final report

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Prepared by: Philip Green, Stewart Fischer, Sam Beker
Greenleaf Enterprises

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Meat and Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

Developing Greenleaf capability and tools in processing efficiency economic impact

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Abstract

Greenleaf have partnered with MLA to conduct the initial assessment in the short term, anticipating that red meat processors will gain insight into the strategic importance of collecting and interpreting financial impact data using cost benefits analyses (CBAs).

A South-East Queensland beef processor has done substantive background work and planning in materials handling. The following business related issues have been identified:

i) Sales requirements call for increased assembly of mixed products,
ii) Storing products and calling on oldest first items is a labor intensive task,
iii) Products requiring immediate shipping need to be fast tracked to eliminate double handling,
iv) OH&S issues with manual handling
v) Labor intensive.

Tentatively a number of priority areas identified, but not limited to operational efficiencies to be gained in the following strategic areas:

i) Optimal semi- and/or automated de-palletisation and container loading
ii) Verification of product processes (i.e. review of current port-marking and tracking product).
iii) Product sortation (Pre-sorting product).
iv) Review of dunnage materials integrity and reliability during container transport.
v) Automation of information (i.e. information management) – integration of information for optimal processing efficiencies (i.e. modelling of information using current production including product flow and mix).
vi) Value proposition, scoping and feasibility study to be independently developed for materials handling program including independent recommendations.

In this strategy, the intention is to automate the palletising, temporary storage and retrieval of cartons into and from a short term holding chiller. Also the purpose is to re-introduce product into existing facilities in an organised sequence ready for container loading or automated palletising for storage. A meat processor has recognised that customisation is critical for future prosperity. With increasing customised ordering comes a high level of complexity. This strategy will also address the required skills and capability, information intelligence and systems required in such a comprehensive and sophisticated material handling system.

Greenleaf have a wide range of expertise in business case analysis and, through the delivery of this project, aim to provide companies with the knowledge and understanding of how building their skills and capability in CBA Analysis and Methodology can facilitate and add value to their Material Handling and other R&D initiatives.

Executive Summary

A red meat beef processor located in SE Queensland has done substantive background work and planning in materials handling. The following business related issues have been identified: i) Sales requirements call for increased assembly of mixed products, ii) Storing products and calling on oldest first items is a labour intensive task, iii) Products requiring immediate shipping need to be fast tracked to eliminate double handling, iv) OH&S issues with manual handling, and v) Labour intensive.

Tentatively a number of priority areas identified, but not limited to operational efficiencies to be gained in the following strategic areas:

i) Optimal semi- and/or automated de-palletisation and container loading
ii) Verification of product processes (i.e. review of current port-marking and tracking product).
iii) Product sortation (Pre-sorting product).
iv) Review of dunnage materials integrity and reliability during container transport.
v) Automation of information (i.e. information management) – integration of information for optimal processing efficiencies (i.e. modelling of information using current production including product flow and mix).
vi) Value proposition, scoping and feasibility study to be independently developed for materials handling program including independent recommendations.

The aim of the project is to provide red meat processors with the knowledge and understanding of how building their skills and capability in CBA Analysis and Methodology can facilitate and add value to their Material Handling and other R&D initiatives.

The key outcome of the project was that the data supplied has provided good insights but does not yet fully reflect or support the full combination of options red meat processors may consider. Therefore, the following actions are recommended:

- Analysis should be done around possibility of configuring new infrastructure to handle a much higher percentage of cartons than the 65% in these scenarios in order to further reduce double handling and increase labour savings.
- More data is required to complete any further investigation. It would be ideal for this to include:
    - More details around orders for some of the data already supplied
    - A larger sample of data to capture peaks and troughs in production over time that the system will be required to manage
    - Capital costing estimates for the range of options being proposed to a more helpful trade-off of options for red meat processors to consider

The next step will be to present detailed findings back to the processor in order to refine preferred options and accommodate any new assumptions. Following acceptance by the processor, targeted CISP partner visits will be established by MLA and the provider (Greenleaf) to share the process and methodology more broadly across the industry.

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1 Background

MLA is partnering with processors in a three-year Collaborative Innovation Strategies Partnership (CISP) program. As part of the early stages of the CISP program, a R&D strategic plan is developed between MLA and the company that identifies R&D areas aligned with company's business priorities. A preliminary gaps analysis is generally conducted parallel to the company's strategic planning process. The required skills, capabilities and capacities are recognised in this process as critical in the development of a comprehensive and sophisticated materials handling system.

A red meat processor requires assistance to prioritise R&D focus in material handling. Currently, there are limited internal means of processors identifying priority areas without conducting an analysis. This supports the initial phase of CISP where it has been identified that developing capability in impact analysis is critical to the next step of identifying priority focus areas.

A typical Materials Handling Vision and Strategy plan has identified highest priority areas initially to be piloted as:

i) Semi or fully-automated de-palletising & container loading
ii) Verification systems - Investigation of port marking options.
iii) Sortation - hardware to convey, check, mark & reject/ diversion mechanisms
iv) Dunnage - dunnage materials integrity and reliability during container transport.
v) Information management including mapping software / IT requirements

The main components of the proposed manual handling system include:

1. Diverter - picks out shortlisted products for pre-sorting area.
2. Robot – stacks and un-stacks, sorts and delivers cartons at a controlled rate for container loading or auto palletising.
3. Divert 2. Directs cartons to container or palletising machine or auto/manual stack down.
4. Load check and port mark applicator
5. Container loading equipment to be developed to automate the process.

