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July 24, 2006

OFFICE OF DEFECTS
INVESTIGATION

VIA DHL AND ELECTRONIC MAIL

Jeffrey L. Quandt, Chief
Vehicle Control Division
Office of Defects Investigation
National Highway Traffic Safety Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

Re: **Kia Sportage Fuel Tank (EA 06-007)**

Dear Mr. Quandt:

This letter is a preliminary followup report to NHTSA regarding the results of the Service Inspection Campaign which Kia has conducted in support of this investigation. The mailing for this campaign occurred on May 15, 2006. As part of this campaign, 5,000 notices were mailed by KMA to a random selection of customers in three regions (North, Central and South) to have them bring their vehicles in for a fuel tank safety inspection. The content of this letter summarizes all information developed through July 14, 2006, or approximately two months of response time.

All notices were mailed to customers whose addresses were indicated to be reliable before the mailing. Of the 5,000 mailings, 263 customers responded and had inspections completed. The current response level is significantly less robust than the response Kia obtained for an inspection campaign conducted in 2002 concerning battery cable chafing for the 1998 – 2000 Sephia, pursuant to which 752 of 5,000 customers brought their vehicles to dealers for inspections.

In this case, dealers found nothing of significance to report in 253 inspections. In 138 cases, the dealers simply identified that nothing was of concern and did not prepare reports and did no repairs. In the other 115 inspections, the dealers filled out report forms in a manner which did not indicate any conditions of significance. (This report form was provided to ODI prior to the service inspection campaign mailing).

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Ten reports contain at least some information of interest and are still being analyzed by KMA and records obtained. Fuel tanks have in some cases been saved by dealers and are being inspected. Again on a preliminary basis, Kia has noted the following:

- Two vehicles had significantly corroded fuel sending units and fuel was identified seeping in the area of the fuel sending unit screws and/or plate. Mileage was 147,000 and 114,000.
- Three vehicles had cracked plastic elbows or nipples connecting fuel lines to the sending unit. All of these were in the limited vehicle range previously identified to ODI.
- One vehicle was reported to have a "hole" on the bottom, but the vehicle did not have an insulation pad or clips, no fuel leak is indicated and records reviewed to date indicate that the fuel tank was not replaced. This is being investigated further.
- One tank had an insulation pad whose clips which had contacted the bottom of the fuel tank, leading to leakage.
- Three of the ten reports indicating the presence or possibility of leakage come from one dealer and these results are being verified by fuel tank inspections by Kia field personnel.

Kia anticipates that it should have complete information within approximately two weeks. At about the same time, it anticipates being able to provide ODI with complete information on all inspections, along with an analysis of the underlying data and a proposed final analysis of all the fuel tank issues identified. If additional inspection reports are received after July 14th, we will of course include them in the next report. Kia is therefore proposing that it provide a complete followup report with analysis on August 6th.

Please let me know if this date creates any problems, or if you have any questions in the meantime.

Very truly yours,



Robert Babcock
Manager,
Certification and Compliance Affairs



HYUNDAI · KIA MOTORS

August 9, 2006

Via Electronic Mail and DHL Express

Jeffrey Quandt, Chief
Defects and Recall Information Analysis Division
Office of Defects Investigation
National Highway Traffic Safety Administration
400 Seventh Street, S.W.
Washington D.C. 20590

Re: Kia Sportage Fuel Tank (EA 06-007)

Dear Mr. Quandt:

In accordance with prior communications, this letter contains a completed report regarding the results of the Service Inspection Campaign which Kia has conducted regarding this investigation.

As discussed with your office prior to the Service Inspection Campaign, Kia Motors America, Inc. (KMA) mailed 5,000 notices to a random selection of the owners of the 268,137 Sportages which were sold in the U.S. for model years 1996 – 2002. The Campaign mailing was directed to customers in the three regions (North, Central and South) where it was hoped that more severe conditions, including cold, salt and/or moisture, would help provide more information regarding the types of problems which had been seen on an irregular basis during Kia's other investigations regarding this matter. As you may recall, Kia had previously conducted an extensive inspection of fuel tanks in vehicles located in salvage and other storage yards in California and adjacent states, as well as inspecting fuel tanks in Sportages as they came into dealerships for other servicing. Those inspections were essentially negative for any fuel tank related problems.

