Creating markets for recycled resources

Used Tyres Material Flows and Market Analysis - Market Disruption Planning

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Used Tyres Market Disruption Planning Report

1 Background and Summary of Findings

1.1 Background

In January 2006 Oakdene Hollins Ltd (OHL) presented a report to the Waste & Resources Action Programme (WRAP) setting out the findings of a market study of used tyre arisings, recovery and disposal volumes in the UK in 2004. This report is based on the data generated by that study and describes a set of possible change scenarios and their potential effects on the market.

Five scenarios were agreed with WRAP at the outset of the programme in September 2005. They were:

- **The cement industry reduces or increases the use of tyres as fuel for cement kilns.** This might be in response to regulatory change, market price changes or to energy price increases. The range of waste derived fuel types available to the cement manufacturers, such as secondary liquid fuel, waste oils, paper and packaging waste and meat and bone meal, provides the industry with some flexibility to influence the market.

- **The collapse of the used tyre export markets**. This is considered a possibility as vehicle safety regulations in many export markets - particularly in Europe - are tightened, thereby reducing the suitability of part-worn tyres from the UK.

- **The banning of the disposal of shredded tyres to landfill.** Disposal of shredded tyres will be banned by the regulations arising out of the Landfill Directive from July 2006.

- **The opening of a large scale pyrolysis or cryogenics plant**. Whilst the recovery of raw materials and energy from used tyres through pyrolysis and gasification has not proved to date to be commercially viable, a number of cryogenic treatment plants are being considered in the UK. Such technical innovations could influence the end product application markets, increasing the demand for tyre rubber.

- **The collapse of the shredding and crumbing market.** This scenario might consider the collapse of the demand for a significant end product, such as tyre shred for equestrian ménages, or tyre crumb for sports and play surfaces. These might in turn be driven by the influx of alternative materials for these markets or by the UK market being flooded by imports as other countries, especially those that are short of recovery and disposal capacity, seek to address the problem of used tyre surpluses.

In December 2005 the study was extended to consider how the key market players in the industry and national or devolved governments would have to respond to a major event that would interrupt a significant disposal stream. Examples of these events could be:

- **The banning of the use of shredded tyres in landfill engineering projects.** The regulatory situation regarding the use of shredded tyres as a replacement material for aggregates in approved engineering of landfill cells was unclear at the outset of this study. However, some clarity on this was obtained in a European Commission letter in January 2006.

- **A catastrophic fire at a key processor.**

- **A major downturn in the cement industry's use of tyres**. This might be due to any reason, such as a collapse in gate fees or technical or regulatory changes.

1.2 Methodology

The base data required for this study was available from the Used Tyre Market report, prepared by OHL, which is based on arisings and recovery and disposal volumes in the UK in 2004. This data was extended by additional research which included:

- Consideration of any significant market trends during 2005 and into 2006 which might necessitate adjustment to the 2004 data
- Assessment of the maximum available capacity of the collection, primary processing, disposal and end product sectors of the industry
- Consideration of the ability of the major disposal and end product markets to absorb additional tonnage
- Calculation of the extent of the excess of capacity over arisings and the mobilisation timescales that would be required to exploit any excess capacity, in particular within the cement industry
- Identification of the potential capacity of new and proposed processing plant, together with lead times
- Review of gate fees and processed rubber prices and consideration of the distortions to these that would be caused by each potential market condition
- A workshop meeting held at WRAP, Banbury, in December 2005 with the DTI and industry representatives to consider the ideal corrective actions and interventions that could be implemented.

The 2004 used tyre market figures and potential market disruption scenarios were presented and discussed at the second WRAP Tyres Forum in London in January 2006 and were also discussed at a following meeting of the Used Tyre Working Group (UTWG). At the date of the presentation and the UTWG meeting, the regulatory situation regarding the use of shredded tyres in landfill engineering had not been resolved, a factor which significantly distorted the figures. However, a number of issues raised by delegates at these events were noted and incorporated into this report.

Because of the different technical characteristics between car and truck tyres, which give rise to different end product applications, the data taken from the 2004 market report was simplified into three categories, defined as:

- **Car**, i.e. tyres from all passenger cars, including four wheel drive vehicles, car derived vans, and light commercial vehicles
- **Truck**. i.e. tyres from medium and heavy trucks and buses and
- **Other**, i.e. tyres not falling into either of the above main categories, such as bicycle tyres and those fitted to agricultural vehicles and earthmovers.

1.3 Summary of Findings

1.3.1 Projections

The market data from the UK Used Tyre Market 2004 report were projected forward for five years. The projections were based on the extrapolation of historical events, with adjustments to cover the “known” change scenarios such as the implementation of the Landfill Directive, and supported by information from sources within, and knowledge of, the industry. The interpretation of such information, and any assumptions made, should be seen as being solely the opinion of the author and not necessarily of WRAP or of the used tyre industry as a whole.

1.3.2 “No Disruption” and Best Case Scenarios

The study shows that, without disruption to the market by changes other than by known external and internal factors, the demand for used tyres will, sensibly, be in balance with the available arisings, thereby obviating the effect of the landfill disposal ban in July 2006. At the beginning of 2006 gate fees have been going up, which suggests a shortfall of demand. However, the use of tyre shred in landfill engineering applications is known to be seasonal, and heavy current demand in this area is forecast to reduce any short term used tyre surpluses by the end of 2006. Increasing end product application and energy recovery demand may even lead to shortages from 2007 onwards, which in turn will cause a fall in gate fees and bring the market back in to balance.

The above has been calculated on the basis of some conservative forecast demands, especially for car tyres used by the UK cement industry. In a “best case scenario”, for instance the achievement by the cement industry of its current five year forecasts, any short term surplus up to 2006 will be fully recovered by 2007 obviating the need for stockpiling. It is also expected that external support for the research, trialling and demonstration of new applications and end products, as provided by the current WRAP Tyres Programme, will increase demand in the time frame considered, especially for higher value products, and will further accelerate the reduction of any used tyre surpluses.

1.3.3 “Disruption” Scenarios

Clearly in the event of a significant adverse disruption to the market, a surplus will arise.

The collapse of a major processing business is not seen as other than a short term problem since it is believed that the industry could recover within six months, through new investment which would be encouraged by increasing gate fees.

There is capacity for some processors to increase throughput in the short term by additional shifting, a process that could be assisted by the easing or fast tracking of planning applications in some cases.

The worst case disruptive scenario envisaged would be a 40,000 tpa collapse in the demand for used tyre material for an end product market commencing in 2006. In this event, a cumulative surplus of 50,000 tonnes would accumulate by 2008. At the WRAP workshop meeting at Banbury in December 2005, representatives from the used tyre industry indicated that the industry has the ability to accommodate such an increase in stocks, although contingency planning for some external stockpile facilities may be required.