All critical technological components are proposed to be pilot configuration that will be setup in the plant. This pre-production pilot facility will be used to evaluate all critical components in material handling.

This proposal is the initial stage (Stage 1) of a feasibility and pilot study of operational efficiencies in Materials Handling from product cartoning, portmarking and tracking, palletising and containerisation. A number of critical processing parameters will be evaluated using a pre-production pilot plant facility on site. Capability and systems development is proposed to be supported in a Collaborative program. This approach will ensure systems are in place to develop the required skills and capability of its operatives and information infra-structure to support all technological developments in material handling.

This project will develop a high level economic analysis that can be disseminated to the whole of the processing industry however in the case of the red meat processor involved in the project it will assist with their strategic imperative area of material handling. The primary benefit of the project is to develop skills and capability inhouse with key personnel involved in R&D to identify and evaluate priority R&D areas. It is anticipated as a result of the project that new standardised reporting procedures and frameworks will be implemented.

2 Project Objectives

Expected outcomes of this project with Greenleaf are:

- To develop a thorough understanding in the value of building their skills and capability in Cost Benefits Analysis and Methodology
- Build capability in the knowledge and understanding of collecting and interpreting Cost Benefits Analyses
- Identify priority P&P R&D areas for red meat processing companies

The proposed solution in this document is to automate the palletising, temporary storage and retrieval of cartons into and from a short term holding chiller. Also proposed to re-introduce product into existing facilities in an organised sequence ready for container loading or automated palletising for storage. The sections between item 1 and 3 in the diagram below identify the area of the process that require materials handling solutions to support automated container loading.

This will ensure greater accuracy and timeliness in accessing new R&D opportunities to back a greater proportion of winners with the optimum payback. It is anticipated that this will encourage a more positive culture of putting ideas forward when processors have an agreed company CBA framework in place.

Specifically the desired outcomes are:

- Develop a thorough understanding in the value of building their skills and capability in Cost Benefits Analysis and Methodology to determine primary R&D focus areas
- Build capability in the knowledge and understanding of collecting data and interpreting Cost Benefits Analyses to inform business investment decisions
- Identify priority R&D areas within red meat processing companies
- Inform company's business improvement strategic plans and identify primary focus project areas and initiatives
- Deliver a CBA Analysis and Methodology package that can be disseminated to other processors including current CISP partners and/or other red meat processors.

By Greenleaf partnering with MLA to conduct the initial assessment in the short term, it is anticipated that red meat processors will gain insight into the strategic importance of collecting and interpreting financial impact data using CBAs (cost benefits analyses). This project is critical to the company's business improvement strategic planning and is expected to encourage development of company's capability in this area to evaluate priority areas.

The expected Collaborative Innovation Strategies Program (CISP) outcomes between companies and MLA are:

1) Materials Handling solutions to address(pallet storage to carton dispatch)
    - Automation of information – integration of information for optimal processing efficiencies
    - Optimal semi-and/or automated palletisation & de-palletisation processes
    - Value proposition, scoping and feasibility study to be developed for cold stores & materials handling program opportunity to have independent review and recommendations
    - Modelling of information using in current production including product flow and mix.

3 Methodology

3.1 Data Quality Control

The processor's data base was interrogated in a first pass to determine what types of data would be available to assist in determining the finer details of design required to address the company's unique mix of clients and customer orders. Data was collected from a number of day's production and depending on the client code, had container order details associated with it.

The data obtained to date has a number of gaps in information so assumptions have been made about container order size and frequency. It has been assumed the data is representative of 12 months production but testing of a wider sample of data would be useful in quantifying peaks and troughs in production that will impact on the capacities of the required integrated solutions.

3.2 Data Analysis

The purpose of the analysis is to provide what-if-analysis of a range of different hourly carton capacities for diversion, staging, retrieval and re-introduction of cartons to the container loading process. This analysis is based on fixed assumptions but requires an iterative data review process as different combinations of solutions with different capital investment and benefits are weighed up.

4 Results and Discussion

The data provided to date has been modelled across three progressive iterations as assumptions have been developed and various capital options have been investigated and compared. This scoping and design process is currently undertaking involves weighing up a range of different options. The most recent design options the processor is considering may not be included in the following stages of data analysis.

4.1 First stage data analysis

This section describes the first pass of data analysis and the questions that arose from the analysis.

Below is a summary of orders processed on 12/6/2013 to 14/6/2013 and 18/6/2013. A modelling tool was developed to drill into and process the order data based on a range of configurable assumptions. In order to assess which orders would be best suited to go through the automation process, we used filters of:

- Less than or equal to 4 hours to process the whole order
- At least 200 boxes in an order (i.e. enough to be a container type order)
- This resulted in the 5 yellow shaded orders in the table below. This equates to 8.6% of the total 58 orders and 20% of the total boxes for all orders. (Note this data excludes the non-order boxes).

