Statement regarding the use of conductive and non-conductive pipes at filling stations

Following intense debate regarding the use of conductive and non-conductive pipe we (Kungsörs Plast AB, Sweden, manufacturer of the KPS Petrol Pipe System™) have commissioned electrostatic testing of non-conductive and conductive plastic piping by independent experts. The large-scale testing was undertaken in May of this year and took place over two full days.

Testing was performed by flowing fuel through:

- KPS conductive piping
- KPS non-conductive piping (which has an EVOH-liner)
- Competitor non-conductive piping (which has a nylon/polyamide liner)

A total of 21 test runs were undertaken. During the flowing of fuel measurements were made of static electricity and its build-up on the fuel, on the pipe walls, through the walls and on electrically isolated peripherals such as welding socket wiring, metal flanges etc.

A test was also done simulating gravity fill drop (not pump assisted).

The tests were arranged and designed so that normal operating conditions were simulated using three different test fuels ranging from low to high conductivity.

The tests were conducted by leading independent experts on electrostatics led by Mr. Stephen L. Fowler, Fowler Associates, USA (www.sfowler.com).

Pictures from the testing can be found at:

http://www.flickr.com/photos/42055964@N05/sets/72157622091126653/detail/

Summary of findings and conclusions:

- High potentials were measured and can be expected to accumulate in non-conductive piping under normal operating conditions.
- The highest potential measured reached almost 90,000 volts through the pipe wall from the competitor's non-conductive pipe.
- There are reasons to assume that under normal operating conditions, potentials can build up in non-conductive piping to levels that could cause puncture of the pipe wall.
- High potentials can build up within a matter of seconds.
- This building up of charges and the resulting potentials can lead to incendive discharges around the pipe on isolated conductors such as clips, flanges, couplers and personnel.

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- in testing on the non-conductive pipe the flow of fuel through the pipe caused a potential measured greater than 20,000 volts on the welding socket wiring.
- When approaching an isolated conductor near the competitor's non-conductive pipe with an electrode, a clearly incendive spark was produced on the outside of the pipe.
- During gravity fill drop through the non-conductive pipe, charges continue to build up and increase for the duration of the fill and can be expected to reach high potentials under normal operating conditions.
- Charge generation depends on the combination of fuel type and type of pipe barrier material used - predicting performance based on one combination of fuel type/type of permeation barrier can be misleading.
- Nylon/polyamide liner accumulated higher charge in the pipe than EVOH-liner in the experiments performed.
- A grounded conductive liner will dissipate charges from the plastic surface safely to earth. Thus, no dangerous level of static charge will accumulate on the surface of the conductive piping.

Earlier studies commissioned by competitors that do not simulate forecourt operations are not a sufficient basis for concluding that non-conductive pipes are safe from electrostatic ignition hazards under normal operating conditions, since voltages much higher than those recorded in such studies can and do occur.

In general, the industry, suppliers, oil companies and regulators, need to be aware that the use of non-conducting materials should be avoided wherever possible. This should be combined with an active elimination of isolated conductors.

Oil companies should demand in their specifications that all equipment supplied for the transportation of fuel be of sufficient electrical conductivity in order to ground the system to earth; without exception and including tank access chambers and dispenser sumps that today in many cases are composed of non-conductive materials.

Worker's safety is compromised if these issues are not handled. Products approved to EN 13463-1 and ATEX 1999/92/EC certify that the products are tested for workplace safety.

As stated by Mr. Stephen L. Fowler following the testing: "It is reasonable to expect that high potentials generated on the inside liner of non-conductive pipes buried or partially buried in soil and concrete would reach energy levels capable of providing incendive brush discharges and the more energetic propagating brush discharges. Isolated personnel filling the system or working in petrol laden sump and fill boxes will be exposed to high potentials from non-conductive pipes and certainly present a very real danger."

Suppliers that remain "non-conductive" should include in their instructions that all isolated conductors (clips, screws, nuts, bolts etc) must be grounded to earth and bonded. This is not common practice today. This grounding must then be periodically checked for integrity.

Non-conductive suppliers should also be required to explain how they avoid static electric build-up in the piping - a requirement in EN 14125, points 9.1 and 9.2. Non-conducting piping cannot avoid static electricity building up - neither KPS non-conductive pipes, nor anyone else´s.

Adherence to the available codes of practice for handling of static electricity (i.e. Cenelec TR 50404 in Europe, NFPA 77, NFPA 30 in the US, and others) should be examined and put into practice at filling stations. The ISO-standard ISO 14692-3 and its chapter 10 on static electricity is excellent and relevant guidance.

Standards like EN 14125, UL 971, already handle static electricity (either directly and/or by reference to codes of practice), and practises should be improved so that products seeking approval to these standards are required to dissipate static electricity to earth in order to be approved.

Further, we regret the misleading information that some parties spread on the market and find it deplorable that confusing information is distributed on an issue that requires and deserves professional attention.

Conductive piping systems grounded to earth are necessary in order to avoid electrostatic build-up on the pipe surface that could lead to incendive discharges. The industry needs to move away from non-conducting materials in order to minimize risks for workers' and consumers' health and safety. The argument that many non-conductive stations have been installed over the years does not justify non-action.

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KPS Petrol Pipe System™/Kungsörs Plast AB

Technical Department