This scenario would require a significant new end product application to be available to the market in a short time frame, in order to avoid stockpiling. It is expected that some of this new demand would be available through the support being provided by the WRAP Tyres Programme. Also, additional throughput in the cement industry and the export of tyres for energy recovery are seen as possible short term mechanisms to absorb some of the surplus tonnage. Clearly the actual scale of any stockpiling would be a factor of the extent and speed of the disruption and the ability of the key market players to enact these alternative recovery routes. Where regulatory issues are restricting the speed of industry to re-act, for instance with cement combustion trials or with the application of waste definitions, then some intervention in the form of the easing of minor restrictions or the speeding up the permitting processes could be considered.

Assuming that no intervention policies are enacted, it is believed that the reaction to any major disruption will be that the major collectors will continue to meet their contracts but that the smaller collectors would quickly find no easy outlet for their tyres and may go out of business. Gate fees will increase and this will be passed back to the consumer, who may in turn start to refuse to pay more to cover the cost of recovery of the replaced tyre. In this scenario, an increase in fly tipping is inevitable in the short term as either the less scrupulous operators, or even consumers, decide to illegally dump their used tyres rather than to pay the higher charges.

Rising gate fees will encourage investment in new recycling options. However, the market is demand driven, and significant new end products and applications will be required to provide sufficient additional demand for any new processing capacity to be realised and for the market to return to near 100% recovery. This is likely to take up to three years, i.e. up to 2009, to recover from such a worst case disruption, by which time a significant “national stockpile” of used tyres may have accumulated.

1.3.4 Policy Intervention

In summary, it is the opinion of the writer that the growth in demand for used tyres, assisted by such programmes as the WRAP Tyres Programme, will provide, within an acceptable time frame, a market solution to absorb the surplus of used tyres that will occur up to 2006. This assumes that there are no further significant disruptions in demand pull.

In the event of a significant disruption in demand, Government policy intervention would be required to minimise fly tipping and unregulated stockpiling. This could be in the form of:

- Providing stockpile flexibility within the industry, with appropriate environmental and safety controls, to provide a medium term buffer for surplus tyres.
- Setting up additional external stockpiles, with management of the stocks and final clearance funded by the gate fees received.
- Providing further and accelerated funding of new recovery and end product applications.
- A public procurement policy which encourages the sourcing of recycled products, in particular retreaded tyres for public vehicle fleets,
- Ensuring consistency of approach to the permitting and planning of landfill designs.
- Fast-tracking planning applications and the permitting of key industry processes.

2 Market Trends to 2006 and Beyond

2.1 Background

A number of step changes in the UK used tyres market are occurring between 2004 and 2006. Some are caused by external events such as regulatory change, and some by known internal market events. Following 2006 the market is expected to stabilise, with normal growth/decline patterns in arisings and in the existing recovery sectors and with the gradual introduction of new technologies in processing and end product applications.

Trends are initially considered assuming that there will be no further disruptive events in the market.

2.2 External Market Changes from 2004 - Arisings

The UK Used Tyre Market report details the arisings and recovery and disposal routes of used tyres in 2004. In this report the arisings have been adjusted to show the tyres that are removed from vehicles, and therefore available for recovery and/or disposal, by deducting those that are "lost" by remaining on end of life vehicles (ELVs) and disposed to landfill with the auto shred residue (ASR).

The significant "known" external changes to the available arisings between 2004 and the present are:

- <u>Traffic growth</u>, which increases the quantities of tyres replaced. Arisings are expected to have increased with traffic growth, which is predicted to continue at 1.3% per annum. (This figure is the five year average annual growth in traffic to 2004, based on Department for Transport statistics giving motor vehicle distances covered in Great Britain).
- <u>Implementation of the ELV Directive</u>, which is encouraging vehicle salvage operators to increasingly remove all of the tyres from ELV cars prior to baling and shredding. This will start to influence the market from as early as January 2006 by increasing the quantity of tyres that become "available" to the recovery sector. In 2004 an estimated 45% of tyres remained on natural ELV cars prior to baling. Whilst it is not accepted as good practice by leading operators of Authorized Treatment Facilities (ATFs), there is a significant financial benefit to the vehicle salvage company by leaving tyres in the vehicle bales. Although the fragmenting companies are discouraging this practice, it is felt that commercial pressures will continue to influence events and that many tyres will continue to end up in landfill within the ASR all the time that it remains legal. On balance it is therefore estimated that the Directive will have the effect of reducing the number of tyres remaining in ELV cars down to one per vehicle, or 25% from 2006. The effect of the Directive on truck tyres is not significant.

Based on these assumptions, the figures for "available" tyre tonnage are calculated in Appendix I and are summarised below:

'000 tonnes	2004	2005	2006	Increase '04 – '06
Car	299.0	310.1	321.3	22.3
Truck	131.7	133.4	135.2	3.5
Other	14.4	14.6	14.8	0.4
Total	445.1	458.1	471.3	26.2

Beyond 2006 external market changes will be restricted to traffic growth causing small increases, continuing at 1.3% per year, in replacement tyre arisings.

Because of the relatively balanced market in truck tyres, these are considered separately in the five year market forecasts and scenario analyses and, for simplification, the "other" category tyres are aggregated with "car" tyres.

2.3 External Market Changes from 2004 – Disposal

The key external factor affecting disposal options for used tyres is the effect of the Regulations transposed from the Landfill Directive which will prevent the disposal of shredded tyres to landfill from July 2006. (The disposal of most whole tyres to landfill was banned from July 2003). Whilst some flexibility will arise through individual site licensing and permitting arrangements, in essence the Regulations will prevent the majority of all but small tyres, such as bicycle tyres, and very large tyres, such as earthmover and tractor tyres, from going to landfill for disposal from July 2006.

In 2004, 22,000 tonnes of tyres were legitimately disposed to landfill. A further 23,500 tonnes tyres were unaccounted for, the majority of which are deemed to have been disposed of to landfill in small quantities through the municipal waste (MSW) stream. Whilst some small quantities are likely to continue to be landfilled through MSW, the ban will make the presence of these tyres more transparent and this is likely to increase the vigilance of landfill operators to reject mixed loads containing some tyres.

In summary, by comparison to 2004, the Landfill Regulations will have the effect of placing an additional stock of up to 45,000 tonnes of used tyres per year into the various recovery routes from July 2006.

2.4 Internal Market Changes to 2006

Based on industry returns for the first half of 2005 and on anecdotal information from key stakeholders in the industry, the significant known internal market changes after 2004 are as follows:

- Increased usage in landfill engineering projects. The majority of tyres for this application are car tyres, either whole, baled or shredded, used as a drainage layer in the base of landfill cells. A survey of UK landfill sites carried out for the DTI in January 2006 showed that 29,000 tonnes of whole and shredded tyres were used for landfill engineering purposes in 2004. The survey also reported 19,000 tonnes of tyres, all of them shredded, were used in the first half of 2005. However, the construction of new cells is predominately carried out during the summer months and the tyres are laid towards the end of the project, i.e in the second half of the year. A report by NISP, dated October 2005, on used tyre derived aggregate replacement (UTDAR) in landfill engineering suggests that the tonnage going to this application was likely to be 59,000 tonnes in 2005, double the 2004 usage. Preliminary data from the UTWG used tyre analysis for 2005 effectively confirm this figure, which has therefore been adopted for this analysis. The NISP report and other sources suggest that growth will continue for landfill engineering applications in 2006 and in future years. For the purpose of this report, and for the reasons outlined in Section 2.5 below, 75,000 tonnes has been taken as the ceiling for this application for 2006 and beyond.

