

Used Mattress Disposal and Component Recycling – Opportunities and Challenges

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Background

Used product disposal is a persistent and to some extent growing problem for U.S. mattress manufacturers. Traditional disposal at landfills is becoming increasingly expensive and difficult due to increased regulation of landfills generally, space constraints and decisions to ban mattresses from landfills based on business or regulatory considerations. Likewise, few viable mattress dismantling operations exist. Without a local landfill or dismantling alternative, used mattresses either are shipped out of state, illegally dumped or find their way to “renovators” that recover the used products, frequently misrepresenting them to consumers as new mattresses.

Given that selling renovated mattresses as new products is illegal in many states, no accurate statistics exist on how many units of used mattresses are renovated and resold in this manner. Nevertheless, ISPA in 1995 estimated that this underground market could equal up to 35% of annual new units sold.¹ Based on these estimates, 2003 U.S. sales of 39.7 million units (representing \$5 billion in sales) of mattresses and box-springs, the renovated market could account for up to 13.9 million units worth up to \$1.75 billion.²

To investigate solutions to mattress disposal problems, the International Sleep Products Association (ISPA) Board of Trustees created the Mattress Disposal Task Force (MDTF) in 2003. The Task Force’s charge is:

- To conduct a comprehensive analysis of:
 - how the U.S. mattress industry could benefit from commercially viable mattress disposal programs
 - the current status of responsible mattress disposal programs
 - technological, commercial and regulatory obstacles, trends and opportunities affecting future viability of responsible disposal programs
 - potential strategic partners and mentors for further action
 - challenges to broader use of mattress responsible disposal optionsand
- Report to the ISPA Board of Trustees summarizing Disposal Task Force’s findings and recommended actions, either through the Board’s own initiative or by ISPA’s Government Relations Committee.

Executive Summary and Recommendations

Findings

The MDTF met with several stakeholders involved with mattress and waste disposal operations, including current and past recyclers of mattresses and other products, waste haulers, representatives from supplier industries and associations representing products with similar disposal obstacles, such as batteries and tires. The MDTF considered different shredding and material sorting technologies, machinery and processes available to a potential mattress disposal operation. Options included shredding the full product, manual dismantling, incineration, waste to energy and charitable donations.

¹ “The Market Potential of Mattress Disposal,” Craig Barnes. *Bedtimes*, Feb. 1997. p. 11-25.

² Based on data from ISPA’s *2003 U.S. Mattress Industry: Annual Report and Sales Statistics*. p. 2.

Based on these interviews and information, the Task Force offers the following initial conclusions:

- The value of the recovered mattress materials alone cannot sustain a mattress disposal operation: The principle materials that can be recovered from a mattress are steel, foam, fiber and other filling materials, and wood. Reliable markets for the used steel and foam exist, but markets for the fiber and other filling materials are more limited, with possible uses and markets for the wood being even less attractive (primarily because the used wood contains nails and staples that limits its usefulness as a second hand material). Moreover, the market values of those scrap materials that can be sold are highly volatile and will rarely (if ever) cover the cost of collecting the used mattresses, dismantling the product, separating the components, selling the recovered materials and disposing of the residual waste.
- Finding a sustainable income source to supplement the scrap revenue is key to a successful operation: Options include collecting fees from consumers, retailers, manufacturers or municipalities equal to the “tipping fee” that a landfill would otherwise have charged had the mattress instead been dumped at the landfill, and not dismantled. One operation has also persuaded some landfills that it is economically more efficient for the landfill to pay a dismantler to take the used mattresses rather than consume the dump’s limited space. Factors include:
 - the “opportunity cost” to the landfill from taking light bulky mattresses that generate relatively less revenues compared to those possible from heavier dense refuse,
 - higher landfill development costs resulting from the shortened life of the landfill, and
 - higher operational costs (mattresses can be difficult to handle in a landfill).
- Facility location and security are critical: Location is important to minimize the cost of moving product to the facility and to sell the recovered materials to potential customers. Covered space or secure containers are necessary to keep the used mattresses and recovered scrap dry (wet foam and fiber is often worthless) and safe from theft. (Unfortunately, renovators have used some collection facilities as sources for used beds.) Obtaining any necessary governmental permits and licenses (which can be difficult because many communities consider recycling operations undesirable) is also a prerequisite.
- Preparing recovered scrap in saleable form can be challenging: Steel scrap (in the form of mattress and box-spring coils and springs) is by far the most valuable and easily recovered mattress material. However, bailing the scrap in a form acceptable to scrap dealers can be difficult. Scrap preparation is less challenging for used foam and other fiber materials, provided there is demand for these components. Box-spring lumber often has little value and can be relatively costly to prepare for sale, although it can have limited applications (mulch, landscaping material). Factors that affect the recoverability of these materials include how firmly they are attached together and whether the mattress is very soiled or wet.