Kia's Service Inspection Campaign mailing occurred on May 15, 2006. The notices were all directed to random customers in those regions whose addresses were indicated as reliable. The notice advised the customers to bring their vehicles in for a fuel tank safety inspection in the belief that the emphasis on fuel leakage and safety would generate the greatest response rate possible. In particular, since any leakage of fuel causes a fuel smell, it was believed that anyone who had any experience with the possible smell of fuel would be highly motivated to respond to the letter. While Kia

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believes that a reference to the National Highway Traffic Safety Administration's interest in this matter might have increased the response rate, Kia honored your staff's advice that legal concerns made this reference impossible.

As of July 31, 2006, 308 customers had brought their vehicles to dealers to be inspected. This is 40% of the response rate of inspections which resulted from Kia's similar mailing in an unrelated Service Inspection Campaign in 2002. In that case, 752 inspections were conducted.

In 300 inspections, nothing of significance was noted. This includes 181 cases where the dealer elected not to prepare a report in the face of a clean inspection, and 119 reports where nothing of significance was noted. Those reports are being provided with this letter.

Eight reports contain information on leaks. All vehicles except one were identified in our preliminary report dated July 24, 2006.

- *One vehicle was reported to have fuel seeping out between the fuel sending unit plate and the fuel tank, based on fuel stains visible in the area of the fuel sending unit. Mileage 146,900.*
- *A second vehicle which Kia believed initially was leaking around the screws may in fact have had a leak around a metal fuel line. Mileage 114,000.*
- *Two vehicles had leaks from plastic nipples/elbows exiting the fuel sending unit. Mileage was 35,500 and 76,750. The vehicle with 35,500 miles was the only low mileage vehicle with a leak.*
- *The retaining clip for the insulation pad on the protective shield of one vehicle contacted the underside of the tank, wore away the pvc, resulting in corrosion, a hole and a leak. Mileage was 76,650.*
- *One vehicle was reported to have a hole on the bottom with no insulation pad or clips. Mileage 104,450.*
- *An additional vehicle was identified since the preliminary report. A leak was reported on the bottom of a vehicle which had an insulation pad and clips. The location of the leak is identified at one of the two middle clip contact points. Mileage 140,000.*
- *One vehicle has been impacted to the left front corner of the shield, the pvc coat had lifted on the tank and surface corrosion was visible, seams at the rear were reported as split but were not leaking, and the right rear*

mounting bolt broke on inspection. A fuel line was identified as cracked. Mileage was 105,300. [11]

These inspections provided some more detail on known issues. In addition, there are a couple points of significance:

1. The notice for the service inspection campaign was intended to raise enough of interest to give customers a motivation to look and smell for signs of leakage, and to bring their vehicle in for an inspection. Fuel leaks are a condition that customers can self – diagnose through their senses and thus this notice should have generated a higher response rate if problems were occurring. It is particularly significant that there has been such a low response rate during an extremely hot summer, where fuel smells are much more likely to be noticeable.
2. The low response rate is, however, consistent with the low incident rates for leaks seen in warranty and CA files, and with the results of the prior field inspections.
3. The diversity in information is consistent with the number of different factors previously identified out of the warranty claims and the CA complaints. No dominant theme exists and no new or underlying problem has been identified.

1 [11] In the preliminary report on the service inspection campaign, it was noted that 3 vehicles had been reported by a single dealer as having their fuel tanks replaced due to the campaign. Upon inspection by KMA, none of the tanks had a leak.

Jeffrey Quandt, Chief
Defects and Recall Information Analysis Division
August 7, 2006
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This information will be further discussed in connection with the analysis letter submitted simultaneously with this report.

