Final report

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Prepared by: Greenleaf Enterprises

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Quantifying the value proposition to the Australian Beef Industry of freezing and transporting frozen trimmings without a carton

Naked Block Project Cost Review

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Executive Summary

The Australian Beef Processing industry is investigating the viability of an alternative method for production, handling and transport of frozen trimmings to the final manufacturer. The objective is to develop a more efficient and cost effective supply chain for the distribution of frozen trimmings to some markets.

Previous studies demonstrated the potential to produce frozen blocks without cartons (referred to in this project as Naked Blocks) rather than conventional 60lb frozen trim cartons. Technology could be developed and installed at individual processing plants or alternatively at a centralized facility. Both options provide various challenges and benefits and will have different impacts on the existing processing facilities and on the subsequent benefits to industry.

Processors, transporters, import cold stores and grinding companies were consulted to understand the net benefits of this technology and to quantify the value proposition for a future commercial frozen block system on the various supply chain participants.

Benefits to the supply chain

Naked block technology delivers the following primary benefits:

1. Reduction in packaging costs
2. Reduction in product quality risks (Plastic entrapment)
3. Reduction in labour cost (magnitude of savings depends on plant processes)
4. Increase in product sales value (dependant on existing performance)
5. Reduced inspection costs

Naked block technology has the potential to deliver the following additional benefits which are dependent on a processing plant's existing infrastructure:

1. Expansion to freezing capacity at a reduced capital cost compared to traditional plate freezing and cold storage capital
2. Increased production volumes where existing trimming sorting and pack off infrastructure limit boning room volume

Return on Investment for Australian Processors

The *physical implementation* of naked block technology is variable on a plant by plant basis. The *operational differences* across the plants investigated impacted significantly on the effectiveness of naked block to deliver an acceptable return to that plant. Even within plant the return on investment varied considerably depending on which capital infrastructure options were possible.

Processors most likely to generate an acceptable return on investment will fit into the following scenarios:

1. Large volumes of off-site plate freezing and cold storage;
2. Trim sortation labour is used primarily for product handling and packaging, not for QA inspection or CL blending;
3. Plants considering increasing production volume beyond the limits of existing plate freezers and storage, AND have open space in close proximity to the boning room to build naked block infrastructure;
4. Have spare plate freezing capacity AND require minimal capex to transfer product from the boning room to the plates AND can reduce labour as per point 2 above.

For some processing plants naked block investment is feasible with cost reductions around $0.17/kg while others would require an additional price premium before considering naked block.

It should also be noted that naked block production requires changes to existing product specification and would require volume commitments from the customer or the investment would be too risky.

Automation of the packing line requires trim re-sizing through a course kidney plate grinder. Where frozen block volumes required to achieve plant benefits (such as removal of trim packing staff) exceed customer volumes, it has been assumed the product will be packed automatically into cartons post freezing. Processors would need to confirm if re-sized product was acceptable to other customers.

Centralised processing of naked block was not considered a viable option given the cost of bulk bins being the same as frozen cartons, unless of course, the customer saw a large enough price incentive to encourage processor investment, coupled with supply contracts.

Benefits for Inspection Houses

Inspection Houses will benefit in the order of $16.65 USD per load if product was presented as naked block including the following benefits:

1. Reduced inspection house labour cost to less than 15% of current requirements
2. Reduction of USDA inspection time by half
3. Eliminate shrink wrap material cost and time to shrink wrap pallets
4. Reduce the time product stands on loading docks by almost 30 minutes per load, freeing up space for other activities

Total benefits for this sector if all Australian product destined for McDonalds USA was processed as naked block is approximately $70,000 USD per annum. Savings in loading dock time and reduced USDA inspector time was not counted as a cost saving.

No capital investment is required at the inspection houses to achieve these benefits.

Benefits for Grinding Companies

The total benefits are estimated at $0.011 USD/kg based on figures provided by the US companies.

The key areas of benefit to the grinders by using naked block include:

1. Reduction in the amount of waste generated and subsequent disposal costs
    a. Sustainability benefits are a direct result of these reductions with 1100MT of packaging savings per annum
2. Reduction in labour involved in removal and disposal of frozen carton packaging.
    a. 2.7 labour units per plant per day if all frozen trim is converted to naked block
3. Reduced risk of plastic entrapment
    a. No cost was counted for the USA but should be counted for more sensitive markets like Japan.

No capital investment is required at the grinders to achieve these benefits.

Figure 1 on the following page identifies the decisions a processor would need to consider in determining naked block's relevance to their business.

Figure 2 shows the distribution of benefit between different types of processors relative to the inspection houses and grinders who would be receiving the naked block product.

