ESD for Fired Heater

Part 1: Causes of fired heater trip

Trip of fired heaters is caused by the following:

- Manual panel trip
- Trip of the interlock sequence of the flue gas blower**:** If the flue gas blower shuts down, flue gas will accumulate in the furnace and create excessive over pressure.
- Trip of the interlock sequence of the combustion air blower: If the combustion air blower shuts down, the burners may extinguish and natural gas leaks to the furnace leading to explosion risk. Stop of combustion air blower may also create excessive vacuum in the furnace.
- Too high level in the natural gas KO drum: liquid must be avoided in fuel piping.
- Too low natural gas flow to fired heater: If the natural gas flow decreases, the heat absorbed by the endothermic reaction will drop correspondingly. As a result, the tubes in the fired heater and the fired heater outlet system could overheat.
- Low total flow of steam to feed gas.
- Too low combustion air pressure: If the combustion air pressure is too low, the burners may extinguish and natural gas leaks to the reformer furnace leading to explosion risk.
- Too low draught in furnace: If the pressure in the furnace increases above ambient pressure, hot flue gas (up to approximately 1200ºC) will leak out in numerous places. This presents a potential danger to personnel and/or damage to the steel casing of the fired heater.
- Too high draught in the furnace: Too high vacuum may damage the furnace casing and refractory.
- Too high temperature of flue gas inlet waste heat section may damage coils.
- Too high fuel gas pressure to fired heater: if the pressure in the fuel header gets too high, the furnace and the reforming tubes may overheat.
- Too low fuel gas pressure to fired heater if the pressure in the fuel header gets too low the burners may extinguish. Unburned natural gas may create an explosive mixture inside the furnace.
- Too low flow of start-up nitrogen to fired heater, if the nitrogen flow is too low during heating the tubes may overheat.

The following actions are carried out automatically:

1.Block process gas to the fired heater, close FV-X

2.Double block and bleed process gas to the fired heater, close USV-X

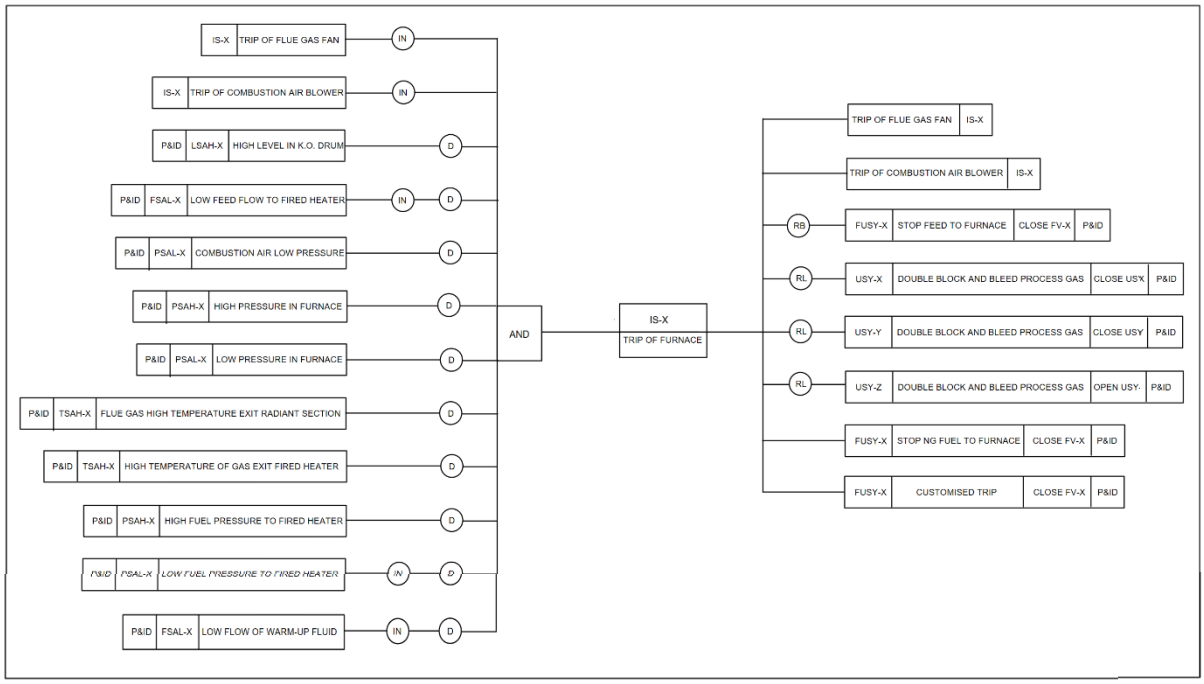
3. Double block and bleed process gas to the fired heater, close USV-Y

