Highways England Incident Prevention

Diesel Spillages

Quality information

Document name	Prepared for	Prepared by	Date	Reviewed by
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Contents

Glossary of Terms

Term(s)	Definition
Gross Vehicle Weight (GVW)	The maximum operating weight/mass of a vehicle as specified by the manufacturer including the vehicle's chassis, body, engine, engine fluids, fuel, accessories, driver, passengers and cargo but excluding that of any trailers
Heavy Goods Vehicle (HGV)	A heavy goods vehicle is the European Union (EU) term for any truck with a gross vehicle weight of over 3.5 tonnes
Light Goods Vehicles (LGV)	A light goods vehicle is the official term used within the European Union, for a commercial carrier vehicle with a gross vehicle weight of not more than 3.5 tonnes
PG9	A roadworthiness prohibition. This is given for mechanical problems or for the condition of a vehicle's bodywork and equipment. It could have an immediate or delayed effect depending on how severe the defect is
Road Traffic Collision (RTC)	When a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree or pole. Traffic collisions may result in injury, death and property damage.
Smart motorway	A section of motorway in Great Britain that uses active traffic management (ATM) techniques to increase capacity by use of variable speed limits and hard shoulder running at busy times.
Strategic Road Network (SRN)	The motorways and major trunk roads in England managed by Highways England
Traffic Commissioner	The person(s) responsible for the licencing and regulation of Heavy Goods and Public Service Vehicle operators.
Vulnerable Road User (VRU)	A term used to describe road users requiring extra care such as pedestrians, cyclists, motorcyclists and horse riders

1 Introduction

1.1 Introduction

AECOM and our project partners PA Consulting and Road Safety Support (RSS) have been commissioned by Highways England (HE) to explore a number of options for reducing the frequency and severity of incidents involving Heavy Goods Vehicles (HGV) on the Strategic Road Network (SRN) which HE are responsible for. This project comprises three workstreams:

- Tyre Management
- Diesel spillages
- Drivers' hours

This report is one of three interim reports produced in line with the three areas of focus highlighted above. It presents the diesel spillage findings and makes informed recommendations that Highways England could potential take forward as part of its Incident Prevention Strategy.

1.2 Report Structure

This interim report has been structured as follows:

- Section 2 – Understanding Diesel Spills
- Section 3 – Diesel Spillage Prevention
- Section 4 – Methods for reducing the impact of diesel spillages on the SRN
- Section 5 – Interventions

1.3 Methodology

A summary of the methodology used to develop the diesel spillage initial intervention report is presented in Figure 1.1. More details on the consultation methods adopted are also presented below.

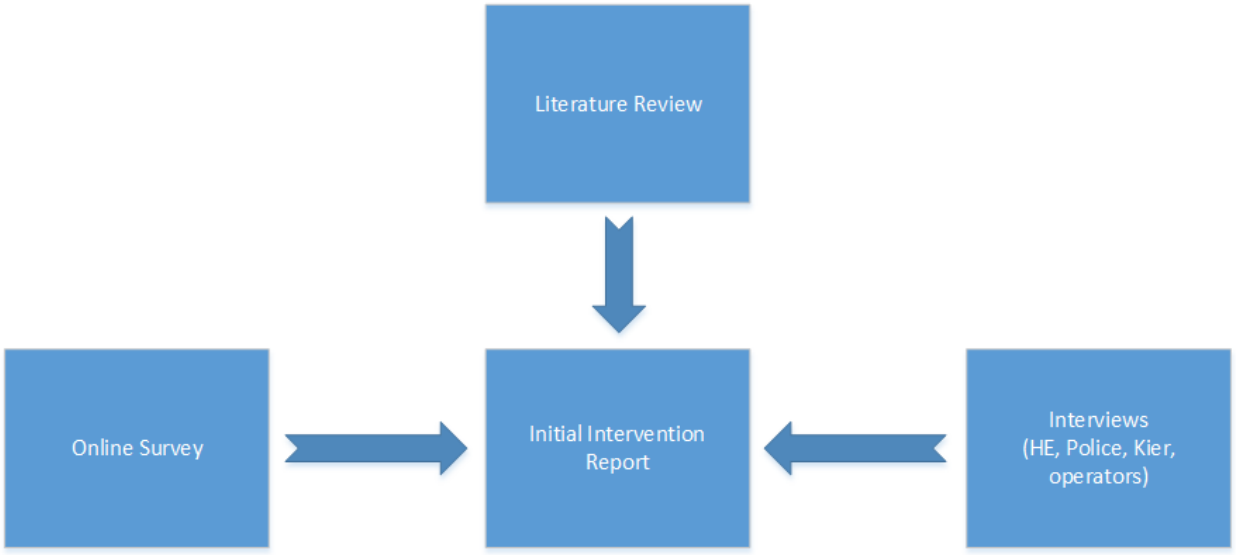


Figure 1.1 – Summary of methodology

A key part of understanding the nature of diesel spills was to undertake secondary research. In developing this report, 40 sources of information were reviewed and assimilated (see Table 1.1 for full list). These sources included reports, industry journals/articles and PowerPoint presentations. This enabled the study team to get a better understanding of the extent of diesel spills on the SRN, the product treatments available and the impact and damage caused by such incidents.

Document	Source	Year	Type
Absorbents don't have to cost the earth	Darcy Spillcare	2014	Presentation
An analysis of inland oil and fuel incidents in England and Wales	Oakdene Hollins	2005	Report
An innovative solution in the fight against road surface spillages	ScotlandTranServ	2014	Report
Annual report and accounts 2013-2014	Highways England	2014	Report
A study of measurement methods for diesel sorbent performance, and the components of road user delay associated with diesel spills on the UK Strategic Road Network (SRN)	STAR Conference	2014	Report
ATL industrial / military fuel cell bladders and tanks	Aero Tec Laboratories (ATL)	2016	Article
Bioremediation of petroleum hydrocarbons	Access to Research Biotechnology Research International	2011	Report
Business case for investment decisions £1m (including VAT) or above and novel or contentious projects	Atkins	2015	Report
Clean-up of water surface from oil spills using natural sorbent materials	Procedia Chemistry (Science Direct)	2014	Journal
Diesel Absorption Trial, Phase 2	Atkins	2013	Report
Domestic road freight statistics, United Kingdom	DfT	2015	Report
DVSA cracks down on diesel spills	SMMT	2014	Article
DVSA targets commercial vehicles over fuel spills	Commercial motor	2014	Article
Fuel Tanks in LGVs	FMG	2013	Presentation
HGV fatal accident rates. Campaign for better transport	MTRU	2013	Report
Heavy goods vehicle inspection manual	DVSA	2013	Manual
HGVs travelling to mainland Europe: Percentage share of all powered goods by country of registration - Q3 2014 - Q2 2015	DfT	2015	Report
Incident Prevention Team	Highways England	2015	Presentation
M4 closure westbound J8/9 to J10, Berkshire.	Highways England traffic bulletin	2016	Article
Metabolite analysis as direct proof of biodegradation: experience from monitored natural attenuation (MNA) projects	URS / AECOM	2010	Report
Motorway accidents involving foreign lorries rise 14%	Fleetworld	2014	Article
Motorway barriers	New civil engineer	2002	Article
Network management manual	Highways England	2009	Report

Document	Source	Year	Type
Oil clean-up products and their application in England and Wales	Environment Agency	2013	Report
Oil spill clean-up by structured fibre assembly	Indian Journal of Fibre and Textile Research	2011	Report
Overview of the UK commercial vehicle industry. pp42	Texaco	2016	Report
Pollution prevention guidelines	Northern Ireland Environment Agency	2011	Report
Pilot will grant Highways Agency officers power to stop HGVs	Commercial motor	2014	Article
Reported Road Causalities Great Britain Annual Report	DfT	2015	Report
Report shows Poland are the leading International road haulage company	Returnloads.net	2014	Article
Review of diesel spillage clean-up procedures	TRL	2010	Report
Spillcare products and services	Thorne & Derrick	2012	Report
Survey of foreign road goods vehicles United Kingdom 2009 – final results	DfT	2010	Report
Technical assessment of petroleum road fuel tankers, Summary report	TRL	2014	Report
The road vehicles (construction and use) regulations 1986	Legislation.gov	1986	Regulations
The road users campaign to kill diesel spills	Killspills	2004	Report
The work of Vehicle and Operator Services Agency (VOSA)	Parliament UK	2013	Report
TP anti-syphon – anti fuel theft device	Aide automotive	2016	Article
UK's Highway safety is set in concrete	Roadtraffictechnology.com	2009	Article
Vehicle handover – Volvo trucks driver development	Volvo	2015	Journal

Table 1.1: Sources of information reviewed

A number of operators from various industry sectors were contacted via an online survey as part of the stakeholder engagement phase. Participants were asked if they would like to provide more information and those that indicated they would were asked further questions via email and telephone interviews.

In total **38** operators completed the diesel spills survey. Operators were asked a variety of questions relating to diesel spills including:

- Whether their vehicles contained oil spill kits
- If their drivers were fully trained to use the spill kits they carried
- If their vehicles had protection methods in place to protect the fuel tanks in the event of an incident
- If operators had been involved in a diesel spillage incident in the past
- What products operators were using to treat spillages

Other stakeholders engaged with as part of this study were Highways England (Northwest Regional Control Centre), Cheshire Police and Kier (Perry Bar).

The results of the stakeholder consultation are referenced throughout this report.

2 Understanding Diesel Spills

2.1 Vehicles types involved in diesel spillages

Diesel spills are a major hazard on the road and represent a danger to other road users and particularly motorcyclists. Major diesel spills are mainly associated with vehicles being involved in a Road Traffic Collison (RTC) which is an area where prevention is a high profile issue[1]. Spillage of diesel and other petroleum products on the SRN is becoming a common problem and a key concern for Highways England who is responsible for managing and maintaining the SRN.

Oil is still by far the most dominant fuel source in the UK's 37million vehicles. Spills can occur by accident, a result of poor maintenance or deliberately. Atkins 'Diesel *Absorption Trial report' (2013)* highlights that oil, and most commonly diesel spills account for approximately 25% of all incident related congestion on the SRN[2]. This seems disproportionally high as figures suggest that there is only one diesel spillage per day on the SRN. However, the time needed to clean-up each diesel spill and return the SRN to normality is large when compared to a typical tyre incident for instance of which there are many more instances recorded.

During 2013, 78% of fuel spillages on the SRN were diesel spills[3]. In terms of the vehicle types involved, based on command and control data (see figure 2.1), the majority (67%) of vehicles involved in diesel related incidents are Heavy Goods Vehicles (HGVs) over 7.5.

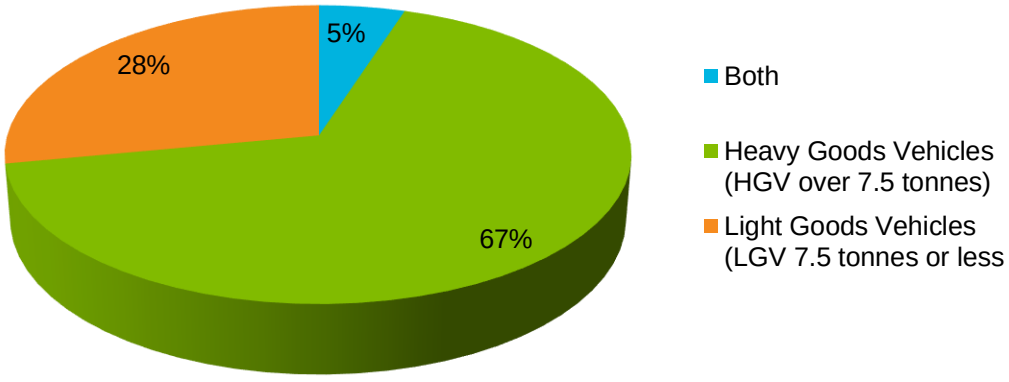


Figure 2.1: CC IP Data 2013/2014- Vehicle types involved in diesel spillages[4]

[1] Oakdene Hollins. (2005). An analysis of inland oil and fuel incidents in England and Wales. pp32

[2] Atkins. (2013). Diesel Absorption Trial Phase 2. Highways England. pp 2

[3] FMG Presentation. (2013). Fuel tanks in LGVs. Highways England. slide 7

[4] The European Union defines Light Goods Vehicle (LGV/van) as vehicles not exceeding 3.5 tonnes gross vehicle weight and Heavy Goods Vehicle (HGV/ lorry) Includes all goods vehicles over 3.5 tonnes gross vehicle weight

In 2014 there were 389,800 taxed heavy goods vehicles. Of these vehicles 115,200 were articulated vehicles and 274,600 were rigid vehicles[5]. Figure 2.2 outlines goods moved over a ten year period by vehicle type. As shown articulated vehicles represent the largest portion of HGV Billion Tonne Kilometres (Btkm) on the road and articulated vehicles have seen steady growth over the years. HGV freight is now more concentrated in heavier lorries and this results in fewer vehicle miles being driven to transport the same weight of goods. In addition, articulated vehicles generally do a higher distance on the motorways in comparison to rigid vehicles.

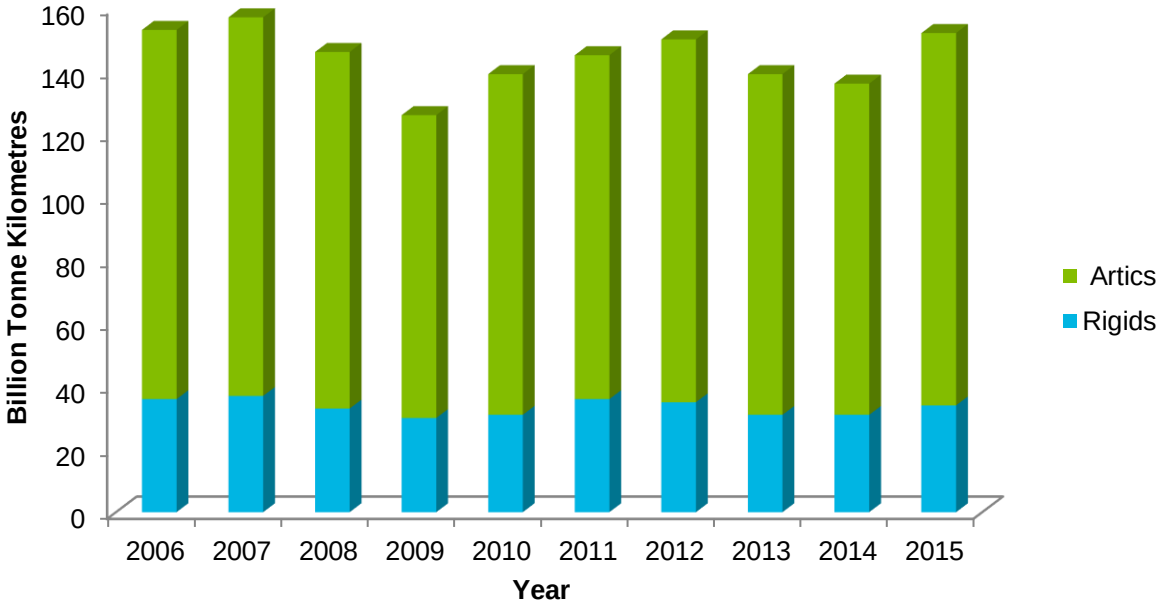


Figure 2.2: Goods moved by type and weight of vehicle in UK, 2006 – 2015 (DfT) Table RFS0107)

UK registered vehicles versus foreign registered vehicles

Figure 2.3 overleaf shows the split between fuel spillage incidents caused by UK registered vehicles and foreign vehicles. As shown in figure 2.3 during the period June 2012 – June 2013, 77% (197) of fuel spillage incidents involved UK registered vehicles and 23% (58) of spillages involved foreign registered vehicles[6].

Over the past decade, the share of UK-registered HGVs travelling out of the UK has shrunk from 15.4% in 2005 to 10.8% in 2014. Foreign-registered HGVs' share of the overall market has risen by 11.7% to 65.7% in that time. The number of HGVs travelling from the UK to mainland Europe (excluding the Republic of Ireland) in 2014 is at the second-highest in the past 10 years at 2.89 million journeys, compared to 2.9 million in 2007[7].

[5] DfT. (2015). Domestic road freight statistics, United Kingdom 2014. pp5

[6] Commercial motor. (2014). DVSA targets commercial vehicles over fuel spills. (http://www.commercialmotor.com/news/dvsa-targets-commercial-vehicles-over-fuel-spills)

[7] Texaco. (2016) Overview of the UK commercial vehicle industry. pp42

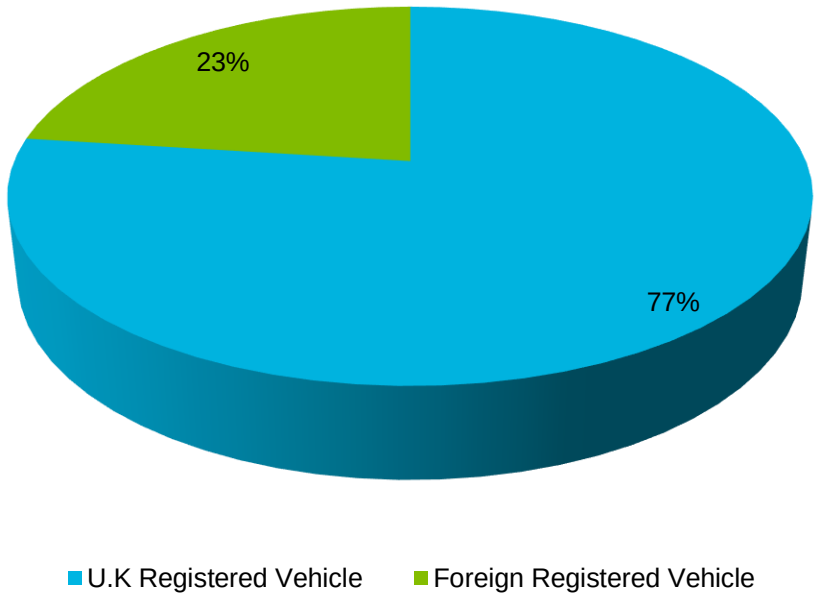


Figure 2.3: Fuel spills UK and foreign vehicles 2013 [8]

Polish registered vehicles accounted for 21% of all goods lifted to/from the UK in 2015, Dutch vehicles 10% and Romanian vehicles accounted for 9%[9]. Poland is classed as an international road haulage country which has a larger proportion of HGVs on the roads than any other EU country[10].

