

CLEAN TECHNOLOGY INITIATIVE
IN
SMEs CLUSTER

BY:

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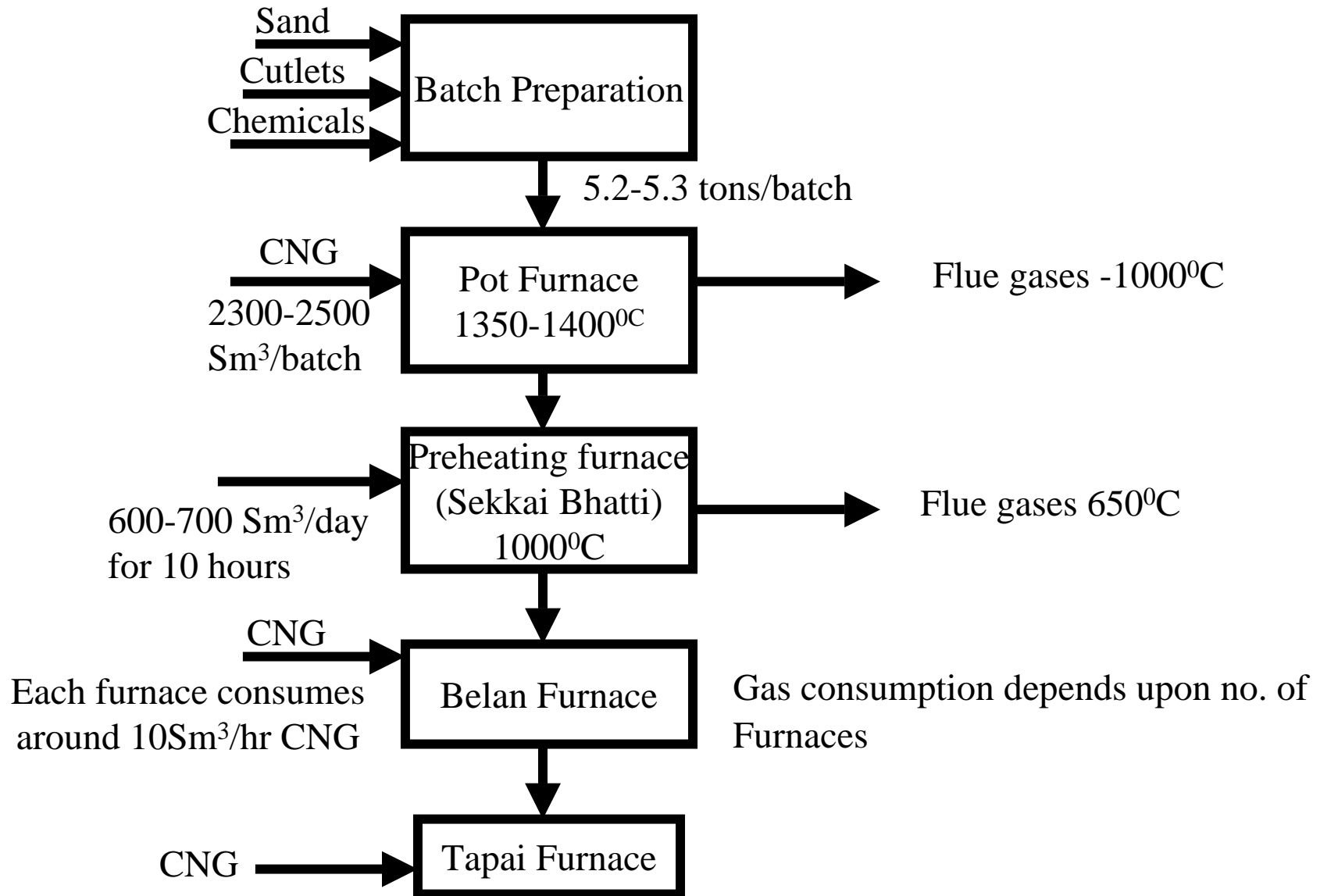
ABOUT THE CLUSTER

- Firozabad city has 400 glass manufacturing units situated 250 km from New Delhi and 40 km from Taj Mahal



- Previously units were using coal, Which emits lots of air pollution effecting the color of White Marble of Taj Mahal.
- To protect the monument, all the units have been asked to switch over to Compressed Natural Gas (CNG).

