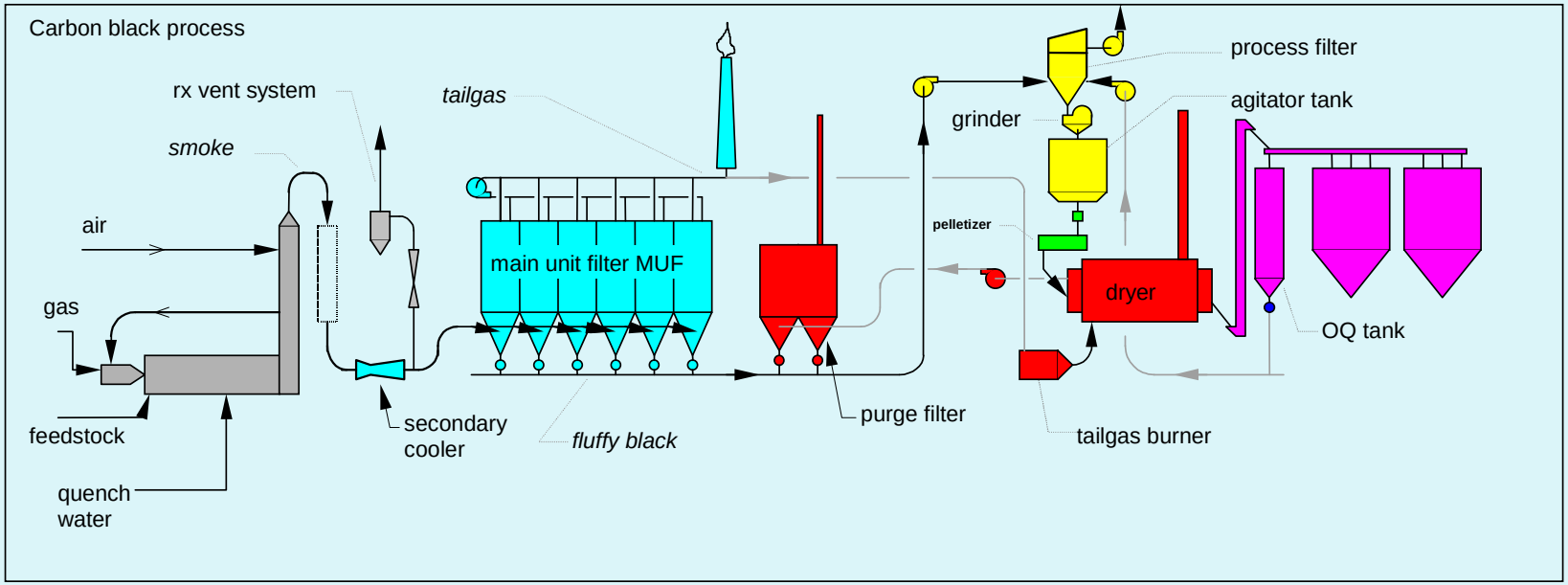
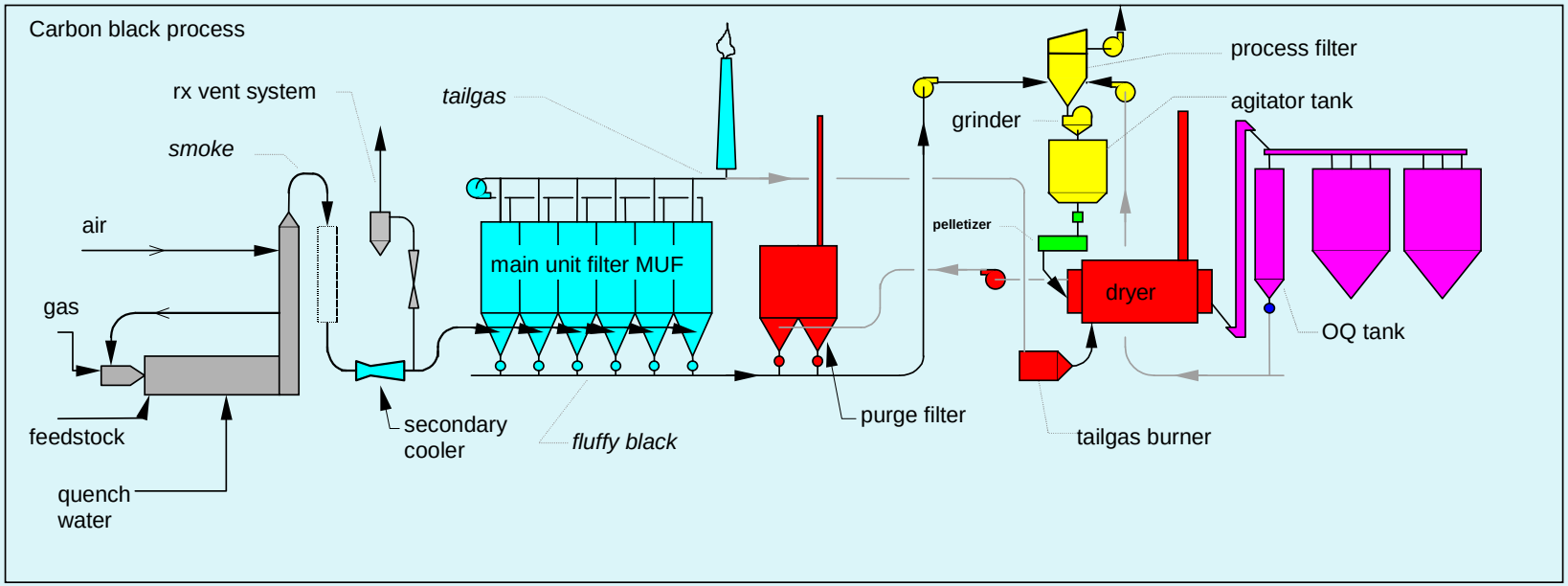
