



# HYUNDAI AMERICA TECHNICAL CENTER, INC.

A Subsidiary of  
Hyundai Motor Company (Korea)

*Handwritten:* 5/2/06

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April 30, 2006

## VIA FEDERAL EXPRESS

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

OFFICE OF DEFECTS INVESTIGATION  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
400 SEVENTH STREET, S.W.  
WASHINGTON, D.C. 20590

Re: Preliminary Evaluation (PE06-002)  
1996-2002 Kia Sportage; Fuel Tank

Dear Mr. Quandt:

This letter contains Kia's supplemental response to Request Numbers 8 and 12 of your letter dated January 26, 2006 (Reference NVS-213kmb/PE06-002) pursuant to the extension you granted on March 14, 2006.

### REQUEST NO. 8:

Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries and/or evaluations (collectively, "actions") that relate to, or may relate to, the alleged defect in the subject vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, Kia. For each such action, provide the following information:

- a. Action title or identifier;
- b. The actual or planned start date;
- c. The actual or expected end date;
- d. Brief summary of the subject and objective of the action;
- e. Engineering group(s)/supplier(s) responsible for designing and for conducting the action;  
And
- f. A brief summary of the findings and/or conclusions resulting from the action.

For each action identified, provide copies of all documents related to the action, regardless of whether the documents are in interim, draft, or final form. Organize the documents chronologically by action.

**RESPONSE TO REQUEST NO. 8:**

Kia's initial response identified that during the normal history of the 1996 – 2002 Sportage there were no field reports received by Kia or dealer notices issued by Kia (whether through TSBs or through the Tech Times dealer communication magazine) which discussed fuel tank leakage issues as a defect problem. There were some reports of internal fuel tank surface corrosion issues, but not of corrosion leading to leaking. Further investigation has failed to turn up any reports from or communications to the field or dealers about such issues.

KMC has reviewed its quality inspection procedures for the 1996 – 2002 Sportage and found that they meet Kia's specs and industry standards. A sample Inspection Standard Document reflecting quality testing locations and requirements is attached. **See Tab 1.**

Kia has attempted to obtain fuel tank information from the 1996 – 2002 fleet of Sportage vehicles still in existence. However, the current investigation involves vehicles which are as much as 10 years old and in no case less than almost four years old. As a result, there have been difficulties in accessing current information about the 1996 – 2002 Sportage fleet. In order to bridge this information gap, Kia has carried out field surveys and in use vehicle inspection program intended to provide information on the condition of the fuel tanks in older and high mileage 1996 – 2002 Sportages. These included: (1) a survey of salvage yard 1996 – 2002 Sportages and conversations with yard owners/managers in California during the period of February 28, 2006 to March 11, 2006; (2) a survey of salvage yard 1996 – 2002 Sportages and conversations with yard owners/managers in Massachusetts, Ohio, Michigan, New Jersey, New York and West Virginia during the period of March 17, 2006 to April 10, 2006; and (3) the inspection of 1996 – 2002 Kia Sportages which came in to Kia authorized dealerships for service during the period of January to April, 2006. **See Tab 2.** Enclosed with this response are Declarations from the investigators Tom Ottoson and B. Gregory Foutty who conducted these investigations. **See Tabs 3 & 4.** The photographs taken as part of the investigations are also provided on CD's titled "Tom Ottoson Sportage Fuel Tank Photographs" and "Greg Foutty Sportage Fuel Tank Photographs". As a continuation of this program, Kia advised you in its initial response on March 16<sup>th</sup> that it was considering a Sportage vehicle service inspection campaign to encourage owners of 1996 – 2002 Sportages to bring their vehicles in to their dealerships in order to allow their fuel systems to be inspected for leaks. On April 4<sup>th</sup>, Kia submitted draft campaign documents to your staff for review by NHTSA. KMA thereafter responded to requests for additional information from your staff. On April 26<sup>th</sup>, Kia was advised by your staff that NHTSA had no objection to the proposed inspection campaign, so long as Kia did not indicate that NHTSA had any connection to the campaign. Steps are being taken to initiate the relevant mailings as quickly as possible.

KMA also collected sample fuel tanks for inspection by KMC. A returned part was inspected on April 4, 2006 at the Material Development Lab by the Metallic Material Research Team at KMC. **See Tab 5 for "See Prior model) Sportage fuel tank rust analysis (Warranty returned parts A) Report".** This part was manufactured in February 1998 and the vehicle had 44,000 miles on its odometer. The vehicle had a customer complaint regarding fuel leakage. KMA obtained the fuel tank, inspected it and forwarded it to KMC. The tank material was determined to be

chromate processed zinc galvanized sheet metal on top and in good condition. The lower PVC coating was fundamentally intact, although it did not meet depth specifications. Various locations on the tank surface were examined and certain rusting was found. NaCl and CaCl<sub>2</sub> were detected, which would have accelerated any corrosion. The insulator pad had rust transfer marks with salt products present. The metallurgists identified that the corrosion was from the exterior, that the aging of the insulator pad allowed for adhesion of the pad to the tank and that moisture with salt products had intruded into the PVC coating.