HGVs registered in Poland accounted for one in five of every truck that travelled out of the UK into mainland Europe and lead the market for goods exports by road by 7.7 percent between July 2014 and June 2015. Outside of UK-registered HGVs, Dutch-registered HGVs remain third (9% share compared to 9.6% share year-on-year) where as big gains have been made by Romanian hauliers, moving from 7% market share to 9.27%, a shift from 151,000 vehicles to 210,355 vehicles. The full split of percentage share by country of registration is outlined in Table 2.1.

[8]Commercial motor. (2014). DVSA targets commercial vehicles over fuel spills. (http://www.commercialmotor.com/news/dvsa-targets-commercial-vehicles-over-fuel-spills)

[9] DfT. (2015) HGVs travelling to mainland Europe: Percentage share of all powered goods by country of registration - Q3 2014 - Q2 2015. pp43

[10] Returnloads.net (2014). Report shows Poland are the leading International road haulage company. (https://www.returnloads.net/news/report-shows-poland-are-the-leading-international/)

Country of Registration	Powered Vehicles	Percentage Share
Poland	478,204	21.08
UK	303,901	13.39
Netherlands	218,655	9.64
Romania	210,355	9.27
Germany	148,257	6.53
Spain	125,853	5.55
France	120,977	5.33
Hungary	102,630	4.52
Czech Republic	89,700	3.95
Other	522,200	20.73
Total	**2,320,732**	**100**

Table 2.1: HGVs travelling to mainland Europe: Percentage share of all powered goods by country of registration - Q3 2014 - Q2 2015[11]

Figure 2.4: Dutch (double tank) truck

Fuel tanks on some foreign heavy goods vehicles are larger than the standard UK fuel tanks. A foreign vehicle often carries additional diesel tanks (see figure 2.4) to enable the vehicles to fill up cheaper with diesel in Europe and this has a number of safety implications, including the risk of a road traffic collision[12].

[11]DfT. 2015: HGVs travelling to mainland Europe: Percentage share of all powered goods by country of registration - Q3 2014 - Q2 2015. pp43

[12] Parliament UK. (2013). The work of Vehicle and Operator Services Agency (VOSA). Section 3. http://www.publications.parliament.uk/pa/cm201213/cmselect/cmtran/writev/vosa/m03.htm

2.2 Root causes of diesel spills at incidents

Diesel spillages occur due to various factors (see figures 2.5 and 2.6) and often include other secondary impacts. The main root causes of diesel spillages as highlighted by Highways England (2013/14) include breakdowns on the SRN, road traffic collisions, general fuel spillages, vehicle fires and obstructions.

Further research conducted by TRL (2010)[13] indicates that the root causes of diesel spills are due to one or a combination of factors including:

- Negligence of the driver refitting the filler cap or forgetting to refit the cap
- When a driver fills the tank right up to the filler cap (necking it)
- Lack of anti-spill devices being fitted into the diesel tank in lorries
- Mechanical failures and fuel system defects (see figure 2.6)
- During collisions, usually involving tankers or multi-vehicle pile-ups
- Problem during the transport of diesel
- Ruptured tanks
- Leakage from corroded or rusty tank
- Engine oil

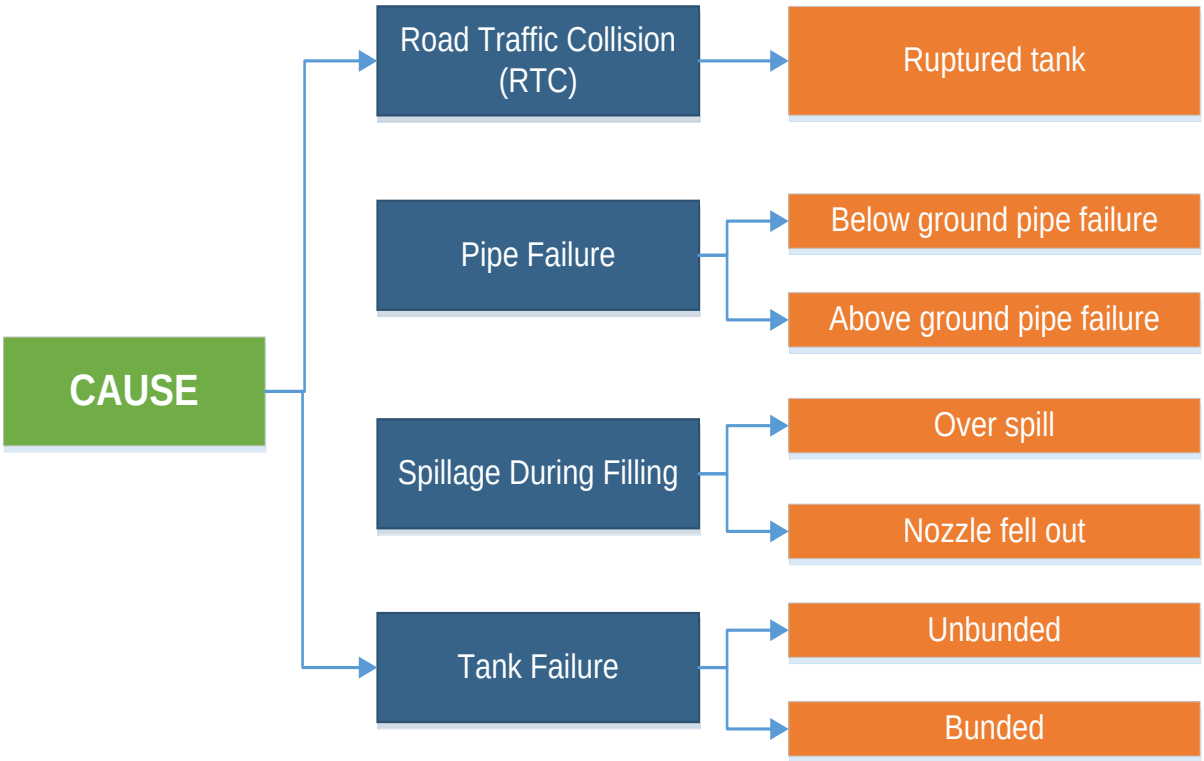


Figure 2.5: Root causes of diesel spillages

[13] Transport Research Laboratory. (2010). Review of diesel spillage clean-up procedures. pp3

Figure 2.6: HGV with an insecure fuel tank and carrying approximately 150 litres of diesel in the tank. The vehicle was issued with a Roadworthiness Prohibition (PG9).

More than half (52%) of fatal incidents on motorways involve HGVs, despite HGVs only making up 10% of the traffic on motorways[14]. Incidents involving HGVs are due to a number of factors including the combination of size, lack of proper enforcement of drivers' hours, vehicle overloading and differing foreign operating standards[15].

The number of diesel related incidents between 2013 and 2014 increased significantly by 94, from 263 incidents to 357 incidents as presented in Table 2.2. As shown below, there were 357 incidents over the course of the year which equates to 29 incidents per month. On average this is equivalent to one diesel incident per day somewhere on the SRN.

Year	Number of incidents
2013	263
2014	357

Table 2.2: Total number of diesel spillage incidents on the SRN 2013/14

Incidents by region

Figure 2.7 highlights the regions which experience diesel spillage incidents the most. As shown, the East of England (21%) has the highest percentage of spillage incidents followed by the South East (18%) and Northwest (16%). The M6 connects the north (from Gretna) to the South end (Catthorpe), the M25 encircles almost all of Greater London and the M4 connects London to South Wales. The high percentages for the regions correspond with the different motorways. M6, M4 and M25.

[14]MTRU. (2013). HGV fatal accident rates. Campaign for better transport. pp2. (http://www.bettertransport.org.uk/sites/default/files/research-files/HGV_fatal_ax_cf_to_all_2012.pdf)

[15] Parliament UK. (2013). The work of Vehicle and Operator Services Agency (VOSA). Section 3. http://www.publications.parliament.uk/pa/cm201213/cmselect/cmtran/writev/vosa/m03.htm

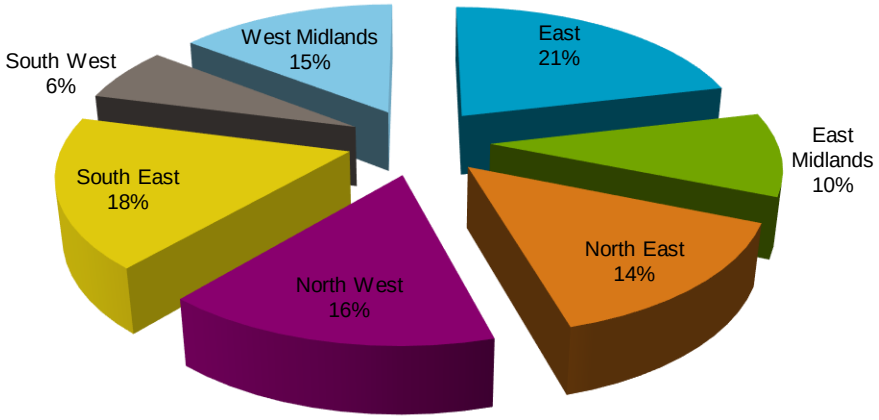


Figure 2.7: Regional breakdown of diesel spillage incidents 2013/14 (n.620 incidents)[16]

Motorways are among the safest roads in the country which carry a large amount of traffic, but due to the volume of traffic using the SRN, the numbers of multi-vehicle incidents that occur are relatively high.

The SRN carries approximately 21% of all traffic, and accounts for 5.4% of fatalities and 4.7% of injured casualties or seriously injured[17]. Motorways are vital for the movement of freight carrying 45.6% of all lorry traffic in 2015[18].

Table 2.3 shows the published 2014 DfT reported figures (based on STATS19 data) for accidents on the SRN in terms of vehicles involved by accident severity. The statistics clearly demonstrate this disproportionate impact, with 27% of all fatal accidents (and 16% of Killed or Seriously Injured (KSI) accidents) being from an accident which involved a heavy goods vehicle, compared to just 12% accidents of all severities[19].

Severity	Cars	Light Goods Vehicles (LGV)	Heavy Goods Vehicles (HGV)	Other	Total
Fatal	122 (65%)	8 (4%)	50 (27%)	7 (4%)	187
Fatal or Serious (KSI)	1,020 (69%)	105 (7%)	236 (16%)	111 (8%)	1,472
All Severities	9,749 (78%)	925 (7%)	1,500 (12%)	298 (2%)	12,472

Table 2.3: Severity of reported accidents on motorways by vehicle type

The motorways with the highest number of diesel spillage incidents are shown in table 2.4. The M6 is the longest motorway in the UK at 232.2 miles followed by the M1 at 193.5 miles. Both roads are heavily utilised by different types of traffic and in particular HGVs. As shown below, on average,

[16] NB. The south west region data is incomplete hence the low percentage

[17] DfT. (2015). Reported Road Causalities Great Britain Annual Report. pp 18
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/556396/rrcgb2015-01.pdf

[18] DfT. (2016). Road traffic estimates Great Britain 2015. pp20
(https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/524261/annual-road-traffic-estimates-2015.pdf)

[19] Atkins. (2015). Business case for investment decisions £1m (including VAT) or above and novel or contentious projects. Highways England. pp26

during 2014, the M1 had 0.27 incidents per mile and therefore for every 3.72 miles there is an incident.

Motorways	Length of motorway	Number of incidents (2013)	Number of incidents (2014)	Incidents/mile (2014)	Miles per incident
M1	193.5 miles London - Leeds	34	52	0.27	3.72
M6	232.2 miles Rugby - Carlisle	44	51	0.22	4.55
M25	117 miles Circle London	38	47	0.40	2.48
M62	107 miles Liverpool - Humberside	20	25	0.23	4.28
M4	191.9 miles London-Pont Abraham	16	23	0.11	8.34
M20	50.6 miles Swanley to Folkestone	12	14	0.07	3.61

Table 2.4: Motorways with the highest diesel spillage incidents 2013/14

Incidents involving foreign vehicles

In 2015, 0.4% of all traffic on British roads was estimated to be accounted for by foreign registered vehicles. HGV traffic has the highest proportion of this with 4.8% of HGV traffic estimated to be foreign registered. The South East region had the highest proportion of foreign registered vehicles which is likely to be because of its geographic location. This it is the region of arrival and departure for many HGVs coming from Europe through the Channel Tunnel and ports[20].

Evidence suggests that during 2015, vehicles from Poland and Germany were more likely to be involved in an incident within the UK than any other foreign registered vehicles. It is thought that this is mainly due to their being higher numbers of vehicles from these countries on the road. Polish lorries represented 15.7% of incidents, German vehicles followed with 13.1% and Spanish vehicles 6.1%.[21] Figures show that one in three collisions (33.1%) involving foreign lorries are on the motorway which as highlighted above are considered some of the safest roads in the country. Typically, just 4.3% of accidents take place on motorways. This means the rate at which foreign lorries have incidents on motorways is nearly eight times higher than the national average.

Liz Fisher, director of sales development at Accident Exchange, said: *"Common types of accidents that might involve trucks are cars getting caught in the blind spot of a lorry that is changing lanes or cars being rear-ended by a much bigger, heavier vehicle."*

[20] DfT. (2016). Road traffic estimates Great Britain 2015. pp31 (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/524261/annual-road-traffic-estimates-2015.pdf)

[21] Fleetworld. (2014). Motorway accidents involving foreign lorries rise 14%. (http://fleetworld.co.uk/motorway-accidents-involving-foreign-lorries-rise-14/)

As the vast majority of foreign vehicles are left-hand drive the chances of cars getting caught in these blind spots are increased. In fact the annual DfT report (2015)[22] states that of the total 6,873 accidents recorded involving HGVs, 495 (7%) involved left-hand drive vehicles.

Other causes of diesel spillages

In addition to the root causes described above, the location and size of the fuel tank also plays a role in the impact and extent of the fuel spill. While fuel tanks on HGVs (both articulated and rigid) are exposed to the same number of hazards it is more common for rigid vehicles to have some form of protection covering the fuel tank (e.g. side guards) than articulated vehicles. A side guard helps lower the likelihood of injury to 'unprotected road users' when struck by a forward-moving vehicle. It's there to deflect and stop people going underneath the sides of the vehicle.

Figure 2.8 shows the positioning of the fuel tank on both rigid and articulated vehicles and the fitment of side guards in relation to the tank. It can be seen that when coupled with the need to fill the gaps to prevent unprotected road users from going underneath the side of the vehicle, the location of the fuel tank on a rigid vehicle allows it to be positioned behind the side guard. As there is no gap to fill where the fuel tank is positioned on the artic vehicle there is no need to fit protection in front of the fuel tank.

Figure 2.8: Location of fuel tanks for rigid and artic vehicles

Within the UK, diesel spillage related incidents due to Road Traffic Collisions (RTC) are common and account for 9%[23] of all fuel spillages. A recurring issue is HGV tanks rupturing both during road traffic collisions and as a tank failure (e.g. leaking tank, punctured tank, leaking cap). Diesel spillage incidents related to ruptured tanks account for approximately 18%[24].

Whilst road traffic collisions and ruptured tanks are often the root causes of diesel spills as shown in figure 2.9, tank failures and overfilling also play a key role accounting for 36% of diesel related incidents. During 2013/14, DVSA carried out a number of trials checking the fuel system defects on HGV vehicles. Examiners detected 2,390 fuel system defects and issued over 1,500 prohibitions to vehicles with defective fuel systems[25].

[22] DfT. 2015. Reported Road Casualties Great Britain: 2014 Annual Report. pp279

[23] FMG Presentation. (2013). Fuel tanks in LGVs. slide12

[24] FMG Presentation. (2013). Fuel tanks in LGVs. Highways England. pp9

[25] The Society of Motor Manufacturers & Traders (SMMT). (2014). DVSA cracks down on diesel spills. (http://www.smmt.co.uk/2014/08/dvsa-cracks-diesel-spills/)

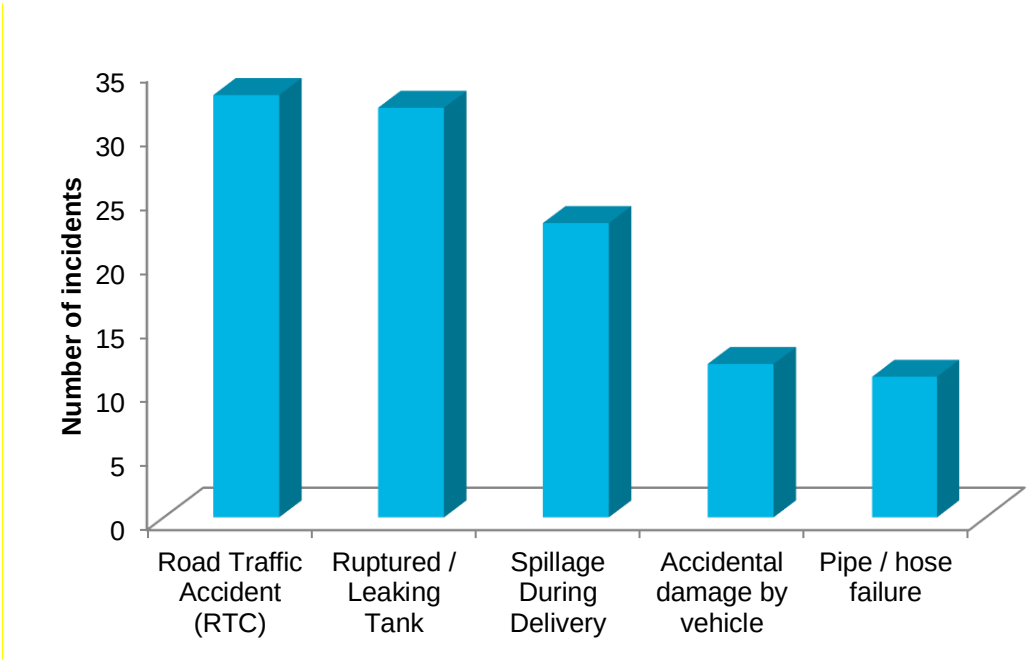


Figure 2.9: The top five causes associated with accidental spillage of diesel[26]

Frequency of incidents

The majority of respondents to the online survey revealed that 87% (33) of them had not been involved in a diesel spillage incident in the last five years. Only 13% indicated that they had been. Of the 13% (5 operators), four operators stated that they had been involved in one spillage incident, and one operator said they had been involved in two spillage incidents.