Order	Min Prod DateTime	Max Prod DateTime	Total Boxes	#	Hours to Fill	# Product Groups	Avg Products/ Group	Min Products/ Group	Max Products/ Group	Use in Calcs	Used Boxes
13	12/06/2013 23:04	14/06/2013 16:14	6,987	1	41.160	56	124.8	1	812		
22	12/06/2013 08:29	18/06/2013 16:23	159	2	151.888	9	17.7	1	48		
82	12/06/2013 10:20	12/06/2013 14:48	41	3	4.470	2	20.5	16	25		
83	18/06/2013 06:20	18/06/2013 13:14	31	4	6.895	2	15.5	10	21		
144	12/06/2013 07:54	12/06/2013 13:05	18	5	5.181	4	4.5	2	8		
1108	13/06/2013 15:43	13/06/2013 15:55	15	6	0.201	1	15.0	15	15		
1120	14/06/2013 15:52	14/06/2013 15:56	3	7	0.070	1	3.0	3	3		
1739	13/06/2013 05:54	13/06/2013 09:11	198	8	3.273	1	198.0	198	198		
1749	14/06/2013 07:27	14/06/2013 12:57	62	9	5.499	5	12.4	2	24		
1750	14/06/2013 06:46	14/06/2013 06:51	2	10	0.085	1	2.0	2	2		
2650	13/06/2013 05:52	13/06/2013 09:01	300	11	3.134	1	300.0	300	300	1	300
5333	14/06/2013 08:23	14/06/2013 10:38	22	12	2.262	1	22.0	22	22		
5710	13/06/2013 09:52	13/06/2013 10:10	30	13	0.287	1	30.0	30	30		
5770	13/06/2013 10:21	13/06/2013 10:39	35	14	0.299	1	35.0	35	35		
5797	13/06/2013 14:33	13/06/2013 15:59	25	15	1.429	1	25.0	25	25		
5798	13/06/2013 15:27	13/06/2013 16:05	20	16	0.625	1	20.0	20	20		
6657	12/06/2013 10:17	12/06/2013 16:05	496	17	5.784	11	45.1	9	117		
6661	18/06/2013 11:05	18/06/2013 13:44	30	18	2.639	2	15.0	10	20		
6664	18/06/2013 06:02	18/06/2013 14:48	220	19	8.750	6	36.7	18	79		
13062	18/06/2013 06:49	18/06/2013 13:37	210	20	6.806	9	23.3	3	68		
60186	13/06/2013 06:10	14/06/2013 16:10	955	21	33.997	21	45.5	6	115		
60236	13/06/2013 09:02	13/06/2013 09:55	77	22	0.887	2	38.5	28	49		
60237	13/06/2013 05:54	13/06/2013 09:26	133	23	3.540	2	66.5	42	91		
60287	12/06/2013 08:15	12/06/2013 17:17	815	24	9.025	48	17.0	1	84		
60288	12/06/2013 07:15	12/06/2013 15:49	508	25	8.569	32	15.9	2	50		
60289	12/06/2013 09:31	12/06/2013 10:10	8	26	0.636	2	4.0	3	5		
60290	18/06/2013 12:43	18/06/2013 16:24	556	27	3.681	26	21.4	3	50	1	556
60291	18/06/2013 06:35	18/06/2013 16:30	503	28	9.913	22	22.9	4	46		
60297	18/06/2013 05:48	18/06/2013 10:57	839	29	5.141	14	59.9	12	121		
60318	14/06/2013 05:52	14/06/2013 15:50	630	30	9.971	22	28.6	1	100		
60322	13/06/2013 09:53	14/06/2013 15:21	444	31	29.466	11	40.4	2	130		
60328	13/06/2013 05:51	13/06/2013 09:48	1,560	32	3.945	10	156.0	10	455	1	1560
60329	13/06/2013 05:53	13/06/2013 09:40	1,340	33	3.786	10	134.0	5	455	1	1340
60336	13/06/2013 09:52	13/06/2013 15:44	1,064	34	5.856	4	266.0	50	594		
60337	13/06/2013 09:57	13/06/2013 13:08	500	35	3.171	2	250.0	200	300	1	500
60342	13/06/2013 09:54	14/06/2013 08:27	370	36	22.562	3	123.3	95	175		
60345	13/06/2013 09:47	14/06/2013 13:21	282	37	27.556	6	47.0	22	125		
60352	12/06/2013 00:03	12/06/2013 22:38	15	38	22.585	6	2.5	1	7		
60356	13/06/2013 09:58	14/06/2013 16:14	1,129	39	30.261	6	188.2	28	295		
60361	14/06/2013 00:05	14/06/2013 00:13	33	40	0.143	9	3.7	1	7		
60364	14/06/2013 00:13	14/06/2013 00:13	1	41	0.000	1	1.0	1	1		
60383	12/06/2013 07:13	12/06/2013 07:13	1	42	0.000	1	1.0	1	1		
60384	12/06/2013 05:58	12/06/2013 06:31	68	43	0.553	11	6.2	1	12		
60385	12/06/2013 06:20	12/06/2013 07:14	43	44	0.902	11	3.9	1	9		
60390	13/06/2013 16:00	14/06/2013 10:06	29	45	18.110	4	7.3	1	15		
60391	14/06/2013 07:37	14/06/2013 08:19	10	46	0.710	1	10.0	10	10		
60396	13/06/2013 15:48	13/06/2013 15:58	49	47	0.175	1	49.0	49	49		
60400	14/06/2013 06:03	14/06/2013 14:12	34	48	8.158	2	17.0	16	18		
60421	12/06/2013 06:38	12/06/2013 07:14	25	49	0.592	13	1.9	1	7		
60434	12/06/2013 17:30	12/06/2013 22:17	394	50	4.779	19	20.7	3	82		
60439	13/06/2013 15:51	13/06/2013 16:02	35	51	0.194	1	35.0	35	35		
60440	13/06/2013 09:58	13/06/2013 10:20	65	52	0.361	1	65.0	65	65		
60445	12/06/2013 07:35	12/06/2013 10:35	30	53	2.991	3	10.0	1	26		
60454	12/06/2013 07:21	12/06/2013 09:15	25	54	1.893	1	25.0	25	25		
60490	18/06/2013 06:03	18/06/2013 06:37	7	55	0.557	1	7.0	7	7		
92629	13/06/2013 10:10	13/06/2013 13:32	78	56	3.372	1	78.0	78	78		
92639	14/06/2013 08:33	14/06/2013 15:09	86	57	6.600	2	43.0	21	65		
92662	14/06/2013 09:09	14/06/2013 09:18	2	58	0.154	1	2.0	2	2		
Grand To	**12/06/2013 00:03**	**18/06/2013 16:30**	**21,647**							**5**	**4,256**
										8.6%	**19.7%**