- Increased tonnage as tyre derived fuel (TDF) in cement kilns. Usage of tyres by the cement industry showed a decline of c.10,000 tonnes, to 72,000 tonnes, between 2003 and 2004. The industry is currently being restricted while regulatory issues, particularly relating to the Substitute Fuels Protocol and the Waste Incineration Directive, are overcome. However, the industry indicated that there will have been an increase of c.10,000 tonnes in usage in 2005, restoring throughput to 2003 levels, and the preliminary data for 2005 suggest that this figure will outturn higher at 84,000 tonnes. This application is confidently expected to absorb increasing quantities in future years: again, the majority being car tyres. Growth in this area is being encouraged by steeply rising costs of fossil fuels, for which tyres are a direct substitute. The annual usage of TDF is predicted by the industry to level out at between 140,000 and 180,000 tonnes in four to five years. For the purpose of this report, and for the reasons outlined in Section 2.5 below, these industry growth expectations have been halved.

- Other internal market changes between 2004 and 2006 are deemed to be minor, with many recovery routes, such as retread and export, remaining static in volume terms but with continuing growth of the use of shred and crumb for a widening range of new end products.

2.5 Five Year Market Forecast

Appendix II sets out the arisings and recovery volumes for 2004 which have been projected forward for five years to 2009. Again, the figures use the 2004 UK Used Tyre Market report, prepared by OHL, as the basis for the forecasts.

The projections are based on the extrapolation of historical events, with adjustments supported by information from sources within, and knowledge of, the industry. The interpretation of such information, and any assumptions made, should be seen as being solely the opinion of the author and not necessarily of WRAP or of the used tyre industry as a whole.

Assumptions made are as follows:

- Arisings will increase with traffic growth which is predicted to continue at 1.3% per annum. (See Section 2.2 above).
- Recovery volumes in re-use and retread markets will remain static.
- Recovery volumes in civil and marine engineering applications will reduce by 50%. The author is not aware of any new major applications being planned, such as the River Witham defence project in 2003/04, but it is

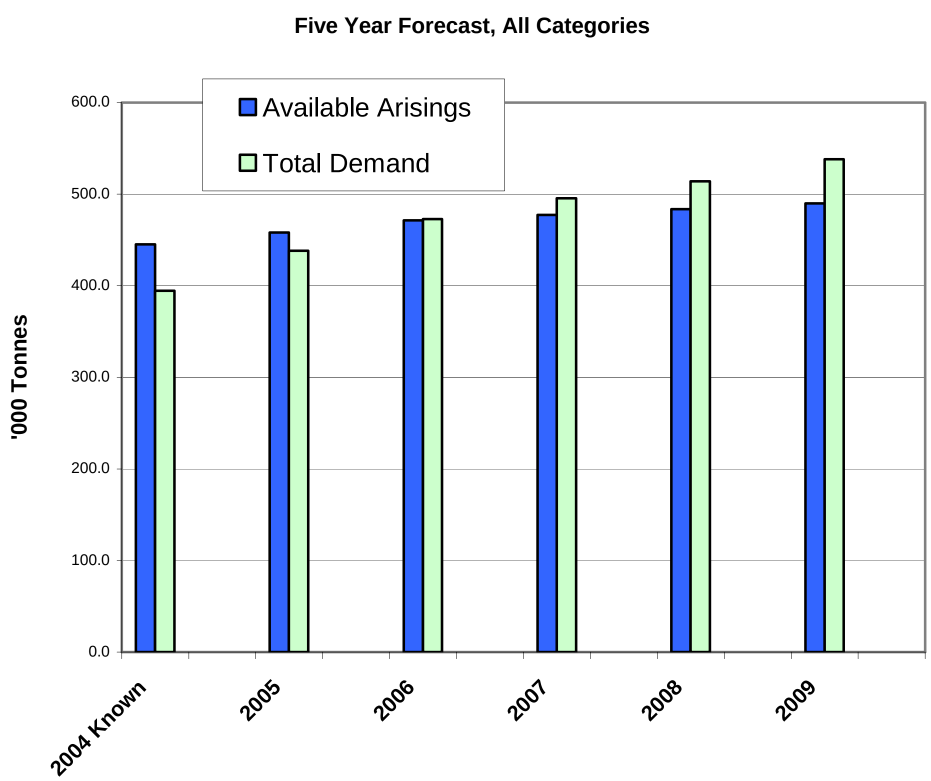
assumed that a number of smaller projects will arise.

- The use of tyre shred as aggregate replacement in landfill engineering applications is assumed to remain static at 75,000 tpa from 2006, as stated in Section 2.4 above. (Whilst some evidence suggests that this will be higher in 2006 and beyond, it would be expected that such high usage would be giving rise to shortages of used car tyres in the market in 2006 and to falling gate fees. Anecdotal evidence, however, shows that gate fees continue to rise and that, indeed, at least one operator has applied temporary restrictions in tyre collections, presumably due to high stock levels).
- The export of tyres for re-use and retread will decline at 5% per year as the importing countries tighten road traffic legislation and/or restrict imports while they deal with their own tyre surpluses.
- Material recovery (shred, crumb and granulate) tonnage will increase at 5% per year. It is noted that historical market data suggests that this tonnage has increased from 83,000 tonnes in 1999 to 172,000 tonnes in 2004, an annual growth of 20%. The key markets in this sector, namely equestrian and sports/play surfacing and carpet underlay, are probably saturated and therefore unlikely to continue growing at this rate. However, new and potentially high volume applications such as artificial turf should continue to grow and it is expected that the momentum provided by the three year WRAP Tyres Programme will encourage the introduction of new end applications for used tyres, some with relatively short lead times. An annual increase in this recovery route of 5% per year from 2004 is conservatively predicted.
- Cement industry growth is discussed in para. 2.4 above. The cement industry forecasts tyres usage trends as follows:

2005	80,000 tonnes
2006	110,000 tonnes
2007	130,000 tonnes
2008	140,000 tonnes
2009	160,000 tonnes

  Historically the industry has not achieved its own growth predictions for the reasons stated. For the purposes of this five year forecast, the industry's growth predictions have been halved in order to provide a more conservative view. The ramifications of the industry meeting its higher forecasts are considered in Section 4.
- It is expected that emerging technologies such as cryogenic size reduction, pyrolysis and gasification are likely to find commercial footings within the time-frame being considered. Nominal tonnages of car tyres are predicted to be absorbed by the use of these technologies from 2007 onwards.