Process of dealing with the spillage

In terms of the process for responding to the spillage, one respondent stated that a recovery vehicle was organised and the fuel tank and tyres were removed due to them being an old specification (315/70). Following the incident, they decided to fit their entire fleet with 31mm higher specification tyres to help the incident from occurring again in the future. Another respondent mentioned that they were not involved in a diesel spillage on the SRN, but it was a spill in their yard.

Feedback from respondents to the online survey implied that a proportion of these diesel spillage incidents could be controlled or reduced. For example, diesel spillages caused by drivers forgetting to refit their filler cap properly and can be addressed through retraining. Spillages caused by road traffic collisions on the other hand are not as easy to avoid as in some cases are caused by external factors that the operator has no control over.

2.3 Effects of diesel spills

If a spillage enters the drainage system on the road and gets into nearby streams or rivers then the environmental impacts can be severe and endanger the local wildlife. Economically, diesel spills are costly to society due to the long delays, buildup of congestion and clean-up costs[27]. A diesel spillage incident can have a significant financial impact on a transport operator, particularly if a driver misses their delivery window. If this happens the transport operator could face a fine from their customer.

[26] Oakdene Hollins. (2005). An analysis of inland oil and fuel incidents in England and Wales. pp27

[27] Transport Research Laboratory (TRL). (2010), Review of diesel clean-up procedures. pp3

Also depending on the scale of the incident, clearing up diesel spills leads to road closures which results in congestion and additional road user delay as minimum speed limits are enforced.

The buildup of congestion can lead to standing traffic, which increases the risk of a secondary collision. Therefore the maintenance operation and the placement and recovery of sorbents needs to be well orchestrated in a way to reduce road user delay and minimise risk to the operatives. In addition diesel spillage incidents often lead to lengthy delays especially in cases where resurfacing is required. Even where immediate resurfacing is not required it can cause the pavement surface to fail over a period of time, well within the life expectancy of the pavement surface, leading to indirect delays through resurfacing roadworks. An example of a spillage incident which resulted in significant congestion is illustrated in figure 2.10.

Diesel spillage incidents are hazards which can threaten the safety of other road users. A spillage incident on the SRN has the ability to reduce the skid resistance of the road and lead to long term damage to the road structure if not removed promptly. The spill not only has the potential to reduce skid resistance, but it can also lead to the permanent damage of bituminous materials. For example diesel exposure for as little as 120 minutes has been shown to result in structural damage to road surfaces[28]. Both long term and short term damage can occur even from a relatively short period of exposure. The damage to the road, mainly the skid resistance of the road, is a safety hazard for motorcyclists. This is because the difference in skid resistance can cause a motorcycle to skid, or swerve to avoid the spillage and this could result in the motorcycle losing control.

Highways England, aims to respond to an incident within 20 minutes and clear 85% of incidents in a live lane within 1 hour.

[28] J C Bullas, J Doxford, & P Hupton. (2014). A study of measurement methods for diesel sorbent performance, and the components of road user delay associated with diesel spills on the UK Strategic Road Network (SRN). STAR Conference. pp3

At approximately 5.20am a diesel tanker was travelling Eastbound on the M62 between junctions 22 and 23 when it began to leak diesel from a burst pipe. The Traffic Officers were first on scene and with the support of the Police, implemented a closure of lanes 2 and 3, leaving lane 1 open (see figure 2.11). The Traffic Officer vehicles are equipped with spill kits that are only suitable for use on minor spillages such as radiator fluid or small diesel spillages.

Due to the time and location of the incident, traffic congestion was an issue as traffic funnelled from 3 lanes into a single lane. It was reported that there were 3 lanes of standing traffic trailing back approximately 10miles/16km from the incident location. The spillage was identified as being approximately 1,000 litres of diesel, so in order to clear the carriageway, service provider attendance was required. In total, the clean-up operation lasted over 45 hours

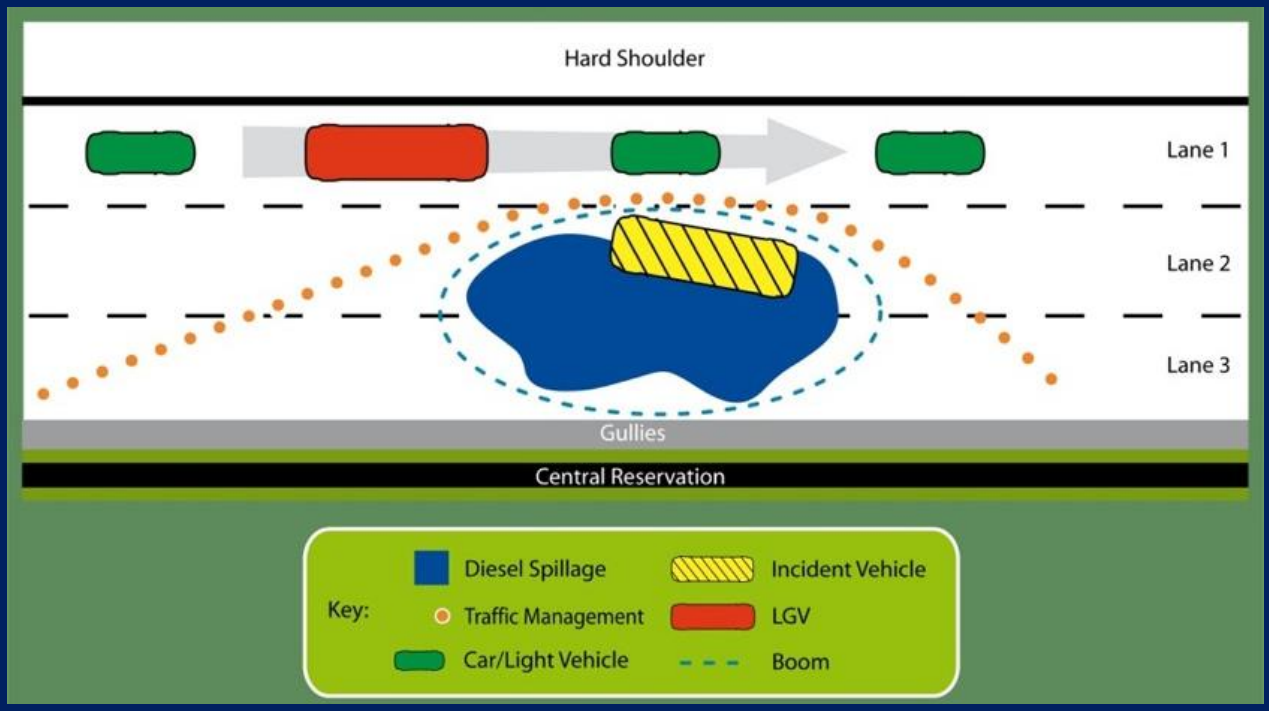


Figure 2.10: Diesel Spillage on the M62 - Closure of Lanes 2/3 and deployment of boom[29]

Duration of incidents

A study conducted by FMG, states that approximately:

41% of diesel spillage incidents are estimated to be 2 hours or less

14% are between two to five hours and;

22% are greater than five hours as shown in figure 2.11[30].

[29] Highways England. (2011). National archives. (http://webarchive.nationalarchives.gov.uk/20120810121037/http://www.highways.gov.uk/business/15668.htm)

[30] FMG Presentation. (2013). Fuel tanks in LGVs. Highways England. Slide 8

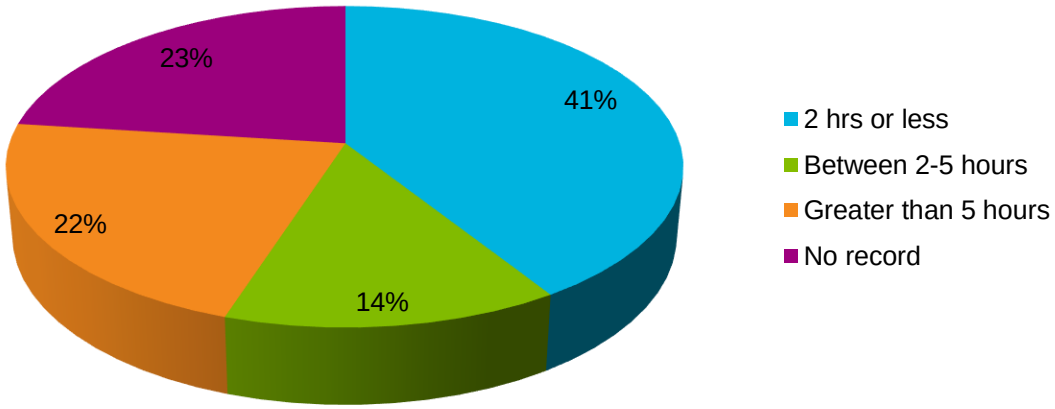


Figure 2.11: Lane Impact Duration (minutes) (255 incidents June 2012 – June 2013)[31]

As well as the financial cost implications, resurfacing also means that the road will get closed over a certain period of time and thus cause disruptions to other road users. The Atkins report (2013)[32] highlighted that the diesel clean-up procedure only accounts for 7% and is far shorter than the time needed to complete the vehicle recovery or other logistics associated with extended lane closures. This is illustrated in figure 2.12.

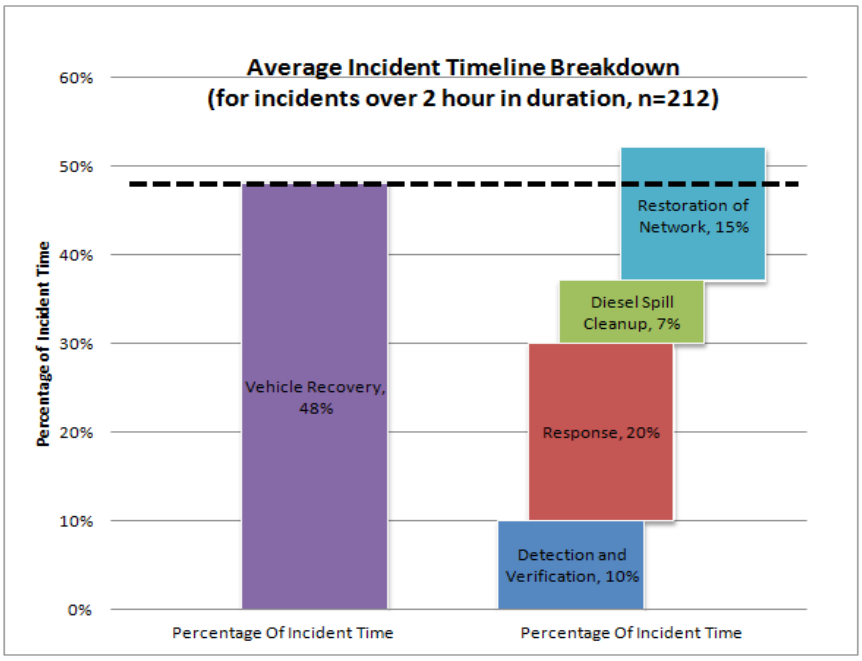


Figure 2.12: Typical Durations of Timeline Components for a Diesel Spillage Clean-up

[31] FMG Presentation. (2013). Fuel tanks in LGVs. Highways England. pp8

[32] Atkins. (2010). Diesel Absorption Trial Phase 2. Highways England. ppii

A 44 tonne HGV over-turned on the M4 in Berkshire and came to rest facing the wrong way. The HGV spread its load of garden waste across 3 lanes and it had also ruptured it fuel tank causing an extensive diesel spill. In addition around 180m of central reservation barrier had been flattened and a lighting column ripped from the ground.

Contractors arrived on the scene with an electrical engineer to assess the severity of the damage. A gritter had also been arranged and deployed to treat the fuel spillage. Upon inspection on the scene it was evident that resurfacing works were required on a **80metre stretch of road across all 3 lanes**, and resurfacing works were carried out throughout the night. The damaged central reservation barrier also needed replacing. This incident took around **18 hours to clear**, from the moment it was reported at 12:50 until lanes were reopened at 06:48 the following morning.

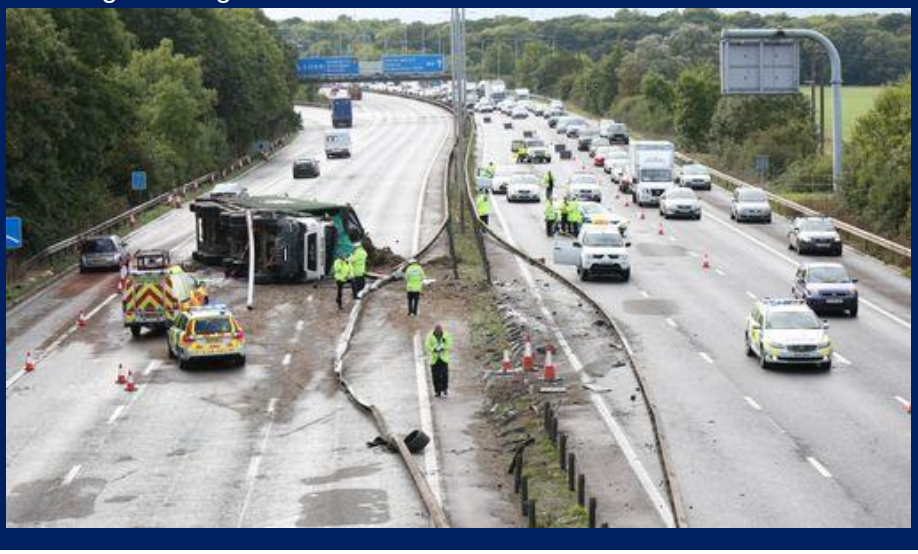


Figure 2.13: Incident of overturned vehicle on the M4[33]

[33] Highways England traffic bulletin. (2016). M4 closure westbound J8/9 to J10, Berkshire. (http://www.highways.gov.uk/traffic-information/traffic-information-services/highways-england-post-incident-bulletin/january-2016-post-incident-bulletins/october-2016-post-incident-bulletins/m4-closure-westbound-j89-to-j10-berkshire-wednesday-12th-october-2016/)

CASE STUDY : M6 S/B J7-6 , 11th April 2012
Burst fuel tank resulting in 270l of diesel spilt.
Impact = Full carriageway closures and diversions in place for a total of 27hrs 42mins
Overall cost = £58,760

CASE STUDY2 – M5 N/B J8-7, 3rd July 2012
Overturned HGV resulting in diesel spillage
Impact = Initial lane closures in place for 8hrs. Further full carriageway closure & diversions in place for 24hrs (3 x 8hr shifts)
Overall cost = £69,908

Based on the two case studies above, **the average cost of a diesel spillage incident is approximately £64,334**

Based on the 357 incidents presented in table 2.2 for 2014, it was estimated that on average there is a diesel spillage incident somewhere on the SRN each day. If HE can reduce the number of fuel spillages on the SRN, the monetary benefits are significant. According to Atkins, for every one diesel spillage incident reduced, there is a monetary benefit of £256,000[34].

[34] Atkins. (2015). Business case for investment decisions £1m (including VAT) or above and novel or contentious projects. pp26

3 Diesel Spillage Prevention

3.1 Introduction

Reports show that diesel consistently accounts for around one third of all specified oil and fuel incidents. Under EU rules, there is no limit on the amount of fuel that maybe carried between member states in standard running tanks provided that it remains in these and it is not off-loaded. The fuel capacity and limits on standard UK HGVs can vary considerably to that of their European counterparts. It is therefore important to gain a better understanding on the fuel capacities as well as an estimate of the miles travelled by both UK and foreign vehicles across the SRN.

3.2 Fuel Limits

3.2.1 UK operators

The majority of UK operators use standard production sized tanks which usually carry in the range of 300-500 litres,[35] dependent on the Maximum Permissible Mass (MPM) of the particular vehicle. Table 3.1 overleaf shows a number of HGV vehicle manufacturers and the fuel capacities for different vehicle types.

A report by the Environmental Agency (2005), stresses that domestic tanks represent a particular high risk since very few are bunded and hence it is extremely difficult to contain a major tank failure[36]

During the stakeholder phase of this study, operators were asked to indicate how much fuel their vehicles carried daily. The majority of operators highlighted that on average their vehicles carried between 200-450 litres a day.

