Method Statement & Risk Assessment

Regenerative Thermal Oxidiser Start Up, Commissioning and Training Procedure.

Method Statement

RTO Start Up Procedure

This is the suggested start up procedure for the RTO Oxidiser. Events and conditions at start up may require deviation from this plan. However, the intent of the start up procedure should still be exercised to promote safe and proper operation of the equipment.

I. Initial Inspection and Mechanical Checks

This work is completed during the first days of the start up. Its purpose is to assure the equipment is properly installed, there are no missing parts or components, and to confirm no accidental events will occur when power is initiated.

- 1. Inspection
  Using the General Arrangement and P & I drawings,
  - Visually inspect the equipment and note any damaged or missing parts.
  - Check component specifications to determine if correctly supplied and note any that are not.
  - Check spec. and tightness of fasteners.
  - Remove any shipping hardware.

Risks:

1. Working at heights.
2. Use of ladders.
3. Use of hand tools.

Control measures:

1. See risk assessment TS06
2. See risk assessment TS07
3. See risk assessment TS01
• **2. Installation**

  Assure that equipment is properly installed.
  - Alignment and fastening of the main fan drive
  - All duct connections are fully bolted
  - Proper piping of burners
  - Supply of pilot gas and pressure
  - Fill of media
  - Door gaskets
  - Check alignment and rotation of mechanically driven valve system

  **Risks:**
  1. Working at heights
  2. Use of ladders
  3. Use of hand tools
  4. Working in confined space

  **Control measures:**
  1. See risk assessment TS06
  2. See risk assessment TS07
  3. See risk assessment TS01
  4. See risk assessment TS05

• **3. Power Off Electrical Check**

  - Check proper wiring of all components including the drive, damper positions, fuel train terminal boxes, transmitters and temperature detectors
  - Check for proper wiring to PLC and Panel view.
  - Check for tightness at all terminal points.
  - Check that dip switches, such as the PLC, are set correctly.

  **Risks:**
  1. Working at heights
  2. Use of ladders
  3. Use of hand tools
  4. Electrical testing and commissioning

  **Control measures:**
  1. See risk assessment TS06
  2. See risk assessment TS07
  3. See risk assessment TS01
  4. See risk assessment TS13
II. Power On Electrical Check

• 1. Initial Voltage Check
  o Turn on power, single disconnect or circuit breaker at a time, checking for proper voltage.
  o Check outputs of all voltage power supplies / converters to assure correct output.
  o Check output at step down transformer.

Risks:
  1. Use of hand tools
  2. Electrical testing and commissioning

Control measures:
  1. See risk assessment TS01
  2. See risk assessment TS13

• 2. Power Check
  o Go through electrical terminal strips and check voltage at wires using schematics to make sure voltage on specific wires.

Risks:
  1. Use of hand tools
  2. Electrical testing and commissioning

Control measures:
  1. See risk assessment TS01
  2. See risk assessment TS13
• 3. PLC Check
  o Check that illuminated Inputs and Outputs are correct.
  o Troubleshoot and repair, as needed any discrepancies to the design.
  o Test and observe all external inputs to assure proper PLC input is energised.

Risks:
  1. Use of hand tools
  2. Electrical testing and commissioning

Control measures:
  1. See risk assessment TS01
  2. See risk assessment TS13

• 4. Control Panel
  o Check panel operation. Assure that all screens are correct.
  o Preset PID loops as needed.

Risks:
  1. Use of hand tools
  2. Electrical testing and commissioning

Control measures:
  1. See risk assessment TS01
  2. See risk assessment TS13
• 5. Instrumentation Testing
  o Check all pressure transmitters for calibration. Using signal generator, send input from transmitter point to PLC. Observe PLC to assure proper signal received and utilised.
  o From PLC point, send signal to components using 4-20ma signal, such as dampers, to assure proper operation.
  o Test and set proximity switches.
  o Preset instrumentation to operational numbers

Risks:
  1. Use of hand tools
  2. Electrical testing and commissioning

Control measures:
  1. See risk assessment TS01
  2. See risk assessment TS13

• 6. Fans
  o Apply power to fan starters. Apply power to fan motors by bumping starters to check fan rotation

Risks:
  1. Use of hand tools
  2. Electrical testing and commissioning

Control measures:
  1. See risk assessment TS01
  2. See risk assessment TS13

• 7. AC Drives
  o Install AC Drive parameters. Using signal generator, start up drive. Check for rotation.

Risks:
  1. Use of hand tools
  2. Electrical testing and commissioning

Control measures:
  1. See risk assessment TS01
  2. See risk assessment TS13
8. Testing

- With all fans locked out, turn on RTO.
- Check that dampers cycle open / close.
- Allow mechanical valve operation. Check timing, limit switches, and smooth operation of stroke.

Risks:

1. Use of hand tools
2. Electrical testing and commissioning

Control measures:

1. See risk assessment TS01
2. See risk assessment TS13
III. Initial Air Flows

Initial airflow is to purge the RTO and establish the heat up condition.