The forecast figures from Appendix II are summarised in the following chart:



A detailed look at the figures in Appendix II shows that the recovery of truck tyres was, sensibly, in balance, with around 9,000 tonnes per year surplus in 2004 out of arisings of 132,000 tonnes, equivalent to approximately 7%. The growth in the "low technology" applications, such as cement kiln combustion and aggregate replacement, will have the effect of recovering the excess car tyre arisings, estimated at 42,000 tonnes in 2004, by 2006.

Overall, on the basis of assumptions made, therefore, it can be predicted that demand for used tyres will match supply during 2006, driven chiefly by the growth in energy recovery and markets for shred and granulate, with continuing significant use of tyres as aggregate replacement in landfill engineering. This implies that the ban on disposal of tyres to landfill from mid 2006, will not cause the industry to have to stockpile tyres. Indeed, from 2007 onwards, tyre demand will potentially outstrip supply, causing shortages in some application markets and falling gate fees. Falling gate fees will, in turn, render some applications uneconomic, reducing overall demand and re-balancing the market.

Clearly this scenario excludes the possibility of disruptive events and assumes that the free market in used tyres maintains. The potential disruptive scenarios are considered in Section 4.

3 Capacity and Financial Considerations

3.1 Capacity

It can be safely assumed that the physical collection and handling infrastructure of the used tyre industry, being primarily a matter of transportation and mechanical handling, can be increased or decreased at short notice to match any significant disruption in material flows. It is the ability of the industry to store, shred and granulate used tyres which is the critical factor in these scenarios.

An estimate has been made of the shredding and granulating capacity of the major used tyre processors in the UK. In arriving at the capacity estimates, information has been taken from company websites, actual returns from surveys and from interviews with a number of stakeholders in the industry. Since many operators wish to maintain confidentiality about their processing capacity, the detailed estimates are not presented in this report, but have been aggregated. Shredding and granulating are considered separately due to the more limited capacity and end product applications for the latter process. Shredded tyres are used for lower technology applications such as equestrian surfaces, co-combustion and landfill engineering, and provide the feedstock for the secondary process of granulating which provides cleaner particles down to powder size for use in resin-bound applications such as play surfaces and carpet underlay.

<u>Shredding</u>

The available shredding capacity of the major companies is of the order of 400,000 tpa and there remains some room for flexibility through additional shifting. In addition to this, there are many smaller companies, some with mobile shredding equipment, which will add to the national processing capacity, probably by a further 20% or 80,000 tpa.

From the UK Used Tyre Market report for 2004, it is noted that the potential demand for shredding is the total arisings less the recovery of whole tyres through e.g. retreading, re-use, export and baling. By deducting this quantity from the total arisings, and assuming that all landfilled tyres were shredded, it can be estimated that the net tyres tonnage that was shredded in 2004 was c.350,000 tonnes. It follows that the shredding capacity of the UK processing sector is sufficient to absorb the used tyre arisings for the foreseeable future. This fact was confirmed by the WRAP meeting of key industry stakeholders in December 2005. Also, it is noted that the locations of the major processors are well spread out in mainland Great Britain, relative to the major cities, which are the main centres of used tyre arisings. In Northern Ireland, new processing plant was set up in 2002 to handle arisings in the Province. Whilst short-term disruption to processing capacity in any region will cause additional transportation and handling, the resultant increase in gate fees will enable the industry to recover these costs, as discussed in the following section.

<u>Granulating</u>

From the 2004 UK Used Tyre Market report it is calculated that an estimated 85,000 tonnes of tyres, out of the 350,000 tonnes that are shredded, are used to provide the granulate and powder for the major applications, namely bound sports and play surfaces, carpet underlay and moulded products.

Granulating capacity is concentrated in just a small number of operators. This is due to the relatively high capital costs of additional plant, i.e. machinery and buildings, required to convert shredded tyres into granulates and powders. The available granulating capacity of these currently matches the demand and there is some flexibility to increase throughput by additional shifting, although this is limited.

It is argued that a controlled growth in end product demand, especially those requiring conventional, ambient ground materials, will be accompanied by a matching growth in investment in new granulating capacity. However, the surplus capacity currently available may not be sufficient to meet a rapid and sustained growth in demand, especially as this is likely to be accompanied by a shift to higher value end products. This will require a shift in the infrastructure of the industry and may include new processing technologies. Within the WRAP Tyre Programme, the Capital Support Competition initiative will be designed to actively develop targeted sectors of the industry to accommodate this potential growth in the market.

3.2 Financial Considerations

It is not possible within the scope of this study to present a detailed analysis of the financial issues associated with the market disruption scenarios. This is due to a number of factors including:

- The fluid nature of the market, with widely differing gate fees and costs between regions and short term supply fluctuations,
- The confidential nature of all financial information,
- The widely differing accounting treatment of capital and overhead costs, and
- The wide range of shred and granulate qualities and applications.

The following illustration, however, shows how the key players in the industry might react to the known market changes and to any major disruption. The example application taken is that of passenger car tyres for use as tyre derived fuel (TDF) in the cement industry.

The charge to the consumer, made by the car tyre retailer for the recovery cost of a replaced tyre, meets the costs of handling the tyre and the "gate fee" paid to the tyre collector. A further gate fee is paid by collectors at the point of delivery to the TDF processors. The levels of these fees are driven by market conditions and will be a factor of local tyre availability and transportation costs. The processor will incur costs in converting the tyres to TDF shred, but the resultant product, at the point of delivery to the cement kiln, retains a negative value. This provides a clear benefit when compared to the cost of fossil fuels, such as coal, and provides an acceptable return on the capital cost of the infrastructure required by the cement manufacturer to handle the substitute fuel.

The trend towards over supply of used car tyres up to 2006, arising out of the Landfill Regulations and the ELV Directive, has put upward pressure on gate fees throughout the supply chain as businesses experienced increasing difficulty in disposing of stocks of used tyres or tyre shred. Whilst there may be some regional upward movements in disposal charges at the retail level, this effect will probably be contained by the industry overall, assuming that there are no further disruptions. In the event of a significant adverse disruption in the market, as discussed in the following section, the increased gate fees are likely to be passed on to the consumer by means of an increased recovery charge from the new tyre retailer.

If the retailer is forced to increase the disposal charge to the consumer, this will raise additional funds at the front end of the supply chain. Some of this will be absorbed by the industry in increased transport costs (since tyres are likely to have to travel longer distances to recovery locations) and in the cost of stockpiling. However, a portion of the additional fees will work through to the processor and end user. In the case of TDF, a small increase in gate fee at the cement kiln would have a relatively large impact on the saving against fossil fuels, thereby improving the potential return on the capital cost of the necessary infrastructure. (Here it is also noted that the cost of fossil fuels is rising sharply, providing further potential margins for this sector).