Operators were then asked to state their fuel tank capacity for their fleet. The amount of fuel carried daily, in comparison to the fuel tank capacity was 50-100 litres less, meaning that operators are already taking measures to prevent overfilling / diesel spills from occurring either on their yard or on the SRN.

The amount of fuel carried by an HGV is often governed by the type of operation being undertaken by the haulier. For instance a 44tonne artic vehicle conducting general haulage will do a much higher annual mileage than a tipper vehicle doing muck away. Petroleum tankers used in the UK also cover a lot of mileage and are typically six axle articulated vehicles which travel up to 220,000 km each year[37]. with most drivers working on a shift system and vehicles are double-shifted. The origin and destination for fuel tankers often means the journeys they undertake are made on the motorways and this increases the risk of these types of vehicles being involved in diesel spillage incidents on the SRN.

[35] FMG Presentation. (2013). Fuel tanks in LGVs. Highways England. pp26

[36] Oakdene Hollins. (2005). An analysis of inland oil and fuel incidents in England and Wales. pp 30

[37] TRL. (2014). Technical assessment of petroleum road fuel tankers, Summary report. DfT – Dangerous goods division. pp3 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/388707/01b-project-summary-report.pdf

Manufacturer Brand	Vehicle Type / Model	Main Fuel Tank Capacity
Mercedes-Benz	1. 1824 LSnRL 4x2 BM 963406 Semitrailer tractor Full air suspension Volume Lowliner	**390 litres** Left, 650 x 565 x 1250 mm Aluminium
	2. Antos 2542 L 6x2 BM 963020 Platform chassis With air suspension	**290 litres,** Left, 650 x 565 x 950 mm, Aluminium
	3. Arocs 4153 AK 8x8/4 BM 964233 All-wheel-drive dumper Grounder	**290 litres,** Left, 650 x 565 x 950 mm Steel
MAN Truck & Bus UK Ltd	1. TGX 4x2 Drawbar Chassis Specification: TGX 18.360 4x2 BL EURO 5 TGX 18.400 4x2 BL TGX 18.440 4x2 BL	**400 litres** Steel with RHS mounted, Locking cap
	2. TGS 6x2 Midlift Tractor Chassis Specification: TGS 26.400 6x2/2 BLS EURO 5 TGS 26.440 6x2/2 BLS	**450 litres** Aluminium with Integral Step, RHS mounted, Locking cap
	3. TGL 12 Tonne 4x2 Rigid Chassis Specification: TGL 12.180 4x2 BBTGL 12.220 4x2 BB TGL 12.250 4x2 BB	**150 litres** Steel, RHS mounted, Locking cap
Volvo Trucks	1. FH 16 4x2 Tractor - Rear Air Suspension FH 42 T6HA	**330 litres** R330A71 Right aluminium 710 mm D-shaped fuel tank,
	2. FH 13 6x2 Tractor - Low - Lite Pusher - Rear Air Suspension FH 62 PT3LA	**255litre** L255A56 Left aluminium 560mm D-shaped fuel tank
	3. FH 13 8x4 Rigid - Tag Tridem – contact sales engineering reference application FH 84	**330 litres** R330A71 Right aluminium 710 mm D-shaped fuel tank,

DAF	1. CF 220 FA 4x2 rigid, Chassis/Body	Plastic fuel tank 200 litres; Spray suppression; Front underrun protection (FUP); AdBlue tank 25 litres, right side chassis.
	2. LF 220FT 4x2 tractor, 13t	Plastic fuel tank 170 litres; Catwalk with step, extra-long; Spray suppression; Front underrun protection (FUP); AdBlue tank 25 litres, Right side chassis.
	3. XF 460 FTT 6x4 tractor	Aluminium fuel tank 510 litres with step, height 620 mm; Worklamp white; Spray suppression; Front underrun protection (FUP); Catwalk with step; AdBlue tank 90 litres on left-hand mudguard.

Table 3.1: HGV fuel tank capacities for some major European Manufacturers

3.2.2 Foreign operators

On average, it is estimated that foreign registered HGVs enter the UK with around 760 litres of fuel and leave with about 480 litres[38]. It is thought they purchase less than 10 litres of fuel on their trip to the UK.

Foreign registered HGVs are estimated to have travelled 948 million vehicle kilometres in the UK in 2009 and the average length of trip for these vehicles was 649 km[39]. Drivers of foreign registered HGVs visited the UK eleven times on average. Approximately 91% of trips made by foreign drivers were by articulated vehicles, 5% by rigid vehicles with drawbar trailer and 4% rigid vehicles.

Vehicles entering the UK from many of the European countries appear to represent a larger risk of major spillage due to various factors including:

- Foreign vehicles have larger tanks fitted and often to both sides of the vehicle (allowing journeys to be completed without re-fuelling in the UK).
- A foreign HGV can carry up to 2,000 litres (4x the UK norm).
- Foreign vehicles provide greater probability of damage (multiple and larger tanks).
- They produce greater volume of fuel in spillage incidents.

[38] DfT. (2010). Survey of foreign road goods vehicles United Kingdom 2009 – final results. pp15. (http://tna.europarchive.org/20110503185748/http:/www.dft.gov.uk/adobepdf/162469/221412/221522/222957/surveygoodsfinal.pdf)

[39] DfT. (2010). Survey of foreign road goods vehicles United Kingdom 2009 – final results. pp15. (http://tna.europarchive.org/20110503185748/http:/www.dft.gov.uk/adobepdf/162469/221412/221522/222957/surveygoodsfinal.pdf)

- As the majority of foreign registered vehicles are left hand drive, it is understood there might be a higher instance of side swipe traffic collisions due to 'blind spot' issues. These collisions can involve an area of a HGV where the fuel tanks are mounted.

3.2.3 EU laws surrounding fuel limits

As far as fuel is concerned, the Construction and Use Regulations[40] do not lay down a maximum amount of fuel a vehicle can carry.

Regulation 39 stipulates that any fuel must be carried in tanks that are "constructed and maintained so that the leakage of any liquid from the tank is adequately prevented" and "so that the leakage of vapours is adequately prevented".

All vehicles (whether foreign or UK registered) must comply with Community Directive 70/221[41]. Directive 70/221 requires tanks to be corrosion resistant, withstand a pressure of 1.3 bar, and they must not leak (apart from a drip) through the filler cap even if the vehicle overturns. The tanks must not be placed near sharp edges which, in the event of a front or rear impact, could rupture the tank.

For vehicles from non EU countries, UNECE Regulation number 34[42] discusses how to prevent the risk of fire in the event of a collision; however no reference is made to diesel spillages.

3.3 Tank construction and specification

The typical location of fuel tanks on HGV's especially articulated vehicles leaves them exposed in the event of multi-vehicle collisions. On an articulated vehicle the fuel tank is located between the two axles on the driving unit. Rigid vehicles have guard rails installed to minimise the likelihood of other road users going under the vehicle in the event of an incident and the guard rail also offers some form of protection for the fuel tank thus reducing the impact of damage in the event of a multi vehicle collision. A preventative approach to the issue of rupturing fuel tanks is to redesign or relocate the tanks elsewhere on the vehicle to improve their crashworthiness.

The Road Haulage Association highlighted in 2005 that "to their knowledge, little has changed with respect to the design and location of the fuel tank on trucks for years" [43]. This same comment continues to be valid 10 years later. The location of the tanks have not changed since they were constructed, therefore a way of reducing the number of diesel spills occurring on the SRN would be to redesign and possibly relocate the tanks, as this could potentially improve their crashworthiness.

3.3.1 Types of fuel tanks available

Plastic presents the highest risk of splitting and steel or aluminium tanks have a less risk of splitting. Aluminium tanks are also 50% lighter than steel fuel tanks. A number of materials are used for fuel tanks with each material presenting a number of advantages and disadvantages as shown in table 3.2[44].

[40] Legislation.gov.uk. (1986). The road vehicles (construction and use) regulations 1986. Regulation 39

[41] Council Directive 70/221/EEC of 20 March 1970 on the approximation of the laws of the Member States relating to liquid fuel tanks and rear protective devices for motor vehicles and their trailers

[42] https://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/2015/R034r3e.pdf

[43] Oakdene Hollins. (2005). An analysis of inland oil and fuel incidents in England and Wales. pp34

[44] Oakdene Hollins. (2005). An analysis of inland oil and fuel incidents in England and Wales. pp39

Type of fuel tanks	
Steel	Standard, heavier, may rust over time
Aluminium	Lighter, more expensive, longer life
Plastic	Lighter, maybe limited in capacity

Table 3.2: Types of fuel tanks

3.3.2 Ride height of fuel tanks

Research conducted as part of this study has revealed that there are no specifications relating to fuel tank clearance above the ground for HGVs. However, research conducted by FMG (2013)[45] suggests that the lower the fuel tank, the greater risk there is of damage from debris or a puncture. In addition the lower the fuel tank is to the ground, the more exposed it is.

3.3.3 Fuel tank caps

There are no specific requirements or specifications for fuel caps or the fuel inlet location. However, MOT inspections in the UK require that a commercial vehicle's tank filler cap must not leak under normal usage. Vehicles fail their test should any sealing washer be damaged or missing. [46]

The Road Vehicles (Construction and Use) Regulations 1986, regulation 39, stipulates that 'every tank containing petroleum spirit which is fitted to a wheeled vehicle and is used either for the propulsion of the vehicle or for driving an ancillary engine or equipment forming part of the vehicle shall be: *constructed and maintained so that the leakage of any liquid or vapour from the tank is adequately prevented, so, however, that the tank may be fitted with a device which, by the intake of air or the emission of vapour, relieves changes of pressure in the tank* '[47].

Operators completing the online survey conducted as part of this study, were asked to indicate whether their drivers checked their fuel tanks and caps during their daily walkaround checks. The majority (95%) of respondents stated that their drivers did check them and only a small proportion (5%) stated that they didn't. This is illustrated in figure 3.2 below. Some of the things covered by the walkaround checks include:

- Checking that the fuel cap is in place and fastened properly
- If there are any signs of leaking or seepage from the filler neck
- Checking that the fuel tank seal is intact
- Checking there is no sign of fuel on the tank and on the ground
- Signs that the tank has been breached

[45] FMG Presentation. (2013). Fuel tanks in LGVs. Highways England. pp 34

[46] The road users campaign to kill diesel spills – Killspills. (2004). Report to the Prime Minister. pp8 (http://www.mag-uk.org/content/pr/2004/september/government_report.pdf)

[47] Legislation.gov.uk. (1986). The road vehicles (construction and use) regulations 1986. Regulation 39. (http://www.legislation.gov.uk/uksi/1986/1078/part/II/chapter/G/made?view=plain)

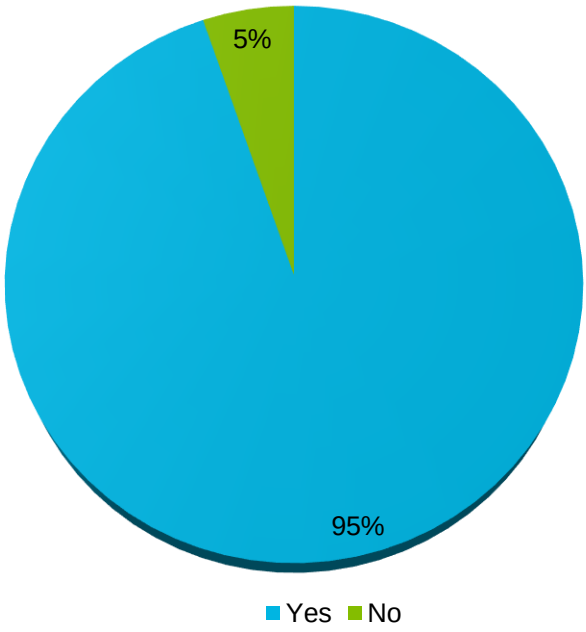


Figure 3.2: Do drivers check their fuel tank/caps during their daily walk around checks

3.3.4 Additional measures to prevent spills and diesel theft

As well as carrying out the standard daily walkaround checks on the vehicle, a number of organisations and manufacturers offer systems and devices to protect vehicles from spills and diesel theft. To date a number of commercial vehicles (DAF, IVECO, Scania, Volvo, and Mercedes) are fully fitted with locking fuel caps as standard for security purposes. By having this in place it protects the fuel from theft, contamination and helps prevent diesel spillages on the roads. Within the consultation phase, only one respondent indicated that they have an 'anti-spill' system fitted to all their vehicle fuel tanks.

Volvo Trucks Driver Development (2015)

As part of Volvo's vehicle handovers, drivers have the opportunity to attend a one day training course (7 hours towards driver CPC) so they can get a full understanding of the vehicle and the different controls. Expert advice is given on daily maintenance checks required. Volvo emphasise to drivers the dangers of over-filling the fuel tank, trainers explain the importance of not overfilling to drivers, reasons behind the D-shaped fuel tank on Volvo vehicles and why the fuel tank is hung on the Chassis.

All fuel tanks on new Volvo vehicles have anti-syphon devices (as shown in the images below), anti-spill flaps (in the event of a roll over and the cap comes off (the spring loaded flap stops the fuel from leaking). In addition all Volvo vehicles have a locking fuel cap as standard. The importance of these devices and how to prevent diesel spills is communicated to drivers during their training.

This course is only delivered with every new Volvo vehicle and is offered as one-to-one training.

Figure 3.1: Case study- Vehicle Handover Volvo

Anti-Siphon devices

Another heavily used vehicle protection method for the fuel cap is the use of anti-siphon devices as shown in figure 3.3. These devices are used to reduce fuel spillages and prevent diesel theft. Anti-siphon devices stop diesel from spilling onto the road surfaces in the event that the fuel cap falls off or it is not put back on after refuelling. The devices can be retrofitted to vehicles for around £80 and they are compatible with a number of manufacturer's trucks such as DAF, Iveco, Renault, Volvo, MAN and Mercedes. In addition the anti-siphon devices also work on vehicles with plastic tanks.

There are a number of companies offering anti-siphon devices including TISS Anti-siphon Ltd, Tanksafe, TruckProtect, Aide Automotive and Solution Specialists Ltd. A number of operators including Sainsbury's, Co-op, Maritime Transport, Biffa Waste and Tesco have had their entire fleet fitted with anti-siphon devices to prevent both diesel spillages and theft. In addition, a number of truck manufacturers including Volvo, MAN, DAF, Iveco, Scania, Renault, Foden, Hino & Mercedes also fit their fuel tanks with these devices[49].

[48] Volvo. (2015). Vehicle handover – Volvo trucks driver development. (http://www.volvotrucks.co.uk/content/dam/volvo/volvo-trucks/markets/uk/services/services-images/driverdevelopment/vtdd_vehicle_handover_fp.pdf)

[49] Aide automotive. (2016). TP anti-syphon – anti fuel theft device. (https://www.aideautomotive.com/products/fuel-theft/)

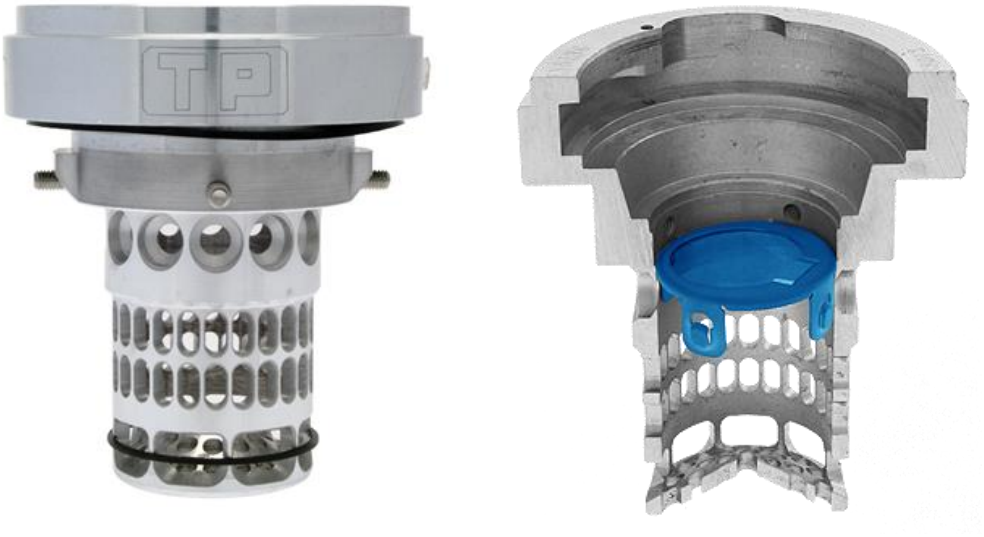


Figure 3.3: Anti-siphon devices

3.4 Vehicle Protection Methods

3.4.1 Methods available

There are a number of vehicle protection methods available, giving operators a choice of which best suits their vehicles. A number of rigid vehicles have guard rails in place which help to protect the fuel tank from collision damage, whilst many articulated vehicles have limited forms of protection for the fuel tank. Guard rails are a standard for rigid vehicles and are commonly used to prevent vulnerable road users from going underneath the vehicle.

Consultation with operators revealed that 1 in 2 operators have guard rails in place as shown in figure 3.4. The findings also suggested that self-healing and reinforced tanks are not as widely used by operators. Some stakeholders consulted during this research (who have no vehicle protection methods in place) stated they used 'additional locking devices' to prevent removing the fuel tank caps.

In addition to the methods mentioned above, according to FMG (2013)[50] other fuel spillage prevention measures could include reducing the size of foreign HGV fuel tanks, adopting a more robust interpretation of 'standard tanks', raising the ride height of the fuel tank, changing the positioning/construction of the fuel tank caps, installation of concrete central reservations on the SRN.

[50] NB Several foreign operators use vehicles with fuel tanks on either side of the vehicle to lengthen the range of benefit from filling up in countries with lower fuel prices.