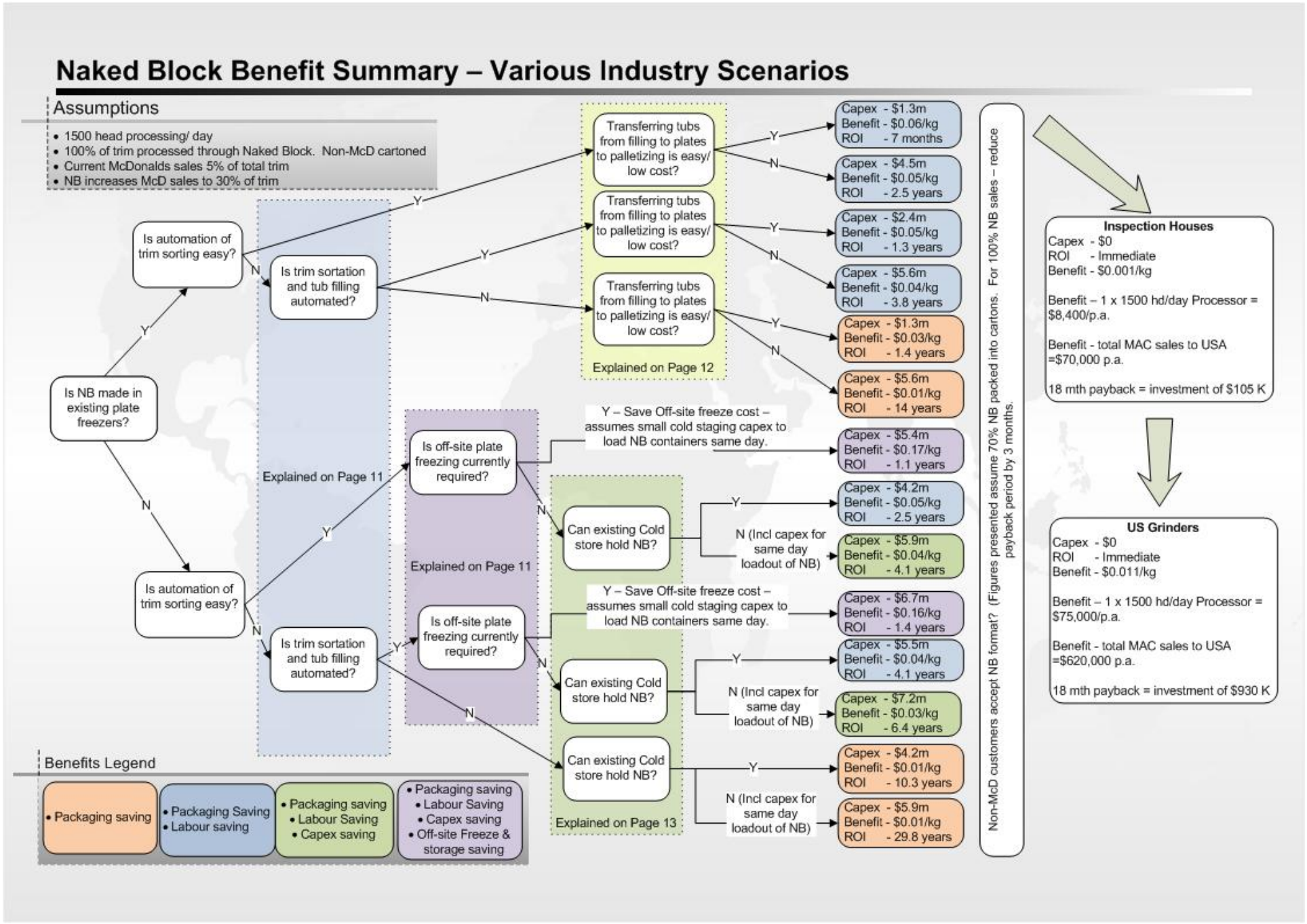

Figure 1: Matrix of decisions required by a processor to determine the potential opportunity of naked block and the return relative to downstream customers.

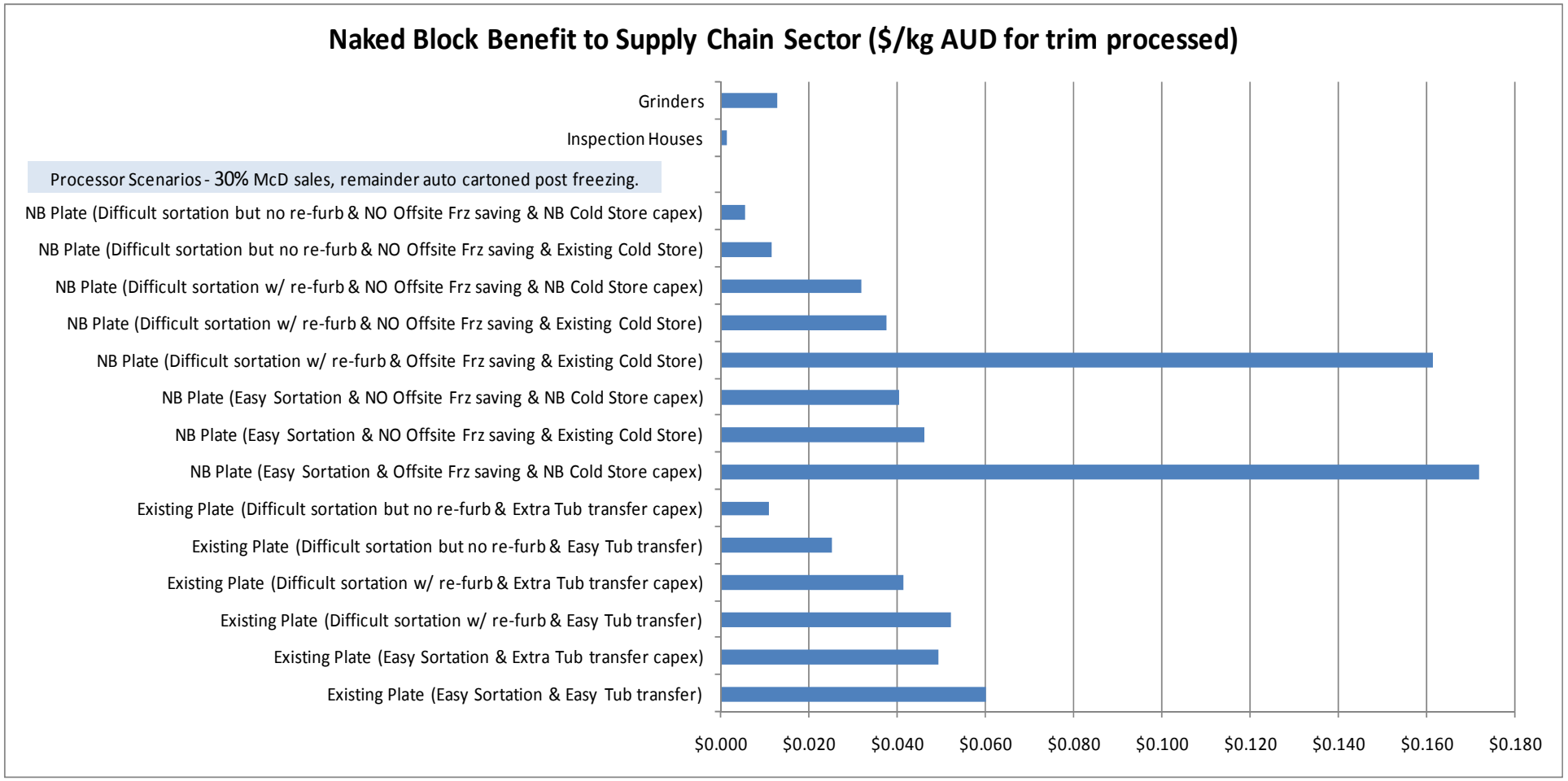

Figure 2: Relative distribution of naked block benefit between various processors, inspection houses and grinders

Background information

The Australian Beef Processing industry is investigating the viability of an alternative method for production, handling and transport of frozen trimmings to the final manufacturer. The objective is to develop a more efficient and cost effective supply chain for the distribution of frozen trimmings to some markets.

Project trials were commissioned prior to this report to test the technological challenges associated with this new process and to gain support from regulatory authorities and other sectors of the international supply chain that would be impacted by the changes. Trial results reported (MLA project: A.TEC.0056 Frozen meat for manufacturing and A.TEC.0067 Frozen Beef: Preliminary Consignment) indicate regulatory considerations are not significant and there are no barriers to proceeding with further technological developments.

Technology could be developed and installed at individual processing plants or alternatively at a centralized facility. Both options provide various challenges and benefits and will have different impacts on the existing processing facilities and on the subsequent benefits to industry. The net benefits of this technology to industry and the various tradeoffs between centralized and plant specific systems are not well understood.

Capital investment required to develop either option is considerable and would require further technology refinement before a commercial system could be proposed.

Objectives

The objective of this project is to conduct a value proposition analysis of a future commercial frozen block system on the various supply chain participants.

This analysis will determine the quantitative and qualitative benefits to processors, transporters, import cold stores and end users of adopting technology to produce frozen blocks without cartons (referred to in this project as Naked Blocks) rather than conventional 60lb frozen trim.

Methods

The previous research and trial shipments both in Australia and the USA provided a base of experience on which to investigate and quantify in this study the realistic cost and value considerations likely at each step in the supply chain. Detailed investigation and modeling was conducted for each key sector of the naked block supply chain including 1) Processor, 2) Transport and foreign inspection, and 3) Grinder/Manufacturer.

Australian processing plants

Extensive plant investigations were conducted with four Australian processing plants. Figures including sales values and packaging, labour, transport and other operational costs were provided on a confidential basis. From these figures costing models were built that allowed the plants involved to model their various scenarios and determine the costs, benefits and risks

associated with installation of Naked Block capabilities within their plants considering their existing infrastructure.

USDA Inspection Houses

The Naked Block trials in the USA in late 2008 were imported through the Mullica Hill Inspection House in New Jersey. They received and managed the physical product through their Inspection House in conjunction with USDA. A number of phone calls and numerous e-mails were made with Mullica Hill management in order to cost out and validate from their first hand experience during those trials the figures presented in Results and Discussion section below.