Very truly yours,



Robert Babcock
Manager
Certification and Compliance Affairs



HYUNDAI · KIA MOTORS

August 9, 2006

Via Electronic Mail and DHL Express

Jeffrey Quandt, Chief
Defects and Recall Information Analysis Division
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400 Seventh Street, S.W.
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Re: Kia Sportage Fuel Tank (EA 06-007)

Dear Mr. Quandt:

The following letter provides Kia's analysis and positions regarding the issues raised by the current investigation into allegations of 1996 – 2002 Sportage fuel tank leaks.

Identification of Issues

In the ODI Resume dated January 4, 2006, ODI identified that it had 8 VOQs, 5 of which had been received in the prior 6 months. The Resume stated that 7 of the 8 leaks were "clearly visible to the naked eye", including one which involved fuel puddling under the vehicle. The Resume further identified possible sources for the leaks as the fuel sending unit interface, the fuel filler "inlet", and/or along the bottom or sides of the tank where a protective shield may make contact with the tank or trap debris/moisture.

In response to the initial IR, Kia identified the following as a result of its review of those VOQs based on customer interviews and reviews of repair records:

- Corrosion without leak – 2
 - 1 - bottom leak alleged; tank purchased, inspected, some bottom corrosion, no leak
 - 1 – bottom leak alleged, allegation changed to top metal fuel line leak during interview; RO showed fuel pump replacement with screws breaking off; no hole or leak
- Bottom tank pvc disruption leak – 2, in both cases something had caused the protective shield to contact the pvc and wore it off over time, permitting corrosion

- Broken plastic fuel nipple connected to fuel sending unit – 1
- Corrosion of fuel sending unit – 1
- Seam leak or top corrosion or fuel pump problem – 1, VOQ identifies a seam leak, plus unrelated top corrosion; customer interviewed and said she was told top of tank had rusted through and fuel pump was shot – she does not know if this was source of any leak
- Unknown – 1, customer provided no information to NHTSA, did not contact Kia, and, when contacted, she declined to provide any information

Once Kia began looking at its data in detail, it became clear that the major issue which has existed in relation to the Sportage fuel tank is internal non-leak corrosion which has required the great bulk of tank replacements and other repairs, such as fuel pump replacements. These replacements have been based on a number of different situations and dealer decisions. Most noteworthy has been the fact that a decision to replace the fuel pump and flush the tank has been frustrated by non-leak corrosion of the fuel sending unit plate and screws. Confronted with that corrosion, dealers have often had to replace the entire fuel tank instead of just the pump, thus creating a cost-based customer satisfaction problem. Consistent with this analysis, Kia has provided you with data showing that 86% of warranty tank replacements were unrelated to leak claims.

The customer satisfaction issue has caused a certain number of internal corrosion problems to be reported as leak related. This cannot be quantified, but it has been identified in a few instances where more detailed evaluations have been made. An example of this occurred in relation to VOQ 10131354 (Zoma) where the customer complained to NHTSA of a leak in the bottom of the tank, which she says leaked out while she was on the highway. When interviewed, however, Ms. Zoma alleged a “smell of gas” which she attributed to a corroded “metal fuel line” on the top of the tank. However, the contemporaneous repair records show that the mechanic was trying to replace the fuel pump with no indication of a hole or leak, but corrosion of the fuel sending unit caused the screws to break off, requiring a fuel tank replacement.

Internal corrosion issues have caused and can be expected to cause continuing fuel tank sales out of dealer parts inventories.

Warranty Analysis

Leak warranty claims have been received. They total 343 out of 268,137 vehicles sold or just over 1/10th of 1% of all vehicles sold; i.e., a factor of 0.00127. Kia's analysis of those claims focused on the tech notes which identified that there were leak claims on both the top and the bottom of the fuel tank. As opposed to other investigations where these tech notes have been extremely helpful in performing analyses, in this case only 47 claims could be related even to a general area, such as the top or bottom. Tech notes connect 36 replacements to the top of the tank and 11 to the bottom of the tank. The remaining 296 warranty claims provided no significant information.