The next table shows the rate at which boxes are ready for packing for 3 of the 5 selected orders. As can be seen, these 3 orders are being filled simultaneously which would mean having enough bays on hand to store 2 of the orders while the other is being packed into the container. Since the initial thought was to only have one order at a time going through the automated process, we have then removed the smaller of these 3 orders – 2605 and 60329.

	2650	60328										60329									
Prod DateTime	2650	1064	1070	1073	1228	1229	1240	1241	1242	1243	1245	1067	1071	1072	1073	1228	1229	1230	1241	1243	1245
13/06/2013 05:51			6																		
13/06/2013 05:52	6																				
13/06/2013 05:53																	7				
13/06/2013 05:53	6																				
13/06/2013 05:53									8												
13/06/2013 05:55																7					
13/06/2013 05:55																7					
13/06/2013 05:55																7					
13/06/2013 05:55													6								
13/06/2013 05:55	6																				
13/06/2013 05:55	6																				
13/06/2013 05:55																	7				
13/06/2013 05:56																				6	
13/06/2013 05:56																	7				
13/06/2013 05:59																					6
13/06/2013 05:59																	7				
13/06/2013 06:00														6							
13/06/2013 06:00			6																		
13/06/2013 06:00							7														
13/06/2013 06:01							7														
13/06/2013 06:01	6																				
13/06/2013 06:01																				6	
13/06/2013 06:01																				6	
13/06/2013 06:02	6																				
13/06/2013 06:02																		7			
13/06/2013 06:02							7														
13/06/2013 06:02									8												
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13/06/2013 06:03																	7				
13/06/2013 06:03									8												
13/06/2013 06:04							7														
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13/06/2013 06:04		6																			
13/06/2013 06:05																				6	
13/06/2013 06:05	6																				
13/06/2013 06:05																					6
13/06/2013 06:05																					6
13/06/2013 06:06																				6	

Based on the assumptions that each container row is made up of 20 boxes and each holding bay can also hold a maximum of 20 boxes, we concluded that 25 bays would be needed to cover the maximum required from these 3 orders. This was calculated by building up the number of boxes coming down the conveyer per product with the robot packing them into the container once each bay reaches 20.

In practice the robot (or robot driver) may know to start emptying a bay before it fills up so the number of bays could be reduced. However, we have also assumed the robot will empty a bay as soon as it reaches 20 whereas in some cases multiple bays reached 20 around the same time which the robot wouldn't be able to empty – so more bays would be needed.

Now other criteria could be taken into account such as only selecting orders with fewer products. This would reduce the number of orders going via the robot again.

Another approach would be to build the upper sorting/holding bay first. This would mean the boxes sent to the manual process at present would be much more streamlined initially and when the robot system is installed, only one conveyer belt would be needed as the sorting robot would only send a single product at a time for the order. Once all the rows for that product were sent, the second product would be sent.

With the assumption that these bays will cater for 300 boxes and increasing the maximum time from start to completion of an order to 8 hours, we get the following table which caters for 33.5% of all boxes and requires 21 x 300 capacity bays in total. The theory behind this is that boxes are being sent down to the containers at the same rate as they are entering the sorting/holding bay. So on average one entire order would need to be stored before the process was in full swing. This theory obviously needs some more rigorous tests but it gives a good first estimate.

The biggest issue is getting to more than 33% of boxes being processed by the robot is the smallness of the order and the length of time to process. If length of time wasn’t an issue as the sorting/holding facility is refrigerated, then this may not be an issue.