Part B was manufactured in February 1998 and the vehicle had 85,000 miles. A customer had also complained of leaking. KMA obtained the tank and also forwarded it to KMC. The results were similar. See Tab 6 for "See Prior model) Sportage fuel tank rust analysis (Warranty returned parts B) Report".

The supplier of the fuel tanks, Donghee Precision Co., Ltd., conducted inspections of six returned fuel tanks and issued a report on April 6, 2006. The supplier subjected the tanks to pressurized air testing. All tanks had been replaced based on leakage complaints. Three tanks were in fact found to have no leak (8768, 9514, 2458). One tank had a leak at a deformation crease (6426). The other two tanks had visible holes at corrosion locations on the lower part of the tanks (8648, 9704). See Tab 7.

**REQUEST NO. 9:**

Describe all modifications or changes made by, or on behalf of, Kia in the design, material composition, manufacture, quality control, supply, or installation of the subject component, from the start of production to date, which relate to, or may relate to, the alleged defect in the subject vehicles. For each such modification or change, provide the following information:

- a. The date or approximate date on which the modification or change was incorporated into vehicle production;
- b. A detailed description of the modification or change;
- c. The reason(s) for the modification or change;
- d. The part numbers (service and engineering) of the original component;
- e. The part number (service and engineering) of the modified component;
- f. Whether the original unmodified component was withdrawn from production and/or sale, and if so, when;
- g. When the modified component was made available as a service component; and
- h. Whether the modified component can be interchanged with earlier production components.

Also, provide the above information for any modification or change that Kia is aware of which may be incorporated into vehicle production within the next 120 days.

**SUPPLEMENTAL RESPONSE TO REQUEST NO. 9:**

In Kia's previous response dated March 16, 2006 to subpart "a" of this request, the date of May 9, 2000 was incorrectly identified as the date the insulation pad in the fuel tank protector was removed for the 2001MY Sportage. The removal of the insulation pad and addition of the ORVR valve for the 2001MY Sportage occurred on October 1, 2000.

**REQUEST NO. 12:**

Furnish Kia's assessment of the alleged defect in the subject vehicle, including:

- a. The causal or contributory factor(s);
- b. The failure mechanism(s);
- c. The failure mode(s);
- d. The risk to motor vehicle safety that it poses; and
- e. The reports included with this inquiry.

**RESPONSE TO REQUEST NO. 12:**

There are several factors and issues related to various parts and design changes which are involved in Kia's investigation and analysis. A separate section is provided below for each part issue. For clarity, items (a) through (c) are discussed together within each section. Items (d) and (e) are presented separately at the end of this response.

**(1) Conceptual Approach.**

As identified in Kia's initial response to the current IR, as with all vehicles there are numerous potential leak issues. Kia's records for the past 10 years identify various leaks at various points in the Sportage fuel containment and distribution system. Many of these are unique or limited time events which are clearly not part of any trend. These range from undifferentiated "holes", a nylon fitting on fuel tank with pinhole, gas cap cracked, seam leak, weld leak, cracked tank, gas fumes related to check engine light, vacuum leak, evaporative leak, fuel injector issues, and so on. These have been set aside and Kia has attempted to resolve the remaining significant issues.

In particular, Kia notes that only one customer has alleged rusting from the inside out and there is no field or technical reporting to support this idea. After careful consideration, Kia has therefore not further analyzed claims of internal fuel tank corrosion, which is the largest fuel tank issue which Kia encountered with the Sportage. Such corrosion issues are also the major reason for continued fuel tank parts sales.

(3) Analysis (issues a – c)

(a) Leak claims rate and disruption of PVC coating on underside of fuel tank. The fuel tank leak claims rate has a fairly consistent low level pattern from 1996 up until about June 1999. Kia has focused on this time period to focus its analysis of the lower fuel tank issue because this is a time where no other changes are occurring in the system. In addition, the only VOQ for this time period is related to the lower tank.

