

# Project 1 Knox City Council & Knox Transfer Station Pty Ltd

## Brief description of applicant, site & operation

The application was made jointly by Knox City Council and Knox Transfer Station Pty. Ltd. - a division of WM Waste Management Services Pty Ltd.

- Knox City Council is the owner of the Knox Transfer Station site.
- Knox Transfer Station Pty Ltd (KTS) manages and operates the Knox Transfer Station under contract to Knox city Council for the period 2007 to 2022 with an option to extend until 2027.

At the time of the Metro Fund application, Knox Transfer Station was receiving more than 5000 mattresses per month and the number was increasing due to the collapse of *Dreamsafe*<sup>1</sup>.

The mattresses received at Knox Transfer Station were delivered directly by the general public as “drop-offs” and also by commercial collectors including WM Waste Management Services. WM had, at that time, hard waste collection contracts (including the collection of mattresses) with 13 member Councils of the MWMG. The majority of these Councils were located on the eastern side of the Melbourne metro area.

Prior to the MWMG Recovery Funding, WM/KTS processed mattresses at the Knox site using a more labour-intensive methodology focused on volume reduction and recycling of the steel. Mattresses awaiting shredding were stacked on the ground separately or still mixed with other hard-waste depending on how they were received. Mattresses were then fed into a medium-sized shredder either by hand or using a loader. The mixed shredded material then passed through an electro-magnet which was used to extract the steel. Recovery of timber, foam and textiles was minimal because it was a mixed shredded output. Most of this material therefore went to landfill, albeit in a reduced-volume<sup>2</sup>. Nevertheless, the processing methodology provided certain benefits for Councils and contractors delivering mattresses to KTS:

- Processing was regular and there was little risk that the site would become another waste mattress stockpile.
- Landfill space required for the residual was significantly less than that required for whole mattresses
- The landfill operational issues posed by whole mattresses were addressed by shredding

## Need for the project

At the time of the submission of applications for Round 2 Metro Fund an urgent solution was required to fill the void in Melbourne’s mattress recovery capability created by the collapse of *Dreamsafe*. The WM/KTS operation at Wantirna South had stepped up its throughput significantly in the previous months and it was apparent that it represented a key component of the solution – particularly for the eastern Metropolitan region.

However it was also apparent there were a number of significant shortcomings in the existing operation<sup>3</sup>:

- Mattresses and processing were exposed to the weather
- Steel extracted by the magnet was not fully separated from other shredded material and frequent blockages required manual clearing
- Steel springs were sometimes not completely shredded. This presented a risk of entanglement with belts/rollers/magnets and other moving parts in the recovery process and added to maintenance downtime. The steel was also less acceptable to metal recyclers in this form.
- Process was not fully mechanised and the increased intensity of throughput presented an OHS risk due to the level of manual handling required
- Current process was operating close to maximum capacity with no buffer for breakdown, emergency stoppage or mishap.

<sup>1</sup> Interviews with KTS & KCC staff March - May 2014

<sup>2</sup> Interviews with KTS & KCC staff March -May 2014

<sup>3</sup> Interviews with KTS & KCC staff March- May 2014



Compacted mattresses in a load of hard-waste



Compacted mattresses & hard-waste discharged onto receiving pad

## Summary of funding application project

The basis of the proposal was to upgrade the existing process - to make it a more highly mechanized operation which enabled higher throughput, increased level of material recovery and greatly reduced need for manual handling – thus decreasing OH&S risk.

The original proposal included the following components<sup>4</sup>:

- Construct a 22m x 77m concrete pad (including site preparation works)**  
 Both the material received and the processed products would be stored and handled on the concrete slab. Mattresses and kerbside hard waste would also be sorted on the concreted area. Non-spring mattresses and cushions would be separated and taken to the recycling shed for manual stripping. Timber from bed bases and other wood products broken up by the compaction vehicles would be separated for recycling.
- Install a 4X-30 Bramidan baler.**

<sup>4</sup> KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11

The baler would be used to bale foam stripped from foam mattresses, cushions and couches and to compact cardboard and plastic for recycling

- **Install a Hammel VB 750D Shredder.**

The shredder would be used to process spring mattresses and hard waste. This slow speed shredder is designed to process difficult materials and has more than double the capacity and power of the VB 450 machine used previously by Dreamsafe.

