

Safety in FOCUS

February 2013

Loss Prevention Department



p2 Keep on Trucking ... Safely

p4 Recognizing Exceptional Safety

p5 Testing Fire Water Pumps

p7 FRC: What Every Wearer Needs to Know

Keep on Trucking ... Safely

by Steffen Tietze, Dhahran Area Loss Prevention Division

Have you noticed the large number of cargo trucks, tanker trucks and 18-wheelers on the roads? Maybe you've also seen lost items from trucks including tools, parts of transport boxes and more, which end up next to or even on the highway. We've all read or seen eyewitness news reports of potentially dangerous situations when a tanker truck tipped over and lost its load endangering everyone on the road.

Tanker trucks are designed to carry liquefied loads, dry bulk cargo or gases. They tend to be large; they may or may not be insulated; pressurized or nonpressurized; and are designed for single or multiple loads (often by means of internal divisions within the tank). Some are semitrailer trucks.

Drivers and operators

Proper operation is critical to the daily safe operation of tanker trucks. Drivers' specialized skills and training help to keep the vehicles, cargo, themselves and others safe.

To achieve these goals, drivers must:

- Be properly qualified and licensed.
- Prepare and apply journey management plans.
- Properly inspect the vehicle and equipment before use.

- Know their equipment and its limitations.
- Know their truck's special characteristics and how to drive it safely (e.g., avoidance maneuvers, turns and safe clearance heights).
- Report any unsafe conditions immediately.
- Understand the hazards associated with the fuel, cargo and loads they transport or transfer.
- Ensure that the installation of the ground wires, vapor hoses and loading arms is done correctly; confirm that connections are tight and check for any coupler leaks.
- Know the evacuation and rescue procedures in case of an emergency.
- Wear all the required personal protective equipment (PPE) at all times, including the necessary safety equipment for loading and unloading, and a seat belt when driving.
- Never allow others to ride on trailer hitches or walk in the area between the truck and trailer.
- Review and understand the manufacturer's instructions and operating manuals to confirm proper

loading, transport and offloading of materials.

- Understand and review the relevant material safety data sheets (MSDSs) and chemical hazard bulletins (CHBs).
- Continually monitor tank level indicators, and pressure and temperature gauges.
- Obtain all required permits before loading or offloading.

To drive a tanker truck for Saudi Aramco requires training and certification. Saudi Aramco requires that drivers accessing and dealing with bulk materials are familiar with all safety and operational requirements. To achieve this, a training program has been developed. The program ensures that all drivers:

- Attend a full day course, which includes classroom and field training.
- Successfully complete ten self-loading trips under operator supervision.
- Present a loading trips' record.

Saudi Aramco requires more stringent measures for trucks that carry hydrocarbon products. Before such trucks are even allowed to enter a loading facility, they must be inspected by a third party

truck inspection agency and pass a walk around inspection, which checks that the following are present:

- A valid six months sticker.
- An intact windshield.
- Two fire extinguishers.
- A secure, covered box for the external battery.
- A battery disconnect switch.
- Secure electrical wiring.
- Cab and equipment box doors that close securely.
- Safe tank access ladders.
- Good overall truck condition (no cracks, damage, corrosion or leaks).

Tanker trucks

Tanker trucks are difficult to drive due to their size, weight and high center of gravity. Depending on their cargo, driving a tanker truck can be extremely dangerous. To operate safely on the roads, tanker truck drivers must:

- Maintain their truck in safe working condition at all times.
- Complete regular checks of all equipment.

- Have all the required emergency items on board, like a first aid kit, fire extinguisher, blankets, spill kits and shovels.
- Ensure the truck is grounded properly to avoid a static electricity buildup or dust explosion.
- Confirm the truck has three available vacuum release areas: remote, manual and in-line "T." (The in-line "T" is the mechanical device in the hose that kills the vacuum to avoid operator injuries or fatalities.)