This scenario of rising gate fees applies in principle to other sectors of the market. Such an improvement in margins within the industry will encourage accelerated uptake in investment in applications for used tyres which, in time, will increase demand and drive the market back to near 100% recovery.

Clearly in the event of a favourable market scenario, which increases the demand for used tyres, the converse will apply, with lower gate fees and returns having the effect of slowing demand in other areas. This scenario will also encourage further used tyre imports from countries with a less developed recovery infrastructure.

4 Disruptive Market Scenarios

4.1 General

The UK market in used tyres is a “pull” market, driven by the demand for end products and other recovery applications. Without Government policy intervention, following the ban on disposal to landfill, there will be no simple diversion route available for surplus tyres and the free market will be required to achieve 100% recovery.

Appendix III summarises the market forecasts to 2009 starting with the “Known Events” forecasts from Appendix II and quantifies the effects of each disruptive market scenario on tyre surpluses or shortfalls from July 2006, the date of the landfill ban.

The ability of the industry to stockpile surpluses is estimated by industry stakeholders at an additional eight weeks’ throughput, equivalent to approximately 75,000 tonnes. The ban on landfill disposal occurring in July 2006 will not, of itself, generate stockpiles of unwanted tyres, as noted in Section 2 above. However, in the event of a major negative or adverse disruption to the market, assuming that no intervention policies are enacted, the situation will clearly deteriorate and this stocking facility will be called upon.

4.2 Cement Industry

The cement industry uses, predominately, shredded car tyres as a substitute fuel for cement kilns. It might reduce or increase the use of tyres due to market price changes, energy price increases, or due to regulatory changes. Indeed, the range of waste derived fuel types available to the cement manufacturers, such as secondary liquid fuel, waste oils, paper and packaging waste and meat and bone meal, provides the industry with some flexibility to influence the market.

The probability of a reduction in cement industry usage occurring in the time frame considered is low. The UK industry has invested considerably in the infrastructure for the preparation of used tyres as a substitute fuel and in the conversion and trialling of used tyre feeding equipment at the kilns. Furthermore, as discussed in Section 3, the combustion of tyres becomes financially more attractive as fossil fuel prices continue to increase and the industry seeks to meet its environmental targets. In recent months, with the increasing availability of car tyres and with the tyre recovery industry in general starting to react to the pending ban on landfill disposal, gate fees have been rising, adding further to the attractiveness of tyres as a substitute fuel.

A 50% reduction in the cement industry’s 2004 usage starting, say, in 2007 would place a further 40,000 tpa of tyres onto the market, causing surpluses to accumulate. As seen from Appendix III, rising demand for other applications would mitigate the effect, but stockpiling of up to 30,000 tonnes of tyres would be required by 2008. From 2009 demand will again overtake supply and stocks would start to fall.

If however the industry was to achieve its five-year forecast, throughput would increase to 160,000 tpa by 2009, as detailed in Section 2.5 above. This increase in demand for tyres will totally eliminate any car tyre surpluses from 2006.

4.3 Landfill Engineering

The regulatory situation regarding the use of shredded tyres as a replacement material for aggregates in approved engineering of landfill cells was unclear at the outset of this study. It was deemed a possibility that this application might be banned under the Landfill Directive from July 2006, at the same time that the disposal of shredded tyres will be banned.

In January 2006 a European Commission letter confirmed that any legitimate recovery of waste is not covered by the Landfill Directive and the letter went on to suggest that an engineering application for waste material is a “legitimate recovery” if it replaces other materials, and thereby conserves natural resources, and if it does not pose a risk to the environment. Whether or not the use of shredded tyres in any landfill engineering project complies with these conditions will continue to be decided on a case-by-case basis by the appropriate national regulatory bodies through evaluation of each design prior to construction.

Based on this development, it is expected that local interpretation by the UK environment protection agencies and by local planning authorities, as to whether or not a particular engineering project meets the requirements of “legitimate recovery", will continue unchanged and that the use of shredded tyres in landfill engineering will therefore be unaffected by the Directive. This prediction is supported by the fact that demand for shredded tyres for this application at the beginning of 2006 continues to be strong.

This change scenario, therefore, has not been specifically addressed in this study. In the unlikely event of a surge of adverse rulings on landfill engineering applications, the effect would be similar to that of a downturn in cement industry usage of shredded tyres, as discussed above.

Clearly, a consistency of regulatory approach to the permitting and planning of landfill designs is key to the achievement of a stable market in this sector. To this end it is understood that the Environment Agency will be issuing technical guidance on design criteria.

4.4 Collapse of the Used Tyre Export Markets

Significant quantities of whole tyres are exported for re-use as part-worns to countries that do not have such onerous regulatory standards as in the UK. If it is presumed, for instance, that non EC15 countries such as Poland will have to meet EC15 standards in the future, and that regulatory demands in African and American countries also tighten thereby reducing the suitability of part-worn tyres from the UK, then there might be a collapse or significant reduction in used tyre exports. A collapse is deemed to be less likely where tyres are exported for shred, for instance to the Netherlands, France, and Germany.

Based on the 2004 figures, a total of 30,000 tonnes of worn tyres is exported annually, both singly and fitted to older goods vehicles which are exported for further use abroad. Some 50% of these tyres are exported to Europe.

On the assumption that all of the European tyre export business is lost on this basis, a further 15,000 tonnes of used tyres will be placed on the UK market annually. On the basis of increasing demand for other applications, this scenario would not, of itself, cause any surpluses in the market.

4.5 Fire, or Business Failure at a Major Processor

It was considered a possibility, at the outset of this study, that a typical major tyre processor, with a capacity of say 25,000 tpa might be temporarily put out of business by a catastrophic fire, or might go permanently out of business for this or any other reason. Indeed, the risk of fire is always relatively high, given the heat generated and the flammable nature of the dust extracted from the mechanical grinding processes. Ironically, such an event transpired in December 2005 at Granutyre, a key processor based in Sheffield with a capacity of 30,000 tpa. The effect of the fire has been to cause considerable disruption to the collection infrastructure in the North East of England and a consequential increase in gate fees locally.

However, fires have occurred previously at tyre processors and experience has shown that recovery from such an event by the industry as a whole can be relatively quick, given the commercial nature of the market. With gate fees rising, investment decisions are brought forward and processing capacity can be restored either by the affected business or by new entrants within six months, assuming that market conditions remained favourable. In the very short term, additional shifts can be employed at processing plants unaffected by the event, a process that may be assisted by the easing or fast tracking of planning applications in some cases. Whilst the situation regarding granulating capacity is considerably tighter than for shredding, as discussed in Section 3 above, it is believed that the option of additional shifting by the unaffected processors would be sufficient to meet the demand.

The collapse of a major processing business is not therefore seen as other than a short term problem since it is believed that the industry could recover quickly.

