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## **B.5 RTO Burners**

B.5.0 The RTO is equipped with two burners in its combustion chamber with one of the burners mounted in tower#2 and the other mounted in tower#4. The burners are used for preheating the unit to oxidation temperatures, and maintaining the unit at oxidation temperatures during periods at very low levels of solvent concentration in the process stream.

*Note: During self-sustaining periods of operation the burners, fuel trains, and combustion blowers will be shut-off to minimize utility consumption.*

B.5.1 These burners are manufactured by Eclipse. They are packaged, refractory-less air burner incorporating nozzle mixing with an block and holder assembly.

B.5.1.1 The clean burning design of the Eclipse Ratiomatic burner allows emissions of NO<sub>x</sub>, CO, and aldehydes to be extremely low.

B.5.1.2 The burner's fast mixing nozzle has a unique geometry that provides a clean, stable flame at all firing rates. The burner firing tube can operate with cross flows at 3000 FPM.

B.5.1.3 The burner's nozzle placement and construction releases heat directly into the combustion chamber.

B.5.1.4 The burner's nozzle burns natural gas, propane or propane/air mixtures without requiring internal burner changes in order to switch fuels.

B.5.1.5 *Only qualified maintenance personnel familiar with the construction and operation of this type of burner equipment and the hazards involved should service and / or maintain it.*

B.5.2 Each burner has a maximum output capacity of 10,000,000 BTU and a turndown ratio of 40:1.

B.5.2.1 Customer's fuel supply piping must be sufficiently large to flow the maximum capacity at the rated pressures. Clean fuel lines are essential to prevent blockage of fuel ports within the burner.



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Dirty fuel lines may require the use of special filters.

- B.5.2.2 To achieve rated capacities, a Ratiomatic burner must be adjusted to give specific air and gas differential pressures

**Note:** *Do not make burner setting adjustments without consulting Dürr Environmental, Inc. first. Misadjustment will have a detrimental effect on the burner's operating characteristics.*

- B.5.3 The air-gas nozzle of the Ratiomatic burners also serve as an air and fuel mixing device and are equipped with integral combustion blowers for air supply.

- B.5.3.1 The blower assemblies are rated for a delivery of 2200 CFM each.

- B.5.3.2 The blowers are direct driven by a 10 HP, 3600 RPM, 460 Volt, 3 Phase, 60 Hz, TEFC electric motor.

- B.5.3.3 The blower is equipped with an inlet filter. Periodically inspect the blower filter for dirt built-up which can reduce air flow. Appropriate action would be to clean and wash or change filter before blower performance deteriorates.

- B.5.3.4 The burner's firing rate or ratio of combustion air and fuel mixture is controlled by the position of a modulating control motor which is direct coupled to an air control butterfly valve which is integrally mounted in the burner.

**Note:** *If necessary during self-sustaining periods of operation with the burner and combustion blower off, the air control valve can be automatically driven to a partially open position to allow the negative chamber pressure to draw enough air in to cool the burner housing.*

- B.5.3.5 The air control butterfly valve's position is monitored by a Microswitch cam-actuated limit switch to indicate 'Low-Fire Position'.



B.5.3.6 The change in air pressure caused by the movement of the butterfly valve is transmitted via a loading line to a gas Ratio Regulator which changes the amount of gas flow in proportion to the loading air pressure.

Note:        *Higher Pressure = more gas*  
                  *Lower Pressure = less gas*

B.5.3.7 The burner flame is sensed by a Ultra Violet light Scanner . The UV Scanner generates a signal which goes back to the flame relay. Loss of this signal will shutdown the burner and the fuel train.

B.5.4 Each RTO burner is equipped with its own integral IRI approved, single block fuel train.

B.5.4.1 The gas supply to the fuel train's main regulator should be a minimum of 5 PSIG. The main gas regulator should be adjusted to regulate the gas pressure to between 20 and 24"wc for proper fuel train and burner operation.

B.5.4.2 There is a separate pilot gas pressure regulator. Do not adjust the pilot pressure setting below 8" wc. The pilot solenoid for burner ignition is mounted in close proximity to the burner to minimize ignition problems.

B.5.4.3 The gas Ratio Regulator (Proportionator Valve) has a low fire gas adjustment that is factory set for most applications, however it can be field adjusted if necessary.