Among those 47 warranty claims with at least some location information, Kia was able to identify various issues to investigate. On the top of the tank, cracks in a fuel nipple/elbow used between early 1999 and September 2000 on 104,639 vehicles were identified, as was corrosion to the fuel sending unit and screws, and some leaks from unspecified fuel lines. On the bottom and lower sides of the tank, corrosion related leaks were identified, some related to contact between the tank and the holding clips for an insulation pad used from the 1997 through the end of the 2000 and first 5 production months of the 2001 4-door model year production and from the 1999 through the end of the 2002 2-door model year production (184,178 vehicles) which was attached to the tank's protective shield for emission control purposes, and other corrosion leaks were related to closing of the gap between the protective shield and the tank in other areas. There was also a leak issue identified related to the tank seam on its side.

An analysis of all claims from the 1996 model year forwards shows a generally downwards trend in overall claims with an increase for some of the production months in 1999 and 2000. The total numbers of claims dropped back down in the production month of July 2000 and then moved for the first time to about zero in the production month of October 2000, where it has remained.

Leak claims are at a low level beginning with the 1996 model year and remained at that level going forwards. The rate increased in the production month of June 1999 and then increased again in the production month of May 2001, before dropping significantly after two months and then moving towards zero beginning in the production month of October 2000.

CA File Analysis

Kia has received 107 customer complaints. In 65 cases, sufficient information was received to provide at least some analysis of the claim.^{1[1]} Of these, 54 appear to be applicable to this investigation and break down as follows:

- Bottom pvc disruption/corrosion leak related to insulation retaining clip contact – 2
- Bottom pvc/corrosion leak with no identification of a contact point - 8
- Top corrosion of fuel sending unit or fuel line problems – 10
- Top break of plastic nipple/elbow – 7
- Top no specificity – 4
- Side seam leak – 3
- Top spray event – 3
- Language indicating that rust had opened the integrity of the tank, with no location identified – 17 [2]

Kia believes that the breakdown listed above, although accurate, does not permit a meaningful analysis because of the number of unspecific complaints in the last two categories. However, Kia made an allocation of those two categories to help focus further investigation work. First, the 17 corrosion incidents were allocated to all three of the specific corrosion categories based on the existing ratios between the three of them. Second, all three spray incidents were allocated to the plastic nipple/elbow category for statistical purposes based on the one minor spray event that was identified. Kia then determined percentages based on the 65 events with identifiable causes:

1 [1] The other 42 CA complaints only identify that a leak of some sort was present.

2 [2] Eleven (11) of the 65 events were either unrelated to actual fuel leaks or do not fit in to any pattern.

- Fuel tank fracture - 1
- Gas cap crack – 1
- Evaporative leak causing check engine light to go on – 2
- Vacuum leak – 1
- Canister saturation vapor leak - 1
- Complaint of fuel smell not subsequently connected to liquid leak – 5

- Bottom pvc disruption/corrosion leak related to insulation retaining clip contact – 4 (6%)
- Bottom pvc/corrosion leak with no identification of a contact point – 14 (22%)
- Top corrosion of fuel sending unit or fuel line – 18 (28%)
- Top break of plastic nipple/elbow – 10 (15%)
- Top no specificity – 4 (6%)
- Side seam leak – 4 (6%)
- Not applicable – 11 (17%)

This provided another view of issues to focus on and with their possible relative importance, but with still no actual trend information

Field Investigations

In order to develop more information regarding these issues, Kia engaged outside investigators to inspect Sportages held in salvage yards. Kia's logic was that vehicles at the end of their useful life should show the worst deterioration, especially related to corrosion issues. All tanks located were to be inspected; i.e., the investigators did not have discretion to include or exclude vehicles. All tanks were photographed and the photos provided to NHTSA. Affidavits from the investigators have previously been supplied to NHTSA.

The California inspections were performed first in February 2006. All 13 fuel tanks were in good condition. None of the tanks displayed penetrating rust and only 3 had surface rust. All of the protective shields were in their original installed position and no pvc wear had occurred. The salvage yard operators were interviewed and none had found rusted out tanks as they did their normal disassembly process. The most knowledgeable yard owner, who specializes in Kia vehicles, was also the firmest in stating that the Sportage was not subject to disruptive corrosion or leaks.