												Max Bays	21
Order	Min Prod DateTime	Max Prod DateTime	Total Boxes	#	Hours to Fill	# Product Groups	Avg Products/ Group	Min Products/ Group	Max Products/ Group	Use in Calcs	Used Boxes	Bays Needed	Used Bays
13	12/06/2013 23:04	14/06/2013 16:14	6,987	1	41.160	56	124.8	1	812			67	0
22	12/06/2013 08:29	18/06/2013 16:23	159	2	151.888	9	17.7	1	48			2	0
82	12/06/2013 10:20	12/06/2013 14:48	41	3	4.470	2	20.5	16	25			4	0
83	18/06/2013 06:20	18/06/2013 13:14	31	4	6.895	2	15.5	10	21			1	0
144	12/06/2013 07:54	12/06/2013 13:05	18	5	5.181	4	4.5	2	8			5	0
1108	13/06/2013 15:43	13/06/2013 15:55	15	6	0.201	1	15.0	15	15			1	0
1120	14/06/2013 15:52	14/06/2013 15:56	3	7	0.070	1	3.0	3	3			1	0
1739	13/06/2013 05:54	13/06/2013 09:11	198	8	3.273	1	198.0	198	198			1	0
1749	14/06/2013 07:27	14/06/2013 12:57	62	9	5.499	5	12.4	2	24			11	0
1750	14/06/2013 06:46	14/06/2013 06:51	2	10	0.085	1	2.0	2	2			6	0
2650	13/06/2013 05:52	13/06/2013 09:01	300	11	3.134	1	300.0	300	300	1	300	21	21
5333	14/06/2013 08:23	14/06/2013 10:38	22	12	2.262	1	22.0	22	22			2	0
5710	13/06/2013 09:52	13/06/2013 10:10	30	13	0.287	1	30.0	30	30			32	0
5770	13/06/2013 10:21	13/06/2013 10:39	35	14	0.299	1	35.0	35	35			26	0
5797	13/06/2013 14:33	13/06/2013 15:59	25	15	1.429	1	25.0	25	25			14	0
5798	13/06/2013 15:27	13/06/2013 16:05	20	16	0.625	1	20.0	20	20			11	0
6657	12/06/2013 10:17	12/06/2013 16:05	496	17	5.784	11	45.1	9	117	1	496	11	11
6661	18/06/2013 11:05	18/06/2013 13:44	30	18	2.639	2	15.0	10	20			2	0
6664	18/06/2013 06:02	18/06/2013 14:48	220	19	8.750	6	36.7	18	79			6	0
13062	18/06/2013 06:49	18/06/2013 13:37	210	20	6.806	9	23.3	3	68	1	210	6	6
60186	13/06/2013 06:10	14/06/2013 16:10	955	21	33.997	21	45.5	6	115			1	0
60236	13/06/2013 09:02	13/06/2013 09:55	77	22	0.887	2	38.5	28	49			11	0
60237	13/06/2013 05:54	13/06/2013 09:26	133	23	3.540	2	66.5	42	91			4	0
60287	12/06/2013 08:15	12/06/2013 17:17	815	24	9.025	48	17.0	1	84			1	0
60288	12/06/2013 07:15	12/06/2013 15:49	508	25	8.569	32	15.9	2	50			13	0
60289	12/06/2013 09:31	12/06/2013 10:10	8	26	0.636	2	4.0	3	5			1	0
60290	18/06/2013 12:43	18/06/2013 16:24	556	27	3.681	26	21.4	3	50	1	556	3	3
60291	18/06/2013 06:35	18/06/2013 16:30	503	28	9.913	22	22.9	4	46			1	0
60297	18/06/2013 05:48	18/06/2013 10:57	839	29	5.141	14	59.9	12	121	1	839	2	2
60318	14/06/2013 05:52	14/06/2013 15:50	630	30	9.971	22	28.6	1	100			0	0
60322	13/06/2013 09:53	14/06/2013 15:21	444	31	29.466	11	40.4	2	130			0	0
60328	13/06/2013 05:51	13/06/2013 09:48	1,560	32	3.945	10	156.0	10	455	1	1560	0	0
60329	13/06/2013 05:53	13/06/2013 09:40	1,340	33	3.786	10	134.0	5	455	1	1340	0	0
60336	13/06/2013 09:52	13/06/2013 15:44	1,064	34	5.856	4	266.0	50	594	1	1064	0	0
60337	13/06/2013 09:57	13/06/2013 13:08	500	35	3.171	2	250.0	200	300	1	500	0	0
60342	13/06/2013 09:54	14/06/2013 08:27	370	36	22.562	3	123.3	95	175			0	0
60345	13/06/2013 09:47	14/06/2013 13:21	282	37	27.556	6	47.0	22	125			0	0
60352	12/06/2013 00:03	12/06/2013 22:38	15	38	22.585	6	2.5	1	7			0	0
60356	13/06/2013 09:58	14/06/2013 16:14	1,129	39	30.261	6	188.2	28	295			0	0
60361	14/06/2013 00:05	14/06/2013 00:13	33	40	0.143	9	3.7	1	7			0	0
60364	14/06/2013 00:13	14/06/2013 00:13	1	41	0.000	1	1.0	1	1			0	0
60383	12/06/2013 07:13	12/06/2013 07:13	1	42	0.000	1	1.0	1	1			0	0
60384	12/06/2013 05:58	12/06/2013 06:31	68	43	0.553	11	6.2	1	12			0	0
60385	12/06/2013 06:20	12/06/2013 07:14	43	44	0.902	11	3.9	1	9			0	0
60390	13/06/2013 16:00	14/06/2013 10:06	29	45	18.110	4	7.3	1	15			0	0
60391	14/06/2013 07:37	14/06/2013 08:19	10	46	0.710	1	10.0	10	10			0	0
60396	13/06/2013 15:48	13/06/2013 15:58	49	47	0.175	1	49.0	49	49			0	0
60400	14/06/2013 06:03	14/06/2013 14:12	34	48	8.158	2	17.0	16	18			0	0
60421	12/06/2013 06:38	12/06/2013 07:14	25	49	0.592	13	1.9	1	7			0	0
60434	12/06/2013 17:30	12/06/2013 22:17	394	50	4.779	19	20.7	3	82	1	394	0	0
60439	13/06/2013 15:51	13/06/2013 16:02	35	51	0.194	1	35.0	35	35			0	0
60440	13/06/2013 09:58	13/06/2013 10:20	65	52	0.361	1	65.0	65	65			0	0
60445	12/06/2013 07:35	12/06/2013 10:35	30	53	2.991	3	10.0	1	26			0	0
60454	12/06/2013 07:21	12/06/2013 09:15	25	54	1.893	1	25.0	25	25			0	0
60490	18/06/2013 06:03	18/06/2013 06:37	7	55	0.557	1	7.0	7	7			0	0
92629	13/06/2013 10:10	13/06/2013 13:32	78	56	3.372	1	78.0	78	78			0	0
92639	14/06/2013 08:33	14/06/2013 15:09	86	57	6.600	2	43.0	21	65			0	0
92662	14/06/2013 09:09	14/06/2013 09:18	2	58	0.154	1	2.0	2	2			0	0
Grand Total	**12/06/2013 00:03**	**18/06/2013 16:30**	**21,647**							**10**	**7,259**		
										17.2%	**33.5%**		