General safety points

Driving a tanker truck safely requires a unique set of driver skills, specifically suited for large vehicles. It also requires a thorough mechanical check of the vehicle. It's not enough just to drive a well-maintained tanker truck safely; a driver must also:

- Understand and follow the requirements for confined space entry, as the tank is a confined space.
- Safely transfer fluids observing the proper grounding and bonding procedures, and to never transfer fluids from one truck to another.

- Position trucks to minimize exposure to any discharged gases or fluids.
- Position vent lines away from operators.
- Keep an accurate driver log and records of all the materials transported.

For the rest of us

What can we do to help keep our highways safe and assist tanker truck drivers to finish their trip safely? We can be aware of some of the difficulties truck drivers face.

Tanker trucks require extra room for maneuvering, stopping and turning so it is important that those sharing the road help the tanker truck driver to operate his rig safely. This means keeping a greater distance from the truck; staying alert when trucks are changing lanes or using exits as they have to slow down more than a normal vehicle to maintain control; and remembering that trucks have very large blind spots and often take very wide turns.

Together, tanker truck drivers and other drivers can minimize the chance of tanker truck accidents, which makes all of us much safer.



Recognizing Exceptional Safety

By Subhi K. Abderrezaq, Planning and Technical Services Division

Ever wonder why or how safety developments and enhancements come into practice? In years past, incidents — all too often tragic — were the catalyst. “Lessons learned” were the basis for safer operations.

While lessons learned may still lead to safety enhancements, a proactive approach, that doesn’t wait for an incident, is the best way to implement safety enhancements. This is the underlying principle of the Exceptional Safety Achievement Recognition Program (ESARP). It also provides a forum for companywide acknowledgment for outstanding safety achievements by an individual or a team. ESARP achievements can be a model that others may follow, thus improving safety overall.

What is the purpose of ESARP?

The ESARP is intended to recognize and motivate individuals and teams as they develop and implement exceptional safety initiatives within Saudi Aramco that produce real results in improving safety.

Who is eligible?

Individuals or teams who have fully implemented safety initiatives are eligible for recognition under the ESARP. Managers may nominate two employees or teams led by an employee of the department, who

have implemented a successful safety initiative within the last three years.

What is a qualifying ESARP safety initiative?

To qualify, the safety initiative should be a proactive effort that has demonstrably advanced safety within Saudi Aramco or the public. It should also be one that can serve as an example to others to improve safety.

Examples of such initiatives include:

- A team improvement project that has a positive demonstrable impact on the company or public.
- The implementation of a technology that significantly reduces operational risks.
- The implementation of safety training competency assurance techniques, including feedback to improve training curricula and effectiveness.
- The development and implementation of an effective contractor safety management program resulting in a significant reduction in safety hazards and incidents.
- The development of a traffic safety program resulting in reduction of risk exposure to company employees or the public.

To be considered, an initiative should have been implemented within the last three years, focus primarily on improving

safety and should not be a previously submitted initiative that was not selected, unless significant improvements to the original have been made. Initiatives that cannot be considered for an ESARP include: a previously successfully ESARP (or a close replica) or an implementation of an external recommendation, or a safety campaign, safety fair or safety day. Any initiative that doesn’t meet Saudi Aramco’s safety policies, goals or procedures is not eligible.

Exceptional recognition

The ESARP is a distinguished award that brings high level departmental and company recognition. And although it is an honor to the recipients, perhaps the greatest reward is the satisfaction of introducing a safety initiative that will help prevent incidents, injuries or even fatalities.

Apply today!

Download the ESARP nomination form from the Loss Prevention Intranet website: <http://lp.aramco.com.sa>. Department managers may submit as many as two nominations to the manager of Loss Prevention before March 10, 2013.

All nominations are screened for validity and scored based on numerous factors, including the initiative’s scope, innovation, cost savings, risk reduction, intangible benefits and applicability elsewhere.

Testing Fire Water Pumps

By Prince Onuwaje, Abqaiq Area Loss Prevention Division

Before the late 1600s, fighting a fire involved the passing of buckets full of water from person to person, from the water source to the fire, also known as a “bucket brigade.”