- **Install a Trommel Screen with conveyors, fixed magnets, chutes and barriers.**

The shredder material would be passed through a trommel screen for size separation then past a number of magnets to extract the shredded springs and other metal for recycling. Screening the shredded material before passing the magnets is designed to maximize steel recovery and minimize contamination.

- **Construct a 25m x 17m Shed on the concrete pad**

The shed would be open on three sides to enable easy access for stored material and protect workers from rain and sun. Sorting and processing of mattresses and selection of hard waste would also be undertaken in the shed.

- **Install a 34,000 litre Rainwater Tank & undertake drainage works**

The rainwater tank would be constructed to catch water from the shed. The tank would have CFA approved connections to enable it to be used in the case of a fire. Drains would be required to adequately manage stormwater.

The original proposal allowed for MWMG to provide 43% of the funding and WM/KTS to provide 57%.



Excavator-grab loading mixed hard-waste into Hammel VB 750D Shredder.

In November 2012, Knox City Council and WM/KTS submitted a revised funding proposal to MWMG.

The revised proposal included the following changes<sup>5</sup>:

### Fire Main installation

Knox City Council and KTS asked for the portion of the grant related to the construction of the recycling shed to be reallocated for infrastructure to improve the fire-fighting capacity of the site. The revised proposal included the installation of a fire main connecting Knox Transfer Station to the Eastern Recreation Precinct – resulting in a fire hydrant being established close to the mattress recycling area. The site had experienced a number of fires and it was determined that without the proposed fire hydrant the mattress recycling operation would be required to operate at a lower capacity than was originally envisaged.

### Recycling Shed construction cancelled

<sup>5</sup> KCC&KTS MWMG Project Variation Proposal 19.11.12;



KTS proposed to remove the shed from the proposal. This was justified by the need to urgently allocate funds to fire safety measures and by an equipment change to a taller excavator which would not fit inside the originally proposed shed design. It was proposed for mattress baling to be relocated and for the other proposed activities to be undertaken on the concrete pad but in the open.

### Screening equipment changed

Visits by KTS staff earlier in 2012 to waste equipment expos in North America and Europe resulted in a decision to propose the use of a Dynamic Ecostar screen with a 3 magnet metal recovery system instead of the trommel screen. It was predicted that the changed screen and magnet system would result in better materials separation, lower contamination and additional overall recovery.

The revised proposal required \$136,000 additional funding for the project of which MWMG was asked to provide \$65,000. The revised proposal therefore required MWMG to provide 44% of the total funding and WM/KTS to provide 58%.

MWMG formally approved the revised proposal 19.12.12 and a new funding agreement was executed 01.04.13

### Comparison of Original<sup>6</sup> & Revised<sup>7</sup> Funding Proposals

Project Component	ORIGINAL MWMG funding application	REVISED MWMG funding application	ORIGINAL Applicant funding committed	REVISED Applicant funding committed	ORIGINAL Total	REVISED Total
Site Preparation			\$25,140	<b>\$25,140</b>	\$25,140	<b>\$25,140</b>
Concrete slab	\$42,500	<b>\$42,500</b>	\$126,900	<b>\$126,900</b>	\$169,400	<b>\$169,400</b>
Baler	\$22,500	<b>\$22,500</b>			\$22,500	<b>\$22,500</b>
Trommel Screen & Magnets	\$100,000		\$100,000		\$200,000	<b>\$331,000</b>
Ecostar Screen & Magnets		<b>\$165,000</b>		<b>\$166,000</b>		<b>\$331,000</b>
Shed	\$40,000		\$30,000		\$70,000	
Fire main and hydrant		<b>\$40,000</b>		<b>\$35,000</b>		<b>\$75,000</b>
Water tank & drainage	\$10,000	<b>\$10,000</b>			\$10,000	<b>\$10,000</b>
<b>TOTAL</b>	<b>\$215,000</b>	<b>\$280,000</b>	<b>\$282,040</b>	<b>\$353,040</b>	<b>\$497,040</b>	<b>\$633,040</b>

Table 1 Comparison of Original<sup>8</sup> & Revised<sup>9</sup> Funding Proposals

### Current status of application

Site works and ordering equipment commenced soon after MWMG's agreement to the revised project scope and increased funding. Brief Revised Milestone Reports were submitted.