Australian and US Grinders

A series of questions were distributed to the 7 grinders in the USA and Australia that currently source product through MAC (McDonalds Asia-Pacific Consortium). Matt Toll from MAC also met with all the grinders in person to discuss the questions.

Responses were obtained by e-mail and further questions were clarified where required. Some grinders did not reply with hard numbers. Where gaps in data occurred benefits were assumed to be the same for those plants as the average results reported clearly by other plants. The average benefits were then applied to the total volume of trimmings being modelled.

Annual volume data supplied by MAC to the USA and other destinations was used to model the total industry benefit.

Results and Discussion

Findings from these investigations have been summarized using average industry costs and reported in this section as a non-confidential summary.

Processor Considerations

The *operational differences* across the plants investigated impacted significantly on the effectiveness of naked block to deliver an acceptable return to that plant.

The *physical implementation* of naked block technology is variable on a plant by plant basis due to a range of plant specific variables. Even within plants the return on investment varied considerably depending on which capital infrastructure options were possible.

Naked block technology delivers the following primary benefits:

1. Reduction in packaging costs
2. Reduction in product quality risks (Plastic entrapment)
3. Reduction in labour cost (magnitude of savings depends on plant processes)
4. Increase in product sales value (dependent on existing performance)

Naked block technology has the potential to deliver the following additional benefits which are dependent on a processing plant's existing limitations:

5. Expansion to freezing capacity at a reduced capital cost compared to traditional plate freezing and cold storage capital

6. Increased production volumes where trimming sorting and pack off limit boning room volume

Technology Benefits Unique to Naked Block

In making capital investment decisions, processors need to have a sound understanding of the technologies available to them, their trade-offs and the different value propositions each technology provides.

Separating the benefits unique to naked block technology from other operational benefits that could be achieved with existing technology is important. For example, where limited freezing capacity requires off-site freezing and cold storage, a plant could install traditional plate freezers just as easily as naked block freezers to eliminate these costs. The fundamental question is what additional benefits can be generated by using naked block freezing over existing solutions? For this reason unique naked block benefits are reported separately. Separating benefits this way achieves the following:

- Enables comparative benefit of naked block across different processor systems without confusing the benefits that have nothing to do with naked block's unique benefits

- Compares the relative distribution of Naked Block benefit received by processor, Inspection House, Grinder and End User without inflating processor benefits due to inclusion of operational investments (off-site cold storage for example) that could have achieved the same benefit for the processor but not benefited any other part of the supply chain.

Table 1 demonstrates the distribution of benefits where existing outside storage is eliminated with installation of naked block freezers.

Table 1: Existing conventional opportunities compared with unique naked block benefits for a plant using off-site freezing and storage

NAKED BLOCK BENEFITS (separated from operational improvements)					
Benefit Summary	$/Hd	$/kg	Per Day	Total (yearly)	% of Total
Benefits unique to Naked Block Technology	$ 1.16	$ 0.07	$ 1,623	$ 416,775	23.4%
Associated Operational Benefits*	$ 3.79	$ 0.16	$ 5,910	$ 1,364,008	76.6%

*Benefits that can be achieved without naked block technology such as off-site freezing and storage. Note the relative difference between these benefits will change depending on plants circumstances.

Trim Sorting and Packaging Area – Labour Savings

The process of transferring trim from the boning room to a packed carton requires a significant amount of labour. Naked block technology has the potential to improve process flow and reduce labour costs by automating the transfer of meat into the finished carton. This can be achieved automatically using a kidney plate grinder to reduce the size of trimmings, automatically fill trim

into tubs, freeze, de-tub and palletize. However, the existing process from creation of trim in the boning room through sorting for CL content, inspecting for defects, re-trimming and packaging into cardboard cartons varies significantly between plants. This variation impacts on the ease with which these labour savings can be achieved.

Plants that could most easily remove labour from the sorting and packing area by installing naked block have processes that:

- Ensure inspection for defects and further trimming occurs in the boning room before trim is placed on the trim belt; AND
- Are in close proximity to an external space large enough to build naked block infrastructure and transfer product to that area; AND
- Have large enough volume to pack the full range of CL contents, or have boners that accurately meet CL targets with minimal focus on blending in the sorting area

Across the plants reviewed, the opportunity for removal of labour without significant changes to product inspection programs and capital infrastructure varied from as little as 1 fulltime equivalent (FTE) per packing line per shift to as much as 10 FTE's per packing line per shift. The basis for these labour savings is that naked block technology quoted previously to MLA by external suppliers will deliver an automated method for size reduction, filling and weighing of plastic tubs.

Plants that rely heavily on their sorting and packing staff to inspect, trim and blend CL's will find it difficult to save any more than one labour unit per line with naked block unless they adapt their process to include the bullet points above. Plants in this position should not write off this opportunity quickly. Depending on plant size a labour saving opportunity between $750,000 - $1,250,000 per annum is realistic and may justify the adjustment to process flows.

Post freezing labour savings

Most plate freezers are loaded and unloaded with mixed product codes throughout the day's production, resulting in a large number of product lines to be palletised. Therefore, automated sorting and palletizing solutions are almost impossible, except for a smaller number of high volume product lines.

Inclusion of automated palletising is possible with naked block because the number of product codes requiring sorting and palletising is greatly reduced. Furthermore, the robots used to de-tub frozen blocks after freezing would palletise in the same process.

The total labour savings expected in this area depend on the operation, but range from 2 to 3 labour units per shift.

Naked block does not provide any benefits to plants that slip load containers in their current processes.

Packaging savings

There are a number of ways a plant could approach the installation of naked block from processing a small volume for US existing customers, to processing all off-site frozen product, through to processing 100% of trim produced. Depending on the volume sold as Naked Block, the capital equipment being quoted has the capability to robotically pack frozen blocks into thin cardboard cartons after freezing.

A slight reduction in packaging cost after freezing has been assumed due to no plastic liner and a thinner board grade to cover a pre-frozen block.

The net packaging benefit for a plant will depend on the percentage of product packed each of the three ways listed in Table 2 below.

Re-cartoning of frozen blocks may not produce significant savings in packaging costs. However, the ability to automate the process and remove labour in the trimming, sorting and packaging area produces significant savings.

Table 2: Naked Block Packaging Material Savings

Benefit Summary	$/kg	Packaging Saving $/kg
Naked Block Technology Benefits		
Packaging costs for existing 27.2 kg cartons	$ 0.042	
Naked Block Technology Costs		
Naked Block Packaging	$ 0.018	$ 0.024
Frozen Carton Packaging - Re-carton Naked Block	$ 0.037	$ 0.005

Energy savings vs. capital savings

Plate Freezers

Previous project reports highlighted the benefits of eliminating packaging (insulation) and reducing the thickness of frozen blocks to increase rate of freezing and therefore throughput in plate freezers.

It is important to note that the energy required to remove the same latent heat in the meat does not change. Packaging insulation will slow the rate of heat removal but the energy cost to freeze will be the same, even if the cycle time is only 2 hours in the case of naked block.

With a cycle time of 90 minutes and continuous load and unload of tubs, Naked Block plate freezing foot print and capital cost is significantly less than that required for standard plate freezers. The real cost saving is reduced capital infrastructure compared with conventional plate freezers.