- Consistent product volume is necessary to maintain an efficient dismantling operation: Transporting the used mattresses to the disposal site and labor are two significant costs that can be controlled efficiently only if the flow of products for pickup and dismantling is steady. Likewise, efficient sale of recovered scrap depends on scrap being generated in consistent volumes worthwhile to dealers. Therefore, developing collection plans that minimize the handling and transport of the product and allow for consistent product flow are key. Otherwise, labor and transportation will not be used efficiently, bottlenecks are likely to occur in the dismantling process and selling the recovered materials may be more difficult.
- Low-tech manual dismantling appears to be more efficient than more automated alternatives, although new technologies are under development: Various shredding and separation technologies might have application in mattress disposal. Given the cost of such technology, the variability of the mattresses dismantled (in terms of size, content and to some extent construction), a manual approach using relatively low-skilled labor equipped with box-cutters is the preferred approach at present. Capital expenditures are needed, however, to shred product that cannot be quickly dismantled by hand. These include magnetic separators, bailers, forklifts to handle the product and the scrap, etc.
- Burning used mattresses for their energy value can minimize many logistical issues associated with dismantling: An incinerator's fee can be significantly less than tipping fees because the plant generates income through electricity sales. Steel scrap can be recovered either before or after the incineration process occurs, but this income is insufficient to support the cost of collecting, processing and burning the used products. Once again, a sustainable supplemental income source is necessary. Furthermore, many facilities cannot process mattresses efficiently without cutting the units into smaller pieces, and many areas of the United States are not serviced by incineration or waste-to-energy plants.

Interim Recommendations

Based on the Task Force's research, we realize that the U.S. mattress manufacturing industry has little or no control over many of the factors that contribute to the success or failure of a given mattress disposal facility. For example:

- The mattress industry has absolutely no control over volatile scrap prices.
- It is unlikely that mattress construction methods will change significantly over even the long term that would make it easier to dismantle used mattresses, and even if such changes were feasible sooner, they would not have an impact on dismantling operations for 10-20 years given the long useful life of these products.
- We have no direct control over what consumers and retailers do with used mattresses, and changing their behavior and attitudes toward responsible mattress disposal through persuasive public education campaigns alone is difficult, if not impossible.

Instead, the Task Force has concluded that its efforts are best spent (1) attempting to eliminate current obstacles to efficient disposal operations and (2) serving as a clearing house for information that others can use in setting up or improving new dismantling efforts. Specifically, we recommend that ISPA consider the following:

- Work with regulators to establish a federal mattress requirement that sets consistent national rules to discourage unscrupulous renovator operations: Removing the incentive to divert used mattresses from responsible disposal will be critical to improving the commercial viability of those operations. The rules should be sufficiently comprehensive to regulate not only those that recover and sell renovated mattresses, but also those that facilitate such activities, such as refuse haulers, landfill operators, retailers that collect used mattresses when they deliver a new mattress and others that facilitate this unscrupulous process by providing used products to renovators.
- The mattress industry should work with the polyurethane foam industry to remove and prevent further legal restrictions on the recycling of foam: Specifically several states have or are considering bans on the use of certain PBDE fire retardants in foam. These laws may have the effect of limiting the use of post-consumer foam in foam carpet underlay, the primary market for used mattress foam.
- To supplement these efforts, the industry should work with large-volume mattress consumers (such as hotels, government agencies, universities, etc.) and those involved with waste management (such as trash haulers and landfills) to establish “Codes of Conduct” supporting responsible mattress disposal: Such Codes of Conduct for the large volume consumers would be a cost effective means for encouraging them to send large quantities of similar sized and built products to disposal operations that can handle this material efficiently. With regard to the waste management companies, the Codes of Conduct might encourage them to prohibit their employees from scavenging used mattresses for renovators, etc.
- The mattress industry should also work with the waste management industry to promote the concept that supporting mattress dismantling operations will make landfills more profitable: This could help the develop a reliable income stream to defray some of the mattress disposal costs that are not covered by scrap revenues.
- The industry should work with state and municipal government associations to set reasonable parameters for recycling operations, thereby alleviating NIMBY (Not In My Back Yard) objections that some communities have against such activities: Success on this front could eliminate a large logistical obstacle to establishing disposal operations.
- The mattress industry should be a source for logistical support for new disposal projects: Such assistance might consist of sharing information about practices that other dismantlers have found to work, start-up and logistical issues dismantlers should consider, assistance with government grant applications, etc. In this way, the industry and the disposal community can learn more about making such operations more commercially viable.