- Revised Milestone Report 1: April 2013
  - Concrete pad construction complete
  - Baler purchased and installed
  - Water tank purchased and installed
  - Ecostar screen purchased and undergoing modification to fit sorting line

<sup>6</sup> KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11

<sup>7</sup> KCC&KTS MWMG Project Variation Proposal 19.11.12

<sup>8</sup> KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11

<sup>9</sup> KCC&KTS MWMG Project Variation Proposal 19.11.12

- Magnets and hopper ordered
- Fire main designed and construction work awarded
- Revised Milestone Report 2 :Undated (assumed to be May/June 2013)
  - Ecostar screen and sorting line modified and installed
  - Sorting line commissioned and in use
  - Fire main constructed tested and certified as compliant
  - Fault detected in main hydrant line to Knox Sports Park and in process of being repaired
  - Transfer station hydrant out of service until main hydrant line repaired
- Revised Milestone Report 3: Undated (assumed to be June/July 2013)
  - Fire main now in service
  - Ecostar sorting line complete and operating. KTS committed to measuring recycling rates of shredded mattresses and hard waste with new system
  - Project completed with all funding received and allocated.

Installation of the revised shredding and sorting equipment was finalised, commissioning completed and regular processing of mattresses and hard-waste underway by July 2013. As with most mixed waste handling processes however, the following months have been a period of ongoing modification of equipment and processing methodology to resolve the operational issues which have arisen. Off-the-shelf equipment usually requires a significant bedding-in period for the characteristics of local waste streams to be considered. Typically this has involved addressing points of blockage, spillage, material build-up and contamination within the new system and issues related to Work Health & Safety (WHS) and efficient materials flow across the site<sup>10</sup>. Nevertheless, processing of hard waste and mattresses has been undertaken since July 2013 at a rate of around 80% of the projected system capacity (and in some weeks up to 140% of capacity) without failure<sup>11</sup>.

### Comparison Primary Project Objectives<sup>12</sup> vs Project Outcomes

As discussed, the operation of the mattress recycling system at Knox has effectively been in an extended commissioning phase for most of the past year. Commentary on achievement of KPIs is in some cases based more on qualitative assessment than quantitative analysis.

Project Objective	Project Outcome
1. Increase recovery of recyclable materials from mattresses from 15% to 60% (w/w)	Mattresses are mostly delivered in mixed loads and are not weighed separately. Random audits indicate recovery of recyclable materials from mattresses has increased to around 40% (w/w)
2. Increase recycling of hard waste (excl.mattresses) from 15% to 25% (w/w)	Hard waste is processed together with mattresses and combined input weights are not recorded. Random audits indicate recovery of recyclable materials from hard waste (excl.mattresses) has increased to around 23% (w/w)
3. Increase site recycling capacity from 40,000 mattresses p.a. to 100,000 mattresses p.a.	Current average receipt tonnage of mattresses is c.6500tpm (78,000tpa). Recycling performance during peak times indicates the site now has capacity to receive and process at least 8500tpm (>100,000tpa) comfortably.
4. Increase recycling rate of mattresses & sofa beds from 25% to 60% of each mattress received <sup>13</sup>	Mattress bases, sofa beds and other timber/steel framed furniture are delivered in mixed loads and are not weighed separately. Random audits indicate recovery of recyclable materials from timber/steel framed furniture has increased to around 40% (w/w)
5. Provide a safer working environment and reduce manual handling injury claims from processing mattresses & hard waste	Previously subcontractors loading mattresses at KTS or delivering mattresses to other (manual stripping) facilities mostly stacked whole mattresses in a non-compaction vehicle. Manual handling has been greatly decreased. Although there had been no injury claims by KTS previously (and none since the commissioning of the new system) other processing facilities and subcontractor collectors had received PINs from Workcover. The risk of injury is reduced by the progression towards a fully mechanized operation.
6. Improve fire management of site	CFA, WorkCover and Police had made comments about the fire risk inherent in the operation when they had attended fires at the site prior to the revised processing and fire infrastructure initiatives being installed.