In 1829, the steam-pump fire engine was introduced in London; most were team-driven steam-driven reciprocating piston pumps and a few were rotary pumps. The invention of the internal combustion engine led to the replacement of all steam pumps with motorized pumps by 1925. In time, these were eventually replaced by centrifugal pumps.

The modern fire water (FW) pumps used in Saudi Aramco facilities are critical fire safety components that must be periodically inspected and tested to verify reliability, performance and mechanical integrity. The consequences of a failing FW pump could be catastrophic — a minor incident could escalate into a major one not only resulting in property damage but in injuries and fatalities.

An FW pump unit is an assembled unit consisting of a fire pump, driver, controller and accessories. FW pumps are generally divided into several categories:

- **Main fire pumps.** These are normally centrifugal-type pumps capable of providing liquid flow and downstream pressure to dedicated fire protection devices.

- **Jockey pumps** (system pressure maintenance pumps). These are installed on fire protection systems to keep them pressurized and to make up for small pressure losses due to system water draw-off, minor leaks or temperature changes.

Routine pump testing

There are two types of routine tests for the FW pumps used in Saudi Aramco per General Instruction (GI) 1781.001: *Inspection Testing and Maintenance of Water-Based Fire Protection Systems* a weekly run test and an annual performance (flow) test. Weekly and annual testing serve entirely different purposes and each has its specific and well-defined procedures.

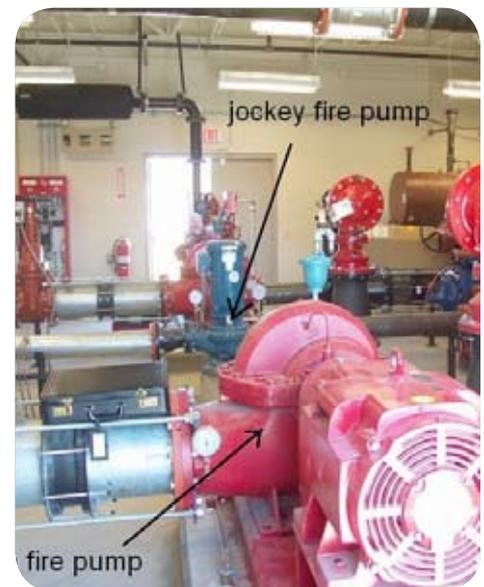
Weekly testing

Competent and authorized personnel, such as operators, using an approved, written checklist typically conduct this testing.

The following tests are just some of those that are required. The weekly test involves running the pump and visually observing that it is operating properly. GI 1781.001 lists all the checks that are necessary.

For the electrically-driven pump, weekly testing includes, but is not limited to, the following:

- Checking and recording suction and discharge pressures.



Fire water system

- Checking packing glands for slight water discharge and adjusting gland nuts if necessary.
- Checking for unusual noise or vibration.
- Checking packing boxes, bearings and pump casings for overheating.

For a diesel-driven pump, weekly testing for engine procedures only, includes:

- Observing the time for the engine to crank and reach its running speed.
- Checking the engine’s oil pressure, speed indicator, water and oil temperature indicators periodically while the engine is running and recording any abnormal conditions.

Continued on next page ...

Continued from previous page ...



Diesel-driven fire water pump



Electrically-driven fire water pump

- Checking the heat exchanger for cooling water flow.
- Checking to see if the control valves are in proper operating positions.
- Checking the diesel fuel tank level and instrumentation.

To assess the FW system's dependability, the pumps run for a specific time depending on the type. Diesel-driven pumps should be operated for at least 30 minutes and electrically driven main and jockey pumps for 15 minutes every week.

Annual testing

An annual performance test should be conducted for each pump to determine whether it performs satisfactorily compared to the manufacturer's original pump curve. Pump parameters (e.g., pressure head) should be checked at flow increments of 25% — from 0 to 150% of the rated flow.