Cold Storage infrastructure

Fast cycle times and continuous loading allows product to be removed and palletised as naked block pallets. This occurs closely in line with boning production volumes. Product could be

loaded into containers for same day shipment if required. This creates another capital advantage for plants that have limited cold storage space and currently send product off site for freezing and storage. Rather than build additional frozen pallet storage, a small palletising chiller and loading dock would be sufficient.

Summary of Capital Savings

The capital cost of conventional plate freezers and cold store facility was compared with naked block capital. Capital comparisons are highly dependent on a plants particular situation. However the cost differences shown in Table 3 below will give an indication of magnitude of capital savings.

Table 3: Capital saving for naked block compared to conventional plate freezing costs

CAPITAL COST DIFFERENCES - NAKED BLOCK vs. STANDARD PLATE FREEZER				
Freezing Technology	Total Capex	$/Hd	$/kg	Total (yearly)
Naked Block Freezing and Container Packing	$ 5.3M	$ 2.04	$ 0.026	$ 764,311
Standard Plate Freezing and Cold Store*	$ 11.6M	$ 3.71	$ 0.048	$1,394,870
Additional Capital for Naked Block#	-$ 6.3M	-$ 1.68	-$ 0.022	-$ 630,558

* Detailed capital cost assumptions are provided in Table 4 below

\# Naked Block Capital includes freezing and load out and is expressed as a reduction in capital cost over capex for standard plate freezing and cold storage infrastructure.

Table 4: Standard Plate Freezing Capital Cost estimate based on set carton capacity per day

Traditional Plate Freezer - OPTION 4

Plant Notes: Generic Plate freezing costs using assumption on the average cost per carton for capital. Additional capital for conveyors, auto load and unload, building etc may need to be included in the "Extra Considerations" cells.

Life expectancy	20	
		Annual Cost
Capital	**$ 8,205,115**	**$ 410,256**
Rough Capital $/ctn	$ 1,600	This is an estimated cost per carton space for plate freezing including In-feed, out-feed, transfer conveyors, building etc. These items have not been itemised in the "Extra Considerations" section.
Carton Capacity per day	4459	
Extra Considerations		
Extra Considerations		
Extra Considerations		
Extra Considerations		
Extra Considerations		
Extra Considerations		
Extra Considerations		
Extra Considerations		
Contingency @ 15%	$ 1,070,232	
Interest Cost	7.00%	$ 574,358
Plate Freezer - Option 4		$ 984,614

COLD STORAGE ONLY - OPTION 1

Plant Notes: Assuming traditional plate freezing and cold storage were built to hold product currently being sent off-site for freezing, this capex is the cold store component. This investment is required in conjunction with traditional plate freezing options above. Cold store needs to be large enough to hold product more than 24 hours. These costs will be compared against a Naked Block alternative to quantify the Naked Block Plate freezing capex benefit.

Freezer Life expectancy	20	
		Annual Cost
Capital	**$ 3,418,798**	**$ 170,940**
Rough Capital $/pallet space	$ 1,200	This is an estimated cost per pallet space including the loading dock and pallet racking.
Ctns/pallet	36	
Days Storage required	20	
Pallet Spcaes required	2,477	
Carton Capacity per day	4459	
Building	$ 2,972,868	
Stand Alone refrig		
Extra Considerations		
Extra Considerations		
Contingency @ 15%	$ 445,930	
Interest Cost	7.00%	$ 239,316
Cold Store - Option 1		$ 410,256

Space limitations for capital installation

Space limitations for installation of new freezing capital and constraints on integration with existing processes are unique for each plant. However, where space limitations currently inhibit expansion of conventional freezing capacity and onsite storage, naked block freezing with direct loading into shipping containers will provide more flexibility and at a reduced capital cost.

Sales value increase

MAC Rewards Sales Premiums

The MAC rewards program is an established sales premium paid retrospectively for compliance to measured performance standards. The rewards program consists of eight measurement criteria shown in the Table 5 below. The measurements highlighted in green will be definite advantages arising from naked block while the measures in light blue are potential benefits depending on the sophistication of the naked block process and how a plant manages load out procedures.

Table 5: MAC Rewards Sales Benefits (extract from processor modelling tool)

MAC Reward Benefits					
This section estimates the improvement in product achievement of MAC rewards. The MAC rewards benefits would remain the same so Naked Block will assist in achieving full rewards. Enter existing MAC rewards performance in the yellow cells and the estimated increase in MAC rewards will be calculated.					
MAC Rewards	**c/lb**	**Current Performance**	**Estimated Performance w/ NB**	**c/lb Increase**	**c/kg Increase**
Meeting CL targets	0.75	50%	80%	0.225	0.50
Eliminating plastic entrapment	0.5	0%	100%	0.5	1.10
FOB	0.5	50%	50%		
Age	0.25	50%	50%		
Reduced pack dates	0.25	50%	80%	0.075	0.17
Precise load weights	0.25	0%	90%	0.225	0.50
Shipping Reliability	0.25	50%	50%		
Refused Cartons	0.25	0%	95%	0.2375	0.52
Total MAC Rewards improvement	**3.00**			**1.26**	**2.78**

Depending on a plants current performance, the sales premium could be as much as $0.0278/kg for the three measures highlighted in green.

Other sales premiums

Extrapolating unsubstantiated sales premiums is very dangerous when investigating any capital justification. Our approach has been to quantify the net benefits of Naked Block, then using a

targeted return on investment, calculate the sales premium required to achieve that rate of return.

Depending on a plant's specific situation, the sales premium required to deliver a 24 month return on capital infrastructure ranged from requiring a price increase of $0.24/kg down to achieving a payback in 7 months with no price increase.

Centralised processing

The idea of building a centralised naked block processing plant near the port with trim from different processors feeding into it had previously been raised.

Potential benefits of central naked block processing

Processors, who send 100% of their trim in bulk bins to a central super plant for freezing, provided a number of novel advantages including:

- Minimal additional capital on plant where land is at a shortage
- Opportunity to remove labour from the plant
- Container weights could be increased due to heavier road axel limits near the port
- A more sophisticated naked block process at a "super plant" could optimise trim CL targets with blending
    - Blending to specific CL targets can greatly increase the value of trim by packing to the most profitable CL points for the current market. However, ownership of the centralised plant would affect whether blending benefited the processor.

One key premise around naked block is the reduction in packaging costs. Centralised processing would require load out of fresh trim from processors in bulk pallecons. This eliminates the packaging benefit for naked block because there is no difference in packaging cost between fresh pallecons and frozen 27.2 kg cardboard cartons. The high cost of CO^2 snow required in pallecons to reduce the meat temperature to acceptable load out temperatures drives fresh bulk bins to be as expensive as frozen cartons in Table 6 below.

Table 6: Comparison of Carton and Pallet packaging showing similar costs per kilogram

Fresh Australian Pallecon Costs		
Item	**Pallecon price**	**Cost per kg of trim**
CO2	$13.74	$ 0.015
Liners		$ -
Base, Box, Lid		$ -
Slip Sheet		$ -
Shrink Wrap		$ -
Label	$22.29	$ 0.025
TOTAL	**$ 36.03**	**$ 0.040**

Frozen Carton Costs		
Item	**Carton Price**	**Cost per kg of trim**
Base		$ -
Lid		$ -
Liner		$ -
Glue		$ -
Strap		$ -
Label	$ 1.15	$ 0.042
TOTAL	**$1.15**	**$ 0.042**

It is highly unlikely that AQIS or the end customer would agree to any dispensations on load out temperatures to reduce CO^2 snow.