4.6 Significant New Processing Capacity

Currently, it is only the level of demand for end product applications that is constraining tyre processing capacity. It is understood that a number of cryogenic tyre processing plants are at the feasibility stage in the UK. The expected capacity of a commercially viable new plant would be in the order of 30,000 tpa and this will be available within say three years. However, even without a major new plant opening, the industry could increase its conventional, ambient shredding and granulating capacity in a short time, say six months, through the procurement of new machinery and extended shift working.

There is sensibly, therefore, no restraint on capacity for conventional, ambient ground materials. If new end product demand occurs, then the current processing industry could increase supply to match it.

Clearly, if the new processing capacity coming on stream is based on "new technology", providing technically different materials from that produced by ambient processing, as would be the case with cryogenic grinding, water jetting, pyrolysis and gasification or devulcanisation, then this would open up new end product markets.

In summary, it follows that focus must be on finding new high tonnage end products or applications for tyre derived materials and this would be aided by the introduction of new processing technologies. Support for both the products and processes, as being provided by the WRAP Tyres Programme, will facilitate this trend.

4.7 Collapse of an End Product Market.

This scenario considers the collapse of the demand for a significant end product, such as tyre shred for equestrian ménages, or tyre crumb for sports and play surfaces. As stated in Section 2.5, volumes through this sector have grown at the rate of 20% p.a. since 1999. However, it is believed that demand may have now levelled out for some of these application areas. Indeed, a downturn cannot be ruled out, driven by the influx of alternative materials for these markets or by restrictions on planning permissions for new ventures.

In 2004, 172,000 tonnes of used tyres were processed into shred and granulate rubber for a range of end product applications. The rubber material derived from processing is between 62% and 72% of the weight of the tyre feedstock, depending on the type of tyre processed. Tonnages of tyres going to the major end product applications are set out below:

Major Application	**End Product '000 tonnes**	**Tyre Feedstock '000 tonnes**
Shred for equestrian menages etc.	41	58
Crumb for sports and play surface	33	53
Crumb for carpet underlay	17	24

A loss of demand from these key applications of around 40,000 tpa, occurring over a period of one to two years, starting as early as 2006, could be envisaged. This scenario would have a similar effect to a collapse in cement industry usage (Section 4.2 above) but if, indeed, it commenced as early as 2006, would generate greater quantities of surplus tyres. Also, since a number of these applications require truck tyres as feedstock, the balanced demand for truck tyres could be adversely affected. In this event, stockpiling of up to 50,000 tonnes of used tyres would be required by 2008.

4.8 Market Disruption Scenario Summary

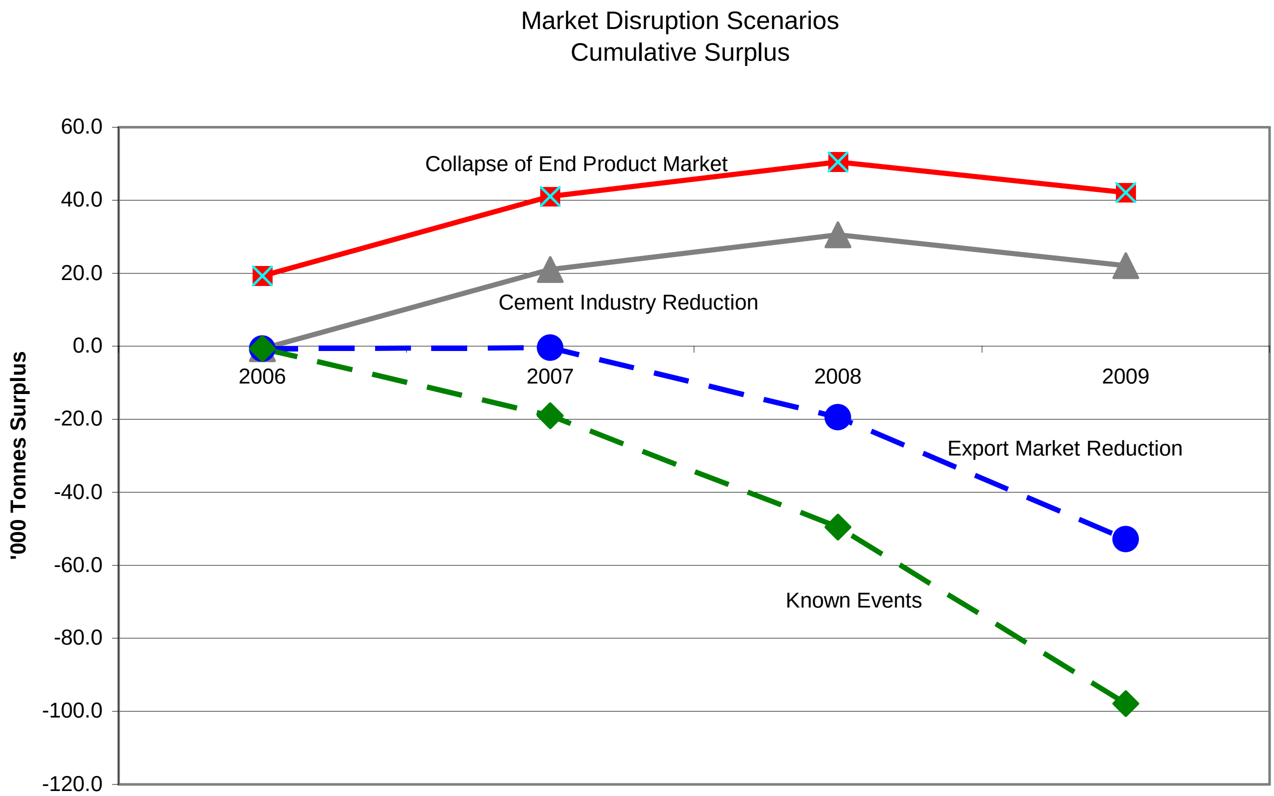
From Appendix III the cumulative effect resulting from each of the scenarios that would cause used tyre surpluses, and therefore stockpiling, can be established.

Without disruption, it has been noted that a balanced supply and demand situation will be achieved by the end of 2006.

In the best case scenario, namely the achievement by the cement industry of its current five year forecasts, any short term surpluses up to 2006 will be fully recovered.

In the worst case disruptive scenario, namely a 40,000 tpa collapse in an end product market commencing in 2006, a cumulative surplus of 50,000 tonnes, or 6 million tyres, would accumulate by 2008.

The cumulative surpluses, or shortages, resulting from the major adverse disruptive scenarios are compared to the "known events" situation in the following chart. (Clearly the shortages shown in the chart are hypothetical. In the event of the market demand outstripping supply to this extent, gate fees would fall to the point that some applications would become uneconomic and this would have the effect of reducing demand and returning the market to equilibrium).



