PETROL PIPE SYSTEM

KPS

Safer and Easier with Conductive Piping

Making Fuel Flow Safely

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Fire Prevention

Fire at the filling station is something that needs to be prevented. The risk of a flammable atmosphere occurring is always present where fuel is handled. Just as smoking or open flames are not allowed in the station area, any other possible ignition sources must be eliminated. This includes discharges from static electricity on objects or people.

Fires with Non-Conductive Piping

Fill Fires with Non-Conductive Piping

Fill fires occur during or after filling of the underground tanks. In severe cases a full scale fire develops when fuel vapors are ignited by a static discharge. Sometimes the fire will be restricted and stop once there are no more vapors or oxygen to sustain it. Fill fires are sometimes preceded by audible cracking or tapping noises from discharges in or around the fill pipes.

Fill fires have the potential of scaring away customers or lead to temporary close-down during investigation, implementation of new safety measures or reconstruction. Truck drivers may refuse to fill tanks at stations where incidents have occurred or where there is indication of static problems.

There have been hundreds of known fill fires, some of which have been thoroughly documented and investigated.

Chamber Fires with Non-Conductive Piping

Fires in chambers are less common than fill fires, but may occur during inspection, repair or maintenance in tank chambers that contain spill and fuel vapors. Charged objects inside the chamber may discharge to the person entering the chamber or to tools he brings with him, igniting the flammable atmosphere.

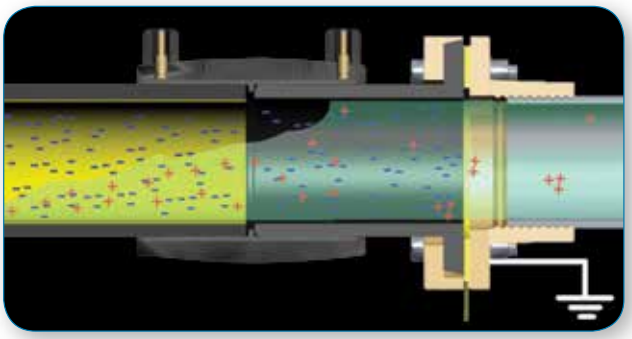
Any fire in a confined space can have severe consequences and obviously needs to be avoided.

Risk factors

Factors that add to the risk of static fires are:

- Use of non-conductive piping (prerequisite)
- High speed fuel flow
- Low conductivity fuels
- Fuel quality and impurities in the fuel
- Dry air
- Turbulence caused by elbows, reducers, filters and flame arresters

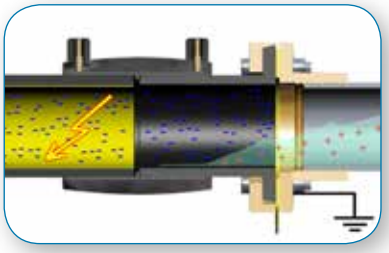
Charging of Non-conductive Pipes



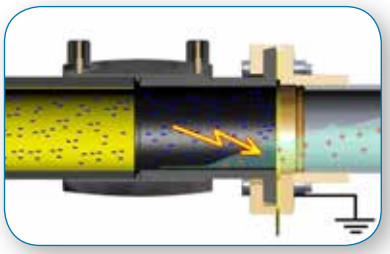
Static electricity is generated when a low conductivity fuel flows in a non-conductive pipe. The fuel will be positively-charged and the pipe wall negatively-charged.

Since the charges of the pipe wall cannot go anywhere, static electricity will accumulate as long as fuel flow continues.

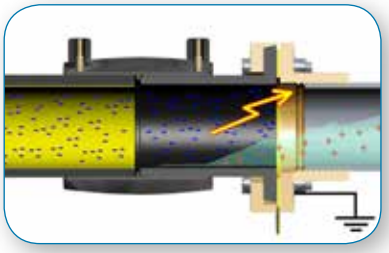
Possible Discharges



Between areas on the pipe wall with different charges.



Between negatively charged pipe and positively charged fuel.



Between negatively charged pipe and grounded conductor.

Precautions for Avoiding Static Risks with Non-conductive Pipes

If you decide to use non-conductive piping despite the risks, you need to take the precautions listed in the IEC standard TR 60079-32.

Avoid unburied piping

- Always backfill on top of pipes before starting any fuel flow
- Keep pipe lengths inside chambers and fill boxes as short at possible

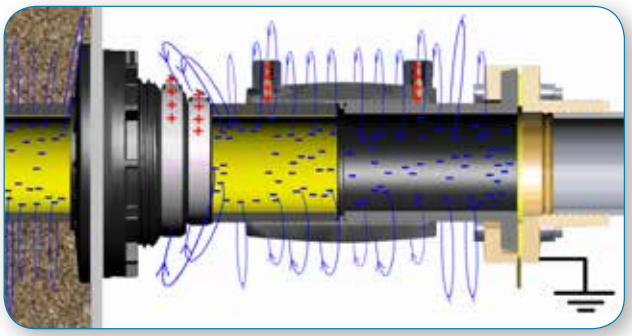
Limit speed of fuel flow

- Charging increases with flow velocity
- Keep fuel flow below 2,8 m/s

Avoid turbulence

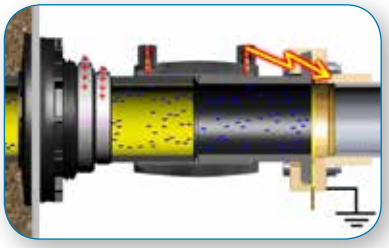
- Turbulence increase charging
- Do not use flame arresters or fine filters unless after very careful consideration

Charging by Induction from Non-conductive Pipes

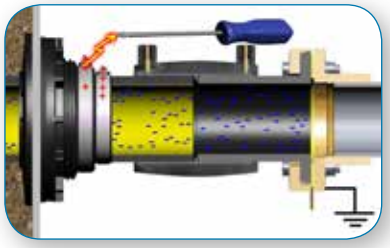


The static charges in the pipe create an electrostatic field and conductive objects in the field will get an induced charge.

