

In the concept of Fire Triangle, there are three elements to be present for fire to take place and continue, namely: oxygen, fuel and ignition source (or heat). Once oxygen and fuel are present, flammable material can be ignited by two ways:

- external ignition sources providing sufficient ignition energy
- increasing temperature to higher than auto-ignition temperature of flammable material



### Identify Ignition Sources

In process industries, fuel may be released in the case of equipment or piping failure, while oxygen is always available in the air. Hence identifying ignition sources and their appropriate isolation become critically important in terms of fire prevention and escalation.

While carrying out daily operation in process plant, one should be more sensitive to various types of potential ignition sources that may be present in surrounding areas. Some ignition sources are obvious to identify, while others are not so obvious. Figures below show some typical examples of ignition sources:



Open flame



Static electricity



Sparks



Hot surface (piping)



Vehicles



Chemical reactions



Lightning



Electrical equipment



Pyrophoric materials

### What can you do?

Most fires can be prevented. Process industries normally involve handling of flammable and combustible material, thus posing higher risk of fire and explosion. Such risks can be minimised through proper control of ignition sources.

- Strictly no open flame, no smoking in hazardous areas. Set up designated areas for hot work and smoking.
- Substitute work method to eliminate ignition source. For example, use of cold cutting technique instead of hot work.
- If hot work at hazardous area cannot be avoided, apply permit-to-work system to identify potential ignition source. Take adequate measures to isolate all ignition sources. For example, use of fire blanket to contain sparks.
- Inspect all electrical equipment before use. Do not overload electrical circuits and promptly report signs of electrical malfunction.
- Provide appropriate grounding to all equipment capable of generating static electricity.
- Beware of hot surfaces especially in the vicinity of handling of low auto-ignition temperature material. Provide proper insulation when necessary.
- Establish standard operating procedures and provide related training to workers involved in handling of pyrophoric material.

**Process Safety is Everybody's Responsibility!**

An initiative of the Process & Engineering Committee

**SINGAPORE CHEMICAL INDUSTRY COUNCIL LIMITED (SCIC)**  
 8 Jurong Town Hall Road, #25-04, The JTC Summit, Singapore 609434  
 Tel : 6267 8891 Fax : 6267 8893