BANGLE MANUFACTURING PROCESS

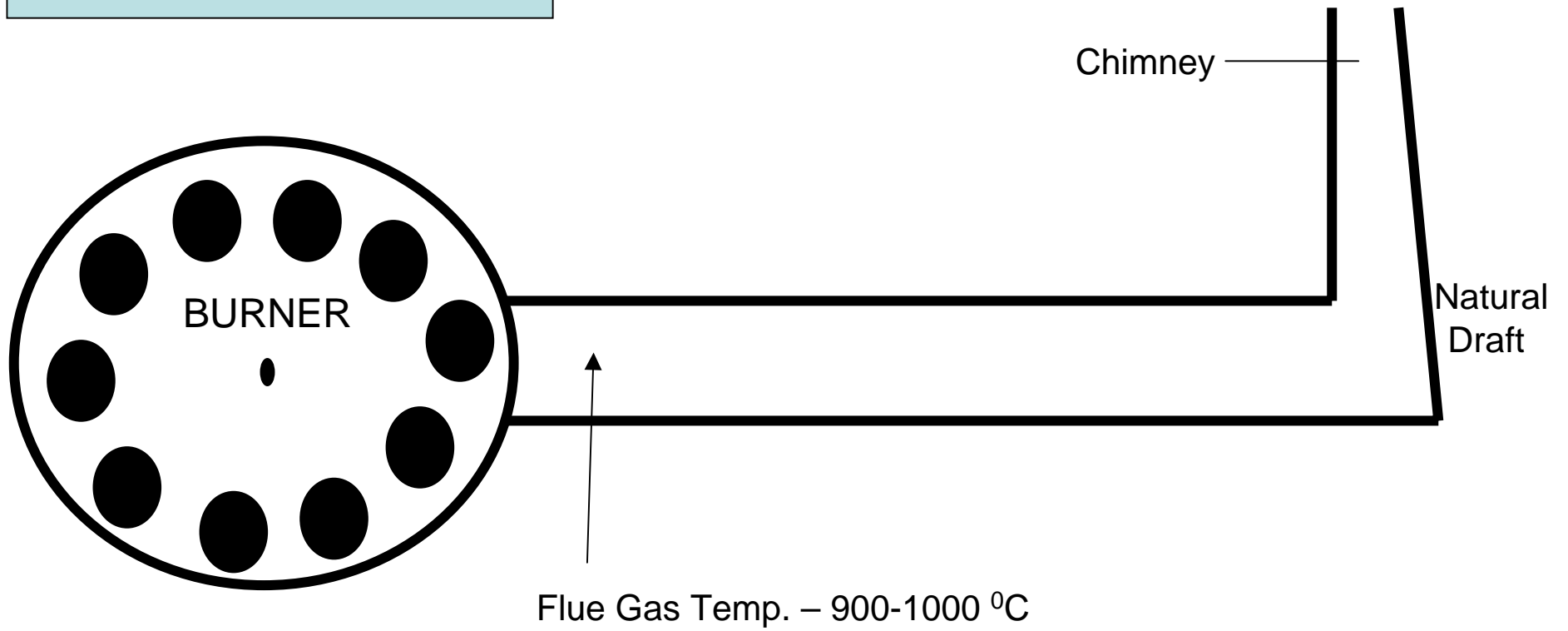




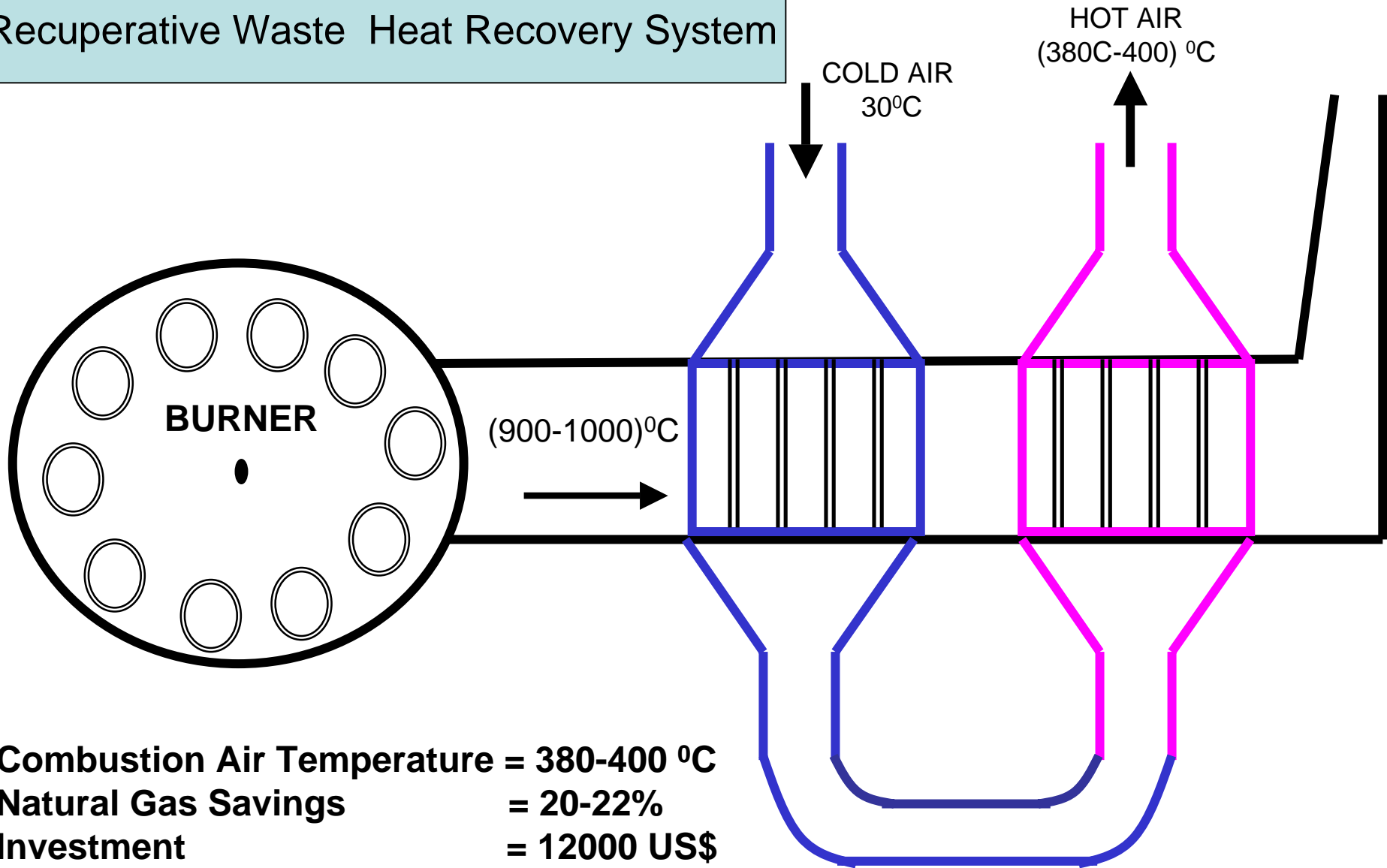
FOCUS AREA-I

- **Glass Melting Pot Furnace:-**
 1. No. of Furnaces – 200 nos operating continuously
 2. Average Glass Melting per day – 5.3 tons
 3. Average Natural Gas Consumption per–2200 Sm³/Furnace
 4. No. of Working day in a year – 300
 5. Furnace Temperature – 1380-1400⁰C
 6. Flue Gas Temperature – 1000⁰C (Average)
 7. Annual CNG Consumption – 132 million Sm³
 8. Cost of CNG/year – 26.4 million US \$ (0.2 \$/Sm³)
 9. GHG Emission – 310,068 tons/yr

Existing System



Recuperative Waste Heat Recovery System



Combustion Air Temperature	= 380-400 °C
Natural Gas Savings	= 20-22%
Investment	= 12000 US\$
Annual Gas Savings	= 132000 Sm³
Monetary Savings	= 26400 US \$
Simple Pay Back Period	= 5.5 Months