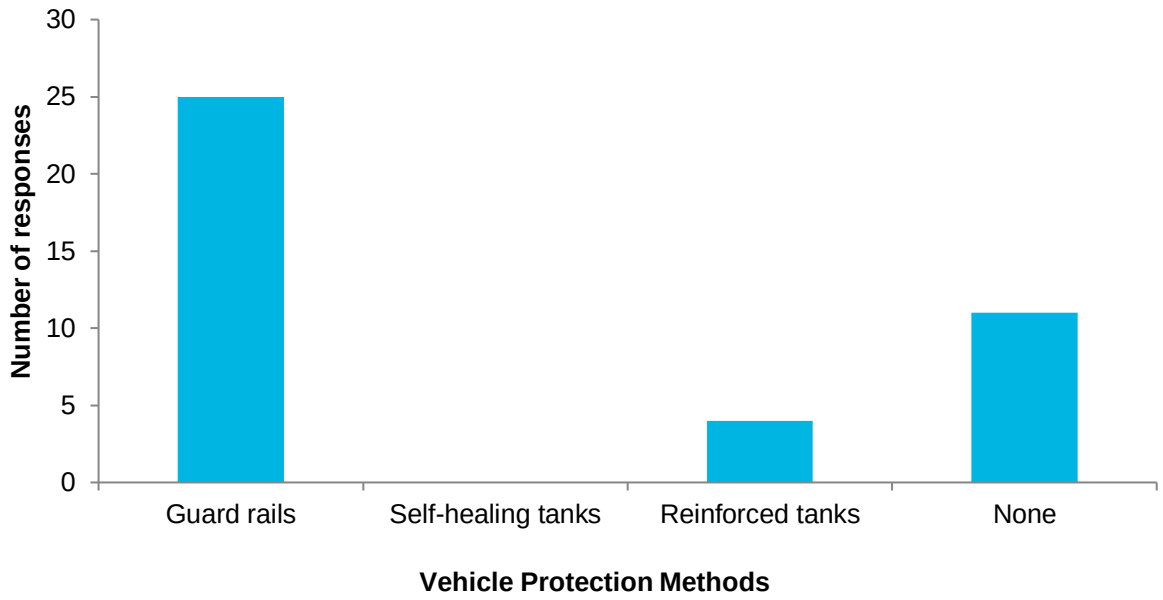


Figure 3.4: Vehicle protection methods used by operators

3.4.2 Effectiveness of vehicle protection methods

3.4.2.1 Guard Rails

Guard rails help prevent vulnerable road users (pedestrians, cyclists and motorcyclists) from going underneath the vehicle. The positioning of guard rails on an HGV is dependent on the 'type' of vehicle they are fitted to. For instance, on an articulated vehicle, the guard rails are fitted to the trailer section and fill the gap between the rear wheels of the tractor unit and the wheels on the trailer (see figure 3.5). In the vast majority of cases the separable tractor unit does not have any guard rails fitted which leaves the fuel tank exposed. Figure 3.6 presents an articulated vehicles ruptured fuel tank which has been caused by a collision with another vehicle.

Figure 3.7 shows the fitment of guard rails to a rigid vehicle. Again the guard rails fill the gap between the wheels however; as the cab unit and vehicular body are non-detachable the fuel tank is provided a degree of protection and is housed behind the guard rail.

Figure 3.5: Positioning of guard rails on articulated vehicle

Figure 3.6: Ruptured tank on an articulated vehicle

Figure 3.7: Positioning of guard rails on rigid vehicle

3.4.2.2 Laws surrounding guard rail manufacturing and testing

Guard rails are manufactured and tested to the following standards:
The Road Vehicles (Construction and Use) Regulations (NI) 1999 as amended.
Directive 89/297/EEC
The technical requirements of the Directive 89/297/EEC.

3.4.2.3 Tractor side panels

Tractor Side Panels are most commonly fitted by operators to improve a vehicles aerodynamics and thus improve fuel economy. However, they do provide a certain level of protection to the fuel tank as the panels cover the gap between the front and rear tractor wheels and are fitted in front of the fuel tank itself (see figure 3.8). Tractor side panels can be fitted as new or retrofitted and cost around £750 providing a payback period of around 2.5 years.

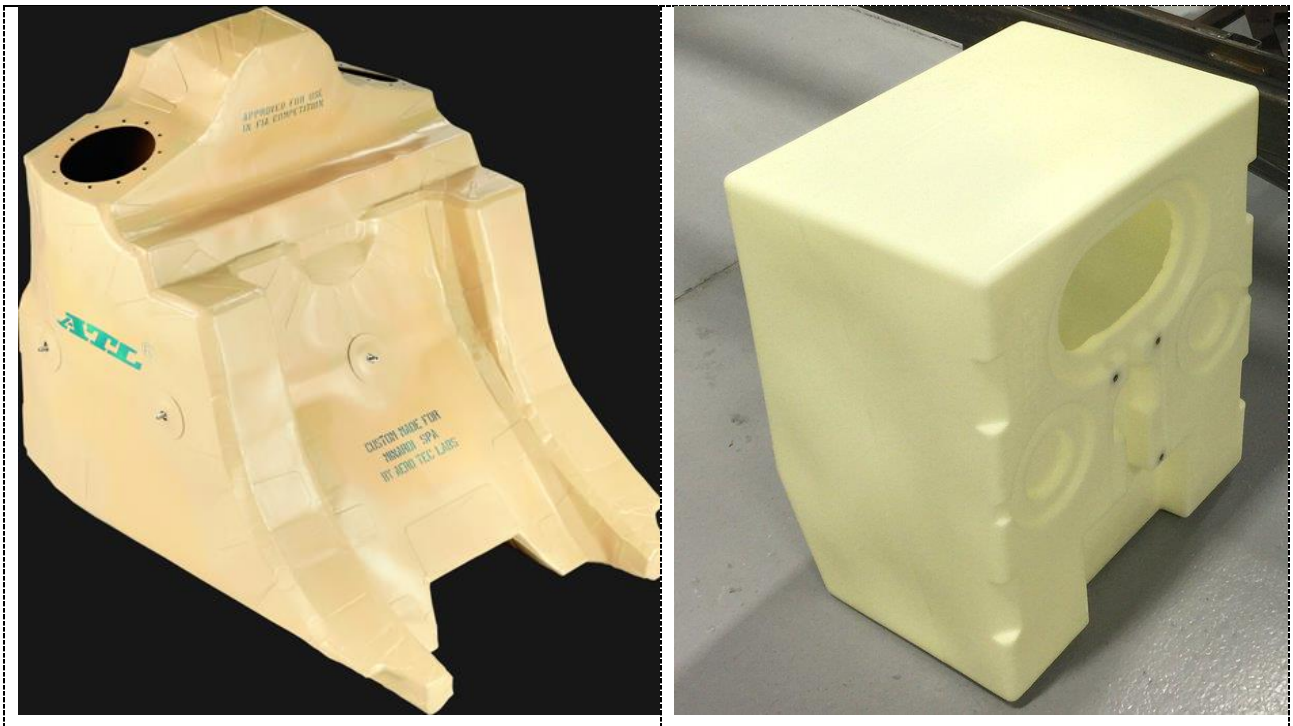
Figure 3.8 Tractor side panels

3.4.2.4 Self-sealing / Reinforced tanks

Self-sealing / reinforced tanks have commonly been used in aviation as they prevent fuel tanks and bladders from leaking fuel and igniting after being damaged. More recently these types of tanks have been used on military vehicles and in Formula1 motorsport.

Aero Tech Laboratories (ATL) self-healing tanks consist of two solid layers with a gel like material underneath. When a hole is formed in the fuel tank, the gel reacts with the fuel, hardens up and blocks the hole to stop the leak. ATL currently design and construct the fuel tank system on Formula1 cars. The tanks are flexible and safely deform in a crash. ATL's fuel tank bladder is made from 'DuPont Kevlar fibers' that are tightly woven to create a strong material and then impregnated and coated with an 'elastomer'. An example of ATL's fuel tank bladders are shown in figure 3.9. The material is strong and so makes the fuel tank more durable which decreases damage impact in the event of an incident.

In addition to the reinforced tanks for sports cars, ATL have also developed fuel cell bladders for military operations. The military fuel cell bladders are puncture resistant, non-exploding and impact-immune. The bladders are capable of protecting vehicles, personnel, bystanders and structures from fuel spills, vapours, fire and detonation[51].



Safety fuel tank bladder fitted on F1 cars	Military fuel tank bladder moulded by ATL

Figure 3.9: Aero Tech Laboratories fuel tank bladders

3.5 DVSA's inspection process

DVSA's inspection process is outlined in table 3.3 below. The method of inspection is robust and the procedure covers:

[51] Aero Tec Laboratories (ATL). (2016). ATL industrial / military fuel cell bladders and tanks. (http://atlinc.com/industrial.html)

- Inspection of the fuel tank
- Tank straps condition
- Leaking pipes
- The fuel/filler cap

Checking the condition and security of the fuel tank helps prevent leakages from occurring. If an operator is found to have a defective fuel system or a leak during roadside checks, the DVSA issue an immediate prohibition.

An immediate prohibition will be given for:

- Missing or ineffective fuel cap or sealing arrangement
- Fuel leak caused by a defect, contaminating the road surface
- Insecure fuel tank where detachment is imminent

Fuel and tank system	
Method of Inspection	**Reason for Failure**
1. Check the **fuel tank for security** 2. Check **tank straps and supports** for: a) Condition and presence. b) Security and strength 3. Check Fuel System for : **a) Leaks** b) **Condition of pipes** and that they are complete and secure. c) **Positioning of pipes** so that they are unlikely to be fouled by moving parts. 4. Check **Filler Cap** for: a) Presence. b) Security: • by a positive means, or • such that pressure is maintained on the sealing arrangement. c) c. presence and condition of the sealing washer and that the mounting flange/sealing method is effective	**1. Tank so insecure on its mountings that it is likely to drop away partially or completely when the vehicle is used. 2. A tank strap or support: a. broken or missing. **b so insecure or weakened that the tank is likely to drop away partially or completely when the vehicle is used. 3. Fuel System: *a leaking. b pipes so damaged (restricted/chafed), insecure or with an inadequate repair such that they are likely to fail and leak which would cause danger to persons on the vehicle or to other road users. c pipes damaged or so positioned that they are fouled by moving parts of the vehicle.

	4. Filler Cap: **a missing. **b does not fasten securely: • by a positive means, or • such that pressure is not maintained on the sealing arrangement. **c sealing washer torn, deteriorated or missing, or a mounting flange/sealing method defective such that leakage of fuel is possible.

Table 3.3: Inspecting a fuel and tank system process (DVSA 2013)[52]

3.6 Infrastructure Prevention Methods

3.6.1 Concrete central reservations

Each year there are more than 400 cross over accidents and approximately 40 deaths (at a cost of £1m a fatality) where vehicles crash through the (steel) central reservation barrier[53]. Barriers are designed to prevent vehicles from crossing from one carriageway to the other and to prevent vehicles from impacting or entering other roadside hazards. A study by TRL showed that 70% of crossover incidents can be avoided through the use of concrete barriers[54].

Central reservation barriers are also in place to limit the impact caused by vehicles in the event they crash through the barrier. Crossovers are among the most serious incidents on the motorway and central reservation barriers provide an effective solution which help to reduce a proportion of these incidents.

Across the SRN, there are number of different types of barriers available, which perform differently on impact. Central Reservation barriers range from flexible barriers such as steel wire or steel beams to rigid barriers such as concrete[55]. To date a number of key routes across the SRN including the (M1, M25 and M62) are now being fitted with concrete barriers. FMG (2013)[56] suggest that concrete reservation barriers play a major role in reducing the risk of fuel penetration from one carriageway to the other.

[52] DVSA. (2013). Heavy Goods Vehicle inspection manual. pp149

[53] Roadtraffictechnology.com. (2009). UK's Highway safety is set in concrete. (http://www.roadtraffic-technology.com/features/feature67206/)

[54] Roadtraffictechnology.com. (2009). UK's Highway safety is set in concrete. (http://www.roadtraffic-technology.com/features/feature67206/)

[55] New civil engineer. (2002). Debate – Motorway barriers. (https://www.newcivilengineer.com/debate-motorway-barriers/802921.article)

[56] FMG Presentation. (2013). Fuel tanks in LGVs. Highways England. Slide 38

Concrete Central Reservation Barrier

Steel concrete Reservation Barrier

Figure 3.10: Concrete Reservation Barriers in UK

4 Methods for reducing the impact of diesel spillages on the SRN

4.1 Treatment types available

Dealing with a diesel spillage incident on the SRN and determining the type of treatment required to treat a particular spill varies. Different councils and service providers (areas of management) and other road authorities use a variety of proprietary absorbent products and follow different clean-up procedures which are developed in house.

If a diesel spillage is left on the SRN for a long period of time it often leads to temporary softening and loss of surface texture as well as the loss of friction often leading to skidding and therefore resurfacing of the surface is generally required.

There are a number of appropriate containment products which can be used to prevent diesel from spreading across the road surfaces. Products come in different forms such as loose or packed sorbents, booms, sheets, pads, pillows and washing agents. Sorbents can be used to soak up a spill and stop it spreading. There are two different types of sorbent available:

1. Oil selective
2. Chemically resistant

These types are described in British Standard BS 7959 Part 1: 2004 which provides a measure of sorbent performance over time. This test measures sorbency at a number of time periods to discriminate materials that have a higher sorbency rate with lower total sorbency per kilo, as opposed to materials with lower sorbency rate with higher total sorbency[57]. Bioremediation products are also available containing micro-organisms which will breakdown the hydrocarbon in carbon dioxide and water[58].

Products to treat oil spillages include:

- Sorbent materials (loose granules, sheets or rolls, pillows or booms)
- Spill kits
- Leak containments
- Bioremediation

Diagrammatic representations of these diesel spillage treatments are provided in figure 4.1 below.

UNIVERSAL MAINTENANCE – Absorbent Pads, Rolls, Pillows, Spill Socks and Booms

[57] J C Bullas, J Doxford, & P Hupton. (2014). A study of measurement methods for diesel sorbent performance, and the components of road user delay associated with diesel spills on the UK Strategic Road Network (SRN). STAR Conference. pp7

[58] Transport Research Laboratory. (2010). Review of diesel spillage clean-up procedures. pp 7

Maintenance Pads

Maintenance Rolls

Maintenance Socks

Maintenance Booms

Maintenance Cushions

OIL ABSORBENTS

Oil Pads

Oil Rolls

Oil Socks

Oil Booms

Oil Pompoms

SPILL KITS

Truck Spill Kit

Bunker Spill Kit

Figure 4.1: Diesel Spillage Treatment Types

4.1.1 Treatments available in the UK

There are a range of products which are available for treating diesel spillages as previously mentioned. Across the UK, different authorities and service providers use a variety of items as shown in figure 4.2. These products vary from liquid dispersants to absorbent granules. Both solid and liquid products are available to neutralise, stabilise or soak up spilled diesel; however, the introduction of non-solid materials on to the road surface may introduce the potential for pollution of watercourses and the UK Environment Agency advocate the use of mechanical recovery and/or sorbents to remove oil

Sphag-sorb	**Fuel Safe**	**Spill dry**

Figure 4.2: Treatment products used within the UK

During the engagement phase of this project, stakeholders were asked whether their vehicles contained oil spill kits on-board. 58% of respondents indicated that their vehicles contained an oil spill kit, and 42% of respondents highlighted that they don't. The vast majority of operators who said they did have spill kits on-board came from the construction, scaffolding, aggregates, maintenance and landscaping sectors. There were also some responses from general haulage firms, mineral extracting firms, parcels & post, as well as laundry services.

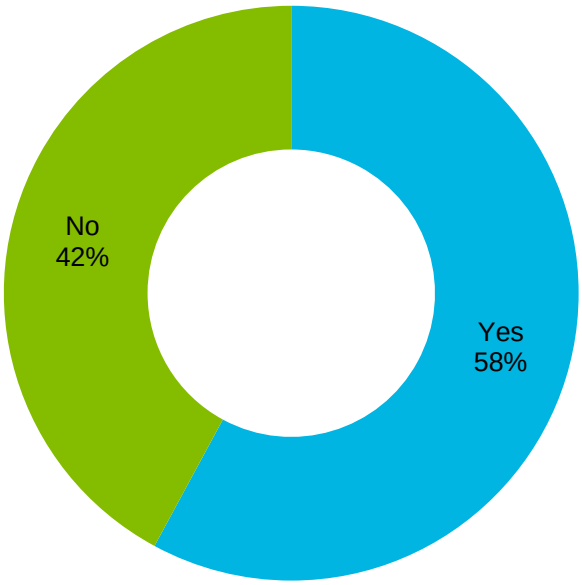


Figure 4.3: Do your vehicles have oil spill kits on-board

From a total of 38 respondents, **50%** highlighted that drivers were trained to administer spill kits in the event of a spillage. Comments from operators who completed this question included:

Scaffolding Company *"Our driver's main priority is to contain and control the spill. This will generally require more support and a clean-up operation depending on how severe and where the issue is. It is common in our industry and nature of work to spill hydraulic oil. We have used external cleaning teams in the past to make sure there is no environmental impact"*

Sand and Gravel Supplier *"Drivers are trained how to deal with small spillages from fuels and oil. They receive an instruction manual with each spill kit which details out how to use the different products. In addition the use of each kit is also communicated to drivers through a toolbox talk".*

4.1.2 Specialist operations

Drivers responsible for transporting hazardous goods (including fuel) by road are required by law to undertake ADR training. This training comprises of a number of modules including dealing with emergencies and spillages. However, it is not a legal requirement for all drivers of HGVs to have this level of training and so those doing general haulage for instance may have no knowledge of how to use a spill kit should they need to. This lack of training could be an area that Highways England could target as adequate training could potentially reduce the impact a spillage might have on the SRN and other road users significantly.