<sup>10</sup> Interviews with KTS & KCC staff March-May 2014

<sup>11</sup> Interviews with KTS & KCC staff March -May 2014

<sup>12</sup> Project Objectives listed in *MWGA Funding Agreement WRRF2.01A 01.04.13: 2.3 Principles of the Activity*

<sup>13</sup> The meaning of this objective is unclear. As written, it appears to be a duplication of Objective #1. Assumption is therefore that it refers to sofa beds, cushions and non-spring mattresses

	<p>CFA has commented that there is now considerably less risk due to the improvements implemented.</p> <p>Police have commented that elimination of the need to run hoses along roadways in an emergency has also appreciably reduced risk.</p> <p>WorkCover has commented that there the dust suppression measures instigated in the processing have significantly decreased fire risk associated with the actual processing.</p> <p>KTS is awaiting comment from its insurers as to the impact improved fire management will have on future premiums.</p>
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**Table 2 Comparison Primary Project Objectives<sup>14</sup> vs Project Outcomes**

### Comparison Secondary Project Objectives<sup>15</sup> vs Project Outcomes

Although not included in the six primary Project Objectives listed in *MWMG Funding Agreement WRRF22.01A 1<sup>st</sup> April 2013 2.3 Principles of the Activity*, the following eight performance commitments are objectives contained in the various Project Descriptions - which the Project seeks to fulfil to achieve successful outcomes.

Project Objective	Project Outcome
7. Reduce contamination in recovered shredded steel <sup>16</sup>	Finer shredding of the “mattress-only stream” achieved using the Hammel VB 950D, followed by size sorting via a modified screen separates much of the chopped steel from the textile wadding and foam. This enables steel to be more easily recovered as a clean stream by the multiple belt magnets installed.
8. Increase % of steel recovered <sup>17</sup>	As above, finer shredding, sorting by modified screening and recovery by multiple belt magnets has greatly reduced the potential for steel to be caught up in other material streams or be directed to disposal.
9. Broken timber from compacted bed bases separated and recovered <sup>18</sup>	Bed bases and other timber-framed furniture collected in mixed compacted loads as part of Council Hard Waste collections are inevitably significantly broken up in the compaction process. Some of the pieces of broken timber frames of these items fall separately onto the unloading pad and are hand sorted into clean timber recycling bins for later shredding for landscaping use. Timber which is still contained/attached within the piece of furniture or mattress base will be shredded as part of a mixed stream. Very little of the timber from the mixed shredded stream is currently recovered.
10. Markets secured for shredded scrap steel from processed mattresses <sup>19</sup>	Metals recyclers have indicated they are happy to continue receiving material in the current processed form.
11. Markets secured for baled foam recovered from processed mattresses <sup>20</sup>	Markets for foam exist but are inconsistent. Higher recovery of foam is dependent on the identification of better quality separation technologies for material which has been partially broken up by shredding.
12. Markets secured for broken and processed timber from compacted or processed mattresses <sup>21</sup>	Clean broken timber recovered from bases and timber framed furniture is collected and sent to Coldstream Recycling for mulch production. As discussed, very little of the timber from the mixed shredded stream is currently able to be recovered due to contamination with other materials and the inclusion of particle board components.
13. Quality of mattresses received and recycling rates achieved to be provided before, during and after project completion <sup>22</sup>	<p>Some qualitative assessment has been undertaken however material is variously affected by weather impact whilst it awaits kerbside collection (or discovery as illegal dumping), compaction and contamination in the commingled collection process and further weather whilst stored on site if there is any delay in processing.</p> <p>Baseline recycling rates and other quantitative analysis was undertaken prior to the installation of new processing system – indicating recovery rates of material from mattresses at around 15%.</p>

<sup>14</sup> Project Objectives listed in *MWGA Funding Agreement WRRF2.01A 01.04.13: 2.3 Principles of the Activity*

<sup>15</sup> Project Objectives nominated in documents which define the Project: *KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11*; *KCC&KTS MWMG Project Variation Proposal 19.11.12*; *MWMG Funding Agreement WRRF2.01A 01.04.13*

<sup>16</sup> *KCC&KTS MWMG Project Variation Proposal 19.11.12*

<sup>17</sup> *KCC&KTS MWMG Project Variation Proposal 19.11.12*

<sup>18</sup> *KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11*

<sup>19</sup> *KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11*

<sup>20</sup> *KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11*

<sup>21</sup> *KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11*

<sup>22</sup> *MWGA Funding Agreement WRRF2.01A 01.04.13: 3.3 Baseline Data & Key Performance Indicators*

	Random audits were undertaken during the commissioning of the new system and as the operation had continued to be fine-tuned - indicating recovery of recyclable materials from mattresses has increased to around 40% (w/w)
14. Implementation of systems, processes, controls and reporting which allows for ongoing monitoring and measurement of progress or success of the Activity <sup>23</sup>	As discussed, the operation of the mattress recycling system at KTS has effectively been in an extended commissioning phase for most of the past year. Management focus has been primarily on fine-tuning the operating system to more efficiently deal with the local input material quality and the development of recovery markets.

