New Mobile Bonding Systems
control static electricity in hazardous areas

There are many situations where mobile vehicles or trailer mounted units must operate on a temporary basis within, or close to, potentially explosive (flammable) atmospheres. These types of applications bring challenges from a safety viewpoint, as many of the established procedures and protective measures we take for granted when operating in well-defined work place environments are no longer present.

One such challenge is the control of static electricity, and more importantly how to prevent an uncontrolled electrostatic discharge within a hazardous area. Recent developments in intrinsically safe bonding and grounding (also known as earthing) technology have enabled systems to be designed for use on vehicles and mobile plant equipment, thereby making a significant contribution towards safety in industrial, transportation and emergency response applications.

Some typical applications for specialised vehicles and mobile plant equipment include:

- Chemical spill and waste recovery service trucks
- Cleaning and maintenance operations
- Re-fuelling aircraft and the use of mobile bowsers
- Evacuating chemicals from reactors, storage tanks and containers
- Metering and calibration systems
- Vacuum trucks
- Emergency response for hazardous/flammable tankers
- Mobile transfer pumps, blowers and mixing systems

As we have seen in previous issues of Ear To The Ground, it is well known that static electricity can build up to dangerous levels on conductive items of plant and equipment that are isolated from the ground. If they are in sufficient contact with the ground, any charge generated from the operation or process will be safely dissipated before it can reach levels that could give rise to an uncontrolled discharge. Any process involving relative movement will generate static electricity by contact and separation of the materials involved. Examples of processes giving rise to static electricity are liquids flowing through a pipeline or hose, pneumatic transfer of loose solid/powdered products, agitation and mixing, and pressure/abrasive cleaning.

International technical standards, guidelines and codes of practice (such as NFPA77 in USA and CLC/TR50404 in Europe) point to effective bonding and grounding (earthing) as the prime way to control static electricity in hazardous areas. Bonding (linking together of conductive objects via a mechanically strong electrical conductor) and grounding (connecting them to true ground/earth potential), ensures that no conductive item can accumulate high levels of static charge. When the operation takes place within a well-defined work place environment, conductive plant and equipment is typically bonded to an identified ground point, such as a grounding bus bar via a cable or monitoring system installed in situ. However, if the operation takes place in a temporary or remote area, there may not always be a dedicated connection point.

In the past, specialised trucks and service vehicles have been equipped with simple bonding lines, to provide a means of grounding or an equipotential link from the vehicle to the plant equipment that is the subject of the operation (pipeline, reactor, tank etc). However, the mere provision of these bonding lines does not verify that they are used correctly, and that they are in a satisfactory working condition. For this reason, many organisations in industrial and emergency response situations now use self-testing bonding systems like the Cenelectrex Bond-Rite or Trans-Rite to add an important safety check into their operations. These types of systems use Intrinsically-Safe monitoring techniques to test the bond, either between the vehicle and the plant equipment, or back to a verified ground point. The test and verification threshold should be in accordance with the prevailing local technical guideline, for instance in North America and Europe a resistance level of < 10 ohms is specified for monitoring the bonding together and grounding of conductive objects. They will usually have some type of universal clamping device to make the connection onto the equipment or grounding point, and this is bonded to the service vehicle via a retractable cable, sometimes fitted on a cable reel. For an additional level of security, matching pins, plugs and socket connectors may be used, but this will require dedicated, grounding points to be installed at all anticipated usage positions.

An important requirement for these types of systems is that they either have their own independent power supply, or take their power from the vehicle battery. For example, they may use a battery, which is approved as part of the intrinsically safe device or take their power directly from the vehicle power system (12 or 24V DC), and convert this to an intrinsically safe monitoring output. Whichever system is selected, it is vitally important for it to have the appropriate hazardous area certification, approval or listing, to allow it to be safely used in the classified flammable area. The use of intrinsic safety concepts provide the widest possible certification spectrum, for virtually all gas/vapour, dust and fibre explosive atmospheres, thereby enabling the service vehicle or mobile equipment to have a license to “go-anywhere”. Local hazardous area classification standards also define the extent of the potentially explosive atmosphere, for instance, the separation distance between continuous and intermittent explosive areas, and those which will only be present under fault conditions.

Special applications, such as emergency response teams attending recovery of stricken chemical tanker trucks after road accidents, may also have additional mandated safety regulations, requiring portable ground rods to be driven into the ground and tested to form a temporary local grounding network. Mobile bonding systems are able to work in conjunction with these procedures, either by proving a low-resistance bond between the stricken tanker and the recovery vehicle, the temporary ground network, or both.

Newer developments in mobile bonding systems also provide additional interlock capability, to prevent an operation from starting until a proper bond has been established between the vehicle and the equipment. A good example of this is the Trans-Rite AVIATION system, where an additional “dead-man's” handle control is used to meet the requirements of NFPA 407. In this application the system ensures that there is a low resistance bond between the fuelling vehicle and the aircraft, and that the operator has pressed the dead-man's control switch to permit the fuel transfer pump to operate. If either of these conditions changes during the operation, either because the bonding wire becomes disconnected or if the operator releases the switch because of some other fault or emergency condition, the pump would immediately stop. In a similar way, such systems may be used in the petrochemical industry to interlock with vacuum pumps when clearing surplus rainwater from the tops of floating roof storage tanks, or cleaning up after chemical spills.

In conclusion, intrinsically safe mobile bonding systems reinforce existing safety protocols when carrying out operations in, or adjacent to, potentially explosive atmospheres, as well as providing a vital verification function and even controlling the operation or process via an interlock. As the number and scope of these temporary/mobile applications increases, the need for the additional safety benefits provided by mobile bonding systems is increasingly being recognised by leading organisations in the fields of industry, transportation and emergency response.

For more information on Bond-Rite and Trans-Rite mobile bonding systems, please contact Newson Gale or your local authorized distributor or representative.

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