There is a designed gap between the lower fuel tank PVC coating and the protective shield. The vast majority of the Sportages manufactured and used over many years have consistently maintained this design gap while in use. There is no trend of warranty and CA reports of tanks corroding at a significant rate, and Kia's salvage yard and in use inspections have shown a general absence of disruption of the PVC coating, and thus there is a general lack of lower fuel tank corrosion. There is also no period where a sudden spike in leakage claims occurred, thus indicating that there was never a short term breakdown in the manufacturing or assembly process. Rather, the episodic nature of such claims is good evidence that the manufacturing process itself was sound, but that events would periodically occur which would permit such disruption to occur.

Kia's investigation has concluded that the typical mechanism leading to PVC disruption would be a slight alteration of the shield as it performed its protective function, which would then allow contact between one or more of the five clips which hold the OBD insulation pad in place. Kia has also identified occasional events where small rocks and road debris have been identified in the gap, with the PVC disrupted, thus permitting corrosion.

The existence of a substantial variation in the PVC disruption mechanism is supported by the rust patterns which have been identified on the tanks and pads. Specifically, the disruption should logically occur at the points where the protective shield most closely approaches the fuel tank; i.e., the five retainer clips for the insulation pad. Sometimes the corrosion points match up to one of the five clips holding the pad in place, sometimes to another clip. Sometimes multiple clips are identified, with one of the clips being related to more substantial wear and corrosion than other clip location(s). This is substantial evidence of the episodic nature of the problem, and its lack of relation to the original manufacture of the Sportage. At other times the corrosion is away from the "high points" created by these clips, but rather coincide with such rocks or road debris reports. A few corrosion points have been identified at the side of the tank where it is not fully protected by the shield. The inference of these observations is that there is no manufacturing or assembly deficiency present, since that would cause a repeatable problem, while the Sportage lower fuel tank corrosion issues are individual in nature.

Once the PVC was disrupted, the tank metal was exposed to the elements. If the insulation pad was only made wet by environmental water, surface corrosion to the tank might occur, but no penetrating corrosion occurred. If the pad was kept wet over long periods of time, and had road salt as a part of that wetness, then the corrosion could be accelerated to cause an affected tank to rust more significantly. Kia believes that this is the pattern for most of the true leaks which have been reported, and is the source all of the substantial leak incidents.

By eliminating the insulation pad with the advent of OBD II in the four door Sportage for the 2001MY, this issue no longer existed in that model.

(b) Corrosion to Fuel Sending Unit Plate and Screws. Kia has identified that it is common to find corrosion on the fuel sending unit plate and the screws which attach it to the fuel tank, and that this type of condition has existed since the start of the Sportage production. The composition of the plate and screws have remained fundamentally unchanged over the years. It is common for the plate and screws to suffer corrosion. More particularly, Kia has identified that the screws over time will become locked onto the plate and the tank due to such corrosion, preventing the fuel pump from being effectively removed from the fuel tank, and requiring the entire tank to be replaced when the fuel pump needs replacing.

The investigation into this issue has identified a substantial number of reports that this corroded area of the plate and screws was the source of leaks. However, Kia has been unable to verify any incident where a leak could be found where fuel was coming from the plate or screws. Rather, such incidents identify that the plate and screws are moist with fuel, not that fuel is coming out of a hole in the unit. An interesting example of this confusion is reported by the [REDACTED] which was the source of a VOQ, where they discuss top side corrosion in detail and it appears that they are indicating that this might be the source for a leak, but in fact that leak is a PVC disruption leak in the bottom of the tank.

[REDACTED] another VOQ, reported smelling fuel and that fuel was allegedly pouring out of the vehicle, and attributed that to the corroded "metal fuel line" coming out of the fuel pump. However, the customer's real complaint was that the fuel sending unit screws broke off when the dealer tried to replace the fuel pump. We have now obtained the repair records for that repair and the part replacement problems due to such corrosion are clearly identified. Although [REDACTED] reported lower tank leakage and a significant volume of fuel coming out of the vehicle, there was in fact no lower tank leakage, no hole and no report by the mechanic of any flow of fuel out of the top of the tank at the fuel sending unit.

At this point, Kia has concluded that there is no leak problem related to corrosion of the sending unit plate and its screws, but this is a significant customer satisfaction issue due to the need for the customers to pay for a new fuel tank when the fuel pump needs to be replaced. In light of the internal tank corrosion incidents which required fuel pump replacements, it is clear that these connected events have contributed to the high consumer complaint level.

Supporting this analysis is the fact, although the metal composition of the plate and screws have remained consistent since 1996, no complaints were received by NHTSA regarding alleged top side fuel leaks for vehicles manufactured prior to June 1999. This is consistent with Kia's customer claims history.

In addition, Kia's fuel tank supplier tested 6 fuel tanks for leaks and all of those which were alleged to have upper fuel tank leaks were found not to leak.