4.2 Second stage analysis

During the Picking, Packing and Materials handling review, the red meat processor identified certain planned automated solutions. One solution to ensure the container loader is operating at capacity and not waiting for cartons to flow out of the chill tunnel is to sort and hold cartons for an order until all product is available. The automation of container loading requires management of the flow of cartons from production to allow buffered staging of cartons into orders until the full container load is ready. One of these solutions included a combination of:

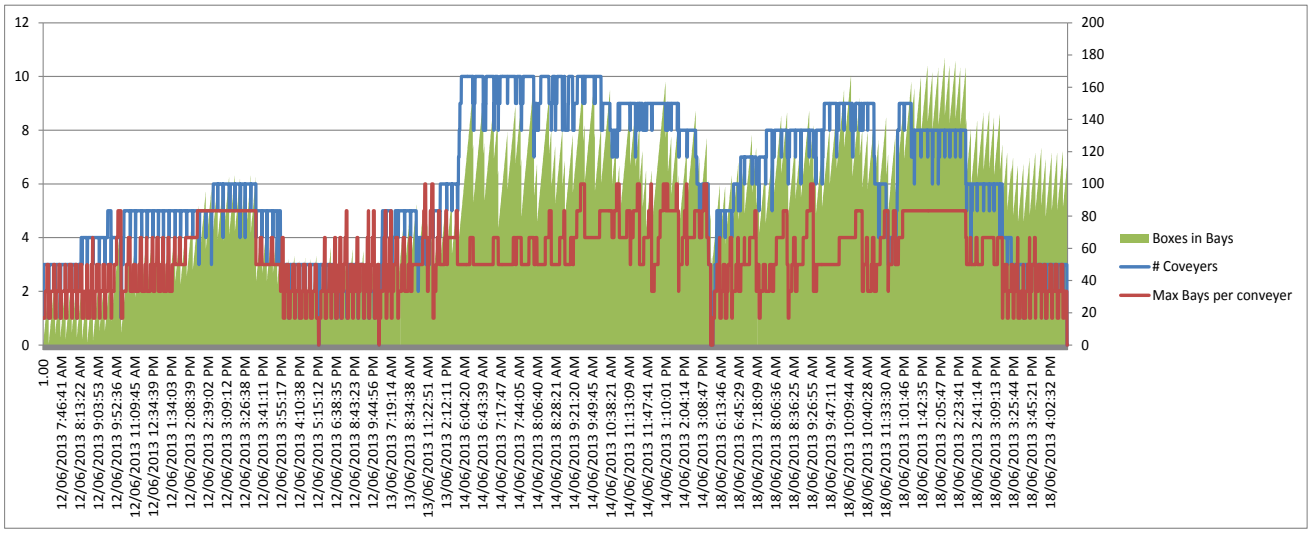
- Staging on conveyors for quick to fill orders
- Automated palletisation, storage and retrieval from pallet racks for slower to fill orders