The second phase of the field inspections took place in salvage yards in the states of Massachusetts, Ohio, Michigan, New Jersey, New York, West Virginia and Kentucky in March 2006. All of the 26 tanks inspected were in good condition and none of them displayed penetrating corrosion or leaks. The yard owners identified no leak issues with the tanks, but they were aware that the screws holding the fuel sending unit to the tanks would typically break off when attempting to remove the fuel sending unit to drain the fuel. It was noted during the inspections that in the vehicles which had insulation pads

attached to the protective shield, the clips attaching the pads were corroded and rust had transferred to the bottom of the tank, but the tanks themselves were not corroded.

In late April 2006, KMA prepared a report based on ongoing inspections of vehicles which it had tried to "capture" for tank inspections as they came in to dealers for normal servicing. Some 35 vehicles were inspected at dealerships in 8 states, including Pennsylvania, New Jersey, Washington, Ohio, Illinois, Indiana, Florida Connecticut and California. Mileage ranged from 23,000 to 112,000 miles. No leaks or penetrating corrosion was identified. Surface corrosion was identified on 4 vehicles.

Fuel Tank Service Inspection Campaign

The just completed Service Inspection Campaign was only conducted in states with salt use and cold, and those with high moisture possibilities. The purpose was to look to obtain information on all issues, but to also gain the maximum exposure to ones related to corrosion. Customers were encouraged to bring their vehicles in for inspection by referring them to a safety condition related to fuel leakage. The hot summer months were also anticipated to be the most responsive because of the fact that heat has historically resulted in high consumer awareness of fuel vapors.

The inspections were helpful in providing information on some of the issues which previously had been identified. They were, however, consistent with the previous evaluations. The corrosion issues on the bottoms of three tanks involved two with insulation pads and clips, and one with no pad/clips. In each case, something had moved a portion of the protective shield into contact with the fuel tank and eventually led to wear. These were reported on very high mileage vehicles; 140,000, 104,400 and 76,700.

Two incidents of corrosion seepage on top of the tank were also identified. Seepage was identified on one as coming between the sending unit plate and the tank at 147,000 miles. The other had seepage as either coming out of the screw area or from a fuel line in that area at 114,000.

Two other vehicles had seepage from cracks in the nipples/elbows. These were at about 76,000 and 35,000 miles.

The last vehicle had an impact on the protective shield and damage in various areas of the bottom of the tank, but no leaks. A leak was attributed to fuel line on top. Mileage was 105,000.

Besides giving some more information related to a few of the types of problems, it gave no indication that there was a higher frequency rate than previously evaluated. It also tended to confirm that there was no manufacturing problem with the manner in which tank protective shields were installed.

Warranty Analysis Based on CA Data

After all of the inspection steps taken, Kia has a significant indication of a diffuse low grade series of events, but still no trend analysis. It then went back to the warranty claims to conduct a further analysis. It had no correlation based on any of the work it had performed for the upturn in leak claims during 1999 – September 2000. Based on the timing of the claims, and the fact that the top corrosion leaks were typically based on wetness or stains, Kia concluded that some unknown but significant percentage of the reported corrosion leaks during this period were probably due to cracked plastic nipples/elbows which could not be identified by service techs because the cracks were too small to be visible and merely dampened the area around the fuel sending unit plates.

The other evaluative step Kia took was to take the 343 warranty claims previously described and calculate claims rates based on the CA percentages described in that section. Applying these percentages to the 343 warranty claims, the following warranty rates are calculated:

- Bottom pvc disruption/corrosion leak related to insulation retaining clip contact – 21 (.00008)
- Bottom pvc/corrosion leak with no identification of a contact point – 75 (.00028)
 - Note: If all pvc disruption related corrosion is combined, the rate is .00036)
- Top break of plastic nipple/elbow – 51 (.00019)3[3]
- Top corrosion of fuel sending unit or fuel line – 96 (.00036)
- Top no specificity – 21 (.00008)
- Side seam leak – 21 (0.00008)
- Not applicable – 58 (.00022)

3[3] 104,639 vehicles were manufactured with a single plastic nipple/elbow. Applying the break number to this more limited population, the warranty claim rate is .00010.

Note that Kia believes that some significant number of top corrosion claims must be shifted over to the plastic nipple/elbow category during the 1999 to September 2000 time period.