- For clean comfort returns, the industry should explore partnering with responsible charities that have a need for donated mattresses: Key objectives of such an arrangement would be to obtain sufficient assurances that neither the charities nor a third party will ever sell the donated products, that their staff and volunteers will not divert the donated products to renovators, that the charities will comply with applicable state or other used mattress sanitization and labeling requirements, etc.

The Current Disposal Process

Landfills are probably the final destination for most mattresses in the United States. But mattresses are bulky and relatively light, while most landfill tipping fees are based on the weight of the item dumped, not its volume. As a result, used mattresses consume a large amount of landfill space relative to their light weight.

One mattress disposal operation, Conigliaro Industries, has estimated the “opportunity cost” that a landfill incurs by processing mattresses. Tipping fees can vary from one landfill to another. For these purposes, Conigliaro used a typical fee of \$75 per ton of material dumped. Conigliaro also assumed that:

- Modern mechanized landfills can compact ordinary garbage and construction and demolition (“C&D”) waste efficiently at a rate of 1500 lbs/cubic yard, thereby generating tipping fee revenues of \$56.25/cubic yard (that is, $75 * (1500/2000) = 56.25$).
- By comparison, Conigliaro conservatively calculates that compacted mattresses would at most weigh about 250 lbs/cubic yard, thereby generating tipping revenues of only \$9.38/cubic yard (that is, $75 * (250/2000) = 9.38$).

In other words, yard for yard, the landfill in this example incurs an opportunity cost of \$46.87 for every cubic yard of mattresses that it accepts and that it could substitute with heavier ordinary garbage and C&D. Conigliaro estimates that 125 mattresses of mixed sizes weigh about 10,000 lbs. If mattress can be compacted at a rate of 250 lbs/cubic yard, these 125 mattresses would take up 40 cubic yards (that is, $10,000/250 = 40$), and 1 cubic yard of compressed mattresses would contain 3.125 mattresses (that is, $125/40 = 3.125$).

As a result, the \$46.87 in opportunity costs that the landfill incurs in accepting mattresses is equal to \$15.00/mattress (that is, $46.87/3.125 = 15.00$). In other words, the landfill would be more profitable if it were to pay anything less than \$15 per unit for someone else to dispose of the used mattress.

Conigliaro also notes that the opportunity cost is not the only disadvantage that landfills experience from accepting mattresses: “Mattresses are a very difficult material to process at a landfill or transfer station. They do not compact well in reality and they do not retain their daily cover very well. Once exposed during the compaction process, the springs of a mattress have a tendency to disable landfill and transfer station equipment.”

Finally, new landfills can be difficult to develop. Accepting mattresses accelerates the depletion of existing landfill “inventory” that will be more costly to replace in the future. Taking all of these factors into consideration, mattresses are relatively expensive to landfill and a landfill has an economic incentive to pay another party to otherwise dispose of the mattress.

As a result of these factors, there is a trend toward some landfills refusing to accept mattresses or for mattresses to be prohibited by law.

On the positive side, the exiting collection process that some cities use to pick-up large items like furniture and mattresses might be a useful means for collecting mattresses destined for dismantling operations.

Other Disposal Options –

A. Dismantling the Mattress for Recoverable Scrap Materials

Mattress Recyclables

Steel scrap (for use in making new steel) and foam (for use primarily in carpet underlay) are the two mattresses components that could be recovered from a used innerspring mattress relatively easily and sold for a reasonable price. (Foam would be the only significant scrap that could be recovered from solid foam or other non-innerspring construction mattresses.)