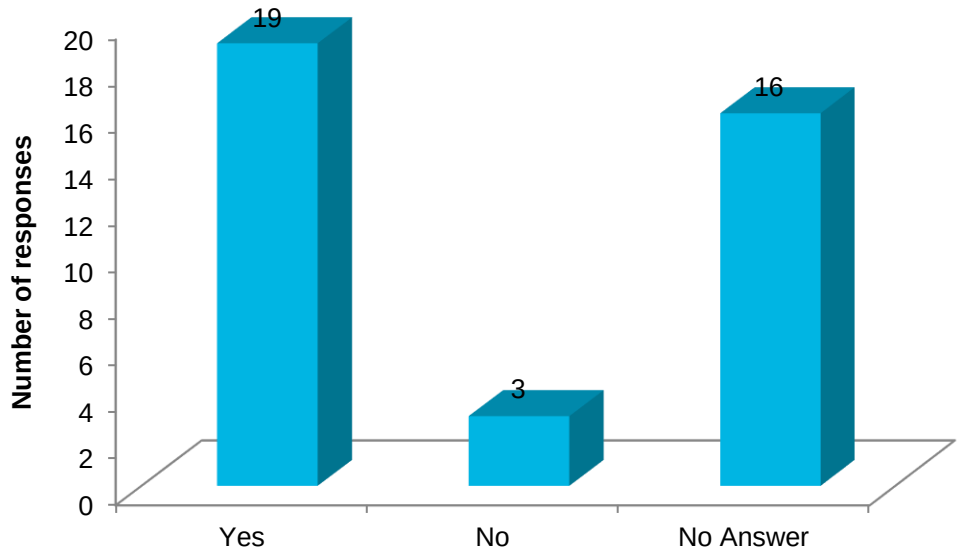


Figure 4.4: Are your drivers fully trained to use the spills kits in the event off a spillage

Respondents were asked to specify products they use to treat diesel spillages. Spill kits, absorbent granules, detergents and sand were amongst the most used products. Some respondents also suggested the use of a cloth to mop up tank spills.

4.1.3 Effectiveness of treatments

There are many products available in the UK that claim to be effective at cleaning up diesel spillages. However, there is very little (if any) evidence to substantiate these claims. Research and stakeholder engagement conducted during this study suggests that sorbents are the most widely used products and provide a reasonable level of effectiveness.

The effectiveness of a spillage treatment is based upon visual and physical observation. However observation can be impaired in poor and/or severe weather conditions and at times it becomes impractical to apply a product and observe if it has treated the surface effectively or not. Taking into consideration both the environmental and the logistical elements of a diesel spill, the effectiveness of a product will depend on one or more of the following properties:

- It needs to have little if any negative effect on the road surface it treats (e.g. it cannot make the road slippier when applied, nor should it damage it)

- It needs to suit the available methods of recovery of the contaminated product (e.g. if it cannot be recovered, it cannot later lose any diesel it has soaked up)
- It needs to have little if any negative effect on the ecosystem of the area it is used to treat (e.g. it cannot in itself be a pollution risk, nor can it lose entrained diesel following sorption)[59]

In addition, depending on the scale of the spillage different products will be used. For example a spill kit and absorbent granules will suffice for a small scale spillage but not for larger fuel spills which will require more complex equipment and treatments.

Within the UK, different products and procedures are being used by various service providers across the SRN with mixed results.[60] It is important that the most effective products are used to treat spillages as the use of ineffective ones can have safety implications such as reduced skid-resistance during and after the clear up operations. This can often lead to extended clean-up durations and unnecessarily high volumes of contaminated waste.

According to Atkins (2013)[61], there is no consistent way to objectively assess the extent of damage to the road surface caused by diesel. As well as observing cracks or bitumen degradation, an engineer will examine the surface's skid resistance to assess if it is safe to travel over. The common approach to doing this seems to be based more on experience than on adhering to a prescribed standard. Examples of the implements used to test the road surface for hardness or signs of deterioration include car keys, pens and screwdrivers, while the heel of a shoe is often used to feel how slippery it was.

4.1.3.1 Fuel Safe (Main Group)

Clearing up fuel spillages is one of the issues that is faced by Highways England on a regular basis. As discussed earlier, this can often lead to more congestion and longer waiting times for drivers. Fuel safe is a liquid dispersant use to treat small scale diesel spillages. The product provides a non-slip finish with only one application in comparison to absorbent granules which may require the road to be closed until repeat applications are complete.

Fuel safe dries quickly and can be used in severe weather conditions making it versatile and reliable. As a result this reduces the requirement for the disposal of controlled waste which is often costly and time consuming. The product can be used neat or diluted with up to four parts water, and it is applied to the contaminated area and worked into the surface with a brush. Unlike other products, Fuel safe can be left to dry naturally or the excess can be removed with absorbent pads. Fuel safe has been tested on a variety of mixtures and it does not strip bitumen or asphalt from the stone which makes it an ideal formulation for use on all surfaces. Five litres of Fuel safe treats approximately 125 metres of road surface which is the equivalent of six bags of SPHAG-sorb. During consultation, it was highlighted that three litres of Fuel safe would be enough for Traffic Officers to carry in their vehicles to treat small scale spillages.

The process of cleaning up diesel using Fuel Safe is shown in figure 4.5.

[59] J C Bullas, J Doxford, & P Hupton. (2014). A study of measurement methods for diesel sorbent performance, and the components of road user delay associated with diesel spills on the UK Strategic Road Network (SRN). STAR Conference. pp5

[60] Transport Research Laboratory. (2010). Review of diesel spillage clean-up procedures. pp 11

[61] Atkins. (2013). Diesel Absorption Trial Phase 2. Highways England. pp8

1) Apply the treatment ‘ Fuel Safe’ to the diesel spill

4) Once the water has been applied, sweep the surface again (this process can be repeated several times)

2) Brush out the treatment, making sure that the diesel and treatment doesn’t go out of the contaminated area

5) Once the application and cleaning process has finished, mats are used to absorb any remaining residue & the surface will be diesel free

3) Apply some water to the treatment. Fuel Safe can be four parts water and also works well in the rain

6) All booms and mats must be disposed of correctly, by bagging the used materials into a hazardous bag

Figure 4.5: Application of Fuel Safe Treatment Product

A case study produced by ScotlandTranServ (2014)[62], stated *"Fuel Safe is a pioneering solution which instantly evaporates fuel, diesel, oil and solvent spillages on the road surface; almost halving the time required to clear up road traffic collisions by removing the need for specialist equipment."*

Scotland TranServ introduced 'Fuel Safe' in 2014 to deal with diesel spillages. Scotland TranServ store upto 1,000 litres of the product at their depot in Polmadie Glasgow. The Trunk Road Incident Support Service (TRISS) and Incident Support unit (ISU) operatives were the first group in Scotland to receive eight backpack sprayers of Fuel Safe which carry 16 litres each. Fuel Safe is a more efficient and eco-friendly option to treat spills than the commonly used absorbent granules.

Tom Docherty *(The Trunk Road Incident Support Service (TRISS))* Supervisor said:

"The introduction of Fuel Safe has served to enhance our capabilities and partnership working with Traffic Scotland and the emergency services"

Kier (Area 9 - West Midlands) use Fuel safe to treat spillages. The product can be left on the surface, however any excess residue is collected using mats and booms. The mats and booms are disposed of at the depot unit and they get collected by a waste company (Veolia). Area 9 have been using Fuel safe for a quite a long period of time and have found it to be very effective.

4.1.3.2 SPHAG-sorb (Earth Care Products)

SPHAG-sorb is a universal absorbent consisting of loose granules and is used widely across England. It is carried and used by Highways England's Traffic Officers to respond to small scale diesel spillage incidents on the highway. The product is applied by scattering it directly onto the and it is then left to soak up the diesel. Applying Sphag-sorb in high winds can be problematic as it much of it blows away before it comes into contact with the spill and it is not as effective in rain or snow as the material soaks up the water in equal measures to the diesel. Other limitations of SPHAG-sorb are that it cannot be used on battery acid, nor can it be used together with Fuel safe. This is because SPHAG-sorb has a tendency to soak up the Fuel safe along with any spiilage present. Instead, where SPHAG-sorb has already been applied, it must first be cleaned up before products such as Fuel safe can be administered.

As discussed above the majority of Traffic Officer's patrol cars are stocked with SPHAG-sorb, and officers are able to respond successfully to minor diesel spillage incidents (up to approximately 50 litres) using this product. The application process of SPHAG-sorb is illustrated in table 4.1.

[62] ScotlandTranServ. (2014). An innovative solution in the fight against road surface spillages. (http://www.scotlandtranserv.co.uk/wp-content/uploads/2014/01/Scotland-TranServ-Fuel-Safe-Case-Study.pdf)

Using the Spill kit
a) Use protective glasses, nitrile gloves and if necessary dust masks (particularly if the spill kit material (Sphag Sorb) has to be applied downwind of a spillage). Avoid skin contact with the spilt liquid. b) Place Sphag Sorb pads or socks to contain the spill and in or around any nearby gullies or drainage channels. c) Once the spillage is contained, spread loose Sphag Sorb onto it. d) Where practicable, spread the Sphag Sorb from upwind and from as close to the spillage surface as possible until the liquid is completely absorbed and a light brown layer of Sphag Sorb remains - light brushing in will assist absorption. e) Use a brush and shovel to clear the contaminated material into a contaminated material bag. f) If the brushes and shovels used are unlikely to be cleanable at the Outstation, also place these into the contaminated material bag. g) If any Sphag Sorb is left over in an open bag, reseal the bag or place it in the contaminated material bag. h) Seal the contaminated material bag with a cable tie and place it in a safe location on the verge (or rear boundary of a nearby refuge area or lay-by), mark up the contents and arrange collection by the MSP directly on-scene or via the RCC. **i)** If a safe location cannot be identified, the contaminated material bag may be double bagged, sealed with a cable tie and taken in the TOV to the nearest MSP compound for disposal.
Reporting the incident
a) Position the Traffic Officer Vehicle (TOV) upstream of the spillage if possible b) Inform the Regional Control Centre (RCC) of: • The extent of the spillage and the size of area affected • What additional signals, if any, are required (if available) • Whether the spillage is still occurring • Any known details of the road user responsible (for potential use for green claims) c) If the spillage is contained consider hard shoulder or lane closures to prevent the spillage being spread by vehicles. d) Request MSP attendance (if already on-scene, task them with dealing with the spillage itself). e) If the MSP is not already on-scene and the spillage is small i.e. approximately 50 litres or less, consider the use of a spill kit. **f)** Liaise with the MSP to assess any actual or potential environmental impact (e.g. by entering a water course or balancing ponds) and if necessary request the RCC to inform the Environment Agency

Table 4.1: Application of SPHAG- Sorb Treatment Product as per Traffic Officer Work Instructions

4.1.3 Environmental Considerations

Statutory Regulations require that all diesel spillages be contained as fully as possible. Where necessary the Environment Agency must be contacted by the Service Provider and/or Highways England Traffic Officer as required under established contingency plans, or as directed by other attendees at an incident. All waste must be contained, removed from site and be disposed of in accordance with Statutory Regulations and Service Providers Quality procedures.[63]

Liquid diesel fuel or other hydrocarbons are an unwelcome contaminant on the road surface. They most commonly occur following:

- Spillages from overfilled or leaking diesel fuel tanks

[63] Highways England (2009). Network management manual. (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416122/nmm_part_Composit_0_9.pdf)

- Damage to vehicle fuel components in road traffic collision
- Damage to a bulk tanker of diesel fuel

Most treatment products for diesel spills can be left on the surface, however traffic officers and service providers must make sure that the product is disposed of correctly either at a landfill site or via incineration. Within the UK, there are no national guidelines for cleaning up diesel spillages; however those disposing of the products must ensure that they are following the environmental agency's duty of care.

Once a spillage has been treated and the excess liquid has been absorbed, the combined materials are swept up with brooms or a road sweeper depending on the area of spillage and time available.[64] Any products used in the treatment process are removed from the road surface and collected, labelled and disposed of in accordance with the Hazardous Waste Regulations[65] and environmental regulations.[66.]

The impacts of diesel spills are well known, and include environmental degradation, expensive clean-up costs, and long traffic delays. The damage diesel can do to a road if it is left to seep into the asphalt untreated for a period of time is significant. Diesel acts as a solvent and often melts the tar, this in turn makes the top layer of chippings become loose and with the continuous passage of traffic they then become dislodged. Once this starts, the appearance of potholes becomes an issue. In addition improper clean-up of diesel can create further risk to the safety of other road uses namely motorcyclists.

Figure 4.6 shows an area of road where diesel has been left on the surface untreated for approximately two weeks. It can be clearly seen that the life of the surface has been shortened dramatically due to the degradation of the asphalt. When this occurs, the only option to ensure the surface can be used safely again is to resurface the road. It is evident then that time is a critical factor in responding to diesel spills. The quicker the effected surface is treated the better as this will minimise the damage caused by the spillage.

Highways England aim to respond to an incident within 20 minutes and for 85% of cases they ensure that the road is cleared up within an hour.

[64] Transport Research Laboratory. (2010). Review of diesel spillage clean-up procedures. pp 12

[65] Atkins. (2013). Diesel Absorption Trial Phase 2. Highways England. pp 48

[66] Transport Research Laboratory. (2010). Review of diesel spillage clean-up procedures. pp 12

Figure 4.6: Effects of diesel being left on the road surface untreated

4.2 Leak inhibitors

Dammit Putty is an example of a leak inhibitor and it is a heavy duty putty that is designed to stop leaks from tears and holes in drums, road tankers, storage tanks and fuel tanks. Dammit Putty is widely used in the UK by the fire service and does not require premix or surface preparation. When incidents such as diesel spills occur the first priority is to seal all leaks as quickly as possible to prevent pollutants from spreading. Dammit Putty is sold by Darcy Spill care, depending on the weight of the product the prices vary.

The application of Dammit putty is presented in figure 4.7. The dammit putty must be removed from the tub (wearing suitable gloves), then moulded into a ball. Once this is done it must be firmly placed over the tear / hole which in most cases seals it instantly. The repair effect of dammit putty is only temporary and it stays in place for up to 24 hours in temperatures down to -20°C. All dammit products are non-combustible and non-hazardous.

Figure 4.7: Darcy Spill Care – Dammit putty[67]

Figure 4.8: Dammit Putty Application

4.3 Portable containers

Diesel spills can be collected using a portable container (see figure 4.9 below). The diesel spillage is collected as it leaves the primary container or secondary containment, for example a damaged vehicle fuel tank or split pipework. Portable storage tanks are made from synthetic rubber, polymers or reinforced plastic and they come in a variety of sizes. The small pack size and light weight of the tanks allows them to be easily transported and safely moved to the spill. Small containers (e.g. pop-

[67] Thorne & Derrick UK. (2012). Spillcare products and services. pp49. (http://www.heattracing.co.uk/upload/Darcy-Spillcare-Spill-Control-Spill-Containment-Liquid-Storage-Drum-Spills-and-Leaks-Drum-Storage---Brochure-2012.pdf)

up pools or over-drums), can be safely put on the ground where the spill is happening to stop it going any further.

Figure 4.9: Portable storage tank

4.4 Health & Safety implications

Dammit putty does not pose a potential risk in terms of safety and the product is non-toxic to both users and to the environment. The product is also non-combustible and thus it does not burn if it is exposed to any fire.

4.5 Traffic Officer training

All Traffic Officers receive initial training (*3-4 weeks residential training*) when they begin working for Highways England. After the initial training they go on a full coaching programme before they are signed off as being competent. The team manager observes the Traffic Officers over the course of a week while they are on the job. During the initial training Traffic Officers do not get specific training on how to deal with diesel spills as it is not their responsibility to deal with a spillage.

4.6 The process of responding to spillages

The Traffic Officer will assess the extent of the spillage, report details to the Regional Control Centre and request Service Provider attendance. For small scale incidents, Traffic Officers utilise absorbent materials to treat the spillage. For large scale diesel spillages Traffic Officers are trained in ensuring adequate signs are utilised as necessary and assist with containing the spillage and ensuring any required restrictions are in place. Service providers are contracted to deal with large scale spillage incidents that need sweeping up or road resurfacing. The process of responding to diesel spillages is summarised below.

Current process of responding to diesel spillages

- Spillage identified and Traffic Officers called to treat and assess.
- Traffic Officer Call for Asset Incident Watchmen (AIW) support to further treat and / or make decision on opening carriageway.
- If it is deemed that spillage has not been cleaned up then AIW call NCC to arrange Hydroblaster.
- AIW then re-assess carriageway.
- Resurfacing mobilised if required

Area 9 has started training Traffic Officers on how to respond to and treat a diesel spillage. To date (12/10/16) approximately 80 Traffic Officers have received training over the course of two weeks. The aim is to get all Traffic Officers trained so that they have enough knowledge to deal with a spill and therefore reduce the impact to the road until the Area Incident Watchmen arrive at the scene. Traffic Officers are given a presentation on the different contract services, awareness of spillages including the treatment types and vehicle restraint systems. Following on from the presentation, they are given a demonstration of how to clean-up a spillage. The process begins from the moment a spill has been detected to the point at which the spillage has been cleared up and it's safe to reopen the carriageway. The demonstration provides the opportunity for Traffic Officers to get 'hands-on' experience in a controlled environment and allows them to ask questions if they are unsure of something.