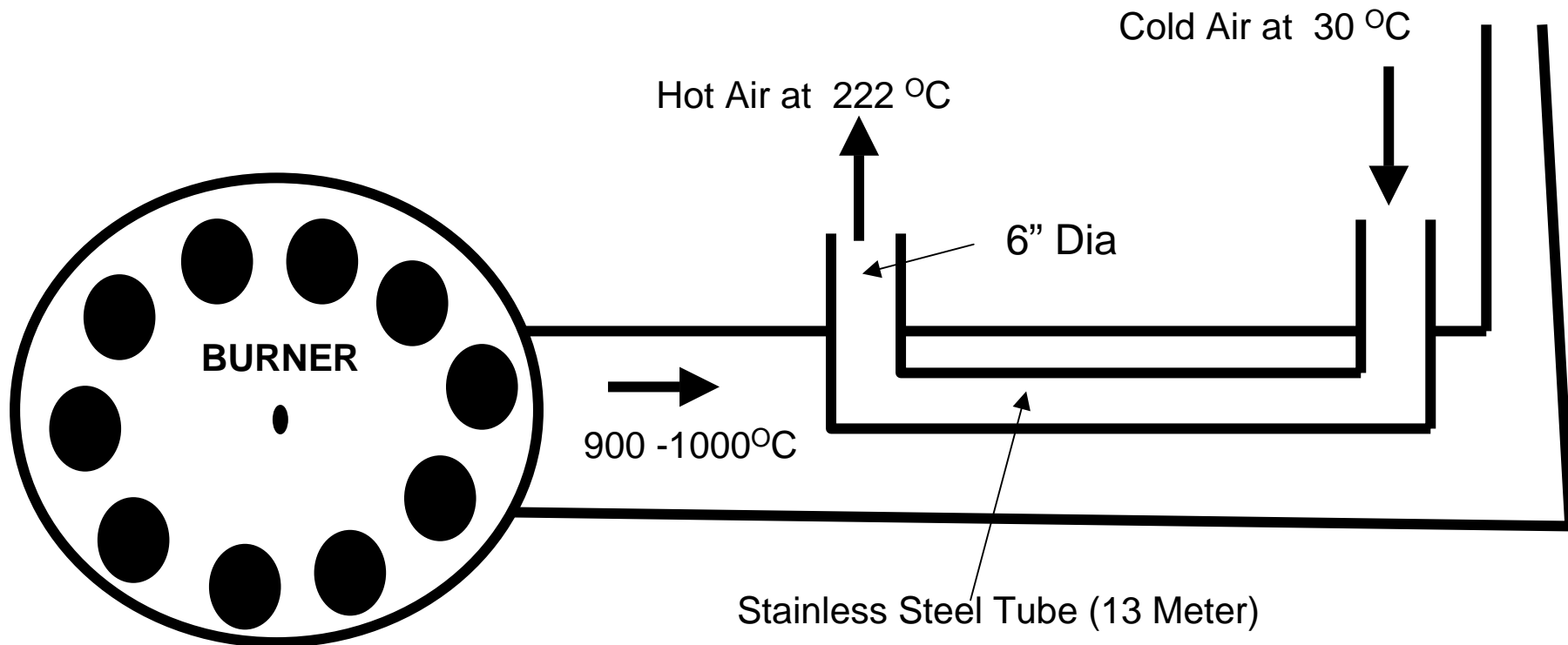
Advantages Of Waste heat Recovery in Pot Furnace

- The combustion air can be preheated to a higher temperature
- As the combustion air temperature is high more fuel economy can be achieved
- Cycle time for melting and refining will be reduced.