The critical operating points are:

- The churn. This is the shutoff point where no water is flowing.
- Rated flow. This is the point noted on the manufacturer's data plate on the pump.
- Peak load. This is 150% of the rated flow.

Once these test points are plotted on the original pump curve, anything less than 95% of the rated pressure at the rated flow is unacceptable (per National Fire Protection Association [NFPA] code 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems) and requires investigation, correction and retesting.

Results analysis

Test results, plotted with the original pump curve for easy comparison, not only illustrate how the pump is performing; interpretation of the test results serve as the basis for determining the level of performance of the pump assembly and should be evaluated by a trained individual.

Conclusion

The integrity of FW pumps, like any other piece of safety critical equipment, should be maintained using a robust inspection, testing and maintenance program. The inspection and testing objective should be that "even if everything else in the facility is failing, the FW pumps will start and remain in top operational conditions at all times."

Routine testing of FW pumps provides the basis for predicting useful pump service life and pump reliability.

FRC: What Every Wearer Needs to Know

By W. Robert Kilpatrick, Ras Tanura Area Loss Prevention Division

Most serious burns from industrial fires are caused by regular work clothing igniting and burning the wearer. Around the world, thousands of clothing-related injuries due to fire occur each year. The most severe burns are often caused not by the original fire hazard but rather are the secondary result of clothing igniting. In the unlikely event of a flash fire, electric arc or metal splash, flame-resistant clothing (FRC):

- Reduces burn injuries.
- Provides time to escape.
- Increases the chances of survival.

Even though a person caught in a flash fire or electric arc may have some injuries, FRC can dramatically reduce their severity. This can mean the difference between life and death.

The FRC wearer needs to be an educated wearer. Here is some basic information that everyone who uses FRC needs to know.

History

Flame-resistant compounds have been used on clothing since the early 1700s when Obadiah Wyld received a patent for the first flame-resistant mixture of alum, ferrous sulfate and borax, which was applied to fabrics. It was in the twentieth century, more specifically

the 1960s, when significant progress was made. Progress in development and manufacturing of specialty fibers and the technology of coating natural fabrics, like cotton, with flame resistant substances, chemical additives in the fibers and fabric treatment were some of the many advances made in the science of flame-resistant clothing.

Today's FRC

For a garment material to be certified as flame resistant, it must pass an extremely rigid set of tests. Most manufacturers follow the US National Fire Protection Association and ASTM standards to ensure that their products are certified as flame resistant. In basic terms, for a material to be considered flame resistant, the material cannot sustain combustion after it has been exposed to a flame for three seconds. This type of clothing is marketed today under different trade names such as Nomex® and Indura®.

Most FRC is constructed of materials that are inherently flame resistant and will not melt, burn or drip when exposed to high temperatures. Nomex® is the most easily recognized trade name associated with FRC garment and is the type of material that Saudi Aramco requires.

The primary functions of FRC are to:

- Reduce the effects of burning clothing in contact with the skin.
- Provide protection while the wearer escapes from a fire incident.

FRC limitations

It is important for FRC wearers to know what the garment will do to protect them, but also what it will not do. FRC alone is not intended nor should it be used for approaching or fighting fires. It does not provide effective protection against extremely severe burn hazards. It will only reduce the level of injury due to exposure to a flash fire, jet fire or electric arc flash.