Steel makes up roughly 50% of an innerspring mattress’ weight. Scrap steel prices are currently high, but are notoriously volatile, having ranged from \$117 to \$168 per ton between 1995 and 2001, before falling to \$97 per ton after the September 11 attacks. Scrap prices were back to \$161 by August 2003 and current prices are nearly \$400 per ton. Although scrap steel prices could remain high for some time, a prudent dismantler must assume lower scrap prices in its business model due to the price volatility of this material.

As for post-consumer polyurethane foam scrap, many mattresses contain large amounts of foam (roughly 10% by weight). Like steel, scrap foam prices can also be volatile. The MDTF met with Gary Lambert from BASF and the Polyurethanes Recycle Recovery Council (PURRC) to discuss the market for and potential uses for foam scrap. At present, U.S. demand for scrap foam is currently strong, with the United States being a net importer of roughly 150 million lbs. of used flexible foam at prices ranging from 25 to 35 cents/lb. Polyurethane foam is typically converted into carpet underlay through a rebonding process. (Foam rebonding is accomplished at very high temperatures that sterilize the batch.)

Research also shows that recycled foam can also be chemically converted to make new polyols — the foam component – although this process is not yet commercially viable.

Several states (e.g., California, Maine and Hawaii) have either enacted laws or are considering legislation to ban or limit the use of certain PBDEs in new foam. Such

restrictions could limit the use of post-consumer foam in carpet underlay because it would be impractical to test whether used foam intended for carpet underlay applications contain the prohibited PBDEs. The foam industry is attempting to modify these efforts in order not to disrupt existing foam recycling practices.

At present, it is unlikely that cotton and fabric used on and in mattresses can be recovered and sold efficiently. To the extent they do have residual value, their reuse applications include carpet underlay or moving cloth. However, the cost of separating them is very high either through manual or mechanical means, because the fabric is usually attached or quilted to other materials.

The lumber used in the box-spring also has limited value because the wood has been stapled or nailed and is of small, non-construction grade sizes. Even in shredded form, many potential purchasers will consider the metal contamination from the staples and nails unacceptable. Dismantlers have indicated that they have sold some wood scrap for mulch and landscaping uses. The disposal operation and wood buyer must agree on an allowable level of contamination in the wood in order to make the product viable.

Material that cannot be recovered for resale must be landfilled, the disposal of which incurs a cost for this disposal operation.

Factors Required for Viable Disposal Operation

Permits and Licenses

The disposal facility must obtain necessary permits or licenses to conduct recycling and waste processing at its facility. Depending on the state and locality, permits could include a business license and waste processing license. Some localities may have strict requirements governing the operation of waste processing near residential areas, and may limit the number of truck deliveries and pickups per day. One mattress disposal operation indicated that it frequently was cited for violations of the local fire code, given the number of mattresses stored at the facility.

Used Mattress Collection Logistics

Collecting, handling and transporting the used mattresses to the disposal facility and the recovered materials from the facility can be costly and time-consuming. A disposal facility should establish well-organized and prearranged methods and schedules for collecting mattresses. This might be accomplished by contracting with major sources of used mattresses (e.g., waste haulers, landfills, retailers, municipalities) and shippers of the recovered materials.

Capital Equipment Needs

The process of removing the innerspring unit from a mattress is efficiently achieved by “filleting” the unit. This can either be done manually using box cutters or by using a specialized machine. Research on such machines is ongoing. Mattress units in good condition can typically be filleted by hand (using a box-cutter) at an efficient rate.

The MDTF analyzed specific categories of equipment that would be useful in disposal operations. Shredders (including an efficient means of feeding mattresses into the shredder) would be critical to maintaining a high processing capability, especially for older mattresses that can be harder to handle and dismantle, and are more efficiently processed by shredding. The shredder selected must be able to process large numbers of mattresses per year with minimal required maintenance. A low-speed, high-torque shredder appears best suited for this purpose.

Other necessary equipment includes conveyors and magnets to separate steel from shredded mattresses and bailers to prepare the recovered steel spring units for delivery and sale to a scrap dealer.