Processors that could consider central processing

The question in this study was to investigate the viability of central processing for individual processors. Based on the figures provided during the study, processors should only consider a centralised processing plant if they meet the following criteria:

- Only plants that could reduce significant amount of labour from their boning room and trim sortation with minimal capital expenditure by sending out bulk trim; AND/OR
- Plants with a large amount of off-site blast freezing and cold storage

To realise these benefits, some processors may need to convert their entire trim production to bulk load out. The implications of this on sales mix would need to be considered.

Other considerations

Depending on who invested in the central processing plant, the ability to get a good return on investment would be minimal for the following reasons:

- Fresh trim pallecons receive a premium over frozen cartons in the market place currently.
- Processors investing in infrastructure to load out bulk pallecons would need a return on investment, so a reduction in trim price would be unlikely (given current premiums for fresh trim);
- Centralised processing investors would need a return on their investment and would not be able to achieve it unless a price premium was paid by the end customer.

Supply commitments would be essential before this type of arrangement could proceed.

Sustainability savings

Most of the grinding companies expected the sustainability benefits resulting from reduced packaging would be more significant to their businesses than direct cost savings. Table 7 shows the expected reduction in cardboard and plastic if 100% of Australian trim sales to McDonalds USA were produced as naked block.

Table 7: Annual savings in packaging materials to MAC's USA supply chain

SUSTAINABILITY - PACKAGING AND CONSUMABLES REDUCTION			**Metric Tonne Savings**	
Plant	Assumes total volume supplied by MAC is Naked Block	**Metric Tonne Fzn**	**Cardboard**	**Plastic**
Total		**57,153**	**1,009**	**109**

Naked Block freezing in existing plates

Assuming a plant has spare capacity in their existing plate freezers, one would question whether it is feasible to produce naked block product, and if so, what the benefits would be.

Provided tubs that hold the meat can have a sealed lid, any other limitations would be the same as those faced with installation of a purpose built naked block freezing line.

One of the key benefits of naked block freezers is the reduced freezing cycle time. This is due partly to the reduced thickness of the blocks. If standard plates are used in conjunction with normal production, the cycle time is usually 24 hours. In this case it is important that the size of the naked blocks remains the same thickness as existing 27.2 kg cartons. Reducing the thickness of the blocks would reduce the capacity of the plates.

Depending on a plant's specific situation, the following benefits could be possible:

- Savings in packaging
- Savings in labour required to pack trimmings
- Improved MAC Rewards payments
- Reduced sea freight cost due to increased shipping container weights

Based on numbers collected from the various plants, an acceptable return on investment depends almost entirely on the associated capital requirements.

Table 8: Processor return on investment scenarios

	Scenario*	Per Kilo of Trim	Annual plant benefit	Pay back (years)	CAPEX (Mill)
1	Existing Plate (Easy Sortation & Easy Tub transfer)	$0.06	$2,138,000	0.6	$ 1.3
2	Existing Plate (Easy Sortation & Extra Tub transfer capex)	$0.05	$1,759,000	2.5	$ 4.5
3	Existing Plate (Difficult sortation w/ re-furb & Easy Tub transfer)	$0.05	$1,854,000	1.3	$ 2.4
4	Existing Plate (Difficult sortation w/ re-furb & Extra Tub transfer capex)	$0.04	$1,475,000	3.8	$ 5.6
5	Existing Plate (Difficult sortation but no re-furb & Easy Tub transfer)	$0.03	$898,000	1.4	$ 1.3
6	Existing Plate (Difficult sortation but no re-furb & Extra Tub transfer capex)	$0.01	$380,000	14.7	$ 5.6
7	NB Plate (Easy Sortation & Offsite Frz saving & NB Cold Store capex)	$0.17	$4,999,000	1.1	$ 5.4
8	NB Plate (Easy Sortation & NO Offsite Frz saving & Existing Cold Store)	$0.05	$1,645,000	2.5	$ 4.2
9	NB Plate (Easy Sortation & NO Offsite Frz saving & NB Cold Store capex)	$0.04	$1,438,000	4.1	$ 5.9
10	NB Plate (Difficult sortation w/ re-furb & Offsite Frz saving & Existing Cold Store)	$0.16	$4,693,000	1.4	$ 6.7
11	NB Plate (Difficult sortation w/ re-furb & NO Offsite Frz saving & Existing Cold Store)	$0.04	$1,338,000	4.1	$ 5.5
12	NB Plate (Difficult sortation w/ re-furb & NO Offsite Frz saving & NB Cold Store capex)	$0.03	$1,131,000	6.4	$ 7.2
13	NB Plate (Difficult sortation but no re-furb & NO Offsite Frz saving & Existing Cold Store)	$0.01	$405,000	10.3	$ 4.2
14	NB Plate (Difficult sortation but no re-furb & NO Offsite Frz saving & NB Cold Store capex)	$0.01	$198,000	29.8	$ 5.9

*Assumes 1500 head processed per day

** Off-site freezing scenarios assume half the trim is frozen off-site.

30% sold as naked block with the remainder processed as naked block but automatically packed into cartons post freezing. * Note that keeping the remaining 70% of naked block as naked block increases plant return by $0.02/kg AUD.

Table 9: Comparison of Naked Block ROI's for different scenarios using existing plate freezers

Scenario	Per Kg	Annual plant Benefit	Pay back (months)	Capex
Use spare capacity in existing plates (27.2 kg NB)* • 100% of naked block sold (no cartons after freezing) • Capex only includes tubs and wash, palletizing, kidney plate • Most plants would need additional conveyor changes, additional rooms and infrastructure to accommodate and to obtain the labour savings achieved	$0.010	$735,087	6.38	$0.39 M
Install NB Plate in plant where no offsite freezing – load direct to container	$0.006	$417,015	87.52	$3.04 M
Install NB Plate and new cold storage to eliminate off-site cold storage	$0.024	$1,780,783	38.82	$5.75 M

*Assumes naked block volume of 2000 ctns / day. Assumes product in plastic tubs freezes at the same rate as carton product on a 24 hour cycle time. Naked block freezing requires the same capacity as carton product resulting in a zero net change in plate capacity.

Table 10: Comparison of scenarios

	Scenario	Per Kilo of Trim	Annual plant benefit	Pay back (months)	CAPEX
1	Existing McDonalds Volume • difficult to automate trim sortation • Existing McDonald's volume sold as NB. Extra volume into cartons after freezing • Offsite freezing and storage costs saved	$0.19	$1,460,339	42.37	$5,15 M
2	McD Trim = 30% of production • difficult to automate trim sortation • McDonalds sales increase – remainder packed into cartons after freezing • Offsite freezing and storage costs saved	$0.24	$1,953,166	31.68	$5,15 M
3	Same scenario as Option 1 except assumes • No offsite freezing costs saved • Making the investment purely to service existing McDonalds markets	$0.03	$263,166	235.13	$5,15 M
4	Same option as 3 except assumes: • No Offsite freezing savings BUT Auto Trim Sortation is easy • This option would become realistic for a company that is outgrowing its existing freezing and storage and wants to find a lower cost way to expand. If the company were to grow and incur off-site freezing costs, the expected return for naked block would be less than 30 months compared with 32 months in scenario 2. The difference is this plant's capacity to automate the sortation of trim.	$0.05	$451,398	95.38	$3,58 M

Inspection House Considerations

The key areas of benefit to the Inspection Houses include:

1. Reduced handling time and labour cost
2. Reduced unloading time, freeing up loading dock time
3. Reduced USDA inspection time
4. Reduced materials (Shrink wrap, inspection stamping)

The following sections explain these benefits in detail.

