

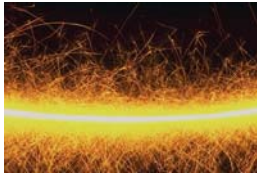
# Static Electricity and Cargo Tanks

Static electricity is almost always with us. Generally the amount is small and is considered a nuisance more than anything. However, on a tanker or barge that nuisance could ignite an explosive atmosphere in a cargo tank endangering the crew and shore side personnel.

Static electricity is present whenever two different types of materials come into contact with each other. The materials, the way they come together and the way they are separated, insulated or grounded determine the amount of charge accumulation and the strength of the charge between the two materials.

We all know that shuffling your feet across a synthetic carpet with your shoes on will create quite a spark when you reach for the doorknob. The reason for this is, the action of sliding two different materials together produces an electrical charge and the charge is then stored in your body because your body is insulated from ground by your shoes and the air (particularly dry air). Your body is approximately 60% water, which makes it a very good conductor of electricity. Good conductors however, cannot hold a charge unless insulated and when the opportunity to discharge occurs, it will be very rapid, thus the spark to the doorknob (ground).

So, what are we trying to say? When handling cargoes that can accumulate a static charge you have to be very careful to prevent a static buildup and the potential for a rapid discharge, resulting in a spark.



Normally, black oils such as crude, residual fuels (No.6, No.4), black diesel oils and asphalts do not accumulate static charges, as they are relatively good conductors of electricity. Clean oils or distillates on the other hand are poor conductors of electricity and are therefore good static accumulators.

These oils include:

Natural Gasolines

Motor & Aviation Gasoline

Heating oils

And surprisingly, Lubricating oils

Kerosenes

Jet Fuel

Heavy Gas oils

White Spirits

Naphthas

Clean Diesel oils

What different types of materials are on board or in a tank that can effect static accumulation? Air, water, rust, scale, pipelines, sounding bobs and tapes, sampling devices are all materials that are different than the clean oils listed above and can have an effect on static electricity. For example, gasoline can and does accumulate static electricity but when rushing through a pipe it generates even more. Mixing the cargo with and then separating it from water also greatly increases the amount of static electricity generated. Entrapping air bubbles by splashing when first loading or pumping or blowing air into the cargo tank brings two different materials together making static electricity. Stirring up rust or scale particles when first loading also brings two different materials together with the resultant static electricity. Loading cargo “over the top” or through an open drop will generate static electricity, first as the cargo falls through the air and then when it meets with the tank bottom or sides and again from the splashing. The mist from this procedure will also generate static electricity. During this type of procedure the gas concentration in the tank will also increase because the splashing will generate more fumes. Once the tank and cargo are charged with static electricity it is still a manageable situation as long as safety precautions are followed.



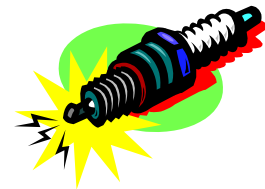
First of all, the charge of static accumulation will gradually dissipate or neutralize itself after activity in the tank stops. If, in the shoes and carpeting example above, you were to sit down for two or three minutes before reaching for the doorknob, the static buildup would have dissipated and there wouldn't be enough energy for a spark to jump the gap when you reached for the knob.



How do we prevent static electricity from building up? How do we get rid of static electricity once it builds? How do we prevent a static discharge? From the preceding paragraph we know that we should never load clean oils “over the top” or from drops that are not piped to the bottom of the tank. When first loading a tank always begin by gravity to prevent static buildup from the velocity of the cargo through the pipe, from turbulence and splashing and from the dispersal and mixing of water and sediment on the tank bottom. This is why terminals want cargo tanks with

minimum bottoms when loading light products. Once the bell mouth or suction line is covered enough so turbulence is minimized then the pumping system can be turned on. During the loading of a tank the static charge builds at a slower rate then when the initial charge of oil entered the tanks because of the reasons mentioned above. Once the tank is loaded to the level wanted and the cargo valve is closed the static charge will begin to dissipate. Although the cargo and tank will always hold some static charge, the potential or voltage difference between the electrostatic field generated by the cargo and cargo tank will slowly neutralize or relax. The time usually recommended before any metal tool or object is introduced into the tank is 30 minutes. This includes using sounding bobs through any opening other than a sounding tube. Sounding through a sounding tube *is* permissible at all times during the loading.

To prevent static discharge (spark) do not allow any part of the tank or structure within the tank to become loose thus preventing it from being grounded to the hull. This could be ladders, probes/sensors, floats, sampling cans, sounding pipes, etc. Structure or equipment that is not grounded can end up being positioned so that a small gap between them will be just right to allow an electrical jump or arc, similar to a spark plug, to take place. Do not allow anything to fall into the tank. A wrench for example, falling through the air will generate static electricity and could possibly discharge a spark as it meets the cargo not to mention a friction spark if it contacts the steel framing of the tank. Sample cans are just as dangerous, especially if left to float around in the tank. PVC pipe, PVC gloves and/or polypropylene line when rubbed together will build up significant amounts of static electricity. This is why PVC is not used for vacuuming wands and why only manila or other natural fiber lines should be used for lowering sampling devices or other equipment into tank compartments.



Bonding or ground cables have no effect on static electricity buildup but were used to try and prevent stray ship to shore currents. It has been proven to be ineffective for the intended purpose and has generally been discontinued. Although not required by any rules or K-Sea policy, some terminals still require the cable.