Labor

Labor is necessary to operate the machinery and dismantle the mattress, move the mattresses and materials, and prepare the separated components for shipment. The workforce must be proportionate to the volume of products to be processed and need not be highly skilled. For example, the draft business plan developed by the NE Minnesota Mattress Recycling Program projects that each trained staff member at its mattress dismantling facility can process 35 pieces daily.³

B. Energy Recovery

Mattresses are combustible products and many contain large amounts of polyurethane foam, which generates significant heat energy when burned. The MDTF examined incineration and waste-to-energy alternatives for mattresses. Incinerators and waste-to-energy facilities both burn waste to reduce its size and weight. The latter also uses the burning process to generate electricity. Currently, there are few U.S. incinerators that can accommodate whole mattresses.

Waste-to-energy operations are relatively more common in the United States, with 89 plants currently operating in 27 states. The facilities are governed by strict regulations limiting pollution similar to the operation of incinerators.

Waste-to-energy facilities that the MDTF interviewed indicated that they also charge a fee to accept waste because operating costs exceed the value of the energy generated. However, that fee may be lower than landfilling or incinerating because the facility offsets its operating expenses with revenues generated from selling the electricity.

While energy recovery eliminates some logistical aspects of a dismantling operation, it still requires transportation of mattresses to the plant; pre-burn processing (to reduce the mattress to an acceptable size and possibly remove the steel springs) and fees to cover the amount by which operating costs exceed energy revenues.

How do Other Countries Deal with Used Mattresses?

The MDTF also considered European mattress disposal practices, and found that incineration and waste to energy was the most common means used. Waste burning is a

³ NE Minnesota Mattress Recycling Program, Draft Business Plan (Apr. 2004) 18.

much more common means for disposing of waste generally in Europe than in the United States. In addition, incineration of European mattresses is more feasible because they are more likely to be constructed of solid foam, and thus would not have steel innersprings that must be separated either before or after the burn.

The European Bedding Industries' Association (EBIA) is opposed to any national or European level effort to impose product end-of-life obligations on mattresses manufacturers. It cites the efficient operation of municipal collection and burning, as well as possible problems associated with handling of post-consumer mattresses, as reasons to continue with the current European disposal system.

Disposal Efficiency and Viability Issues

Transportation

As noted above, efficient transporting of the used mattresses to the disposal facility and the recovered materials from the facility is critical. The number of times that a mattress or material is handled and moved must be minimized. Hauling individual mattresses directly to the recycling facility would be impractical. Rather, the used mattresses should first be taken to local collection points, from which they can be transported to the recycling facility on larger trucks.

Retailers are often the first potential point of contact for many used mattresses if they pickup a used mattress as a service for customers buying a new mattress. A recent non-scientific survey of retailer practices conducted by Sleep Savvy indicated that many retailers will offer to pick up old bedding either as a matter of course or upon request, and all but one of those responding provide this service for free. (This survey is of limited usefulness, as it generated only 35 responses.)

Retailers could then serve as a convenient initial collection point for the used mattresses. Options for delivering those mattresses to the disposal facility include the retailer's trucks, the manufacturers' shipper (when it leaves the retailer after delivering new mattresses) or a third party hauler. Using a retailer's trucks would be the most efficient in terms of minimizing the handling steps. A third party hauler or the manufacturer's shipper could also transport the used mattresses that the retailer has collected to the disposal facility, but would involve additional handling expenses.

Municipalities that accept large pieces of waste, such as mattresses, provide another collection option. The municipal trash collectors could be provided a site at their main waste transfer station where haulers could set mattresses aside for later transport to the disposal facility. In those municipalities that have annual or seasonal large item trash drives, however, this method might cause logistical problems since those collections will provide a temporary spike in supply, and will not provide a viable means for maintaining a steady supply of use mattresses to the disposal facility.

Waste haulers can also play a key role in transporting mattresses from landfills. Some waste haulers use central transfer stations and could thus be encouraged to separate collected mattresses for later delivery to the disposal facility. The individual waste hauler

may already be segregating much of the collected waste in order to transport products efficiently to a given landfill based on distance, product bans and tipping fees.

Initial collection facilities should also have the ability to accept individual mattresses dropped off by consumers. This would likely reduce illegal dumping of mattresses in areas where local trash trucks or landfills do not accept mattresses while also providing additional mattresses to the disposal facility.

The mattresses must then be taken from the collection point to the processing facility. Disposal operations can either contract with a transportation company or use their own trucks if the disposal operation is large enough. Options that will need to be considered will include using the trailers as storage devices or offloading mattresses immediately. This will be directly related to the number of mattresses supplied to the disposal operation and the facility's processing capacity.

