of pork loin chop using colour machine vision with a 90% agreement rate with human operators
- Identification of remaining bones in fish fillets with an accuracy rate of 99%
- Identification of shape, size, colour, blemishes and diseases in vegetables (Tadhg Brosnan, 2004)

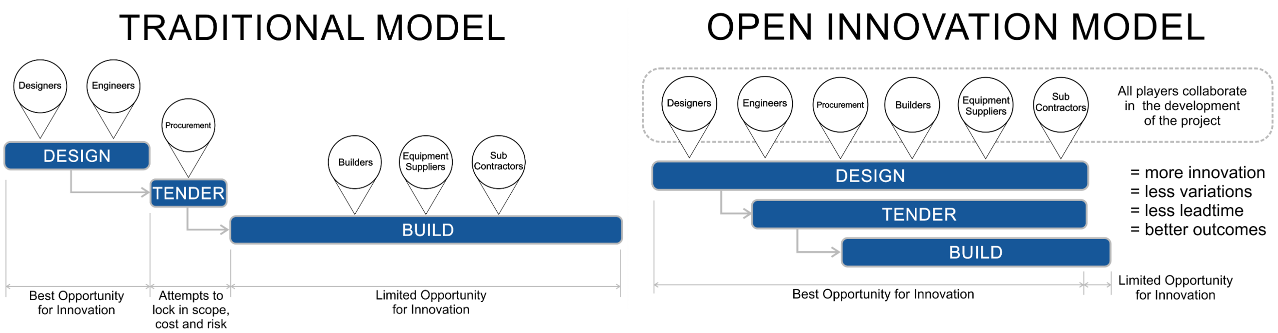
These systems can deliver real-time analytics and data back to you and your maintenance or facility production staff, providing you with readily available information on how your plant, employees and products are performing. Furthermore, systems like those offered by VEO provide small data sets in real time, allowing engineers to pull data from selected objects at any given time (www.m-six.com).

Delivery

Once you have access to the best technology, the best designers and the best construction installation contractors the final piece of the puzzle is a project delivery method that suits the complexities of your project. To implement the best it is important to embrace collaboration; allowing for the best designs to be put forward is only the first step. Making allowance for designers to collaborate on your project delivers a level of integration and coordination that is invaluable to developing the facility of the future.

Unfortunately most procurement departments concentrate on the adversarial tender approach for breaking the project up and then focus on the price of each individual block. This tends to overly constrain collaboration and usually results in a project that runs over time, over budget and under expectations; a system developed early last century that hasn't responded to the demands of today's projects.

Last century limitations in communication also offered a natural barrier to the speed of project development; it reduced the likelihood of changes given the time that changes would take to implement especially when considering post delivery systems and drawings developed by hand. In a society that now has instantaneous access to global communication and sophisticated CAD systems that simplify drawing changes we have yet to modify our method of project control. Technology has enabled faster turnover of options, but rather than speeding the project, it has created a culture that expects to be able to make changes because each change is delivered speedily, and so, the incremental change has become a monumental shift in attitude.



Today, project timelines continue to become shorter and shorter yet we still implement practices that are outdated in comparison with our available resources, our timelines and our project expectations. Rather, in order to deliver the best project using the knowledge of the best contractors and consultants it is imperative that we adopt a model of open collaboration. This model sees multiple project stages taking place concurrently where we can take advantage of the open market and the speed of communication media to produce a project delivery method that benefits from all participants.

Conclusion

The food facility of the future is a multidimensional beast. One which is able to avail of market opportunities, is technologically current, considers the psychology of its workforce and is structured to encourage work models of open collaboration.

Australian manufacturers must invest in new plant and equipment to stay in the game and this needs to be at greater rates than at present. We must use the best equipment and embrace the new design paradigm to achieve plants that are better than our competitors. We must get better value from the money we are investing in capital by using modern collaborative project delivery systems. This is how we will build the food facility of the future.

It takes innovative design, industry knowledge and project experience to ensure that we're not just sticking to the same solution for eternity.

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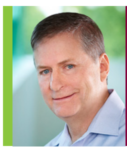

About the author
Steve Christie | Director of Process Engineering | Wiley. *"My passion is change and innovation, I relish the opportunity to implement broad and effective business and engineering initiatives both within Wiley and in the greater food industry."* Steve can be contacted on 1300 385 988 or email connect@wiley.com.au.