Disadvantages Of Recuperative Waste Heat recovery system in Pot Furnace

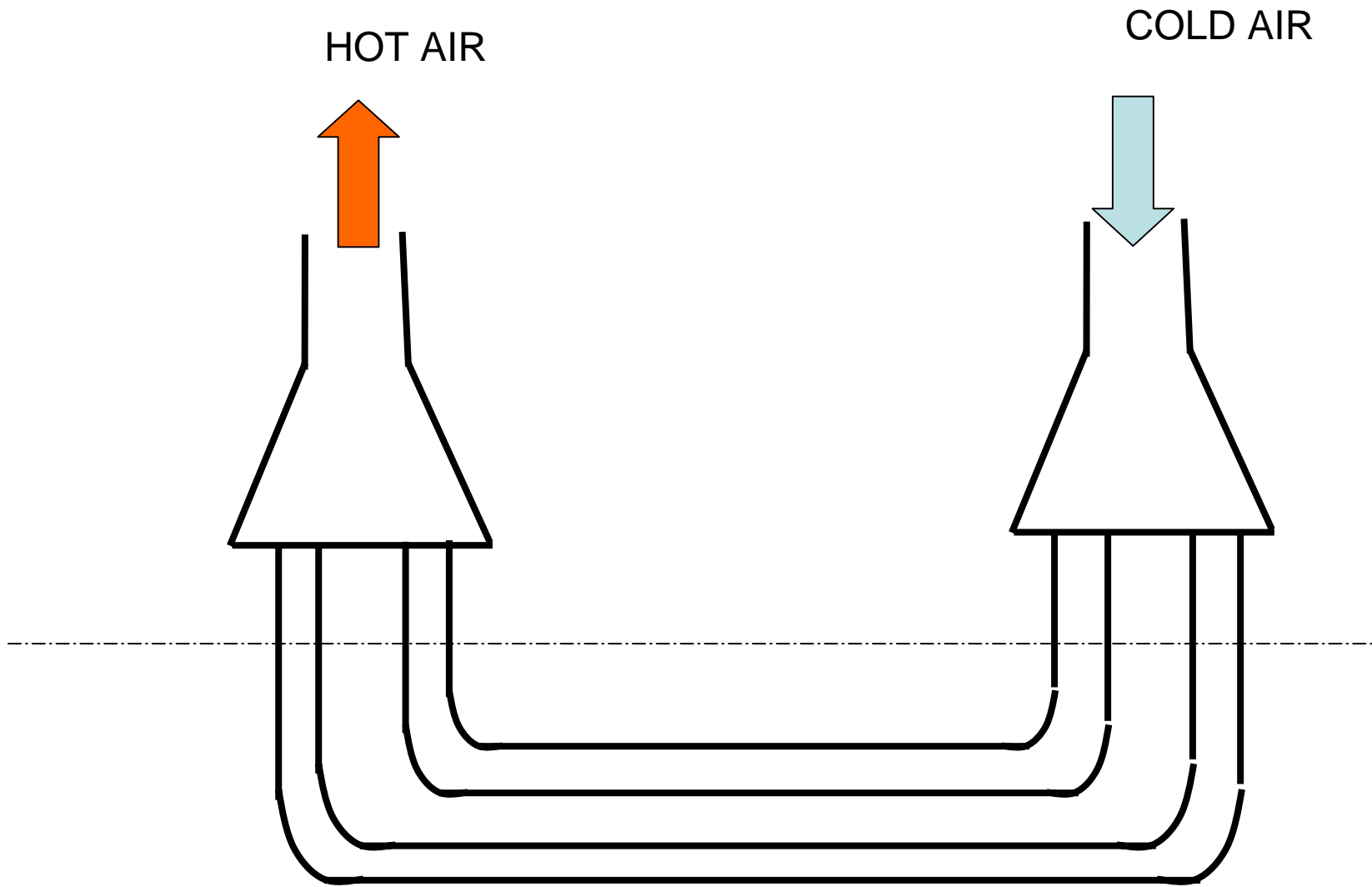
- Being in small scale industry, the initial capital investment is high.
- Entrepreneurs feel that furnace operates under natural draft and carryover of glass will deposit on recuperative tubes affecting the draft condition. It is also a general feeling that excessive positive pressure inside the furnace will reduce the pot life.
- For cleaning of heat transfer area the flue duct is to be cooled down and mechanical cleaning is required. In order to clean the tubes a by pass arrangement for flue gases is required

Modified Waste Heat Recovery System



Techno-Economies

Gas Consumption	= 2200Sm ³ /day
Gas Savings	= 10% (Approx.)
Annual Gas Savings	= 2200 x 0.1 x 300 x 0.2
	= 13200 US\$
Investment	=2000 US \$
Simple Pay Back	= 1.8 month
heat Transfer Area	= 6 m ²