The worst case scenario would require a significant new end product application to be available to the market in a short time frame, in order to avoid major stockpiling. Clearly it is expected that some of this new demand would be available through the support being given to new applications through the WRAP Tyres Programme. Also, additional throughput in the cement industry and the export of tyres for energy recovery are seen as possible short term mechanisms to absorb some of the surplus tonnage. These applications are more widely used in the near European markets where energy recovery regulation appears to be more relaxed. However, national European governments, similarly faced with a ban on landfill disposal and the increasing availability of tyres caused by the ELV Directive, will surely give priority to their indigenous recovery industry and transport cost considerations will further add to the difficulties of UK collectors exploiting this route. There is some potential for an annual usage of say 10,000 to 15,000 tonnes of tyres in the UK steel industry, and this is a possibility which key players in the industry are currently pursuing.

At the WRAP workshop meeting with the DTI and industry representatives it was agreed that, assuming no intervention policies were enacted in response to a severe negative disruption to demand, the major collectors would continue to meet their contracts but smaller collectors would quickly find no outlet for their tyres and could go out of business. Gate fees would increase. The tyre retailers may initially attempt to absorb increasing gate fees for competitive reasons, but would quickly get to the point where these had to be passed on to the consumer, who may in turn start to refuse to pay more to cover the recovery of the replaced tyre. The consumer will have the option to dispose of the tyre privately, at a civic amenity refuse and recycling site, but he or she may still face a charge from the local authority, on top of the cost of transport to the site. In this scenario, an increase in fly tipping is inevitable in the short term.

As noted in Section 3, rising gate fees will further encourage investment in new used tyre processing capacity and end product applications. However, the market is demand driven, and significant new end products and applications will be required to provide sufficient additional demand for any new processing capacity to be realised and for the market to return to near 100% recovery. It is believed that to fill a demand shortfall of 40,000 tonnes per year in this way will take a minimum of three years, i.e. to 2009 at the earliest. Unless the new demand involved a significant new technology, processing capacity will be available to supply this demand. However, it follows that this worst case disruption is likely to cause a significant "national stockpile" of used tyres which will not start to attenuate until 2009 at the earliest. The issue cannot be compared to the recent "fridge mountain" which was not demand driven and which was relatively quickly solved as processing capacity came on stream.

4.9 Intervention Considerations

It is suggested that one short-term intervention solution is to provide a medium term buffer for surplus tyres in the form of regulated stockpiles close to the main centres of arisings, i.e. the major cities. The creation of such large temporary stockpiles to deal with the predicted stock increase is far from ideal. Apart from the environmental risks involved, without additional end product applications, such “tyre mountains” will continue to increase for a minimum of three years. However, this solution is preferable to allowing the industry to set up many small, unregulated stockpiles, and funds generated by the gate fees could be held on deposit to fund clearance at the point at which the demand for recycled tyre material exceeds supply.

Clearly further, and accelerated, funding of new disposal and end product applications projects, as is currently being provided by the WRAP Tyres Programme, will assist the demand for used tyres. Growth in demand for new products using conventional technology could be established relatively quickly. However, history has shown that new technologies, such as pyrolysis, cryogenics and water jetting can take many years to become commercially viable. Any research or development in these areas may be further assisted by interventionist policies such as the imposition of environmental taxes or producer responsibility measures that will provide financial support to the secondary markets as is the case in some other waste streams. However, the UK Government has so far ruled out such intervention for used tyres, always assuming that the free market itself will eventually achieve a supply/demand balance.

In summary, in the event of a significant disruption in demand, Government policy intervention would be required to minimise fly tipping and major unregulated stockpiling. This could be in the form of:

- Providing stockpile flexibility within the industry, with appropriate environmental and safety controls, to provide a medium term buffer for surplus tyres.
- Setting up additional stockpiles, if required, with management of the stocks and final clearance funded by the gate fees received.
- Providing further and accelerated funding of new recovery and end product applications.
- A public procurement policy which encourages the sourcing of recycled products, in particular retreaded tyres for public vehicle fleets,
- Ensuring consistency of approach to the permitting and planning of landfill designs.
- Fast-tracking planning applications and the permitting of key industry processes.

Appendices

Appendix I: **"Available Tyres", 2004 to 2006**

Appendix II: **Five Year Market Forecast**

Appendix III: **Five Year Market Disruption Scenarios**

Appendix I

"Available Tyres" 2004 to 2006, '000 tonnes

Arisings '000 tonnes

	2004, from Market Report				**2005 Forecast**			**2006 Forecast**		
	From Market Report	Adjusted[1]	Lost in ASR	Net Available for Recovery/Disposal	Traffic Increase on 2004[2]	Lost in ASR[3]	Net Available for Recovery/Disposal	Traffic Increase on 2004[2]	Lost in ASR post ELV Directive[3]	Net Available for Recovery/Disposal
Car	325.2	332.2	(33.2)	299.0	4.3	(26.4)	310.1	8.7	(19.6)	321.3
Truck	130.7	133.5	(1.8)	131.7	1.7	(1.8)	133.4	3.5	(1.8)	135.2
Other	14.4	14.4	0.0	14.4	0.2	0.0	14.6	0.4	0.0	14.8
Imported	9.8	0								
Total	480.1	480.1	(35.0)	445.1	6.2	(28.2)	458.1	12.6	(21.4)	471.3

[1]Assumes imports split in ratio of overall arisings
[2]Assumes traffic increase of 1.3% per year
[3]Assumes one tyre per vehicle remains on natural ELV cars and LCVs following the implementation of the ELV Directive. 2005 figure is average of 2004 & 2006. Truck and other categories unchanged.