4. Double block and bleed process gas to the fired heater, open USV-Z

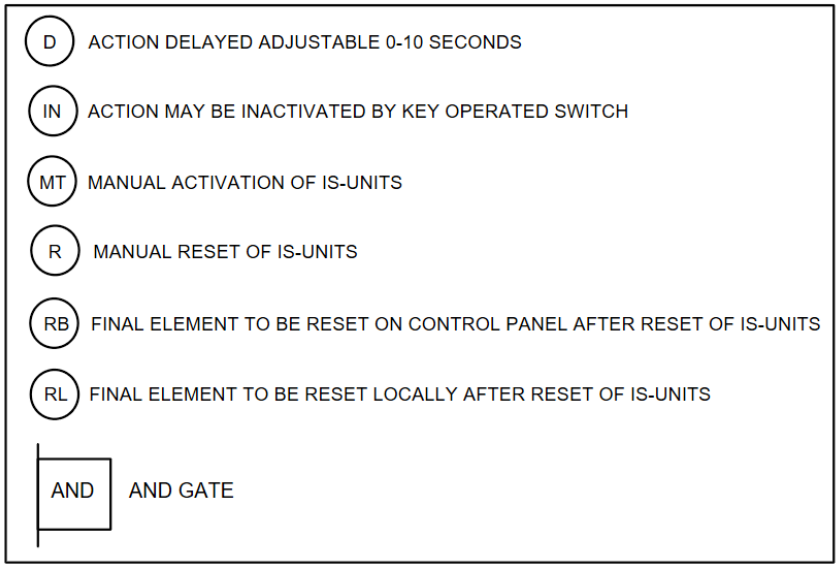
5.Stop combustion air flow, FIC-X

6.Close inlet guide vanes of flue gas blower, close PIC-X

7. Stop NG fuel-first fuel to the fired heater, close FV-X


IS-X TRIP OF FLUE GAS FAN IN
IS-X TRIP OF COMBUSTION AIR BLOWER IN
P&ID LSAH-X HIGH LEVEL IN K.O. DRUM D
P&ID FSAL-X LOW FEED FLOW TO FIRED HEATER IN D
P&ID PSAL-X COMBUSTION AIR LOW PRESSURE D
P&ID PSAH-X HIGH PRESSURE IN FURNACE D
P&ID PSAL-X LOW PRESSURE IN FURNACE D
P&ID TSAH-X FLUE GAS HIGH TEMPERATURE EXIT RADIANT SECTION D
P&ID TSAH-X HIGH TEMPERATURE OF GAS EXIT FIRED HEATER D
P&ID PSAH-X HIGH FUEL PRESSURE TO FIRED HEATER D
P&ID PSAL-X LOW FUEL PRESSURE TO FIRED HEATER IN D
P&ID FSAL-X LOW FLOW OF WARM-UP FLUID IN D
AND
IS-X TRIP OF FURNACE
TRIP OF FLUE GAS FAN IS-X
TRIP OF COMBUSTION AIR BLOWER IS-X
RB FUSY-X STOP FEED TO FURNACE CLOSE FV-X P&ID
RL USY-X DOUBLE BLOCK AND BLEED PROCESS GAS CLOSE USY P&ID
RL USY-Y DOUBLE BLOCK AND BLEED PROCESS GAS CLOSE USY P&ID
RL USY-Z DOUBLE BLOCK AND BLEED PROCESS GAS OPEN USY P&ID
FUSY-X STOP NG FUEL TO FURNACE CLOSE FV-X P&ID
FUSY-X CUSTOMISED TRIP CLOSE FV-X P&ID

Legend


D ACTION DELAYED ADJUSTABLE 0-10 SECONDS
IN ACTION MAY BE INACTIVATED BY KEY OPERATED SWITCH
MT MANUAL ACTIVATION OF IS-UNITS
R MANUAL RESET OF IS-UNITS
RB FINAL ELEMENT TO BE RESET ON CONTROL PANEL AFTER RESET OF IS-UNITS
RL FINAL ELEMENT TO BE RESET LOCALLY AFTER RESET OF IS-UNITS
AND AND GATE