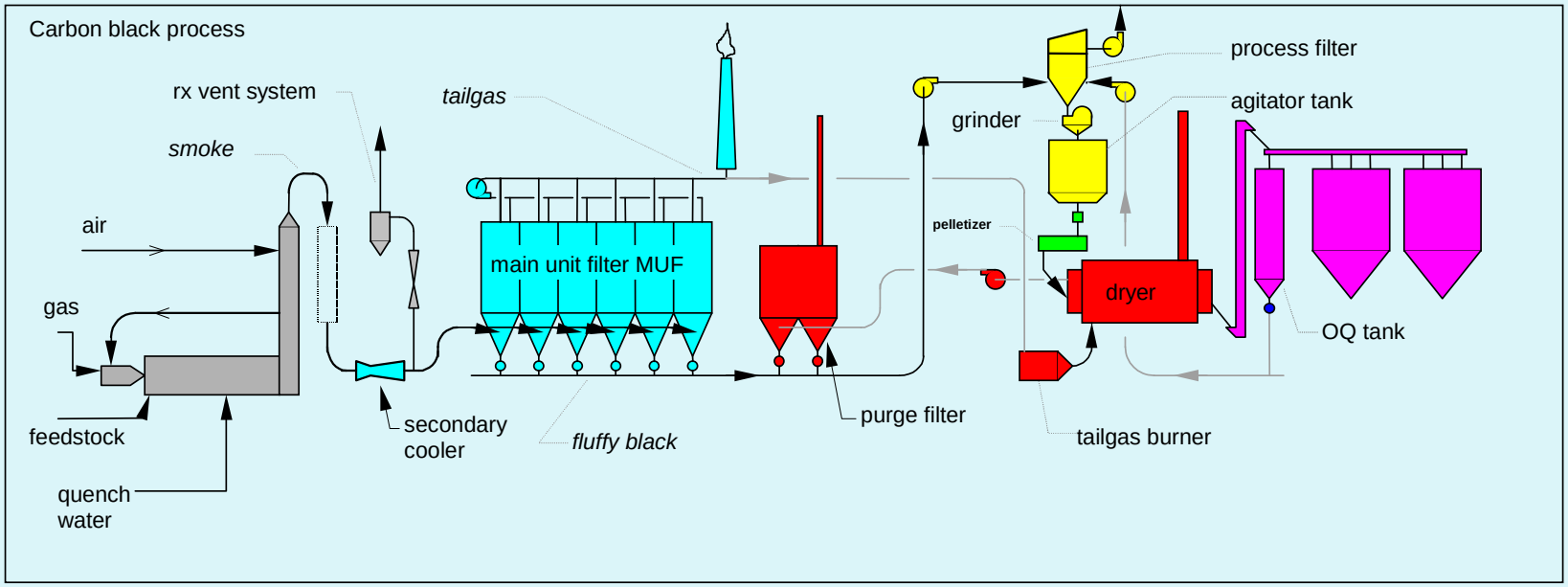
CARBON BLACK DRYERS