Appendix II

Five year market forecast

'000 tonnes	2004 Known		2005		2006		2007		2008		2009		
	Car/other	Truck	Car/other	Truck	Car/other	Truck	Car/other	Truck	Car/other	Truck	Car/other	Truck	Notes
Available Arisings	**445.1**		**458.1**		**471.3**		**477.4**		**483.6**		**489.9**		See report
Car/Truck Mix	313.4	131.7	324.7	133.4	336.1	135.2	340.5	137.0	344.9	138.7	349.4	140.5	
Recovery													
Re-Use (UK)	**29.3**		**29.3**		**29.3**		**29.3**		**29.3**		**29.3**		Assumed static
Car/Truck Mix	25.1	4.2	25.1	4.2	25.1	4.2	25.1	4.2	25.1	4.2	25.1	4.2	
Retread (UK)	**45.9**		**45.9**		**45.9**		**45.9**		**45.9**		**45.9**		Assumed static
Car/Truck Mix	5.1	40.8	5.1	40.8	5.1	40.8	5.1	40.8	5.1	40.8	5.1	40.8	
Other Temporary Recovery	**2.6**		**2.6**		**2.6**		**2.6**		**2.6**		**2.6**		Assumed static
Car/Truck Mix	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
Export (incl. re-use and retread)	**33.1**		**31.4**		**29.9**		**28.4**		**27.0**		**25.6**		Assumed 5% p.a.decline
Car/Truck Mix	17.1	16.0	16.2	15.2	15.4	14.4	14.7	13.7	13.9	13.0	13.2	12.4	
Landfill Engineering	**29.0**		**59.0**		**75.0**		**75.0**		**75.0**		**75.0**		See report
Car/Truck Mix	29.0	0.0	59.0	0.0	75.0	0.0	75.0	0.0	75.0	0.0	75.0	0.0	
Material Recovery	**171.8**		**180.4**		**189.4**		**198.9**		**208.8**		**219.3**		Assume 5% increase p.a.
Car/Truck Mix	116.8	55.0	122.6	57.8	128.8	60.6	135.2	63.7	142.0	66.9	149.1	70.2	
Energy (cement)	**71.6**		**84.0**		**95.0**		**105.0**		**110.0**		**120.0**		See report
Car/Truck Mix	71.6	0	84	0	95	0	105	0	110	0	120	0	
Raw Material & Energy	**0.0**		**0.0**		**0.0**		**5.0**		**10.0**		**15.0**		See report
Car/Truck Mix	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	10.0	0.0	15.0	0.0	
Other Permanent Recovery	**11.3**		**5.6**		**5.6**		**5.6**		**5.6**		**5.6**		Assumed 50% of 2004
Car/Truck Mix	5.7	5.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	
Total Demand	**394.6**		**438.2**		**472.7**		**495.7**		**514.2**		**538.3**		
Car/Truck Mix	271.7	122.9	316.2	122.1	348.5	124.2	369.2	126.5	385.2	129.0	406.6	131.7	
Landfilled, Burned,Unaccounted	**50.5**		**19.9**		**(1.4)**		**(18.2)**		**(30.6)**		**(48.4)**		
Car/Truck Mix	**41.7**	**8.8**	**8.5**	**11.4**	**(12.4)**	**11.0**	**(28.7)**	**10.5**	**(40.3)**	**9.8**	**(57.2)**	**8.9**	

Appendix III

Five year market disruption scenarios

'000 tonnes	2004 Known		2005		2006		2007		2008		2009		Scenario
	Car etc.	Truck	Car etc.	Truck	Car etc.	Truck	Car etc.	Truck	Car etc.	Truck	Car etc.	Truck	

Available Arisings	**445.1**		**458.1**		**471.3**		**477.4**		**483.6**		**489.9**		
Car/Truck Mix	313.4	131.7	324.7	133.4	336.1	135.2	340.5	137.0	344.9	138.7	349.4	140.5	

Known Events

Total Demand	**394.6**		**438.3**		**472.7**		**495.7**		**514.2**		**538.3**		
Car/Truck Mix	271.7	122.9	316.2	122.1	348.5	124.2	369.2	126.5	385.2	129.0	406.6	131.7	
Annual Surplus for Disposal/Recovery	**50.5**		**19.8**		**(1.4)**		**(18.3)**		**(30.6)**		**(48.4)**		
Car/Truck Mix	41.7	8.8	8.5	11.3	(12.4)	11.0	(28.7)	10.5	(40.3)	9.7	(57.2)	8.8	
Cumulative Surplus for Recovery from 2006					**(0.7)**		**(19.0)**		**(49.5)**		**(97.9)**		
Car/Truck Mix					(6.2)	5.5	(34.9)	16.0	(75.2)	25.7	(132.5)	34.5	

Cement Industry/Landfill Engineering Reduction

Total Demand	**394.6**		**438.3**		**472.7**		**455.7**		**474.2**		**498.3**		Loss of 40 ktonnes p.a. demand
Car/Truck Mix	271.7	122.9	316.2	122.1	348.5	124.2	329.2	126.5	345.2	129.0	366.6	131.7	from 2007
Annual Surplus for Disposal/Recovery	**50.5**		**19.8**		**(1.4)**		**21.7**		**9.4**		**(8.4)**		
Car/Truck Mix	41.7	8.8	8.5	11.3	(12.4)	11.0	11.3	10.5	(0.3)	9.7	(17.2)	8.8	
Cumulative Surplus for Recovery from 2006					**(0.7)**		**21.0**		**30.5**		**22.1**		
Car/Truck Mix					(6.2)	5.5	5.1	16.0	4.8	25.7	(12.5)	34.5	

Cement Industry Increase

Total Demand	**394.6**		**438.3**		**487.7**		**520.7**		**544.2**		**578.3**		Increase per cement industry
Car/Truck Mix	271.7	122.9	316.2	122.1	363.5	124.2	394.2	126.5	415.2	129.0	446.6	131.7	forecast, see report
Annual Surplus for Disposal/Recovery	**50.5**		**19.8**		**(16.4)**		**(43.3)**		**(60.6)**		**(88.4)**		
Car/Truck Mix	41.7	8.8	8.5	11.3	(27.4)	11.0	(53.7)	10.5	(70.3)	9.7	(97.2)	8.8	
Cumulative Surplus for Recovery from 2006					**(8.2)**		**(51.5)**		**(112.0)**		**(200.4)**		
Car/Truck Mix					(13.7)	5.5	(67.4)	16.0	(137.7)	25.7	(235.0)	34.5	

Export Market Reduction

Total Demand	**394.6**		**438.3**		**472.7**		**480.7**		**499.2**		**523.3**		Loss of 15 ktonnes p.a.demand
Car/Truck Mix	271.7	122.9	316.2	122.1	348.5	124.2	354.2	126.5	370.2	129.0	391.6	131.7	from 2007
Annual Surplus for Disposal/Recovery	**50.5**		**19.8**		**(1.4)**		**(3.3)**		**(15.6)**		**(33.4)**		
Car/Truck Mix	41.7	8.8	8.5	11.3	(12.4)	11.0	(13.7)	10.5	(25.3)	9.7	(42.2)	8.8	
Cumulative Surplus for Recovery from 2006					**(0.7)**		**(4.0)**		**(19.5)**		**(52.9)**		
Car/Truck Mix					(6.2)	5.5	(19.9)	16.0	(45.2)	25.7	(87.5)	34.5	

Collapse of End Product Market

Total Demand	**394.6**		**438.3**		**432.7**		**455.7**		**474.2**		**498.3**		Loss of 20 ktonnes truck tyres and
Car/Truck Mix	271.7	122.9	316.2	122.1	318.5	114.2	349.2	106.5	365.2	109.0	386.6	111.7	20 ktonnes car tyres from 2006/07
Annual Surplus for Disposal/Recovery	**50.5**		**19.8**		**38.6**		**21.7**		**9.4**		**(8.4)**		
Car/Truck Mix	41.7	8.8	8.5	11.3	17.6	21.0	(8.7)	30.5	(20.3)	29.7	(37.2)	28.8	
Cumulative Surplus for Recovery from 2006					**19.3**		**41.0**		**50.5**		**42.1**		
Car/Truck Mix					8.8	10.5	0.1	41.0	(20.2)	70.7	(57.5)	99.5	