(c) Change from steel to plastic high pressure nipple hose connector on fuel sending unit. In February 1999, Bosch began manufacturing a fuel sending unit which had one metal and one plastic fuel line nipple, instead of the previous two metal nipples. Kia is not certain at this time as to when the new design was first installed in the Sportage. The warranty claims rate for leaks goes up by some noticeable amount beginning with June 1999 production. It then drops to essentially zero in October 2000, after Bosch changes to a dual plastic nipple design and they change their manufacturing assembly process.

Based on information KMC has received from Bosch, the manufacturing process to install the plastic nipple at first used a single action to force the plastic nipple into the fuel sending unit. The new process effective in the Fall of 2000 had two steps, with the first force seating the nipples and the second force inserting them into the unit.

It is Kia's belief that some limited number of Sportages manufactured between May or June 1999 and September 2000 were equipped with fuel sending units which had a plastic fuel line connector nipple which had been cracked in the manufacturing process and which as a general matter eventually might seep fuel. This fuel seepage was eventually noticed by the customers due to a smell of gas. When the customer took the vehicle to a dealer, the dealers could not identify any fuel flow, and, based on the fact that the plate and screws were damp with fuel, they inferred that the plate/screws were leaking. In fact, they were not leaking, but fuel was instead seeping from the plastic nipple onto those adjacent metal parts. Most importantly to the consumer, they were unhappy to find that not only did the fuel sending unit and pump have to be replaced, but the fuel tank also needed to be replaced.

(4) Risk Assessment.

Kia does not believe there is any risk to motor vehicle safety due to any internal corrosion issue. There are clearly a few instances where the disruption of the PVC coating led to corrosion which allowed true fuel leakage, but Kia does not believe that is due to any defect in the Sportage. Kia does not believe that the corrosion to the fuel sending unit plate and screws was the source of substantial leaks, if any. The cracks to the plastic fuel connector hose nipples installed between June 1999 and September 2000 were a source primarily of fuel seepage. Kia has not yet evaluated whether such seepage in the presence of an ignition source would lead to a fire, but it is aware of the difficulties involved in igniting gasoline in that position/condition. It will be conducting a further evaluation of this issue. The vapors potentially released as a result of the early ORVR and related systems did not constitute a safety hazard.

(5) VOQ Analysis.

- a. VOQ No. 10143640; 11/17/05; (VIN: KNDJA7239X5 [REDACTED])

"Found skid plate on bottom of the tank held moisture against the tank and caused it to rust."

We contacted [REDACTED] and he stated he looked underneath the vehicle to see if fuel was leaking, but could not find anything. KMA conducted an analysis of [REDACTED] tank and found no evidence of fuel leakage.

**b. VOQ No. 10087087; 06/08/04; (VIN: KNDJA7237Y [REDACTED])**

"On 06/07/04 brought vehicle to the dealership in Auburn, Massachusetts to find out where the gas leak was coming from. Dealer told him that top of gas tank was rotted away along with fuel pump and sensor."

We contacted Mr. Donald Cross and he stated he was told the fuel pump and the fuel sending unit was rusted. This vehicle was manufactured on September 9, 1999 and contained a fuel sending unit with one metal and one plastic fuel line nipple.

**c. VOQ No. 10129807; 07/07/05; (VIN: KNDJA7235Y [REDACTED])**

"Gasoline leaking out onto vehicle and ground - potential fire hazard. Had to replace sending unit, fuel tank and fuel pump due to rusted connections, ruining each piece of equipment."

On July 24, 2005 [REDACTED] contacted KMA's Consumer Affairs department and stated "he recently had the vehicle in for repair of a gasoline leak. It was determined that the leak was caused by a rusted sender unit which resulted in complete replacement of the fuel tank, pump and sender unit due to corrosion." We contacted [REDACTED] and he specifically stated that "the dealership told him that the sending unit was broken at the "fuel nipple", and that the fuel tank needed to be replaced because the sending unit was rusted." This vehicle was manufactured on June 14, 1999 and contained a fuel sending unit with one metal and one plastic fuel line nipple.

**d. VOQ No. 10140887; 10/24/05; (VIN: KNDJA7234Y [REDACTED])**

"Puddles of gas spotted under my vehicle . . . the local Kia dealer . . . determined that the gas tank had "rotted/rusted" out (additionally, the bolts for the gas tank and the hose connecting the gas tank and filler tube were rusted and disintegrated, respectively, beyond repair and must be replaced), creating a hole through which gas was escaping."

We contacted the [REDACTED] family and although they reported top side corrosion in detail, the photographs taken by NHTSA showed that the leak was due to PVC disruption in the bottom of the tank.