Coordinating with high volume mattress consumers (such as hotels, government agencies, universities, etc.) on their replacement schedules will also allow for efficient collection and transportation of used mattresses to disposal facilities.

Additional costs will be incurred to transport the separated components to their next destination—the scrap recycler, landfill or burning plant. Considerable savings in this area can be realized when finding a location for the mattress recycling facility. The facility should be placed as close as possible to buyers of scrap steel, foam, etc., and a landfill to deposit waste. Separated components will, however, be easier to ship than whole mattresses, allowing for more efficient use of the space within the shipping container.

Basic security must be provided for mattress collection points to prevent theft by renovators. At a minimum, the collection point will most likely require a fence. Operators should also consider environmental theft deterrents such as lighting, low bushes, proximity to other secure locations and visibility from the street. If thefts do occur, operators could slash or otherwise damage the mattresses to make them less desirable for rebuilders.

Shredding Technologies

Shredders have important advantages over manual tear down of mattresses:

- Tear down is easier and faster;
- Component materials can be easily captured; and
- Packaging of waste is smaller and easier.

Disadvantages to using shredders to tear down mattresses include:

- High initial cost: The price for shredders can exceed \$100,000;
- Operating costs: Shredders require additional costs for setup, power and maintenance which add an additional \$10,000 to \$20,000 annually;
- Use considerations: Innerspring units can jam shredders and wear their blades quickly, thereby increasing maintenance costs; and

- Fixed location: Mobile shredders at present do not appear to be practical.

MDTF members considered various low-speed and high-speed shredders, including ring mills, hammer mills and sheer shredders. Low-speed shredders differ from high-speed shredders in that they are designed to tear products apart using hooks or blades while high-speed units smash products into smaller pieces. Based on discussions with current and past mattress disposal operations, it appears that low-speed, high-torque shredders are best suited for mattress disposal.

Some experience shows that high-speed shredders are more susceptible to jamming on innerspring units and long pieces of fabric. Low-speed and high-speed shredders also differ in that the former tends to produce much larger pieces of shredded material while high-speed shredders produce smaller pieces. The shredder chosen for the facility must be able to process several thousand mattresses per year with minimal downtime for maintenance (such as replacing blades), since extended maintenance periods will create a processing bottleneck.

Sorting

The recovered materials must be sorted into steel, foam, wood and fluff components (i.e., fabric, etc.) to be landfilled. Sorting can either be manual, automated or a combination of the two.

Manual Sorting

Manual sorting has most frequently been used by past and current mattress disposal operations to remove the innerspring unit from the mattress. Labor can also be used to remove large pieces of foam at this stage of the breakdown as well. Manual labor could also be used to remove large pieces of foam from mattresses shredded with a low-speed shredder.

Automated Sorting

Automated sorting can potentially sort material more quickly and thoroughly using a combination of air or other “flotation” methods and magnets, but the more sophisticated approaches at present are very costly. An overhead magnetic separator belt that would cross a shred conveyor would cost roughly \$15,000. This would be extremely valuable because manually removing metal from the shredded material would be extremely difficult.

Other sorting technologies are available to separate foam, cloth and other components. These include cyclones and aspirators that are able to sort the various components using air to sort the material by size and weight. At present, this process is not practical for mattress disposal due to the high cost of the system (roughly \$750,000) and the modest value that can be achieved from separating the foam from fabric and cotton.

The cost of any separation machinery must be weighed against the expected revenue that it will generate and possible labor savings that can be achieved. Task force members observed that Conigliaro Industries relied mostly on manual sorting because the majority

of the materials could be taken in the initial stage of filleting the mattress to remove the innerspring unit and large pieces of foam. Part of this efficiency, however, was due to the high number of mattresses that Conigliaro receives in good condition and that are easier to manipulate by hand than more heavily used mattresses.

Supplemental Income Sources A dismantler cannot support its operations based on scrap revenue alone, and must augment this with fees paid by a third party. Possible candidates for such fees include the consumer, waste haulers, landfills, retailers, manufacturers or a combination of these.