**Warning:**

**Do not operate a Ratiomatic Burner with less than 24" wc gas inlet pressure. Lower gas Inlet pressures may cause the ratio regulator to remain fully open as the burner turns down from high fire causing excess fuel operation and the possible accumulation of unburned fuel in the combustion chamber. In extreme cases this may cause an explosion or fire.**

B.5.5 The burners and their respective fuel trains are mounted in weatherproof enclosures.



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B.5.5.1 All fuel train components are wired to terminal boxes in the enclosure.

B.5.6 Safety devices incorporated into the RTO burner control system protect against:

- High Temperature
- High Gas Pressure
- Low Gas Pressure
- Flame Failure
- Loss of Combustion Air
- Loss of Exhaust Air
- Not at low fire switch(modulating air valve actuator problem)
- Combustion blower MOL trip
- Combustion blower disconnect open
- Burner blocking valves failed to open/close
- Low temperature for gas injection operation

Project 22447  
A.R.E. Inc.  
System Operation Matrix

| Operating Conditions      | RTO ISOLATE DAMPER | RTO FRESH AIR DAMPER | RTO HYD. PUMP | RTO TOWER DAMPERS (60Sec)                                | RTO LUBE PUMP | RTO EXHAUST FAN                         | RTO COMB. BLWR1 | RTO BURNER# 1 | RTO GAS VALVE#1 POSITION | GAS INJ1 VALVE POSITION | RTO COMB. BLWR2 | RTO BURNER# 2 | RTO GAS VALVE#2 POSITION | GAS INJ2 VALVE POSITION | System Alarm | Limit Set Point                    |
|---------------------------|--------------------|----------------------|---------------|----------------------------------------------------------|---------------|-----------------------------------------|-----------------|---------------|--------------------------|-------------------------|-----------------|---------------|--------------------------|-------------------------|--------------|------------------------------------|
| RTO Fresh Air Pugging     | CLOSED             | OPEN                 | ON            | Sequencing (60Sec)                                       | ON            | on, min speed, 15hz on, min speed, 15hz | ON              | OFF           | CLSD 0%                  | CLSD 0%                 | ON              | OFF           | CLSD 0%                  | CLSD 0%                 | No           | 5MINUTES                           |
| RTO Warming Up            | CLOSED             | OPEN                 | ON            | Sequencing                                               | ON            | on, min speed, 15hz                     | ON              | ON            | Modulating               | CLSD 0%                 | ON              | ON            | Modulating               | CLSD 0%                 | No           | 400 Deg F/hr                       |
| RTO Normal Operation      | OPEN               | CLOSED               | ON            | Sequencing                                               | ON            | modulating                              | ON              | ON            | Modulating               | CLSD 0%                 | ON              | ON            | Modulating               | CLSD 0%                 | No           | 1500 Deg F                         |
| RTO on Gas Injection      | OPEN               | CLOSED               | ON            | Sequencing                                               | ON            | modulating                              | OFF             | OFF           | 0% Modulating            | 0% Modulating           | OFF             | OFF           | 0% Modulating            | 0% Modulating           | No           | 1500 Deg F                         |
| RTO On-line Bakeout       | OPEN               | CLOSED               | ON            | Sequencing (4tower, other on outlet until bp sp reached) | ON            | modulating on, min speed, 15hz          | ON              | ON            | 0% CLSD 0%               | 0% CLSD 0%              | ON              | OFF           | 0% CLSD 0%               | 0% CLSD 0%              | No           | LOWER BED SP=5000degF CC>150 Deg F |
| RTO Cool Down Operation   | CLOSED             | OPEN                 | ON            | Sequencing                                               | ON            | speed, 15hz                             | ON              | OFF           | CLSD 0%                  | CLSD 0%                 | ON              | OFF           | CLSD 0%                  | CLSD 0%                 | No           | CC < 150 Deg F                     |
| RTO Shut Down             | CLOSED             | OPEN                 | OFF           | ALL CLOSED                                               | OFF           | OFF                                     | OFF             | OFF           | CLSD 0%                  | CLSD 0%                 | OFF             | OFF           | CLSD 0%                  | CLSD 0%                 | No           |                                    |
| B910 SYSTEM SHUTDOWN FLTS |                    |                      |               |                                                          |               |                                         |                 |               |                          |                         |                 |               |                          |                         |              |                                    |
| B910 Control Power Off    | CLOSED             | OPEN                 | OFF           | ALL CLOSED                                               | OFF           | OFF                                     | OFF             | OFF           | 0% SPRNG 0%              | 0% SPRNG 0%             | OFF             | OFF           | 0% SPRNG 0%              | 0% SPRNG 0%             | Yes          | 1:10:0                             |