**e. VOQ No. 10119563; 04/15/05; (VIN: KNDJA7238Y [REDACTED])**

"Fuel tank is leaking. The skid plate that protects the tank is conform the wrong shape and therefore is too close in certain areas and it holds debris and moisture."



We contacted [REDACTED]. He owns a collision/accident repair shop called [REDACTED]. [REDACTED] stated that he found dirt collected at various points on the skid plate. He further stated that it was his belief that the dirt held moisture against the tank, and that the dirt -- combined with normal vibration -- wore a hole in the tank. He indicated that the rust and holes were located on the bottom side of the tank in the places where the skid plate contacted the fuel tank. [REDACTED] leak was a result of a PVC disruption leak in the bottom of the tank.

f. VOQ No. 10139901; 08/17/05; (VIN: KNDJA7236Y [REDACTED])

"The repair shop personnel at Thetford's Auto Center indicated that the tank was rusted and was leaking from the seam. In addition, the fuel supply or return line was rotted at the fuel tank connection. . . ."

We contacted [REDACTED] and he stated that he took his vehicle to "Empire Toyota where he was told that the top of the fuel tank had rusted through and that the fuel pump was "shot". They replaced the fuel tank." This vehicle was manufactured on November 18, 1999 and contained a fuel sending unit with one metal and one plastic fuel line nipple.

g. VOQ No. 10131354; 07/31/05; (VIN: KNDJA723XY [REDACTED])

"The bottom of the vehicle rusted. The fuel tank had a hole in it. While the consumer was driving on the highway the fuel had slowly leaked out."

We contacted [REDACTED] and she stated that she smelled gas and attributed that to the corroded "metal fuel line" coming out of the fuel pump. We have obtained the repair records and it was identified that the fuel sending unit screws broke off when the mechanic tried to replace the fuel pump. Although [REDACTED] reported lower tank leakage and a high volume of fuel coming out of the vehicle, there was no lower tank leakage, no hole and no report by the mechanic of any flow of fuel out of the top of the tank at the fuel sending unit. This vehicle was manufactured on November 9, 1999 and contained a fuel sending unit with one metal and one plastic fuel line nipple.

h. VOQ No. 1005037; 12/04/03; (VIN: KNDJA7231X [REDACTED])

"Vehicle failed state inspection. Fuel tank was leaking, and needed to be replaced. Dealer notified."

Kia does not have record of [REDACTED] ever contacting the KMA consumer affairs department. We contacted her and she stated that she would not answer any questions.

Jeffrey L. Quandt, Chief

April 30, 2006

Page 11 of 11

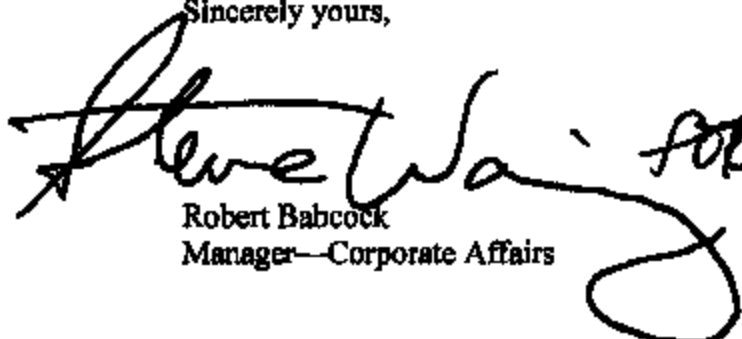
(6) **Conclusion.** The core issue raised by this IR relates to introduction of a plastic fuel line nipple by Bosch on the fuel sending unit which had some incidence of cracking while it was being inserted into the fuel sending unit before delivery to KMC. Those cracks—when they occurred—generally permitted gasoline to seep onto the fuel sending unit plate and screws, and released an gasoline aroma which could be identified by the customer. Since there was no flow of fuel related to this seepage, the repairing dealerships often appear to have typically had no awareness of the source of the fuel, thus explaining the repeated decision to attribute the fuel to a leak in the fuel sending unit, fuel lines or fuel pump. The customer complaints related to this issue had a great deal to do with the cost of replacing the fuel pump and fuel tank due to the corrosion locking those parts together.

(7) **Further Steps to be Taken by Kia**

Kia will be gathering the results from its service inspection campaign, and it will also be conducting a further investigation into issues related to the Bosch fuel sending unit before finalizing its analysis. Such information will be shared with NHTSA as soon as significant data is available.

Please let us know if you have further questions at this time.

Sincerely yours,



Robert Babcock  
Manager—Corporate Affairs