Area – 2 Pipes 4" Diameter & 13 meter length = 8 m²

- 3 Pipes, 4" Diameter & 13 meter length = 12 m²

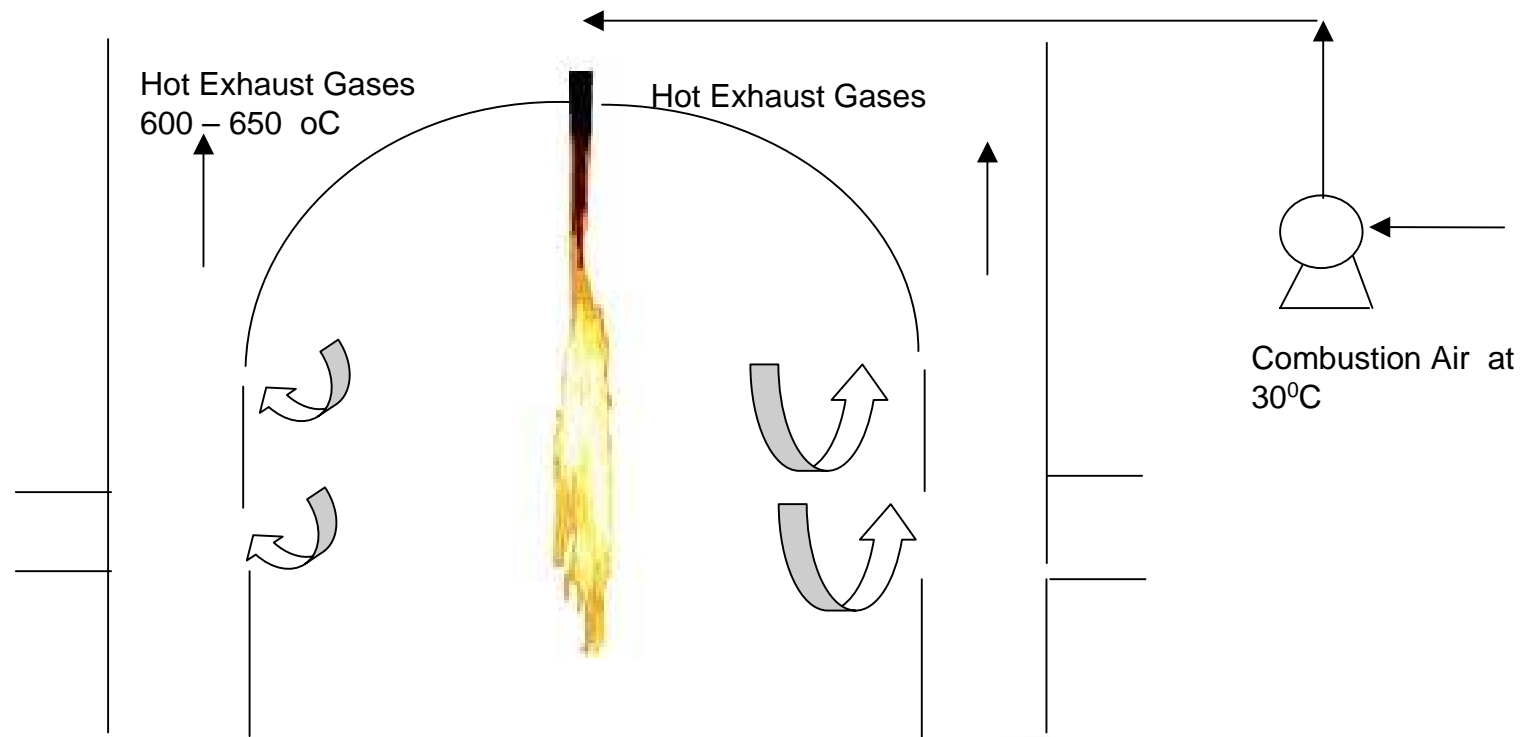
Advantages Of Modified Waste Heat Recovery System

- It is low cost and simple to construct the device.
- Need not required to close the furnace for longer duration.
- Easy for cleaning carry over material and the deposits can be cleaned even during the operating time.
- Not affecting the draft condition.