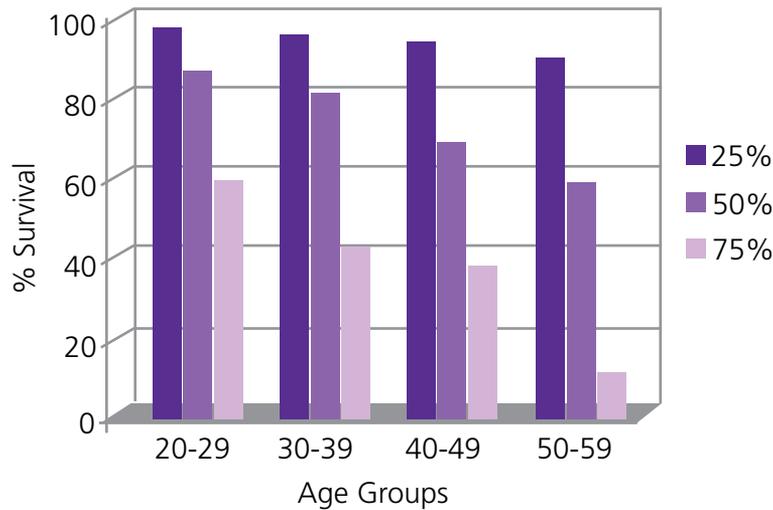
Medical professionals report that if someone receives third degree burns over more than 50% of the body, the chances for survival are slim. When third degree burns cover less than 50% of the skin's surface, the chances of survival dramatically improve. FRC is designed to protect the body by reducing the extent of burns to this level — less than 50% (see Figure 1).

Proper FRC use and care

For FRC to be effective, it must be worn and maintained properly. FRC used in Saudi Aramco must be constructed of

Continued from previous page ...

Figure 1. Burn survival rate



Nomex®. Although Nomex® meets the requirements for FRC clothing, it does conduct heat so the wearer must use a layer of clothing between the skin and FRC garment. This internal layer of clothing must not be made of synthetic fibers (i.e., polyester, nylon or similar material) that could melt and stick to the skin, thus causing serious injury. It should be made of cotton and be loose fitting to provide an insulating air layer between the wearer's skin and the FRC. It should also completely cover the wearer's arms and legs. The goal is to minimize the amount of skin exposed to flame during escape from a fire.

FRC effectiveness also largely depends on how well it is maintained. One of the criticisms of is that the flame resistance characteristics of FRC can degrade after repeated or incorrect laundering. It must be laundered regularly following the manufacturer's instructions, to remove

any oils, grease or other flammable particles that might be trapped in the fibers. It must never be starched nor should it be washed with other clothing because both starch and lint are extremely flammable and would render the garments much less effective. It should not be bleached because chlorine can chemically break down the inherently flame-resistant material.

The Loss Prevention Department (LPD) safety management guide on flame-resistant clothing (see Resources) provides detailed information and guidelines on the administration of an FRC program, servicing and replacement of FRC, as well as the specifications for FRC that Saudi Aramco requires. Additional questions can be addressed by a LPD representative or the nearest LPD area office.

Resources

Resources available at Loss Prevention's homepage: <http://lp.aramco.com.sa>

1. Safety Films available from the LPD Film Library:

- 900.596 – Tank Truck Rollover: Emergency Response in Action
- 901.077 – Coaching the Professional Truck Driver
- 901.561 – Sharing the Road

2. E-Learning Courses

- Flame-Resistant Clothing (FRC) <http://lp.aramco.com.sa/site/references/smg/frc/default.aspx>

3. Special Publications

- FRC Overview Presentation
- SAP Material Numbers for Nomex® Coveralls
- ESARP Nomination Form

4. References

- Safety Management Guide 06-001-2011, *Flame Resistant Clothing*
- General Instruction (GI) 1781.001, *Inspection Testing and Maintenance of Fire Protection Equipment*
- Saudi Aramco Engineering Standard, (SAES)-B-017, *Fire Water System Design*
- National Fire Protection Association (NFPA) 25, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*
- NFPA 2112, *Flame-Resistant Garments for Protection of Industrial Personnel against Flash Fire*
- NFPA 2113, *Selection, Care, Use and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel against Flash Fire*

The editorial staff welcomes readers' comments and ideas. Please email your suggestions to SafetyinFocus@aramco.com or mail them to *Safety in Focus*, Saudi Aramco Loss Prevention Department, A-117, Building 3150, LIP, Dhahran 31311, Saudi Arabia or call 872-8868.

Safety in Focus (ISSN 1319-1802) is produced by the Support Services Unit of Saudi Aramco's Loss Prevention Department and focuses on operational and on-job safety.