Typical Carbon Black Unit

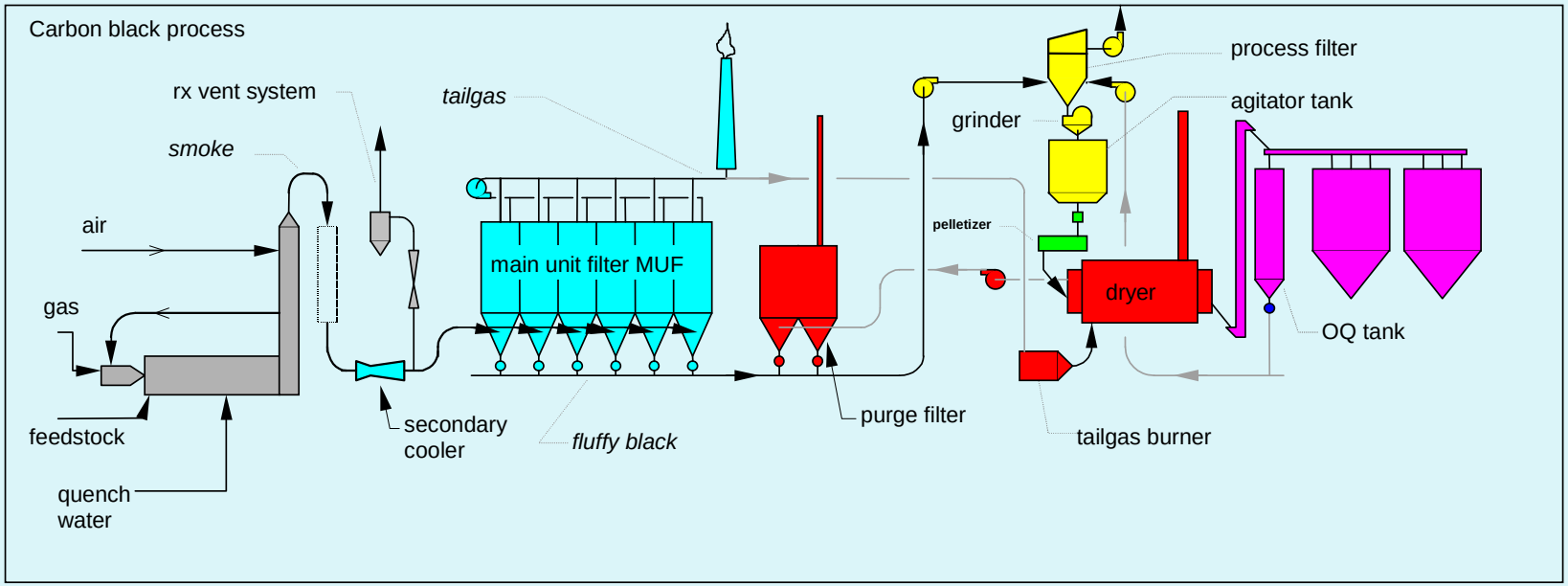




Carbon black process is a process where hydrocarbon feedstock (heavy fuel oil) is converted into carbon black.