4.7 HGV driver training

Every five years drivers must undertake 35 hours of DCPC periodic training to keep driving professionally. The DCPC syllabus includes many skills and competencies and drivers are free to choose from a large number of accredited courses. Although the range of courses is diverse there is no specific training that covers treatment of diesel spillages. The modules are presented in Table 4.2.

Vehicle Systems (Transmission System)	Vehicle Systems (Safety Controls)	Loading/Unloading (LGV)
Legislation (including Drivers Hours, Rules and Regulations and the Working Time Directive)	Regulations for Carriage of Goods (LGV)	Health, Safety and Emergencies
Prevention of Criminality and Trafficking	Personal Health and Wellbeing	Physical/Mental Health and Wellbeing
First Aid	Professional Driver and Company Issues	Economic Environment for Carriage of Goods (LGV)
Safe and Fuel Efficient Driving		

Table 4.2: Driver CPC periodic training modules

Some respondents to the online survey stated that none of their drivers receive any formal training on dealing with diesel spillages. In most cases the amount of training drivers receive in this discipline is dependent on the type of loads being carried. For instance, those carrying hazardous loads are more likely to be trained to do this than those that don't.

Consultation with operators highlighted that a significant number of vehicles contain oil spill kits on board (58%), however details of what drivers are trained to do or how to respond to a spillage were not specified. There are a number of possible reasons why operators choose not to train their drivers. These reasons could include:

- Operators have not been involved in a spillage previously and so feel the training of drivers is not needed
- The cost of the training course is too much
- The operator cannot afford to hire an agency driver to cover the work of the driver being trained
- The driver may not be a permanent employee of the company
- Company staff turnover rates maybe high and so the financial implication of training every driver when there is a high turnover cannot be justified

4.8 Incentivising operator take up of recommended diesel spillage treatments

Operators were asked as part of the online survey to comment on whether they would consider carrying a diesel spillage treatment product if one was recommended by Highways England. The majority (84%) of operators said they would be interested while 16% indicated that they wouldn't. This finding is positive and suggests that operators are willing to be actively involved in helping to reduce the potential impacts of spillages on the SRN.

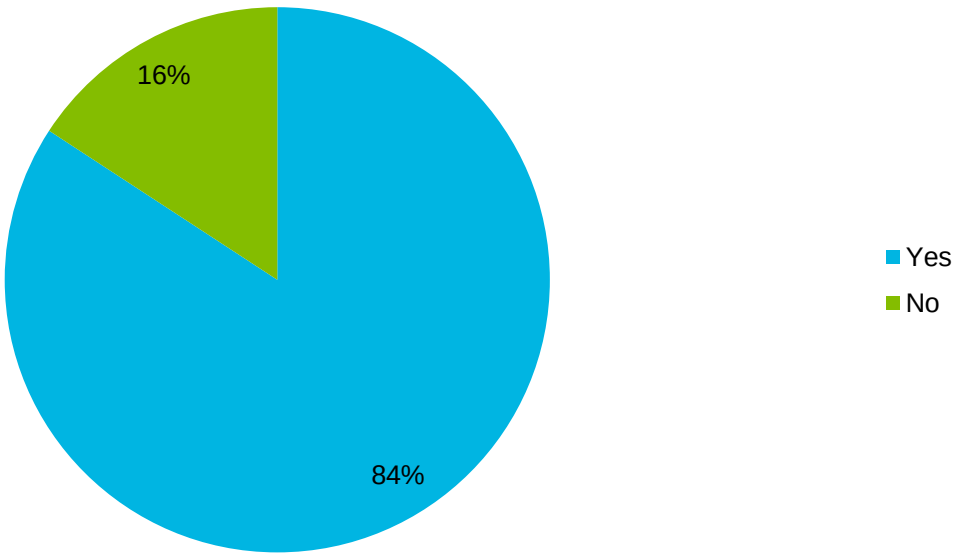


Figure 4.10: Interest in new diesel treatment product

5 Interventions

5.1 Introduction

Based on the findings from the current study, the following interventions are offered with the aim of preventing / reducing diesel spillages from occurring on the SRN.

Following feedback from the client, a number of interventions have been deferred or dismissed due to a range of factors including the perceived effectiveness or timescales involved. Further to this, a number of interventions have been merged to provide more comprehensive options.

For each of the preferred options, the following information is provided in this document:

- Issue
- Evidence
- Potential Solution
- Staged approach to delivery

5.2 Overview of interventions

Table 5.1 presents four interventions that Highways England might consider moving forward with. Each intervention comprises of a number of sub-tasks and each of the sub-tasks has been allocated timescales for implementation.

Ref	Group	Proposed Approach	Timescale
DS1	**Develop diesel spillage guidance for operators and raise awareness of best practice procedure**	Create best practice diesel spillage prevention guide	Short
		Create diesel spillage costs document / case study and incentivise operators to invest in diesel spillage protection to reduce risk of Highways England charges (Green Claims etc.)	Short
		Raise awareness of best practice diesel spillage prevention guide and costs attached to incidents by distributing via FTA, FORS, RHA, Trade Fairs etc.	Medium
		Incentivise operators to carry spill kits (such as fuel safe) especially if they have been involved in a diesel spillage incident in the past	Medium
DS2	**Identify the most effective product(s) for treating diesel spills through trialling and train traffic officers in their use**	Compile list of all treatment types being used in all traffic areas	Short
		Conduct testing to establish the best set of products for Traffic officers to carry in their vehicles	Short
		Pilot best product(s) (such as Fuel Safe) in other traffic areas and obtain feedback on performance	Medium
		If trials successful, roll out product(s) nationally	Medium

Ref	Group	Proposed Approach	Timescale
DS3	**Determine why foreign vehicles are involved in a disproportionate number of fuel spillage incidents**	Collect data on cause of spillage for all vehicles. When foreign vehicles are involved ensure this is recorded in the national database	Medium
		Correlate and assimilate the reasons for the incidents in a list	Medium
		Determine the proportion of foreign vehicles involved in diesel spillage incidents on the SRN when compared to total flow of freight traffic	Medium
		Consider mandating foreign vehicles to carry Highways England's preferred product for treating spillages upon entry to the UK.	Medium
DS4	**Revise HGV fuel tank design, location and capacity for both UK and foreign vehicles**	Encourage vehicle manufacturers to introduce compartments in new vehicles containing a spill kit	Medium
		Consider mandating the fitment of fuel isolating devices on compartmentalised tanks to vehicles wishing to carry large amounts of fuel	Medium
		Make it mandatory for all fuel tanks to be reinforced or have a bund or be self-sealing	Long
		Make amendments to the tractor unit fuel tank design/location and the tank material specifications to better protect the fuel tank	Long

Table 5.1: Potential diesel spillage interventions

Figure 5.1 below outlines the recommended staged approach to implementing each of the interventions by sub-task.

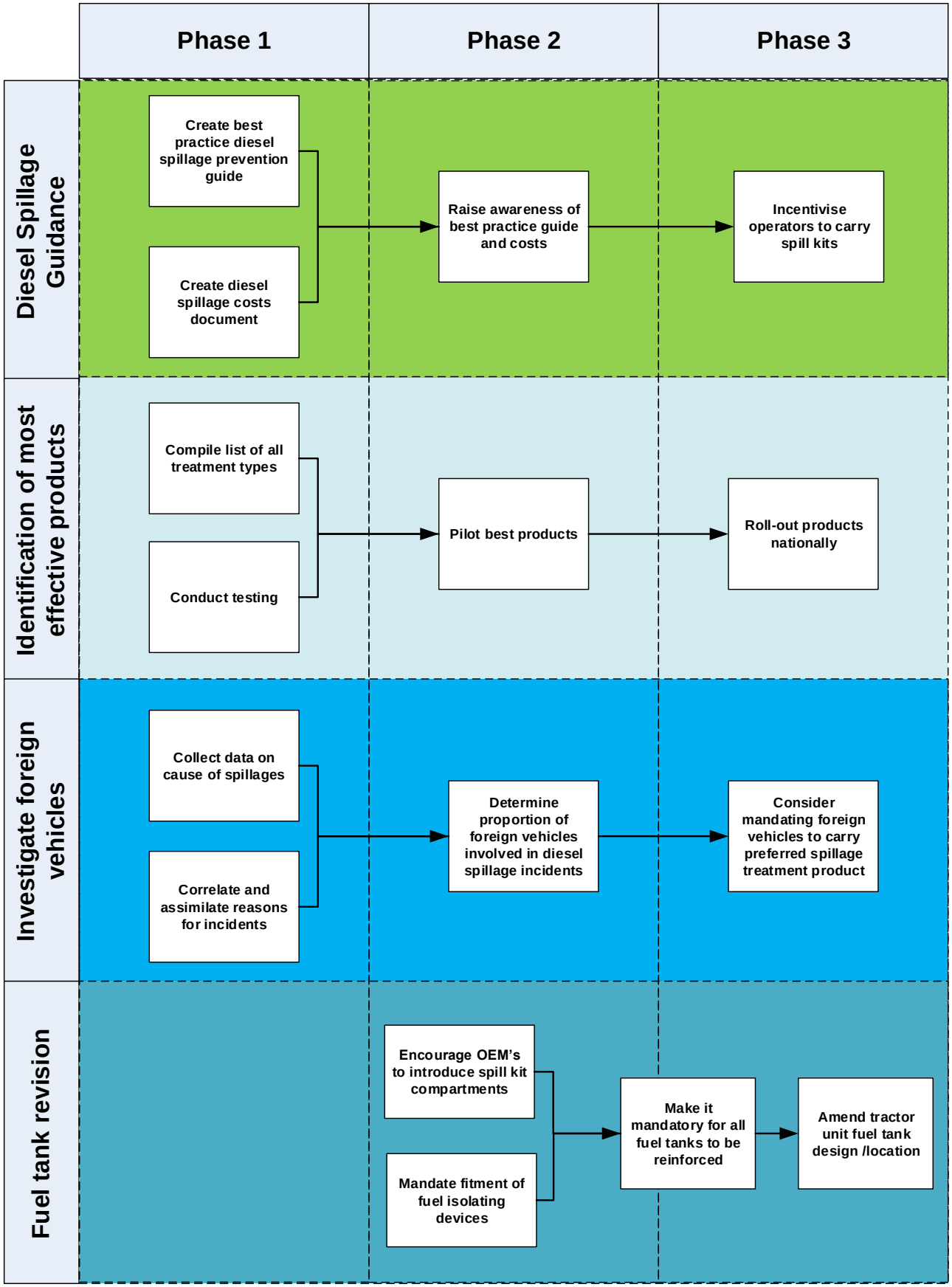


Figure 5.1 – Diesel spillage phasing diagram

Detailed write-ups of what the interventions involve, what has led to their creation and how they can be implemented are provided below.

DS1 - Develop diesel spillage guidance for HGV operators and raise awareness of best practice procedure

Issue

- Congestion on the SRN is a growing concern for Highways England and diesel spillages are a major contributory factor to this issue
- The number of diesel spillage incidents on the SRN is on the increase
- The cost of cleaning up a diesel spillage can be very expensive and time consuming
- Many operators who have not been involved in a diesel spillage incident in the past are not fully aware of the cost/damage associated with diesel spills and as such may not be investing in diesel spillage protection
- Diesel spillages can result in significant delays to the Road User and a significant cost to repair the carriageway
- A large number of fleet operators do not equip their vehicles with a spill kit meaning if they are involved in a spillage it will remain untreated until a response unit arrives at the scene
- If different products are being used by operators as well as traffic officers, it becomes difficult to treat the road surfaces therefore there is a need for one universal product

Evidence

- Diesel spills account for approximately 25% of all incident related congestion on the SRN[68]
- During 2013, 78% of fuel spillages on the SRN were diesel spills[69]
- 67% of vehicles involved in diesel related incidents are HGVs[70]
- According to command and control data there were 263 diesel spillage incidents in 2013 which rose to 357 in 2014[71] (one a day on average)
- Approximately 41% of incidents are estimated to be 2 hours or less, 14% of incidents are between two to five hours and 22% of incidents are greater than five hours[72] (please note there was no record of the other 23%)
- According to Atkins' business case report the cost of an incident lasting for 4 hours on a busy route is £541,440[73]
- The Incident Prevention Teams (IPT) presentation delivered by Highways England contained two case studies. The first detailed the overall cost passed onto the operator was £58,760 and the second detailed an overall cost of £69,908[74]
- Of the survey respondents consulted during the stakeholder phase of this project, 42% said they did not equip their vehicles with a spill kit[75]
- Diesel exposure for as little as 120 minutes has been shown to result in structural damage to road surfaces[76]

[68] Atkins. 2013: Diesel Absorption Trial Phase 2. pp. 2

[69] FMG. 2013: Fuel Tanks in LGV's Presentation. Slide 7

[70] Highways England. 2015: Command and Control Centre Data

[71] Highways England. 2015: Command and Control Centre Data

[72] FMG. 2013: Fuel Tanks in LGV's Presentation. Slide 8

[73] Atkins. 2015: Commercial Vehicle Incident Prevention Strategy Outline Business Case. pp. 25

[74] Highways England. 2015: IPT Presentation. Slide 2

[75] AECOM analysis 2016

[76] J C Bullas, J Doxford, & P Hupton. Star. 2014: A study of measurement methods for diesel sorbent performance, and the components of road user delay associated with diesel spills on the UK SRN. pp 3

Staged approach to delivering this intervention

a) Create best practice diesel spillage prevention guide for commercial vehicle operators which should include:

- The reason why drips, leaks and spillages should be prevented and controlled
- Simple steps that can be taken to prevent drips, leaks and spillages such as:
  - Do not overfill fuel tanks when refuelling
  - Ensure that fuel tank caps are secured before starting your daily shift and after refuelling. If it can't be secured don't use it – report it
  - Use funnels, pumps and drip trays (as appropriate) when refuelling
  - Do not wedge open fuel nozzles when re-fuelling
  - Do not refuel near unprotected drains or controlled waters
  - Plan for drips, leaks and spills – have suitable spill kits immediately available for use. Carry spill kits in vehicles
  - Ensure the spill kit is stored where it can be seen, easily reached and look after them
  - Check the fuel cap is in place and fastened properly
  - There are no signs of leaking or seepage from the filler neck
  - The fuel tank seal is intact and there is no sign of fuel on the tank and on the ground
  - The tank has not been breached as part of the daily walkaround check
- Application of the spill kit (if one is carried)
- The procedure to follow in the event of a spillage
- Information on diesel spillage protection devices such as locking caps, mushroom one-way breather values, lateral straps on the fuel tank to stop it sliding backwards / forwards, guard rails
- Information on self-healing / reinforced tanks

This best practice diesel spillage prevention guide for commercial vehicle operators should be developed and produced in consultation with the relevant stakeholders. It is also important to note that there are existing guides available that should be consulted when developing the content. Existing documents include (please note this list is non-exhaustive):

- Pollution prevention guidelines: Incident Response – dealing with spills PPG22
- Oil Care Campaign: Dealing with oil spills http://oilcare.org.uk/dealing-with-spills/
- Right to ride: http://www.righttoride.co.uk/top-issues/roads-infrastructure/diesel-spills/
- KillSpills report to the Prime Minister " Awareness and Education = Prevention and Cure" September 2006: http://www.network.mag-uk.org/Diesel/GovernmentReportKillSpills2006.pdf

b) Create diesel spillage costs document / case study and incentivise operators to invest in diesel spillage protection to reduce risk of Highways England charges (Green Claims etc.). This should include:

- Costings of diesel spillage incidents (Use cost of vehicle breakdown information contained in Atkins report[77] and create guidance document for operators)
- A statement that Highways England may charge operators involved in diesel spillages that have chosen not to comply with the diesel spillage best practice guide
- A case study that will provide an example of when an operator was involved in a diesel spillage incident and was charged for the clean-up

c) Raise awareness of best practice diesel spillage prevention guide and costs attached to incidents by distributing via FTA, FORS, RHA, Trade Fairs etc. The awareness campaign should include:

- A communications strategy and list of objectives
- A tactical communications plan

[77] Atkins. 2015: Commercial Vehicle Incident Prevention Strategy Outline Business Case. pp. 25

(Launching a public awareness campaign will provide lorry drivers and operators with the information and things to look out for to prevent fuel leakages as well as highlight the dangers diesel spills pose to other road users particularly motorcyclists. Through the campaign additional measures are to be encouraged for operators to take up such as extra fuel protection through the use of anti-leakage devices. The essence of the campaign will be to emphasise the impact of a diesel spillage incident and the financial impact to the operator if they are involved in such an incident. In order to raise awareness that offers a strong incentive for drivers to detect and report any fuel leakages, a key message in the campaign will be to highlight the dangers and the cost to the operator of poor practice.

The campaign can be included in features in industry magazines such as *Road Haulage Association (Roadway Magazine), Freight Transport Association (Freight and Logistics Magazine), CILT Focus, Highways Magazine, Truck and Driver, Transport News, Motor transport, Logistics Manager, and Commercial Motor* for example. These publications will be backed up by coverage of leaflets and billboard signs in truck stops, motorway service areas and HGV fuel stations across the UK coupled with discussion on twitter. In addition Highways England can work with 'The Institute of Highway Engineers Motorcycling Guidelines' to introduce anti-diesel spill stickers across the industry, these stickers will be designed to be placed next to the fuel cap of commercial vehicles to raise awareness of overfilling tanks. For a successful campaign, it should be run in partnership with the industry and each diesel spillage topic for the campaign should be in association with a valued industry partner. For example a National Challenge Group consisting of the police, DVSA, HE traffic officers and trade associations such as RHA, FTA, Brake and Fleet Operator Recognition Scheme (FORS), can assist in promoting the campaign and solve any issues raised relating to diesel spills. This awareness campaign will be similar to that detailed in the Tyre Management interventions.)

d) Incentivise operators to carry spill kits (such as fuel safe) especially if they have been involved in a diesel spillage incident in the past. This could be achieved by:

- Obtaining results from diesel spillage trials and determine the most effective product(s)
- Compiling list of operators involved in a spillage incident in the last five years by consulting HE data
- Incentivising these identified operators to carry spill kits by sending them the best practice spillage guide / costs document
- Considering subsidising the cost of HE's preferred spillage treatment to increase uptake
- Consulting with industry and determine if the number of operators carrying spill kits has increased

(Following trials to determine the most effective diesel spillage product(s), Highways England might look at incentivising operators that have been involved in a diesel spillage in the last five years to carry the preferred HE product for treating spills. If drivers have a spill kit on board their vehicle and are trained on how to use the kit, they would be able to treat the surface themselves and help reduce the impact of the spillage rather than let the surface worsen.