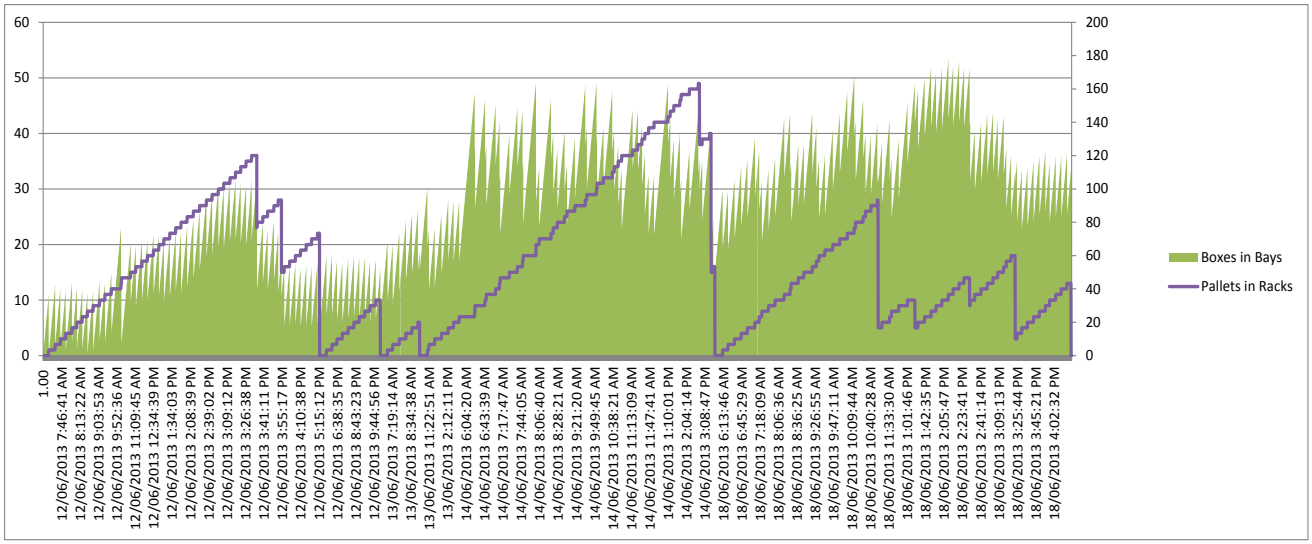
Following further discussions, Greenleaf have conducted some initial analysis to highlight some summary figures based on these planned solutions.

4.2.1 Option 1 (Combination of conveyors and palletisation)

- 24% of orders or 68.5% of cartons were included to be part of the automated system in this analysis
- Over the days from the 12/6/2013 to the 18/6/2013, a maximum of 10 conveyers with capacity for 6 bays was required – i.e. 10 x 36 carton conveyer belts
- Over the same period, a maximum of 49 pallet racks were required.

These figures can be seen in the graphs below which track the stocking capacity required over that time period.



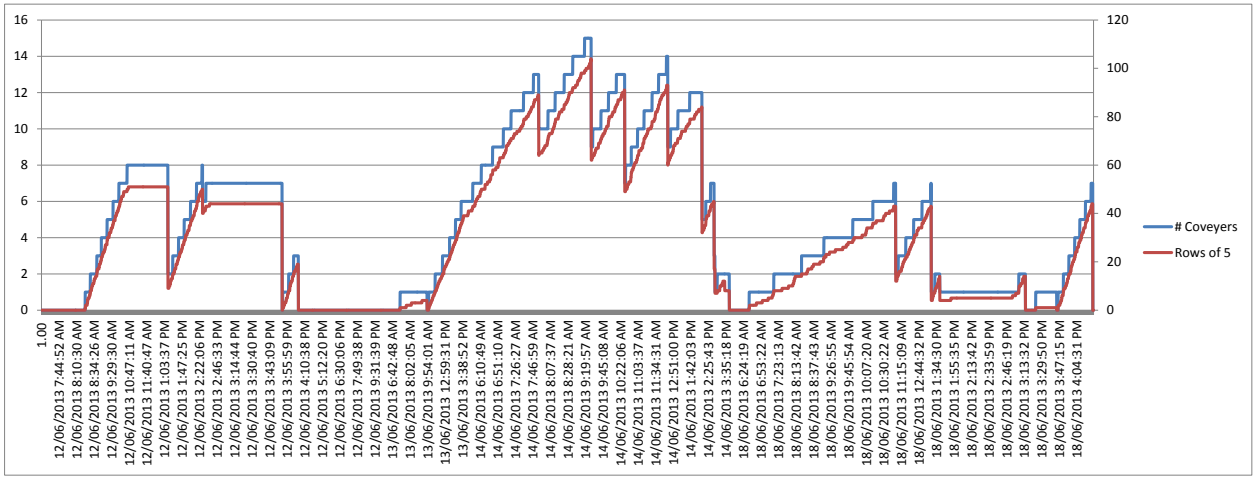


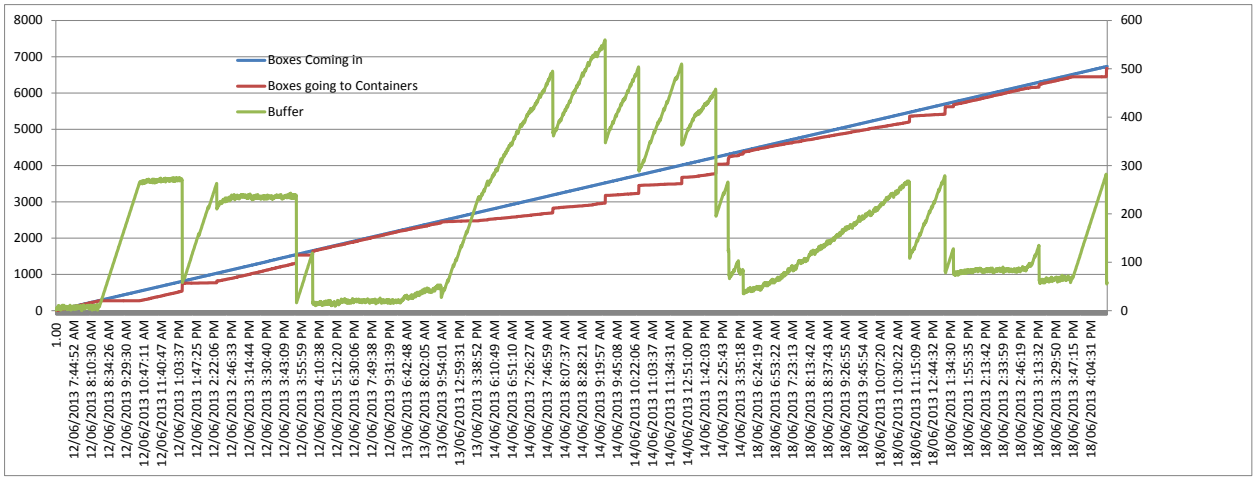
4.2.2 Summary Option 2 (conveyor staging only)