Summary of Conclusions

There are a wide variety of reasons for reports of fuel leaks in Sportage vehicles, but, in their entirety, the claims rates for this population of 268,000 vehicles is low. Moreover, when looked at on an issue by issue basis, it is clear that each issue affects only an extremely small part of the Sportage vehicle population. Kia has however looked at these leak causes carefully, after removing those asserted leak issues which relate to fuel vapors, check engine light readings, cracked fuel caps and the like. These appeared as leak issues in the warranty data, but had no connection to the leak issues raised by this investigation.

The most important issue, because it is the only one which has the potential to generate a significant fuel flow, relates to the spacing between the fuel tank protective shield and the fuel tank. It is noticeable that certain of the reports connect the retaining clip for an insulation pad placed in the protective shield of 1997-2000 and first 5 production months of the 2001 model year 4-door and 1999-2002 2-door Sportages for disruptions of the fuel tanks pvc coating. Such disruption in the correct environment, and especially salt, can lead to corrosion which can penetrate through and create a hole in the tank. However, inspections at various times have identified that the shield also make contact with the fuel tank in other locations and, when that happens, the same wear, disruption and corrosion can occur. This is clear since certain bottom corrosion events have occurred in vehicles manufactured after 2000; i.e., when no pad and clips are present.

The numerous inspections of fuel tanks and shields which have now been conducted have confirmed that virtually all vehicles inspected show no such contact. That is, it is not that Kia has found vehicles which are at various points of the wear and/or corrosion process. There is simply no finding of such vehicles with the exception of a very small number which already have had holes. Stated another way, although such contact can occur at some point during the life of the vehicle, it is an extremely rare event. This conclusion is consistent with the warranty data and analysis.

Most importantly, these inspections support the conclusion that a sufficient gap was designed between the shield and tank so that such contact did not occur when the vehicles were manufactured. Additionally, there is no indication that normal usage

causes such contact. Kia cannot explain the circumstances under which such contact and disruption has occurred, but the infrequency of the event strongly points to bottoming or other contact events closing the gap between the shield and the tank a small fraction. We believe that there are no identified instances of major deformation events to the shield, because that automatically results in deformation of the tank itself and a decision to replace both the tank and shield.

The other event of particular interest is when a crack occurs in the plastic nipple/elbow exiting the fuel sending unit from early 1999 through September 2000. This Bosch product has generally performed well, but a few of the plastic nipples/elbows have had this problem. It was of particular concern to Kia to investigate this issue, because of the two reports of fuel spray which reached the rear seat. It is assumed that the spray came from this part simply because no other source for it has been conceptualized. However, in spite of extensive inspections, searches and investigations, no other incident of this has been identified and it has not been possible to provide any exemplar to Bosch for evaluation. In all other cases, the cracks have logically resulted only in limited seepage.

The other issue of significance for Kia has been the upper tank corrosion related to the fuel sending unit. The fuel sending unit plate, its screws and some lines have been subjected to substantial corrosion. The record is that this corrosion results in some fuel seepage on a very infrequent basis, usually on very high mileage vehicles. Typically, however, this issue has been extensively, and at times inaccurately, reported on because of the connection between the corroded screws/plate and the need break them as the fuel sending unit is removed. This has required the replacement of the entire fuel tank when the tech wants to just replace the fuel pump, with predictable customer dissatisfaction with the situation.

Kia has a long record of designing fuel systems which do not result in fuel tank based fires. It is significant that in the 12 years since production of the Sportage began, there has been no connection between any of the issues identified and a fire. Kia believes that will continue to be the case, both because of the infrequency of these issues and because the events themselves are typically seepage related, including all of the upper tank corrosion issues, which is the one which can be directly connected to road salt corrosion.

For these reasons, Kia believes that no unreasonable risks to highway safety have been identified by the extraordinarily robust investigation conducted by Kia into this

Jeffrey Quandt, Chief
Office of Defects Investigation
August 9, 2006
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matter. Kia therefore believes that the appropriate step at this point is to close this investigation.

Very truly yours,



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