- Preset purge timer, set PLC so fan speed is minimal, and start system.
- Check all relevant dampers to assure their proper position of purge.
- With AC Drive operating, adjust for 25% airflow and set proof of flow switch.
- Check all transmitter readings to actual.
- Adjust fan speed to test and set the minimum and maximum inlet negative pressure switches. Test switches and assure proper RTO response.
- Adjust fan speed for purge condition.
- Set process fan for minimum flow condition. With the combustion blower on, set combustion air. Adjust the actuator for the full range at 4-20ma. Reading the delta pressure.
- Test combustion air safety pressure switches.
- At purge complete, check voltages and make sure only correct places are energised.
- Let flame safeguards check for flame and flameout.
- Set purge timer for proper time

Risks:
1. Working at heights
2. Use of ladders
3. Use of hand tools
4. Electrical testing and commissioning

Control measures:
1. See risk assessment TS06
2. See risk assessment TS07
3. See risk assessment TS01
4. See risk assessment TS13
IV. Safety Switch testing and Burner Flame ignition

- Start up RTO and run to interlocks condition.
- Check that all dampers are correct and AC Drive has maintained heat up flow.
- Disrupt every safety switch to assure a loss of interlocks is obtained on a fault.
- Make sure the burner actuators are both at low fire and the linkage is disengaged. Set at control screen a temperature of 21° C (70° F). This will keep the burners at low fire.
- Make sure the combustion air is at low fire condition.
- Open the pilot gas manual valves and set the pilot interrupt timer for 15 minutes.
- Open the pilot manual valves and press for ignition. It may take several attempts to bleed the line of air and allow the gas to ignite.
- Once the pilot gas is achieved, adjust the pilot gas pressure and orifice cock for a smooth, steady blue flame. Observe flame through the burner sight port.
- Turn off the pilot manual valves and watch that the flame goes out. The flame safeguard should trip.
- Cycle on / off several times to assure pilot relights.
- Turn on flame.
- Adjust the drive for maximum airflow without shutting down the unit.
- Check the pilot for strength, turn off and relight several times.
- Reset pilot interrupt timer.
- Start flame again and allow pilot to automatically turn off. Adjust minimum flame again for small and steady flame.

Risks:

1. Use of hand tools
2. Electrical testing and commissioning

Control measures:

1. See risk assessment TS01
2. See risk assessment TS13
V. Heat Up and Idle Modes

1. Heat Up Mode
   - RTO is heating up, check that the ramp rate is working properly.
   - Make sure ALL dampers are in correct position.
   - Keep dryer off line or any ready signal disconnected so that when the RTO is READY, the RTO will go to IDLE mode.
   - Check main fan motor vibration and temperature sensors.
   - During Heat Up, check in PLC that duct inlet pressure signal is received and prepare to control the AC Drive via inlet pressure

Risks:

1. Use of hand tools
2. Electrical testing and commissioning

Control measures:

1. See risk assessment TS01
2. See risk assessment TS13

2. Heat Up Mode
   During Idle Mode, the RTO continues to receive air through the Fresh Air inlet. Prevent dryer operation from influencing RTO at this time. Prevent secondary heat up at this time.
   - Allow RTO to maintain the idle minimum temperature.
   - Check air flow in idle mode

Risks:

1. Use of hand tools
2. Electrical testing and commissioning

Control measures:

1. See risk assessment TS01
2. See risk assessment TS13
VI. Normal Operation and Low Volume Operation

The dryers should now be in the operating mode and prepared to exhaust to the RTO. If not previously done, check all the dryer – RTO interconnects. RTO should be at READY.

- Start Process Exhaust air. Confirm proper exhaust flow if not already done so.
- Set the Suction control pressure as desired. Test suction control for steady operation.
- After the process and RTO systems are operating steady, try to bring down the dryer exhaust to a low volume. Check the operation of the Fresh Air damper. Test the low flow control loop.
- Record all airflow readings, pressures and temperatures.

Risks:

1. Use of hand tools
2. Electrical testing and commissioning

Control measures:

1. See risk assessment TS01
2. See risk assessment TS13
VII. Shutdown

With the process off, check RTO operation to assure all is operating normally. Check the PLC program that proper shutdown temperatures are set. Turn off the RTO. Check:

- Fresh air damper is full open to atmosphere
- Main exhaust fan is at correct flow
- Burner is at low fire position
- All other dampers are fully closed

Risks:

1. Use of hand tools
2. Electrical testing and commissioning

Control measures:

1. See risk assessment TS01
2. See risk assessment TS13
VIII. Final Checks

- Observe the total operation, adjusting the RTO controls for smooth operation.
- Check and record the sustain in / out set points
- Make final check of all safety devices for proper performance and setting.
- Make sure all weather protection and safety covers are installed.
- Inspect fan lubrications.
- Make sure protective screens are installed around valve drive mechanism

Risks:

1. Use of hand tools
2. Electrical testing and commissioning

Control measures:

1. See risk assessment TS01
2. See risk assessment TS13

IX. Training

Train operators and maintenance personnel, as outlined in the attached training procedure.
Risk Assessment TS01