Another option in order to eliminate the palletiser and pallet racking altogether, would be to sort and hold the cartons in the conveyers until it was able to send them down to the container. Using the same process we employed above and holding an entire order until fully stored before sending down to the container, we would need 49 conveyers of the same size as suggested above (i.e. each holding 36 cartons).

- 24% or orders or 68.5% of cartons were included to be part of the automated system in this analysis
- <u>This analysis removed the palletising system and used conveyers only</u>
- Over the days from the 12/6/2013 to the 18/6/2013, a maximum of 15 conveyers with capacity for 6 bays was required – i.e. 15 x 35 carton conveyer belts
- At $50,000 per conveyer belt, this equates to a total cost of $750,000

These figures can be seen in the graphs below which track the stocking capacity required over that time period.





4.2.3 Assumptions

The second and third analyses were based on the following process flow:

1. Cartons are moved out of the blast Chillers into the sorting Conveyer system
    a. The assumptions made are:
        i. Only data with order numbers were considered – this is suspected to be flawed as all the night time data had no order numbers
        ii. Only orders of 300 or more cartons were considered
        iii. Each conveyer will have a number of bays – each bay carrying 6 cartons (the number required to stack a row on a pallet)
        iv. Each conveyer will only carry one order and one box size at any one time (this is a worst case scenario. A more detailed programming approach would still require each bay within each conveyor to be unique but allow the bays to carry different box sizes or even different orders. Since this analysis is based on one pallet being loaded at a time, this type of approach would need to ensure the next row of the same order was at the front of one of the conveyers.)
2. Cartons are then packed onto pallets and moved into the Pallet Racking
    a. The assumptions made are:
        i. Only one pallet can be loaded at any one time.
        ii. Each pallet will contain only one order
        iii. Each row of a pallet will be the same box size but each row may be of a different box size.
        iv. It is assumed each pallet row contains 6 cartons and a pallet contains 6 rows.
        v. A pallet does not begin being loaded until all the required 36 cartons are in the conveyer belts. This presents a worst case scenario regarding the number of conveyers required. Since the list of cartons coming out of the chiller in order will be known at the start of the day, the packing process could begin as soon as a pallet row is ready thereby potentially slightly reducing the number of conveyers required.

3. Pallets are pulled back out of the Pallet Racking and loaded onto another conveyer belt and sent down to the container loading dock
    a. The assumptions made are:
        i. Pallets do not begin being processed until the entire order is in the pallet racking. This presents a worst case scenario regarding the number of pallet racks required. Since the list of cartons coming out of the chiller in order will be known at the start of the day, the packing process could begin as soon as a pallet is ready thereby potentially reducing the number of racks required

4.2.4 Anomalies

Most orders had box configurations not divisible by 36 – i.e. not filling a whole pallet. One example of this is Order 60287 which had 2 x 4 inch boxes, 1 x 6 inch cartons and 2 x 8 inch cartons left over after filling all other cartons onto pallets. Because of the size differences and the fact that no box size fits a full row, these were ignored in this analysis.

5 Conclusions/Recommendations

The key findings of the project were:

- The data supplied has provided good insights but does not yet fully reflect or support the full combination of options being considered. The following actions are suggested to fill this gap.
- Analysis should be done around possibility of configuring new infrastructure to handle a much higher percentage of cartons than the 65% in these scenarios in order to further reduce double handling and increase labour savings.
- More data is required to complete any further investigation. It would be ideal for this to include:
    - More details around orders for some of the data already supplied
    - A larger sample of data to capture peaks and troughs in production over time that the system will be required to manage
    - Capital costing estimates for the range of options being proposed to a more helpful trade-off of options for red meat companies to consider
- Present details of findings back to the processor involved in the project in order to refine preferred options and accommodate any new assumptions.

6 Key Messages

The key outcomes of this project were:

- A red meat processor is developing a thorough understanding in the value of building their skills and capability in Cost Benefits Analysis and Methodology to determine primary R&D focus areas
- Build capability in the knowledge and understanding of collecting data and interpreting Cost Benefits Analyses to inform business investment decisions
- Identify priority R&D areas within red meat companies
- Inform red meat company's business improvement plans and identify primary focus project areas and initiatives
- Deliver a CBA Analysis and Methodology package that can be disseminated to other processors including current CISP partners and/or red meat industry SMEs.

The next step will be to present details of findings back to the processor involved in the project in order to refine preferred options and accommodate any new assumptions. Following acceptance, targeted CISP partner visits will be established by MLA and the provider (Greenleaf) to share the process and methodology more broadly across the industry.