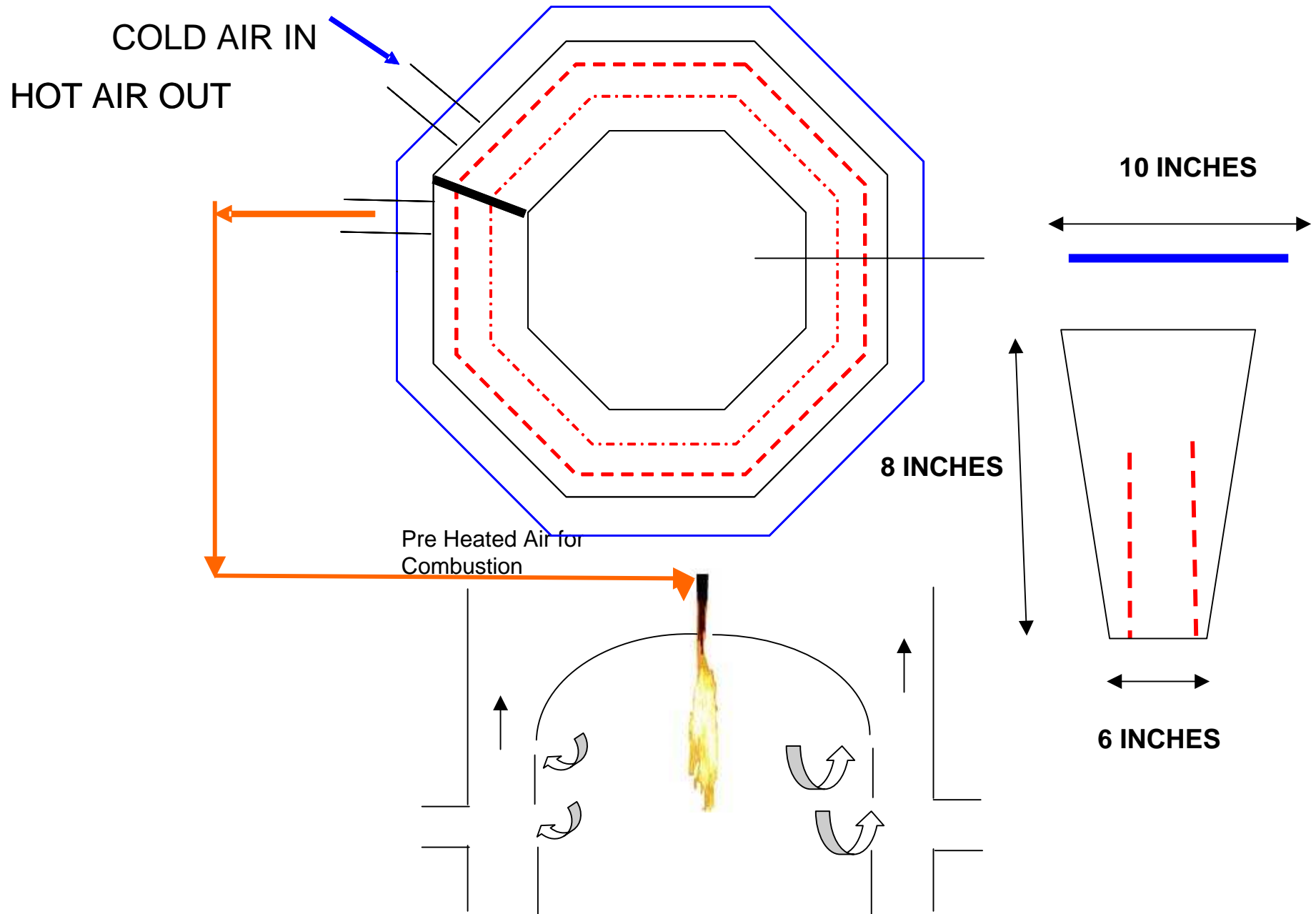
FOCUS AREA-II

- **Pre-Heating Furnaces**
 1. No. of Furnaces – 200 nos operating 10hrs/day
 2. Glass processing per day – 5.3 tons
 3. Natural Gas Consumption per day – 700 Sm³/Furnace
 4. No. of working days in a year – 300
 5. Furnace Temperature – 900-1000⁰C
 6. Flue Gas Temperature – 650⁰C
 7. Annual CNG Consumption – 42 million Sm³
 8. Cost of CNG – 8.4 million US\$ (0.2 \$ / Sm³)
 9. GHG emission – 98,658 tons/yr