Another possible measure that HE might consider adopting is to subsidise the cost of the spillage treatment product for operators and publicise the fact that they are doing so. If this is done in conjunction with the best practice diesel spillage prevention guide, this may encourage greater operator uptake for those that have not been involved in a spillage incident.)

e) Incentivise operators to run less polluting alternatively fuelled vehicles. This could be achieved by:

- Introducing a graduated road user levy system whereby the amount charged per vehicle would be dependent on the propulsion type and the amount of fuel carried. For instance electric vehicles and those run on Liquefied Natural Gas (LNG) (which is known to be non-toxic and evaporates if spilt) would pay the least (e.g. £0-£5 per day) and those run on diesel wishing to carry excess fuel in dual tanks would pay the most (e.g. £20 per

day or an amount which would mean they no longer had a competitive advantage over UK operators).

Points to note
All guidance should be produced in consultation with relevant stakeholders including operators, tyre manufacturers, tyre specialists, DVSA, Police, Traffic Commissioners, contract service providers, fleet operators and Traffic Officers
All guidance should be translated into multiple languages
There are various pieces of existing material which should be used to develop the contents of the guidance. There is no point in creating new material if some already exists
Awareness of this guidance should be raised via FTA, RHA, FORS, Trade Fairs (e.g. commercial vehicle show) etc.
Once developed and awareness has been raised the procedure(s) should be enforced on the entire network and operators who have chosen not to follow best practice should be charged if they are involved in incidents

DS2 - Identify the most effective product(s) for treating diesel spills by trialing products and training traffic officers in their use

Issue

- A variety of products for treating diesel spillages are being used in different regions across England
- There is very little (if any) technical information concerning the performance of these treatment products
- Common knowledge of products being used is not shared amongst parties involved in maintaining and managing the strategic road network
- There is a need to identify all the different products being used in different regions and a record of these products needs to be developed for future reference
- Some Traffic Officers are required to work in more than one region. If each region uses different products then these Traffic Officers will need to be trained to use every product they encounter. This adds additional cost to the model.

Evidence

- The review of diesel spill clean-up procedures conducted by TRL mentions that there are a range of products used by different areas[78]
- The site visit to Perry Barr (Kier) in area 9 revealed that they were using two products namely; Fuel Safe and Sphag-Sorb
- Highways England reported that area 7 were using four different products including Spill Dry
- Area 10 and 13 were found to be using just one product which is Sphag-Sorb
- A Traffic Officer earns an average salary of £35,000 per year[79]

Potential solution

Highways England should consider conducting a comprehensive trial of the different products used to determine which product is most effective at treating diesel spills.

In order to do this a list of available products should be assembled through consultation with each of the area service contract providers. The identified products should then be tested and graded according to how they perform against a number of key criteria. Finally Traffic Officers should be trained to use the most effective products and these should be rolled out across the network.

<u>Staged approach to delivering intervention</u>

a) Compile list of available products and determine how much they cost by consulting with all of the area service contract providers

b) Conduct testing of products to determine those effective and grade products effectiveness by considering the following:
    - Do the new products absorb diesel as claimed?
    - If so, at what rate can they absorb and is it fast enough to counter the breakdown of the pavement structure/strength and maintain its safe skidding resistance for traffic at normal speeds? Can speeds be reduced and be safely maintained and for how long after the spillage?
    - If it does not prevent total breakdown, can the product delay deterioration, possibly into off-peak hours?
    - Does the direct application of these products on the surface actually create a skidding problem itself?
    - What quantities are involved per metre squared for the products to be effective?
    - What is the resultant capital cost?

[78] TRL. 2010: Review of Diesel Spillage Clean-up Procedures. pp 7

[79] https://myjobsearch.com/careers/highways-officer.html

- What are the delay savings from using the products and negating the need for pavement renewals/driver delay?
- Can they be applied simply by TOs/MAC staff?
- Is training, health and safety an issue and if so what are the implications/cost?
- Subject to satisfactory performance, how much product is likely to be needed typically and can it fit into an already weight constrained TO vehicle?
- Are the products detrimental to the pavement for other reasons in accordance with HA standards on pavement engineering?
- Are the products environmentally friendly as claimed, including its disposal? Are they Environmental Agency approved?

c) Pilot best product(s) in other traffic areas and obtain feedback on performance and:

- Determine cost of training / trainer by consulting with Kier (Area 9) for instance
- Determine cost of traffic officer to attend course based on an average salary of £35,000 per year[80]
- Train traffic officers to use product (if not already done so) using the same model as applied by Kier in area 9

d) Roll out most effective product(s) across entire network

[80] https://myjobsearch.com/careers/highways-officer.html

DS3 - Determine why foreign vehicles are involved in a disproportionately high number of fuel spillage incidents

Issue

- Foreign operators often carry enough fuel to cover them for their journey into/and around the UK
- A foreign HGV may carry up to 2,000 litres (4 x the UK norm) meaning that if they are involved in a diesel spillage incident the size and duration of clean up could potentially be a lot larger
- The proportion of HGV traffic estimated to be foreign registered is increasing and the majority of these vehicles are left-hand drive trucks
- The driver's blind spot locations and the position of the fuel tanks are often different on a left hand drive vehicle and these factors may have a bearing on the number of incidents
- Dual tanks on both sides of the vehicle can potentially double the risk of fuel tank penetration

Evidence

- In 2015, 4.8% of UK HGV traffic was estimated to be foreign registered[81]
- During 2013, 77% of fuel spillage incidents involved UK registered vehicles and 23% of spillages involved foreign registered vehicles. Causes ranged from a hole in the fuel tank to defective filler caps and fuel line breakages[82]
- Vehicles from Poland and Germany were more likely to be involved in an incident within the UK mainly due to higher numbers on the road; Polish lorries represented 15.7% of accidents, German vehicles followed with 13.1% and Spanish vehicles 6.1%.[83]
- One in three collisions (33.1%) involving foreign lorries are on the motorway. This is nearly eight times higher than the national average[84]
- Common types of accidents that might involve trucks are cars getting caught in the blind spot of a lorry that is changing lanes or cars being rear-ended by a much bigger, heavier vehicle
- Of the total 6,873 accidents recorded involving HGVs, 495 (7%) involved left-hand drive vehicles[85]

Potential solution

Although only a small fraction of UK HGV traffic is estimated to be foreign registered (4.8%), it accounted for a disproportionately high percentage of diesel spillage incidents on the SRN (23%). As previously mentioned foreign vehicles have larger fuel tanks in comparison to standard UK HGV's, and therefore in most instances carry more fuel. The potential impact that these vehicles might have in terms of cost / duration of clean-up if they are involved in a diesel spillage incident could therefore also be much greater.

Although the total number of accidents involving left-hand drive HGVs is recorded by the DfT, there is a lack of data on why foreign vehicles are involved in a disproportionate number of fuel spillage incidents. Highways England could therefore consider collecting more data and conducting a comparative analysis of why these diesel spillage incidents are occurring. If it can build an understanding of the reasons why these incidents are happening then it would be in a better position to help prevent them occurring in the first place.

Highways England could achieve this by collecting data on the causes of spillage for all vehicles. When foreign vehicles are involved it should ensure this is recorded in the national database. The data should be stored in a database and analysed for any trends in causes and locations of impact. The proportion of foreign vehicles involved in diesel spillage incidents on the SRN should be highlighted when compared to total flow of freight traffic. Finally Highways England could consider mandating foreign vehicles to carry Highways England's preferred product for treating spillages upon entry to the UK.

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[81] DfT. 2015: Annual road traffic estimates. pp31

[82] http://www.commercialmotor.com/news/dvsa-targets-commercial-vehicles-over-fuel-spills

[83] http://fleetworld.co.uk/motorway-accidents-involving-foreign-lorries-rise-14/

[84] http://fleetworld.co.uk/motorway-accidents-involving-foreign-lorries-rise-14/

[85] DfT. 2015: Reported Road Casualties Great Britain: 2014 Annual Report. pp279

HE could improve the quality of their command and control centre data by adding the country, which the vehicle(s) involved are registered. One major benefit of doing this is that it could be shared with domestic and international enforcement agencies such as DVSA and Police and their foreign equivalents.

Highways England suggested that in the future, Traffic Officers may be provided with tablets to record incident details. This additional data is expected to improve the quality of data recorded and reduce inconsistencies.

The following table outlines the data that is currently collected in the Highways England Command and Control Centre Database:

Data Collected at Present

- Incident number
- RCC Region
- Start date
- Month
- Year
- Incident impact duration
- Road link reference
- Road link description
- Location description
- Road type
- Highway name
- Final closure code description
- Other closure code
- Vehicle type (Large Goods Vehicle: over 7.5 t / Large Goods Vehicle: under 7.5 t)

The following table outlines additional data that could be collected to improve the quality and usefulness of existing Command and Control Centre Data:

Additional data	Reasoning
Country of registration	In order to differentiate between GB and Non-GB vehicles and identify whether there are patterns with vehicles registered in a particular country.
Haulier/operator name	To help identify operators who are involved in repeat SRN incidents. Note that some vehicles are not liveried so this data will not always be available.
Vehicle Registration	This data can be obtained from the vehicle registration plate and may help enforcement agencies to identify rogue operators.
Industry Type	To identify whether vehicles serving particular industries are involved in a higher proportion of incidents. This may help to develop recommendations to reduce incident numbers in the future. Examples might include construction, scrap metal, waste disposal, recycling, post/parcel, food and drink.
Vehicle Body Type	To identify if particular vehicle body types are being involved in a higher proportion of incidents than others. This may help to develop recommendations to reduce incident numbers in the future.
Nearside or off side tyre incident	To see if tyre incidents are more common on the offside or nearside. Offside incidents have potential for greater impact as they are next to the live lane.
Number of axles	To see if there are patterns with tyre incidents to drive, tag, steer and trailer axles.
Axle Configuration	To see if there are patterns with tyre incidents to drive, tag, steer and trailer axles.
Single or twin configuration wheel	To see if there are patterns with tyre incidents to drive, tag, steer and trailer axles.
Photograph	Traffic Officers should take a photograph of the vehicle at the scene for future reference. In the case that a TO does not take photograph, the Command and Control operators should take screenshots of the vehicle involved in the incident.

As well as the Command and Control Data, Highways England should also consider utilising STATS19 data. It provides detailed data about the circumstances of personal injury road accidents in Great Britain, the types of vehicles involved and the consequential casualties. The statistics relate only to personal injury accidents on public roads that are reported to the police, and subsequently recorded, using the STATS19 accident reporting form

STATS19 data would be appropriate in identifying diesel spillage incidents where a left hand drive vehicle has been involved (see table below)[86] as the data takes into account vehicles changing lanes from left to right along with other manoeuvres. Other data sets to be considered are shown in the table below.

STATS19 Data	Relevance to diesel spills
RAS20003 Vehicles involved in reported accidents by accident severity and vehicle type	Takes into account Heavy Goods vehicles whether there are rigid or articulated. Differentiates between Vans/Light Goods Vehicles and HGVs
RAS20007 Vehicles involved in reported accidents skidding or overturning, and towing by road surface condition, special conditions at site and vehicle type	Takes into account whether HGVs and Vans/LGVs vehicles skidded, jack-knifed or overturned
RAS20008 Vehicles involved in reported accidents by vehicle type and manoeuvre:	Takes into account whether: Vehicles turning left or right Vehicles waiting to turn or to turn right Vehicles changing lanes from left to right Overtaking a moving vehicle and a stationary vehicle (off-side)
RAS20005 Vehicle involvement rates for reported accidents, by vehicle type, urban and rural roads, road class, accident severity and traffic	Compares the vehicle type and includes HGVs and Vans/LGVs on the motorway

<u>Staged approach to delivering intervention</u>

a) Collect data on cause of spillage for all vehicles. When foreign vehicles are involved ensure this is recorded in the national database. These reasons could include:

- Side-swipes due to reduced driver visibility
- Impact with debris
- Ruptured tanks
- Negligence of the driver refitting the filler cap or forgetting to refit the cap
- When a driver fills the tank right up to the filler cap (necking it)
- Lack of anti-spill devices being fitted into the diesel tank in lorries
- Mechanical failures and fuel system defects
- Issues encountered during the transport of diesel
- Leakage from corroded or rusty tanks

b) Correlate and assimilate the reasons for the incidents in a list highlighting any trends in causes and locations of impact and formulate map of blackspots

c) Determine the proportion of foreign vehicles involved in diesel spillage incidents on the SRN when compared to total flow of freight traffic

[86] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/568484/rrcgb-2015.pdf

d) Consider mandating foreign vehicles to carry Highways England's preferred product for treating spillages upon entry to the UK and introduce mitigation measures such as:

- Reducing the amount of fuel allowed to be carried by foreign vehicles wishing to visit the UK and enforcing this by dipping the fuel tank upon entry
- Issue best practice diesel spillage prevention guide to foreign operators upon entry to UK
- Charge foreign operators involved in diesel spillage incidents for any associated costs

e) Charge foreign vehicles for using dual tanks. HMRC could be consulted / involved in the process of dipping tanks upon arrival to the UK.

DS4 - Revise HGV fuel tank design, location and capacity for both UK and foreign vehicles

Issue

- It is not standard practice for vehicle manufacturers to include a compartment in / on their new vehicles containing a spill kit
- The location or design of the fuel tank on HGV's has not been changed for years
- The number of diesel spillage incidents on the SRN is on the increase
- The cost of cleaning up a diesel spillage can be very expensive and time consuming

Evidence

- Although not required to by law, many commercial vehicles contain first aid kits. A number of vehicle manufacturers offer optional first aid facilities to purchasers of new HGVs. Based on this premise, it is not unreasonable to assume that they could potentially follow a similar approach and offer an optional spill kit
- Volvo among others already provides a one day training course to drivers as part of the vehicle handover which aims to familiarise them with the vehicle and its different controls. This covers amongst other things, daily maintenance checks, and the dangers of over-filling the fuel tank. New Volvo vehicles are also equipped with anti-syphon devices, locking fuel caps and anti-spill flaps
- Side mounting is the most common placement of diesel fuel tanks for trucks; this is accomplished with the use of brackets, straps or a combination of both for the purpose of attaching the fuel tank to the truck chassis frame
- Currently there is no data, which specifies the cause of a diesel spillage incident and how the fuel tank gets damaged.
- According to command and control data there were 263 diesel spillage incidents in 2013 which rose to 357 in 2014[87] (one a day on average)
- Approximately 41% of incidents are estimated to be 2 hours or less, 14% of incidents are between two to five hours and 22% of incidents are greater than five hours[88] (please note there was no record of the other 23%)
- According to Atkins' business case report the cost of an incident lasting for 4 hours on a busy route is £541,440[89]

Potential solution

Many commercial vehicles contain first aid kits so that drivers are able to attend to themselves or other road users in the event of a collision. Most vehicle manufacturers offer these kits as optional extras to operators wishing to purchase new trucks. It would not be unreasonable to make the assumption that they would be willing to follow a similar approach and introduce spill kits as an optional extra also. This would allow drivers to respond quickly to a diesel spill in the event they are involved in an incident.

Evidence suggests that Volvo are already taking active steps to limit the potential for fuel spills through the introduction of anti-syphon devices, locking fuel caps and anti-spill flaps so it is likely that they would be susceptible to the idea of introducing the provision of a spill kit as an optional extra.

Once the causes of diesel spillage incidents are better understood, Highways England might consider seeing what it can do to revise the design, location and capacity of the HGV fuel tank for both UK and foreign vehicles. Engagement with vehicle manufacturers, DfT and industry associations such as the Society of Motor Manufacturers and Traders (SMMT) will be essential when undertaking this task.

<u>Staged approach to delivering intervention</u>

[87] Highways England. 2015: Command and Control Centre Data

[88] FMG. 2013: Fuel Tanks in LGV's Presentation. Slide 8

[89] Atkins. 2015: Commercial Vehicle Incident Prevention Strategy Outline Business Case. pp. 25

a) Encourage vehicle manufacturers to introduce compartments in new vehicles containing a spill kit by:

    - Contacting the six most prevalent vehicle manufacturers trading in the UK (e.g. DAF, MAN, Mercedes, Renault, Scania and Volvo) and make them aware of the Incident Prevention project and what it is trying to achieve

    - Highlighting the most effective diesel spillage product(s) as found during the trials and discuss the plans to encourage uptake of this amongst operators

    - Encouraging vehicle manufacturers to provide this product as an optional extra by outlining that HE will be promoting joint working with cooperative vehicle manufacturers in trade press, operator guides, trade shows etc.

b) Consider mandating the fitment of fuel isolating devices on compartmentalised tanks to vehicles with larger than average fuel tank capacity
c) Make it mandatory for all fuel tanks to be reinforced or have a bund or be self-sealing
d) Make amendments to the tractor unit fuel tank design/location and the tank material specifications to better protect the fuel tank

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