

AMPC SNAPSHOT

Feasibility Study into a High Volume Cellular Processing Plant

Project Report Reference: 2017-1054

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Project Description

The completed research project 2017-1054 contributes to determining the feasibility of a high volume cellular processing plant that would utilise a mix of industrial robots, collaborative robots, special purpose machines and human operators to complete various tasks in red meat production. The outcome of this report builds from the findings of 2016-1033: Cellular Production and helps the industry to better understand the practical considerations that processing plants have with incorporating the new processing method and associated automation.

The report investigates:

- Group theory applied to red meat processing
- Potential automation with respect to a stationary carcass in a production cell
- Individual cell design and application
- Barriers to adoption of cellular manufacturing
- Industry Absorptive capacity
- Management capability

In order to understand industry considerations for transitioning an existing plant into a cellular format four high volume Australian red meat processors participated in a series of surveys and interviews. Analysis of their feedback indicated general support for the cellular manufacturing concept and agreed that it had potential to benefit processing operations.

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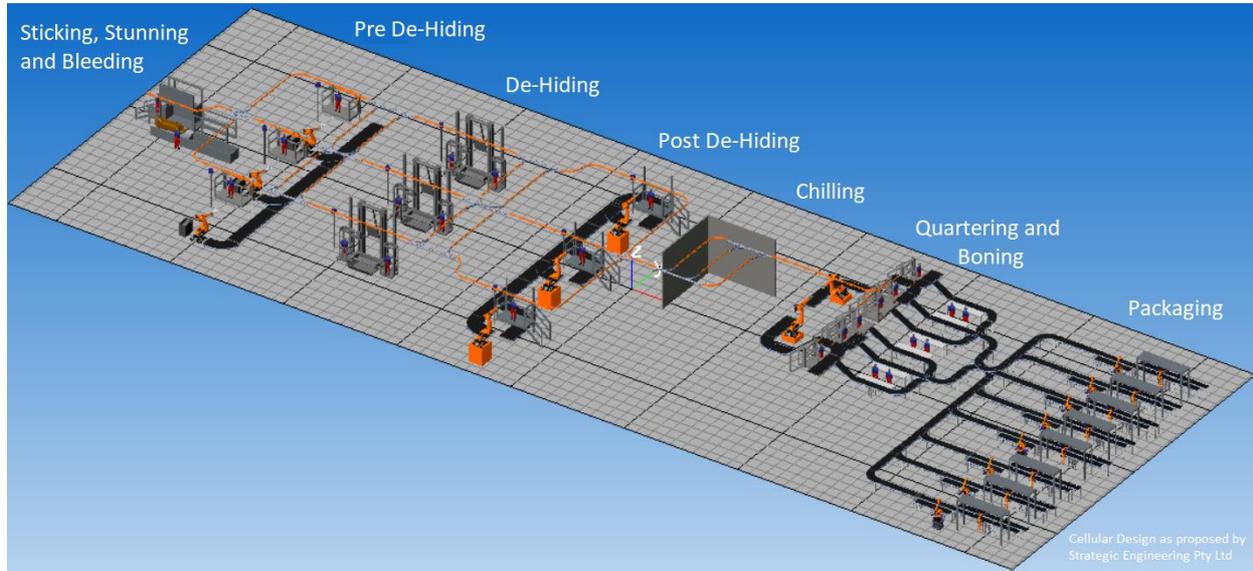
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Project Outcomes

Industry participant – Survey results (Using mixed Likert Scale)

Cellular design as proposed by Strategic Engineering



1. Group Theory applied to continuous chain processing

CELL	GROUP TASKS	DESIRABILITY
1	<ul style="list-style-type: none"> Stunning, Sticking, Bleed Hoist onto chain 	Agree strongly/ Agree
2	<ul style="list-style-type: none"> Bung dropping, Rodding Horn removal, Head removal, Head processing Belly cut, Hock removal, Tail removal Hide preparation and pre-dehiding 	Somewhat agree
3	<ul style="list-style-type: none"> Hide removal 	Agree strongly/ Agree
4	<ul style="list-style-type: none"> Brisket bone cut, Evisceration, Inspection of offal, Carcass splitting Spinal cord removal, Fat sucking/ removal, Carcass inspection/ grading Quarter cut, Scribbling, Trimming 	Somewhat agree
5	<ul style="list-style-type: none"> Chilling 	Agree strongly/ Agree
6	<ul style="list-style-type: none"> Trimming Forequarter primal cutting and slicing Hindquarter primal cutting and slicing 	Somewhat agree
7	<ul style="list-style-type: none"> Quality control inspection of primal cuts Bagging and sealing Picking and Packing 	Somewhat agree
Overall rating of cellular design & associated grouping of tasks		Agree