Container unloading

Unloading of containers becomes much more efficient as shown in Table 11. Two labour units are currently required to hand unload containers. With a naked block configuration, manual unloading would be replaced with a second forklift operator. Two slip sheet forklifts could unload a container in half the time it currently takes with one less person representing a saving of $13.15/load.

Table 11: Inspection House unloading cost comparison between current and naked block packaging

SAVINGS	NOW			NAKED BLOCK		
	Labour	Minutes	Cost	Labour	Minutes	Cost
Unload onto dock/Staging Area						
Labour to unpack container and palletise by port mark(piece work	2	52.5	$ 12.69	0	25	$ -
Fork Lift operator	1	52.5	$ 9.63	2	25	$ 9.17
Truck unloading time reduced at dock (Minutes)		27.5				
Unloading cost reduced		$ 13.15				

USDA Skip Load Inspection

The current procedure for skip loading requires presentation of the load on pallets separated into individual port marks. The inspector walks around the pallets and observes the external surfaces for damage and labelling compliance. If no further inspection is required all cartons must be inspection stamped and pallets shrink wrapped ready for load out.

Table 12 below identifies savings of $16.65 per load if product was presented as naked block including the following benefits:

- Reduced inspection house labour cost to less than 15% of current requirements
- Reduction of USDA inspection time by half
- Eliminate shrink wrap material cost and time to shrink wrap pallets
- Reduce the time product stands on loading docks by almost 30 minutes, freeing up space for other activities

Table 12: Skip load inspections – cost comparison between existing and naked block packaging

SAVINGS	NOW			NAKED BLOCK		
	Labour	Minutes	Cost	Labour	Minutes	Cost
Partial (Skip) Inspection - Dock/Staging Area						
USDA Inspector (15 minutes for "skip" inspections)	1	15		1	8	
Carton stamping after inspection	2	15	$ 3.63	1	5	$ 0.60
Cost of shrink wrapping product	2	15	$ 3.63	None required		
Skip Load USDA Inspection time reduced		7.00				
Labour cost reduced		$ 6.65				
Pallets to shrink wrap (& cost of shrink wrap)		20	$ 10.00	None required		
Materials Cost saving		$ 10.00				

USDA Full container Inspection

Existing protocol

Full USDA inspection requires cartons of frozen trim to be selected randomly from across the total load. Specific carton numbers are selected from specific pallet numbers, and then transferred to a USDA meat inspection room for thawing and detailed quality inspection.

Application of the existing sampling procedure would involve between 9-12 blocks being sampled from as many different naked block pallets. This creates a number of complications:

- Currently covered cartons are selected from the load on the loading dock and combined on one pallet. The pallet with sample cartons is taken into the USDA approved meat inspection room where they are de-cartoned and inspected.
- The loading docks do not meet food standards so meat cannot be uncovered. IN the case of naked blocks, each naked block pallet would have to be uncovered in the USDA approved meat inspection room to select the correct blocks.
- The Mullica Hill Inspection house used during the trials can hold multiple pallets in their USDA Inspection room. However, most inspection houses have much smaller inspection rooms and would hold only one pallet at a time. Moving up to 12 naked block pallets into the room, uncovering, removing the selected block, re-wrapping, covering and returning to the loading dock one by one adds time and cost.
- If USDA stipulated the existing process, full inspections would be more expensive with naked pallets than current carton procedures.

It is estimated in

Table 13 below to cost an additional $14.26 in labour to conduct a full inspection using the current USDA protocols. A saving in shrink wrap of $4.00/load would still occur and result in a net cost increase of $10.26/load.

Table 13: Full USDA inspection protocol increases cost of Naked Block inspection

SAVINGS	NOW			NAKED BLOCK		
	Labour	Minutes	Cost	Labour	Minutes	Cost
Full Inspection - Meat Inspection Area (USDA sample across all pallets using existing random selection)						
Random sampling of 14 cartons across all pallets is required. Currently cartoned blocks are removed from the pallet on the loading dock and taken to the USDA inspection room for decartoning. Meat cannot be exposed on the loading docks. To sample a naked block, the whole pallet would have to be moved into the inspection room before removing the outer cover. Some inspection houses do not have enough room in the USDA inspection room to hold 14 naked block pallets. I-Houses would have to build extension to their inspection rooms or seek USDA approval to load in pallets one at a time.						
Pick ctns on dock (Carton boxes only)	2	15	$ 3.63			
Move ctns vs. Multiple naked block pallets into inspection area	1	5	$ 0.60	1	5	$ 0.60
Remove outer packaging and shrink wrap (NBlock only)				1	2	$ 0.24
Remove required blocks from pallet				1	5	$ 0.60
Remove carton and liner	1	15	$ 1.81			
USDA Inspector (2-2.5 hours for full inspections)	Same time for both systems			Same time for both systems		
Cost of shrink wrapping product	None required			1	2	$ 0.24
				# of Sample Pallets		12
Full USDA Inspection - Time reduced		0.00				
Labour cost reduced		$ (14.26)				
Pallets to shrink wrap (& cost of shrink wrap)		20	$ 10.00		12	$ 6.00
Materials Cost saving		$ 4.00				

pgreen: This could be reduced from 5 mins

pgreen: 40's vs 20's - 20's the sampling will be about 8, 40's will be up to 15

New protocol proposed for Naked Pallets

A new sampling protocol for naked pallets is being proposed but has not yet been confirmed by USDA. This protocol treats a covered pallet as the smallest sample from which to select. A similar number of naked blocks would be sampled but only from 1-2 pallets.

Table 14: Cost comparison of proposed full inspection protocol for Naked Block

SAVINGS	NOW			NAKED BLOCK		
	Labour	Minutes	Cost	Labour	Minutes	Cost
Full Inspection - Meat Inspection Area (USDA sample from 1-2 pallets only)				Time **per pallet** below		
Pick ctns on dock (Carton boxes only)	2	15	$ 3.63			
Move ctns vs. Naked block pallet into inspection area	1	5	$ 0.60	1	5	$ 0.60
Remove outer packaging and shrink wrap (NBlock only)				1	2	$ 0.24
Remove required blocks from pallet				2	5	$ 1.21
Remove carton and liner	1	15	$ 1.81			
USDA Inspector (2-2.5 hours for full inspections)	Same time for both systems			Same time for both systems		
Cost of shrink wrapping product	None required			1	2	$ 0.24
				# of Sample Pallets		2
Full USDA Inspection - Time reduced		0.00				
Labour cost reduced		$ 1.45				
Pallets to shrink wrap (& cost of shrink wrap)		20	$ 10.00		2	$ 1.00
Materials Cost saving		$ 9.00				

Grinder Considerations

Companies that manufacture hamburgers temper frozen cartons before unpacking. This makes it easier to remove the plastic liners from the frozen trimmings. Labour is required to remove the cardboard cartons, unpack the meat and dispose of waste packaging.

The key areas of benefit to the grinders by using naked block include:

5. Reduction in the amount of waste generated and subsequent disposal costs
    a. Sustainability benefits are a direct result of these reductions
6. Reduction in labour involved in removal and disposal of frozen carton packaging
7. Reduced risk of plastic entrapment

The total benefits are estimated at $0.0108/kg based on figures provided by the US companies and detailed in Table 15 and Table 16 below.

