IGNITION SOURCES DURING FUELING

WHAT'S AT STAKE?

Workplace have flammable liquids. They include fuel, common cleaning agents, solvents, points, coxes and polishes. Naked flames or burning cigarettes are obvious ignition sources but it can include static electricity generated from electronics including cellphones.

WHAT'S THE DANGER?

Internal combustion engines, whether fueled by gasoline, diesel, propane, natural gas, or other fuels, can act as **ignition sources.**

Examples:

- Stationary engines such as compressors, generators and pumps.
- Mobile equipment or transports such as vans, trucks, forklifts, cranes, well servicing equipment, drilling rigs, excavators, portable generators and welding trucks.
- Contractor vehicles and motorized equipment.
- Emergency response vehicles such as fire engines and ambulances.
- Vehicle-mounted engines on vacuum trucks, tanker trucks and waste haulers.
- Small portable engines such as mowers, blowers, generators, compressors, welders and pumps. This includes hand tools unrelated to a process, such as chain saws, brought in by contractors.
- Cell phone use in operating areas, propylene oxide handling and storage area, propane, gas and refueling areas.
- Fuel-rich conditions in an engine can result in incomplete combustion.
- When uncombusted fuel from the cylinders enters the exhaust system, it can ignite due to the hot surface, discharging sparks and flames (backfire). These can ignite flammable vapors and gases in the surrounding area.

Other Ignition Sources – Mobile Phones

- Mobile phones that light up when switched on or when they ring release enough energy to provide a spark for ignition
- Mobile phones should not be used in filling stations, or when fueling lawn mowers, boat, etc.
- Mobile phones should not be used, or should be turned off, around other materials that generate flammable or explosive fumes or dust, (I.e., solvents, chemicals, gases, grain dust, etc...)

INTERNAL COMBUSTION ENGINES

Internal combustion engines require a specific fuelto-air ratio to work properly. Air enters the engine through the intake that leads to the combustion chambers (cylinders). If employers allow internal combustion engines in areas where flammable vapors or gases exist, then the vapors and gases can enter the cylinders of the engine along with the air. Additional flammable material in the cylinders provides an external fuel source and increases the fuel-to-air ratio in the engine.

Changes in the fuelto-air ratio create ignition hazards by:

- **Elevating engine operating temperatures.**

  Increasing the fuel-to-air ratio causes an increase in the energy output which results in increased surface and exhaust temperatures. Internal Combustion Engines as Ignition Sources Internal combustion engines present an ignition hazard when used in facilities

processing flammable liquids and gases. If flammable vapors or gases are released in these facilities, an internal combustion engine could ignite the flammable materials with catastrophic consequences. Investigations by OSHA and the U.S. Chemical Safety Board (CSB) document a history of fires and explosions at workplaces (oilfields, refineries, chemical plants, and other facilities) where an internal combustion engine was identified as or suspected to be the source of ignition.1 Increasing the fuel-to-air ratio also causes pre-ignition within internal combustion engines. Pre-ignition occurs when a fuel-rich mixture in the cylinder ignites before the spark plug fires. Pre-ignition creates damaging pressure surges and higher engine surface and exhaust system temperatures. If the temperature of the surface of the engine in contact with the fuel/air mixture reaches the autoignition temperature of that mixture, **a fire or explosion will occur.**

HOW TO PROTECT YOURSELF

Identify Ignition Sources

A list of the different types of ignition sources that identify ignition and fire hazards at your own worksite.

- Matches, cigarettes, cigarette lighters, flames, blow torches, gas appliances and heaters
- Welding and flame cutting equipment
- Static electricity generated by during fuel decanting and dispensing, clothing, or electronic equipment like mobile phones, thermostats, keyless remotes, light switches.
- Hand tools, machinery and equipment that generate sparks eg, grinders
- Operating plant and machinery that generates heat: boilers, steam pipes, engines, furnaces.
- Prevent Engines from Becoming Ignition Workplace Sources
- Identify areas where flammable liquids or gases are used or stored.
- Evaluate where internal combustion engines are located.
- Assess contractor use of internal combustion engines in flammable material areas. Whenever possible, do not install permanently-mounted internal combustion engines in areas where flammable vapors or gases could be present.

Four Rules for Safe Refueling:

1. Turn off engine
2. Don't smoke
3. Don't use your cell phone - leave it inside the vehicle or turn it off
4. Don't re-enter your vehicle during fueling.

FINAL TAKEAWAY

If employers cannot remove internal combustion engines from areas processing flammable materials, then preventive measures should be used. Which include administrative procedures for the safe use of portable or mobile equipment with internal combustion engines.

FINAL WORD

Naked flames and burning cigarettes are clearly ignition sources. But the use of mobile or cell phones may be the worst culprit because the cell phone / mobile phone is attached to the “hip” as an appendage to people.

QUIZ

1. **Naked flames or burning cigarette are obvious ignition sources but static electricity is a big cause of fires and explosions at workplaces.**

   - True
   - False

2. **Changes in the fuelto – air ratio do not cause an increase in the energy output in internal Combustion Engines.**

   - True
   - False

3. **Internal combustion engines can act as ignition sources whether fueled by gasoline, diesel, propane, natural gas, or other fuels.**

   - True
   - False

4. **Mobile phones that light up when switched on or when they ring do not release enough energy to provide a spark for ignition.**

   - True
   - False

WHAT WOULD YOU DO?

You have worked at a plastics and paint foundry for several years and know the dangers of open flames and static electricity.
Your direct supervisor, from time to time when he thought nobody would see him, smoked a cigarette. You confronted him about this. He got angry and threatened discipline. I need my job.

What would you do?

BEFORE THE TALK - TIPS

Before the Meeting Preparation Tips

- Pass around the attendance sheets.

Be prepared to discuss:

- Safe work practices and polices passed around pertaining to Ignition Sources during Fueling protocols and programs industry - wide and at your location.
- Proper reporting procedures relating to incidents, injuries, illnesses, fatalities, near misses / close calls including hazards and concerns at your location.

Other:

- Conduct a "walk-around" the jobsite before the safety talk meeting to get a first-hand look at the safety regimen.
- Lead a discussion with participants about safety hazards they have encountered on the jobsite.
- Invite an HR representative to the meeting for the purpose of explaining and laying out the case why it is critical to report immediately near-misses/close calls.
- What safety procedures or protocols the participants would recommend as a result of discussions of this safety meeting.
- Ask participants what safety problems or concerns they have noticed or observed on the jobsite since the last meeting.

AFTER THE TALK- *CHECKLIST*

PROVIDED FOLLOW-UP TO WORKERS THAT DID

POORLY ON THE QUIZ
NAME: _____
_____
DATE: _____

OBSERVED WORKERS
TASK(S): _____
_____
DATE: _____

REFRESHER TRAINING
TOPIC(S): _____
_____
DATE: _____

OTHER (DESCRIBE): _____
MEETING DATE: _____
LOCATION: _____

NOTES

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ANSWERS:

1. True

2. False

3. True

4. False

ATTENDANCE

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INSTRUCTOR: _____ **DATE:** _____

SAFETY TALK: _____