As discussed above, Conigliaro has developed a rationale for convincing landfill operators and waste haulers that they incur an opportunity cost when they landfill mattresses. As a result, landfills have a financial incentive to reject mattresses, to charge a higher tipping fee for mattresses, or to find another destination for them (i.e., pay a dismantler like Cognigliaro a fee lower than the foregone additional tipping fee, equal to about \$15 per mattress, assuming a tipping fee of \$75/ton) in order to conserve their landfill “inventory” for more profitable refuse. But many landfills do not yet appreciate this analysis.

The MDTF explored several other options for generating the recycling fee. First, retailers could ask consumers to pay a voluntary fee to recycle their old mattress. The Sleep Savvy survey found that most retailers (61%) indicated that they do not think their customers care what happens to their old mattresses, suggesting that customers are unlikely to pay a recycling fee. On a related note, the Sleep Savvy survey also show that retailers believe that promoting the fact that the retailer is responsible in how it disposes of the used mattresses would have minimal impact on a customer’s decision to purchase a mattress.

Persuading large volume consumers and others by means of Codes of Conduct or other means might also create incentives for those entities to fund disposal operations. In order to make the fee arrangement more attractive, it is also possible that the disposal operation could “share” the benefits of temporarily high scrap values with the fee payer by offering a fee rebate if scrap values exceed certain set levels.

Another option would be to collect a fee when the mattress is manufactured or sold that would finance dismantling operations. For example, assuming that:

- annual U.S. sales volumes remain current at approximately 40 million units annually and
- a \$10/unit disposal fee would be needed to make a dismantling operation viable,

then a fee of only \$1 per unit of new mattresses and box springs sold would generate enough money to pay the disposal fee for up to 4 million used units annually. (This estimate, however, does not account for the costs that would be incurred in administering this program, which the MDTF has not estimated.) Assuming further that even if only 50% of these dismantled units would have otherwise found their way into renovators’

hands, and that consumers would have instead bought a new mattress instead of a renovated unit, the \$1 fee per new unit could generate 2 million units of *additional* new mattress sales, worth potentially \$250 million (at the current average unit price for mattress and box-springs combined of \$127).

Collecting and disbursing this fee, however, would pose difficult issues. A voluntary collection system could be costly and difficult to administer. Furthermore, retailers would likely balk at such a system and there would be a strong incentive for many manufacturers and retailers to not participate in the fee but still try to benefit from the program. This “free rider” behavior would likely defeat such a voluntary approach.

A government mandated funding mechanism is also problematic. First, the program would likely work only if the fee were collected nationally – as opposed to collecting it at the state or local levels. Specific legislation in Congress would be needed to authorize such a fee, which could be difficult to accomplish. Even if that were possible, establishing and administering the bureaucratic procedures and criteria for collecting and disbursing the fee would still be complex and would themselves impose additional costs on the industry.

On balance, while the MDTF agrees that there may be merit to collecting a set fee on all mattresses and box-springs as they are made or sold, it would be premature to pursue this option at this time.

Conclusion

Responsible mattress disposal options remain limited at present, primarily because revenues generated from selling the recoverable scrap do not cover the full cost of such operations. Nevertheless, a number of entities have or are attempting to establish viable business models for operating in this field.

Recognizing that the mattress industry cannot influence a number of factors critical to viable mattress disposal (e.g., scrap prices, easier to dismantle mattress designs, and human behavior), the MDTF recommends that the mattress industry use its resources to remove obstacles to such operations and to otherwise help facilitate this process.

Specifically, the Task Force recommends that ISPA authorize the following action items:

- The Task Force would work with the ISPA Government Relations Committee to help structure a national mattress requirement that will help facilitate responsible mattress disposal.
- Support foam industry efforts in states with PBDE foam bans to protect the use of post-consumer foam in carpet underlay.
- Seek to establish Codes of Conduct to support responsible mattress disposal for large volume consumers and entities that handle used mattresses.
- Work with waste disposal industry to promote concept that mattress disposal imposes opportunity costs on landfills.
- Work with state and municipal government organizations to improve perception of recycling operations located in their communities.

- Prepare data sharing opportunities regarding mattress disposal operations, including:
 - ◆ Case studies of successful and unsuccessful disposal operations,
 - ◆ Data base on government grant and funding opportunities for pilot projects,
 - ◆ List serve for parties interested in mattress disposal to communicate directly with each other.
- For clean comfort returns, explore feasibility of disposing of these units through charities that will comply with applicable sanitization laws and not sell the donated goods.