**Table 3 Comparison Secondary Project Objectives<sup>24</sup> vs Project Outcomes**

### Summary of main failings - Causes, Lessons, Rectification

CAUSES	LESSONS	RECTIFICATION
<b>Several fire incidents on the site</b>		
Underestimated fire risk remaining from original process Fire response capacity was generally inadequate Money not originally budgeted for adequate fire response infrastructure.	More comprehensive risk analysis was required.	Funding reallocated and increased to improve infrastructure and fire response capacity.
<b>Recovery of foam inadequate</b>		
Star screen only separates larger chunks of foam Recovered foam market inconsistent.	Recovery predictions not based on equipment trials with actual materials.	Search for additional technology to recover foam earlier in process or to separate foam effectively from mixed shredded material.
<b>Recovery of post-shredding timber inadequate</b>		
Difficult to separate timber from bases and sofa beds before shredding. Star screen sorts by size – doesn't effectively separate timber chips.	Recovery predictions not based on equipment trials with actual materials.	Research additional technology to recover timber earlier in process or to separate timber chips more effectively from mixed shredded material.
<b>Recovery of textiles inadequate</b>		
Shredded textiles difficult to recover. No significant markets identified. Focus has been on heaviest materials.	100% recovery difficult without manual handling or significant investment in dedicated flaying technology.	Research international end-uses. Research textile separation/flaying technology.
<b>Mattress springs constantly becoming entangled in star screen</b>		
Shredder not cutting springs as finely as expected	Recovery predictions not based on equipment trials with actual materials	Upgrade shredder to model with capacity to cut springs more finely. Re-deploy existing shredder on another site. Change screen type during processing of mattress-only stream.
<b>Unable to process and sort during bad weather</b>		
Decision not to proceed with construction of shed covering concrete pad has exposed waste discharge, sorting and processing to rain and wind.	Decision to reallocate funds and abandon plans to construct shed taken without full analysis of consequences	Construct shed or install covering and wind barriers over sorting/processing pad.
<b>Unable to process and sort on very hot days</b>		
Decision not to proceed with construction of shed covering concrete pad has exposed waste discharge, sorting and processing open sun and	Decision to reallocate funds and abandon plans to construct shed taken without full analysis of consequences	Construct shed or install covering and wind barriers over sorting/processing pad. Upgrade fire suppression function of dust suppression system.

<sup>23</sup> MWGA Funding Agreement WRRF2.01A 01.04.13: 5.3 Compliance Requirements

<sup>24</sup> Project Objectives nominated in documents which define the Project: KCC&KTS Metropolitan Local Government and Resource Recovery Fund Application 12.12.11; KCC&KTS MWMG Project Variation Proposal 19.11.12; MWMG Funding Agreement WRRF2.01A 01.04.13

hot winds on very hot days – causing significant operator discomfort and increasing fire risk.		
<b>Dust generation much worse than expected</b>		
Hard waste shredding generates significant dust – making safe operation difficult particularly on windy days	Processing performance predictions not based on equipment trials with actual materials and similar site conditions	Installed dust suppression system Install covering & wind protection over process area. Install dust extraction system.
<b>Manual handling not completely eliminated</b>		
Hard waste and mattresses mostly received commingled. Sorting required between items directed to dismantling and items directed to shredding.	Commingling and compaction may not be compatible with highest order of recycling/recovery - WHS concerns must continue to be priority.	Research means of further reducing manual handling risk whilst retaining recovery benefits of hybrid system (refurbishment / disassembly / shredding)