The induced charges can discharge either between two unbonded conductors in the system or to a tool or a person in the proximity.



Discharge between two unbonded conductive objects.



Discharge to a hand tool or person.

Put safety valves on fill pipes

- Mount safety valves on all non-conductive fill pipes
- Interlocked systems that prevent any air from entering the fill pipe are preferred

Bonding and grounding

- Bond and ground all isolated conductive objects in chambers and fill boxes

Insulation

- If bonding is not practical, insulate completely to prevent sparks
- Plug welding socket pins with plastic caps made of a material that provides long-lasting insulation against discharges

Inspect and check earthing

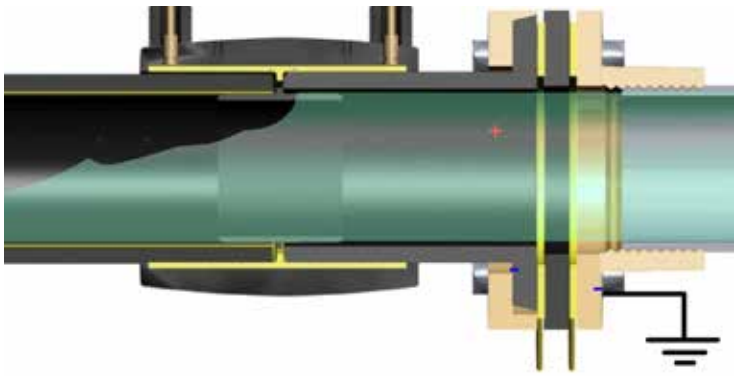
- Earthing arrangements need to be inspected and tested periodically 1 time/year
- Also inspect and test earthing after all work in chambers or at fill points
- Earthing connections may corrode
- Earthing wires may become snagged and damaged or come loose

Conductive Pipes Eliminate Static Risks

Use of conductive plastic pipes eliminates the risks from static electricity.

Very little static electricity is generated in a conductive pipe and the charges are immediately dissipated to earth.

There is no accumulation of charges and zero risk of induction and static discharges.



Easy Installation

Installation of KPS conductive pipes is very easy. Conductive connectors are placed in every joint to make conductivity continuous from end to end.

No Special Earthing Arrangements or Precautions

The conductive pipe is inherently earthed once connected to the end points. No bonding and grounding of conductive objects in chambers or fill boxes is needed. You save lots of work both during installation and after every instance of maintenance, upgrade or repair.

No Periodical Testing

There is no need for periodical testing of pipe conductivity or control of earthing arrangements. The conductive properties of the pipe will remain for the 30 year warranted life time of the pipe.

Smoother Operation with Unrivaled Safety Margin

Conductive piping has an unrivaled safety margin for static fires. KPS conductive pipes cannot get charged to more than approximately 40mV (0.040 V) which gives a safety margin of at least 25,000 times the voltage.

This is why there have been zero (0) static fires or incidents where conductive pipes are installed. You do not need to worry about taking precautions like restricting fuel flow or using special fill safety valves, things that would slow down both dispensing and filling of tanks.

Conductive Pipes Eliminate Static Risks

Future-Proof & Biofuel-Proof

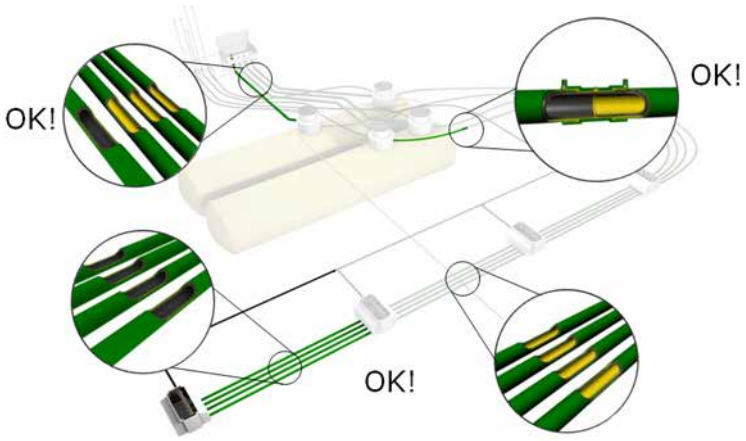
KPS conductive pipes are safe for use with all existing and conceivable future fuels, including biofuels that could be highly charging.

Existing Non-Conductive Installations

How should you deal with existing non-conductive installations? The KPS recommendation is simple: Unless any problems arise, just leave your existing installations as they are. If problems occur later on, you can then either adopt the precautions listed in IEC TR60079-32 or replace the non-conductive pipes with conductive ones.

Conductive pipes can be used for upgrades and repair that need to be done, for example:

- Replacing a pipe line
- Repairing part of a pipe line
- Adding a dispenser island



When you replace non-conductive piping on a station with conductive piping you increase the electrostatic safety, even if only a part of the piping system is conductive.

Summary & Comparison

	Non-conductive pipe	Conductive pipe
Highest voltage	~27,000 V (not worst case)	~40 mV (0.040 V)
Safety margin	At best small (2-5 times), occasionally non-existing	At least ~25,000 times
Fuel	New fuels may not be safe in existing installations	Safe for all conceivable fuels
Fires & incidents	Hundreds of known fires and incidents	No (0) incidents
Future-proof	May not be safe with future fuels	Safe for all existing and conceivable fuels, including biofuels
ATEX 137 compliance	No	Yes