Activity covered by this assessment
Use of hand tools

Significant Hazards
Eye injuries
Injuries to hands, feet and body

Persons at Risk
Those using the tools
Those in the immediate area

Risk Level
Medium

Control Measures
1. Tools provided will be assessed to ensure they are fit for the purpose and the environment in which they are to be used. Tools will be used only for the purpose for which they were intended. The user must ensure that the tools are in good condition and safe to use before commencing work
2. The appropriate PPE will be used i.e. eye protection, protective gloves, overalls and protective footwear
3. Sharp instruments such as knives and screwdrivers are to be carried and used so as not to cause injury to others
4. All persons using hand tools will be suitably trained in the correct method of use

Residual Risk
Low
Risk Assessment TS05

Activity covered by this assessment:

Working in confined spaces

Significant Hazards

Poisoning from toxic gases
Asphyxiation
Accidental contact with hazardous substances
Access difficult to render assistance in the event of an accident

Persons at Risk

All persons entering the confined space

Risk Level

High

Control Measures

1. Permit to work to be used to control entry into confined spaces
2. Ventilated welding face mask to be worn by welder (if welding is taking place)
3. Overalls and welding gloves to be worn by welder (if welding is taking place)
4. A standby man will be used at all times
5. A rope will be tied around the waist of the welder in order to drag him out of confined space in the event of an incident (if welding is taking place)
6. All covers and hatches will be removed in order to give natural ventilation

Residual Risk

Medium
Risk Assessment TS06

Activity covered by this assessment

Working at heights

Significant hazards

Persons falling
Equipment or materials falling

Persons at risk

Those working at height
Persons working or moving below the work area

Risk level

High

Control measures

1. Suitable safe access is provided to the high level work area
2. All equipment is provided and maintained to the required legal standard
3. Suitable signs and barriers are positioned below the work activity warning of overhead operations
4. Area above the work activity will be checked for hazards i.e. power lines
5. Edge protection will be provided for all activities over 2 metres
6. Where edge protection is not reasonably practicable, harnesses will be worn by all personnel at or near the edge
7. Where there is a likelihood of falling debris, barriers will be placed to prevent access into the danger area
8. All equipment will be checked to ensure it is in good order and in date for inspection before use
9. Training and instruction will be provided to all those required to use harnesses

Residual Risk

Low
Risk Assessment TS07

Activity covered by this assessment

Use of ladders

Significant Hazards

Persons falling from ladders
Ladder slipping
Objects dropped by ladder user

Persons at Risk

Those using the ladder
Those within the immediate vicinity of the ladder

Risk Level

High

Control Measures:

1. Ladders will be used only for tasks which they are suitable. Care will be taken to ensure the ladders are stable and secure before use
2. Before using ladders risks which arise from the environment must be assessed and controlled. These include overhead power lines, high winds, vehicle traffic etc
3. Ladders will be inspected at regular intervals and maintained in good working order and repair
4. All those who use ladders will have received adequate training in the health and safety aspects of the equipment and its use
5. Ladders will be used only on a firm level surface, they will be secured at the top and will always be footed when being secured
6. Ladders will extend 1.05 meters above the platform unless a suitable handhold is available. The ladder will rest on a suitable solid surface at an angle of approximately 75 degrees
7. Ladders are for people access, they will not be used to carry heavy materials to the place of work or be used as a work platform

Residual Risk

Medium
Risk Assessment TS13

Activity covered by this assessment

Electrical testing and commissioning

Significant hazards

Electrocution
Burns
Fire

Persons at risk

Those testing and commissioning.
Others in the immediate area.

Risk level

Medium

Control measures

1. Only authorised and competent electricians who have been trained in the IEE wiring regulations 16th edition and the requirements of the Electricity at Work Regulations 1989 will carry out the testing and commissioning and they will be provided with all the information relevant to the work.

2. Suitable, calibrated test equipment will be used for testing and commissioning.

3. Before work begins all switch rooms will be cleared of loose materials and all temporary installations removed. All equipment guards, doors and covers will be fitted.

4. Liaison with other contractors / employees will take place before work begins in order to make everyone aware of the work taking place, Where appropriate a permit to work will be used.

5. All circuits to be worked on will be treated as live until verified dead. There are no exceptions to this requirement.

Residual Risk

Low
REGENERATIVE THERMAL OXIDIZER
TRAINING

General Overview
- Regenerative Oxidizer Theory of Operation
- Operating Characteristics
- Equipment Advantages

Principle of Operation
- Air Flows and Flow Diagram
- Valve Operation
- Burner / Fuel Train Operation, Sustain

Sequence of Operation
- Start Up Mode
- Purge Mode
- Heat Up Mode
- Idle Mode
- On Line Mode
- Standby Mode

Identification of Screens and Controls
- Main Screen Information
- Burner Screen and Control Loop
- AC Drive / Volume Control Screen and Control Loop
- Recirculation Volume Damper Control Screen and Control Loop (optional feature)
- Recirculation Temperature Damper Control Screen and Control Loop (optional feature)
- T Damper Status
- Oxidizer Status

Faults, Fault History, and Maintenance Routines
- Location and Explanation of Fault History Screen
- Explanation of Faults
- Maintenance Information and Requirements

Question / Answer Session