**Table 4 Summary of main failings - Causes, Lessons, Rectification**

### Summary of operational outcomes - main Successes, Lessons, Benefits

- Metropolitan mattress recovery crisis averted
  - Upgrading of the KTS mattress and hard-waste processing capability provided councils on the eastern side of Melbourne with an immediate and developing capacity to divert mattresses from landfill after the collapse of Dreamsafe.
- Buffer for the development of alternative processes
  - The reliability of the processing methodology and the capacity of the facility has afforded MWMG Councils a time buffer in which to consider innovative processes whilst continuing with the use of existing service providers.
- Fire risk decreased
  - Intensification of activity on the KTS site has drawn attention to fire risk and resulted in the development of a solution being prioritised.
- Throughput increased
  - Improvements in the efficiency of every aspect of materials handling on the KTS site has increased the safe throughput capacity as predicted. The throughput of mattresses has at peak times been close 12,000 units in one month without creating significant operational issues. This is equivalent to an annualised throughput of more than 140,000 mattresses – well in excess of the project target of 100,000 mattresses p.a.
- Manual handling decreased
  - Focus on automated processing of materials on-site has obviated much of the requirement to use manual handling in the collection and delivery chain – resulting in more efficient and safer kerbside collection of mattresses.
- OHS risk decreased
  - Reduction of manual handling, reduction of fire risk, reduction of exposure to dust generation and separation of activities on site have all contributed to a greatly decrease OHS risk profile.
- Steel recovery increased
  - Use of an electro-magnetic steel recovery belt was predicted to effectively recover a high proportion of the steel spring componentry of the shredded mattress. In practice, the Ecoscreen and placement of the magnets in the off-the-shelf setup left much of the steel in the shredded waste. A series of trials were conducted resulting in a decision to use a Powerscreen for screening of the shredded mattress-only stream along with a modified mounting for the electro-magnet arrangement which has overcome the problem of build-up of shredded steel at the take of point.
- Contamination in recovered steel decreased
  - Smaller size shredding of steel springs, sorting by modified screening and recovery by multiple belt magnets on modified mounts has greatly reduced the potential for steel to be caught up in other material streams or be directed to disposal.
- Some timber and foam recovered



- Collection of mattresses using compaction vehicles has produced the benefit of breaking up a portion of the timber frame in bed bases, couches and sofa beds. This material is clean and relatively easy to recover prior to shredding - and is able to be diverted to the Coldstream site for mulch production.
- Some of the foam from mattresses is delivered as large chunks by the shredding and screening process. Theoretically, this material can be baled and marketed for underlay manufacture. In practice, the potential for many of the mattresses to be discarded due to soiling - or soiled as a result of the commingled collection and compaction process and waterlogging from weather exposure kerbside or on the receiving pad – makes the material relatively unattractive to foam reprocessors.
- % materials recovery increased
  - Mechanical sorting, shredding and screening of mixed waste materials enables the heaviest recyclable component (steel) to be much more effectively recovered.
  - Use of the concrete pad for receipt and initial sorting has enabled a higher level of pre-shredding recovery to be undertaken.
  - Materials recovery has increased from 15% to 23% for hard waste and from 15% to 40% for mattresses.

## Potential for further improvement

- Covered area to protect materials from weather
  - Construction of a shed or a covering for the receipt/processing pad will protect mattresses from damage due to weather exposure and shelter staff working in that area. This will result in better quality materials, less waste and potential for a longer span of working hours. Covering will also give shelter for staff and the process on excessively hot days – increasing the number of days when processing can be undertaken.
- Protection for shredding on windy days
  - Processing efficiency is reduced during high wind – in some instances processing is forced to cease.
- Dust extraction
  - Dust generation was always expected to be a significant factor and suppression measures have already been put in place. Positive extraction of dust would further reduce amenity and efficiency impacts of generation of dust.
- Better separation technology for shredded foam
  - Effective recovery of foam has proved difficult from a commingled shredded stream.
- Consistent markets for recovered foam
  - The current unreliable market for recycled foam has made its recovery a relatively low priority.
- Better separation technology for shredded timber
  - Very little timber is currently recovered from the shredded stream.
- Completely eliminate manual picking
  - The mattress recovery process operating at KTS is now largely mechanised. The decision to reduce manual handling wherever feasible has proved to be a good decision evidenced by the absence of manual handling injury claims from processing mattresses & hard waste
  - Increased throughput will introduce higher risk of injury occurring unless manual handling & picking of materials in the receipt area is further minimised.
- Better spillage controls
  - Waste processing equipment typically performs differently according to the actual waste composition, presentation and throughput.
  - Modifications have been made to the processing equipment including the materials conveyor system over the past year to improve the efficiency of material flow.
  - Increasing throughput will require further modifications and improved spillage controls to be implemented.