PRE HEATING FURNACE (SIKKAI BHATTI) – EXISTING SYSTEM



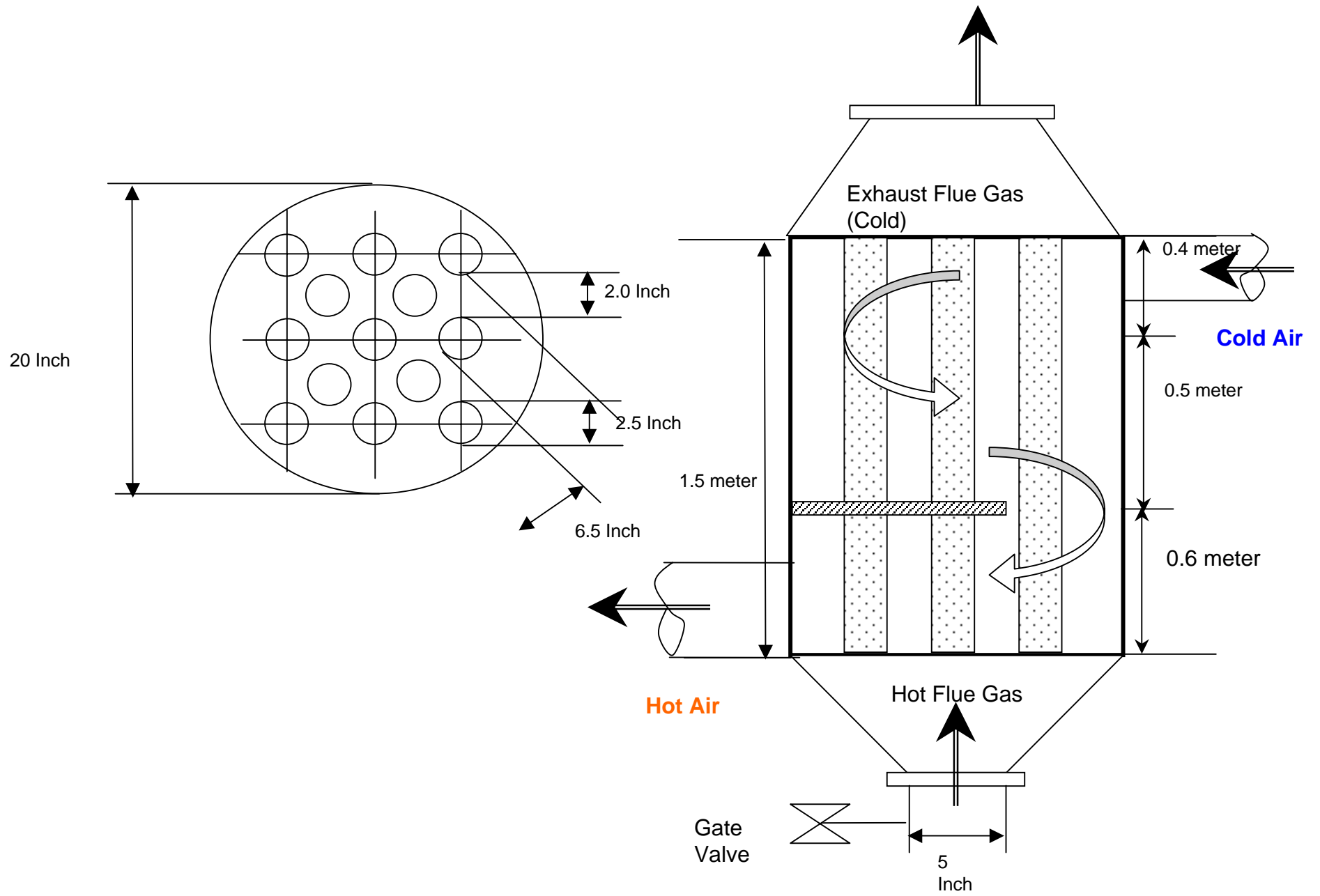
MODIFIED SYSTEM OF PREHEATING FURNACE



FOCUS AREA –III

Waste Heat Recovery From Gas Generators

- All the units at Firozabad Glass Industry cluster has captive power generation from natural gas operated generators. It is estimated that there are nearly 300 generators in the cluster and average flue gas temperature is in the vicinity of 520⁰C.
- As most of the generators are operating during production process, it is proposed to recover the waste heat for preheating combustion air which is used for natural gas combustion. The areas where the hot combustion air can be used are given below:
 - ❖ In bangle manufacturing units the preheated combustion air can be used for pot furnace, Sikkai Bhatti and Tapai Bhatti
 - ❖ In regenerative tank melting furnace the secondary air can be preheated.



THANKS