2. Cellular design as proposed by Strategic Engineering

Application and functionality of proposed cellular design	Good
The complete cellular design would help efficiency and effectiveness in relation to productivity	Agree

3. Absorptive Capacity – Innovation

Total Mean Score for Absorptive Capacity	67.8/100
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Absorptive capacity was rated on areas including ability to Identify, Assimilate, Transform, and Apply valuable external knowledge. With a total mean score of 67.8 out of 100 the survey results suggest that there is room for growth in relation to innovation and technology knowledge gathering and application.

4. Management Capability

Total Mean Score for Management Capability	80/100
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Management capability was rated on areas including Visionary and Strategic Leadership, People Leadership, Organisation Capacity, Innovation of Product and Ideas. Overall participants rated quite highly with a total mean score of 80 out of 100 suggesting that there are sufficient capabilities within the surveyed plants to act on major decisions. However, given that cellular manufacturing represents a significant paradigm shift away from the idea of the chain, plant management would obviously require significant support and resources to implement CM.

5. Barriers to Adoption – Transitioning an existing plant into a cellular format: Summary

NEVER	OCCASSIONALLY	ALWAYS
-Capacity to retrain staff	-Resistance from faculty and operator staff -Managers resistance -Lack of support from various departments -Lack of IT personal/ expertise within organisation	-Factory floor layout -Uncertainty about the return on investment -The amount of capital needed to acquire and implement

6. Potential automation with respect to a stationary carcass in a production cell: Summary

DESIRABLE	BETWEEN: DESIRABLE /HIGHLY DESIRABLE	HIGHLY DESIRABLE
-Fat sucking removal -Quarter cut	-Scribing -Carcass splitting	-Picking and packing -Bagging and sealing

Benefits for the Red Meat Processing Industry

- / A major long term benefit from CM is the potential to increase plant automation. Once integrated CM offers the industry improved efficiencies as well as quality, reliability and flexibility.
- / In a cellular based production model, the product is generally static and more easily restrained for multiple tasks or cutting operations. This eliminates the need for tracking software or restraints as required for almost every task being automated on the existing continuous chain. Additionally, the complete sensing requirements for multiple tasks can be consolidated in each cell, reducing automation capital costs.
- / The cellular nature of CM is also better suited for robotic automation. Robotic cycle time is currently set by the speed of the continuous chain production. In CM the cycle time is more flexible as more difficult tasks can take longer if required without affecting the performance of the whole production facility.
- / In most cases one robot is capable of completing multiple tasks with the right tools, sensing feedback and time to complete each task. With an automatic tool changer, a standard industrial robot could potentially automate multiple tasks in a work cell, with an added advantage of a single sterilisation point. Sensing requirements for all tasks at once might be problematic, but the cellular model makes it easier to develop automation of individual tasks.



Project Conclusion and Recommendations

Based on the research presented in 1017-1054 - Feasibility Study into a High Volume Cellular Processing Plant, it is recommended that AMPC supports implementation strategies to adopt cellular manufacturing in the red meat processing industry.

- / CM is able to deliver improved quality, reliability, flexibility and increased opportunity for automation within the red meat industry. Whilst there are identified barriers to adoption it is believed that these can be overcome so that greater future benefits are achieved.
- / We believe that group theory can successfully be applied to red meat processing, giving greater potential to improve production and yield.
- / Feedback from industry participants supported the presented concept of cell design overall and agreed with its potential to improve efficiency and effectiveness of production.
- / There is strong evidence supporting the need to adopt new technology alternatives now so that processors can achieve desired plant volume capacity. In addition to this CM offers processors the flexibility to increase or decrease volume levels when required.
- / CM has the ability to synergise with Objective Carcass Measurement Systems. The benefits of CM become more real and probable when used in conjunction with this technology.
- / CM benefits would still need to be trialled, observed and quantified so that the industry will accept production changes and return on investment. Once this is achieved we expect that processors will embrace the technology.
- / Whilst there are risks associated with every investment, the returns of CM are seen as worthy for the future advantages it represents. It is recommended that the industry apply a blended cellular transition so that it can be utilised in the areas of most need for individual plant requirements.