Table 15: Reduced recycling costs for a grinding company converting 100% of frozen trim to naked block

CARDBOARD RECYCLING COST	$ Savings	$/kg
Average per plant	**$ 16,826**	**$ 0.0015**

PLASTIC RECYCLING COST	$ Savings	$/kg
Average per plant	**$ 23,000**	**$ 0.0020**

Table 16: Grinding company labour savings through conversion of frozen trim to naked block

LABOUR SAVINGS - TRIM SORTATION						$ Savings	
	Current Job Function	Assumptions	Labour Units / Shift	Labour Units saved /shift	Total Labour Saved (2 Shifts)	Labour Saving / day	Labour Rate /day
	Decarton Frozen ctns		1	0.5	1	$ 129	$ 129.20
	Breakdown boxes for recycling		1	0.5	1	$ 129	$ 129.20
	Remove liners	remove naked block liner - no saving	1	0	0	$ -	$ 129.20
	Load blocks into grinder	still the same process	1	0	0	$ -	$ 129.20
	Carton compacting	no cartons with Naked Block	1	0.35	0.7	$ 90	$ 129.20
					0	$ -	$ 129.20
			5	1.35	2.7	348.84	
							$/kg
			Annual Labour Savings			$ 83,722	$ 0.0073

Supply Chain Summary

Where naked block investment does provide an acceptable return on investment for a processor, the majority of the cost savings lie with the processor as demonstrated in this particular example in Table 17 below. However, it is important to reiterate the variability in return on investment benefits already stated in Results and Discussion section under "Processor Considerations".

For some processing plants naked block investment is not currently feasible unless an additional price premium was guaranteed for the product. It should also be noted that naked block production requires changes to existing product and would require volume commitments from the customer or the investment would be too risky.

Table 17: Profit share scenario where it is profitable to invest in naked block technology

Supply Sector Benefit	Annual Benefit by Sector	
Processor Benefits	$ 420,257	92.5%
Logistics Benefits - Per I-House	$ 8,495	0.8%
Grinder Benefits - Per plant	$ 74,833	6.7%
End Customer Benefits	$ -	- %

Appendices

Appendix 1: Summary page from detailed model

The following example is Scenario 10 displayed above in Table 8.

	Per Kilo of Trim	Per head	Annual plant total	Pay back (months)	NPV
Net benefit	**$0.16**	**$12.50**	$4,692,890	**17.12**	**$ 36,193,755**
Itemized Net Benefits					
Productivity					
Labour	$ 0.054	$ 4.18	$1,568,640		
OH&S benefits	$ -	$ -			
Sales Value / Yield Increase	$ 0.006	$ 0.48	$179,899		
Cost savings	$ 0.124	$ 9.63	$3,613,011		
Total Net benefits			**$5,361,550**		

PLANT SPECIFIC DRIVERS	
Annual number of days operation	240
Standard trim carton weight	27.2
Number of head processed Daily	1,564
Number of head processed Annually	375,360
Naked Block using existing Plates? (Y/N)	N
Is automatted trim sortation EASY? (Y/N)	N
Is sortation and tub fill automatted? (Y/N)	Y
Is off-site Freezing required currently	Y
Is extra Cold Storage required for NB (Y/N)	Y
Naked Block Capital Cost	$ 4,972,087
Additional Capital Infrastructure	$ 1,725,000
Interest rate for NPV	7%

Traditional CAPEX Option INSTEAD OF Naked Block Install	
Plate Freezer - Option 4	8,205,115
Cold Store - Option 1	3,418,798

Trim Production	# Units/day	Daily Kgs	Annual Kgs
Trim Cartons produced	3479	94,637	22,712,880
Pallecons	60	54,000	12,960,000
Total Trim	5,465	148,637	35,672,880

NAKED BLOCK TRIMMINGS - COST / BENEFIT ANALYSIS				
Benefit Summary	$/Hd	$/kg	Per Day	Total (yearly)
Naked Block Technology Benefits				
Labour Savings (Manual CL Blend)	$ 1.75	$0.023	$ 2,736	$ 656,640
Labour Savings (Automatted CL Blend)	$ 2.53	$0.033	$3,952	$ 948,480
Packaging savings	$ 3.28	$0.042	$ 5,128	$ 1,230,767
Energy Cost - Conventional plate	$ -	$0.013	$ -	$ -
Increased Sales Value	$ 0.48	$0.017	$ 750	$ 179,899
Independant Operational Benefits				
Off-site freezing of trim	$ 9.35	$ 0.121	$ 14,625	$ 3,510,000
Labour Savings (Automatted palletising)	$ 0.29	$ 0.004	$ 456	$ 109,440
$ Benefit TOTAL	$ 17.68	$ 0.251	$27,647	$6,635,226

Naked Block Technology Costs				
Labour Costs	$ 0.39	$ 0.005	$ 608	$ 145,920
Naked Block Packaging	$ 0.51	$ 0.018	$ 796	$ 191,150
Frozen Carton Packaging - Re-carton Naked Block	$ 1.78	$ 0.036	$ 2,786	$ 668,660
Energy Costs	$ -	$ 0.013	$ -	$ -
NB capital OR premium on std.plate install	-$ 1.25	-$ 0.016	-$ 1,958	-$ 469,926
Water - Wash tubs	$ 0.03	$ 0.000	$ 429	$ 11,663
Independant Operational Costs				
Capital Cost - Standard Plate Freezer	$ 2.62	$ 0.034	$ 1,508	$ 984,614
Capital Cost - Additional Frozen Storage	$ 1.09	$ 0.014	$ 628	$ 410,256
$ Cost TOTAL	$ 5.17	$ 0.104	$4,798	$ 1,942,336
Total Benefit	**$ 12.50**	**$ 0.147**	**$ 22,849**	**$ 4,692,890**

NAKED BLOCK BENEFITS (separated from operational improvements)				
Benefit Summary	$/Hd	$/kg	Per Day	Total (yearly)
Naked Block - Technology Benefits only	$ 6.58	$ 0.071	$ 9,904	$ 2,468,319
Associated Benefits	$ 5.93	$ 0.076	$ 12,944	$ 2,224,571

CAPITAL COST DIFFERENCES - NAKED BLOCK vs. STANDARD PLATE FREEZER				
Freezing Technology	Total Capex	$/Hd	$/kg	Total (yearly)
Naked Block Freezing and Container Packing	6,697,087	$ 2.46	$ 0.032	$ 924,943
Standard Plate Freezing and Cold Store	11,623,913	$ 3.72	$ 0.048	$ 1,394,870
Additional Capital for Naked Block	- 4,926,826	-$ 1.25	-$ 0.016	-$ 469,926

Naked Block Drivers	**% of TOTAL trin**	**Ctns/ Day**	**Daily kg**	**Annual kg**
Trim sold as McD Naked Block	30.0%	1,639	44,591	10,701,864
McDonalds Sales growth YOY	600.0%			
Non-McD Naked Block Sales	0.0%	-	-	-
Trim frozen through naked block		4,459	121,293	29,110,320
Naked Block re-packed in cartons	63.2%	2,820	76,702	18,408,456
Trim Shipped as Naked Blocks	36.8%	1,639	44,591	10,701,864
Surplus Freezing Capacity	0.0%	-	-	-