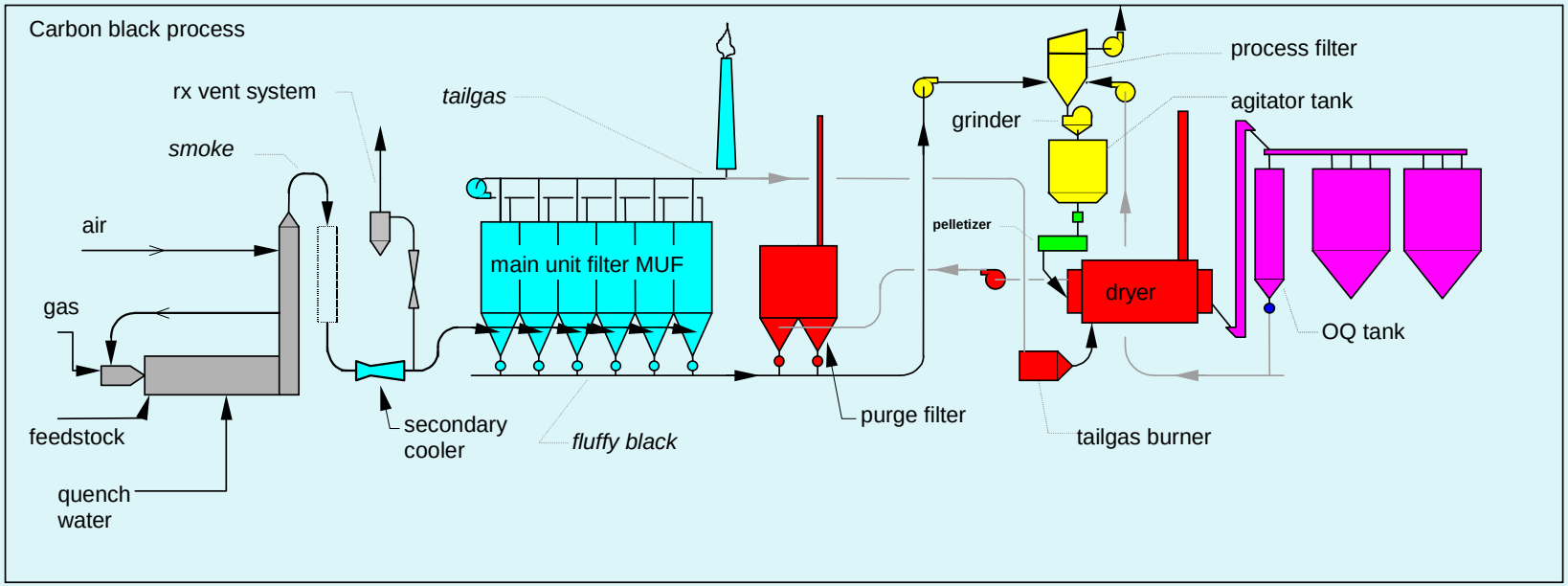


Hydrocarbon fuels, oxidants, additives, and the primary feedstock are injected into a horizontal refractory reactor where they combust with a defect of oxygen.