Appendix 2: Example summary page from a plant modelling investigation

Table 18: Distribution of benefit from one processors volume across the supply chain

PLANT SPECIFIC DRIVERS	
Annual number of days operation	240
Standard trim carton weight	27.2
Number of head processed Daily	1,564
Number of head processed Annually	375,360
Is Naked Block automatted sort and tub fill? (Y/N)	Y
Is off-site freezing required currently	Y
Naked Block Capital Cost	$ 4,972,087
Interest rate for NPV	7%
Packer Volume sold to McDonalds (p.a.)	10,701,864
Packer Volume sold OUTSIDE McDonalds (p.a.)	-
McDonalds TOTAL annual Australian Volume	57,153,225

Total Supply Chain Benefits		
Dollars	**$/kg**	**Annual**
Labour	$ 0.06	$ 1,691,993
Consumables	$ 0.02	$ 1,044,259
Utilities	$ -	$ -
Sales Value	$ 0.02	$ 179,899
Transport	$ -	
Inspection	$ -	
Finance	$ -	
Total		

Total Supply Chain Benefits		
Sustainability	**/kg**	**Annual**
Packaging	0.532	209 Tonnes
Carbon FP		
Total		

Model benefits post processor on processor volume (Y) or TOTAL McDonalds (N)? Y

Processor Benefits	$/kg	Annual
	$ 0.09	$ 3,148,643
Benefits	**$/kg**	**Annual**
Labour (Manual)	$ 0.023	$ 656,640
Labour (Automatic	$ 0.033	$ 948,480
Packaging	$ 0.042	$ 1,230,767
Sales Value	$ 0.017	$ 179,899
Electricity	$ 0.013	$ -
Transport	$ -	
Inspection	$ -	
Finance	$ -	
Total	**$ 0.114**	**$ 3,015,786**
Costs	**$/kg**	**Annual**
Labour	$ 0.005	$ 145,920
Consumables	$ 0.018	$ 191,150
Utilities	$ 0.013	$ -
Capital	-$ 0.016	-$ 469,926
Total	**$ 0.019**	**-$ 132,856**
Sustainability		**Annual Tonnes**
Cardboard	0.48	189
Plastic	0.052	20
Carbon FP		
Total		**209**

I-House Logistics Benefits	$/kg	Annual
	$ 0.001	$ 13,131
Benefits	**$/kg**	**Annual**
Labour	$ 0.001	$ 8,489
Labour FTE's		$ 1
Packaging	$ 0.0004	$ 4,641
Electricity		
Loading Dock (hrs re	0.00	215
USDA Inspection (h	0.00	55
Finance		
Total	**$ 0.001**	**$ 13,131**
Costs	**$/kg**	**Annual**
Transport		
Inspection		
Finance		
Total		
Sustainability	**/kg**	**Annual Tonnes**
Cardboard		
Plastic		
Carbon FP		
Total		**0**

Grinder Benefits	$/kg	Annual
	$ 0.011	$ 115,670
Benefits	**$/kg**	**Annual**
Labour	$ 0.0073	$ 78,384
Consumables		
Utilities	$ 0.0035	$ 37,286
Sales Value		
Electricity		
Transport		
Inspection		
Finance		
Total	**$ 0.011**	**$ 115,670**
Costs	**$/kg**	**Annual**
Labour		
Consumables		
Utilities		
Sales Value		
Total		
Sustainability	**/kg**	**Annual Tonnes**
Cardboard (Metric	0.48	189
Plastic (Metric Ton	0.052	20
Carbon FP		
Total		**209**

End Seller Benefits	$/kg	Annual
	$ -	$ -
Benefits	**$/kg**	**Annual**
Labour		
Consumables		
Utilities		
Sales Value		
Electricity		
Transport		
Inspection		
Finance		
Total	**$ -**	**$ -**
Costs	**$/kg**	**Annual**
Labour		
Consumables		
Utilities		
Sales Value		
Total		
Sustainability	**/kg**	**Annual Tonnes**
Cardboard	0.48	189
Plastic	0.052	20
Carbon FP		
Total		**209**

Processor savings are identical to those in Appendix 1 but only include benefits related to naked block technology. I-House and Grinder benefits relate only to the volume produced by the one processor in Appendix 1.

A distribution of benefit from Table 18 above is summarised in the Table 19 and Figure 3 below.

Table 19: Distribution of naked block benefit for Scenario 10 mentioned above

Supply Chain Sector	Annual Benefit by Sector	
Processor Benefits	$ 3,148,643	96.1%
I-House Logistics Benefits	$ 13,131	0.4%
Grinder Benefits	$ 115,670	3.5%
End Seller Benefits	$ -	0.0%
Total Annual Supply Chain Benefits	$ 3,277,444	100.0%

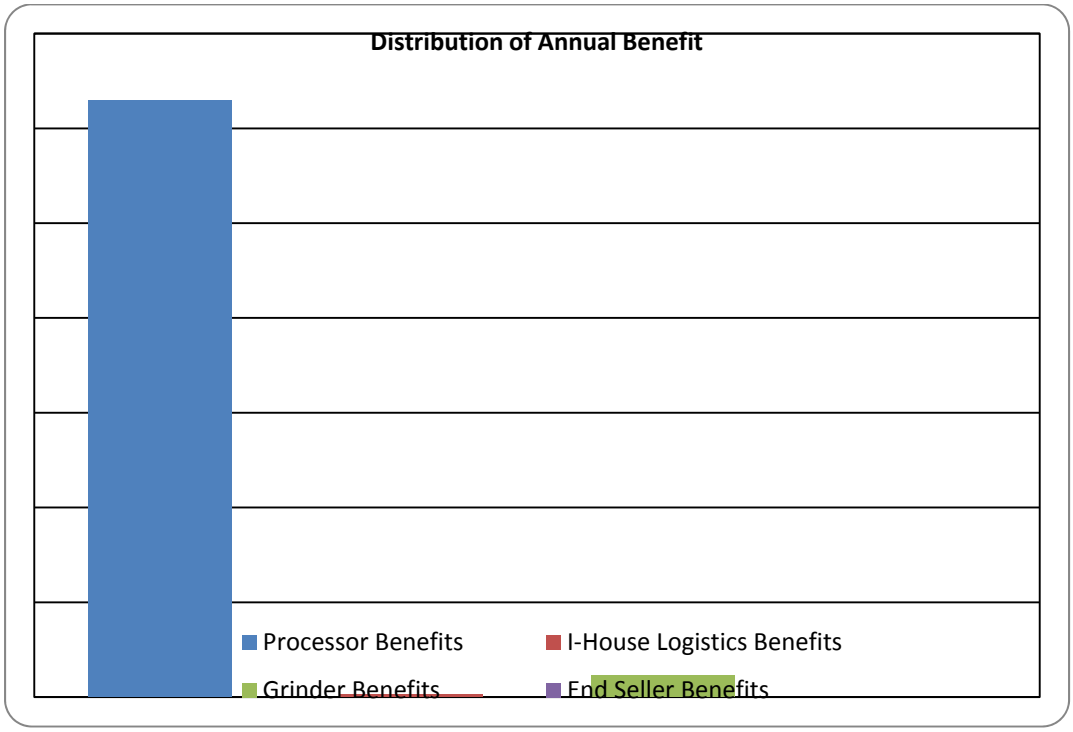

Figure 3: Distribution of naked block benefit for Scenario 10 mentioned above