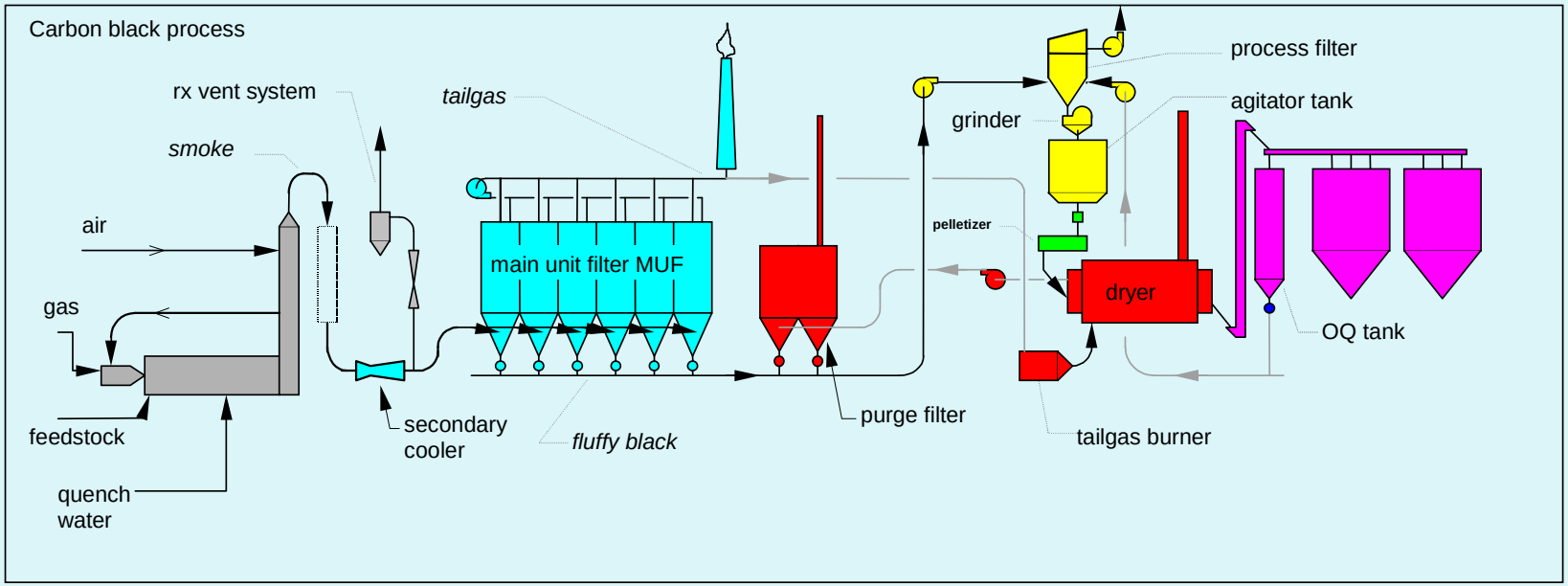


As a result of the incomplete combustion the following are formed:

- **Carbon black (amorphous carbon)**
- **Tail gas**

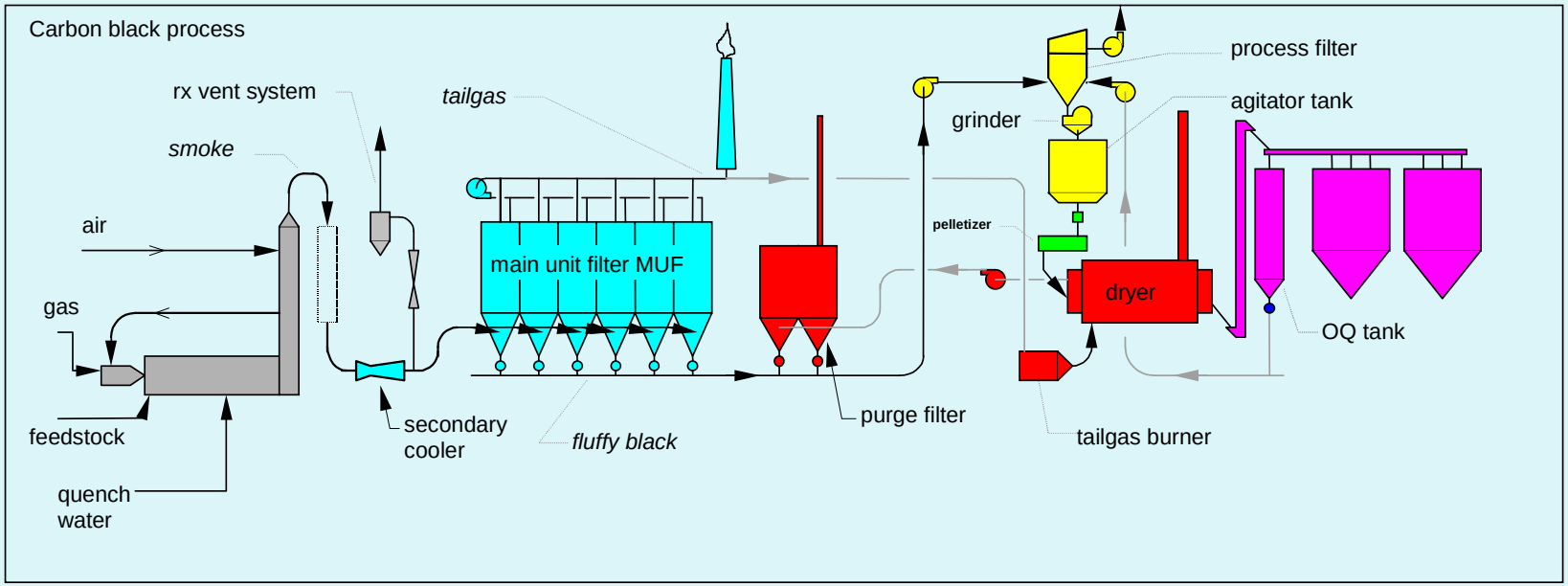


The "tail gas" is flared, incinerated, used for fuel, or any combination of these uses.



The carbon black leaves the filter and is conveyed to a "process filter". The carbon black is then pelletized into dense spheres of about 60 mesh (0.25 mm) diameter to facilitate handling and shipping.

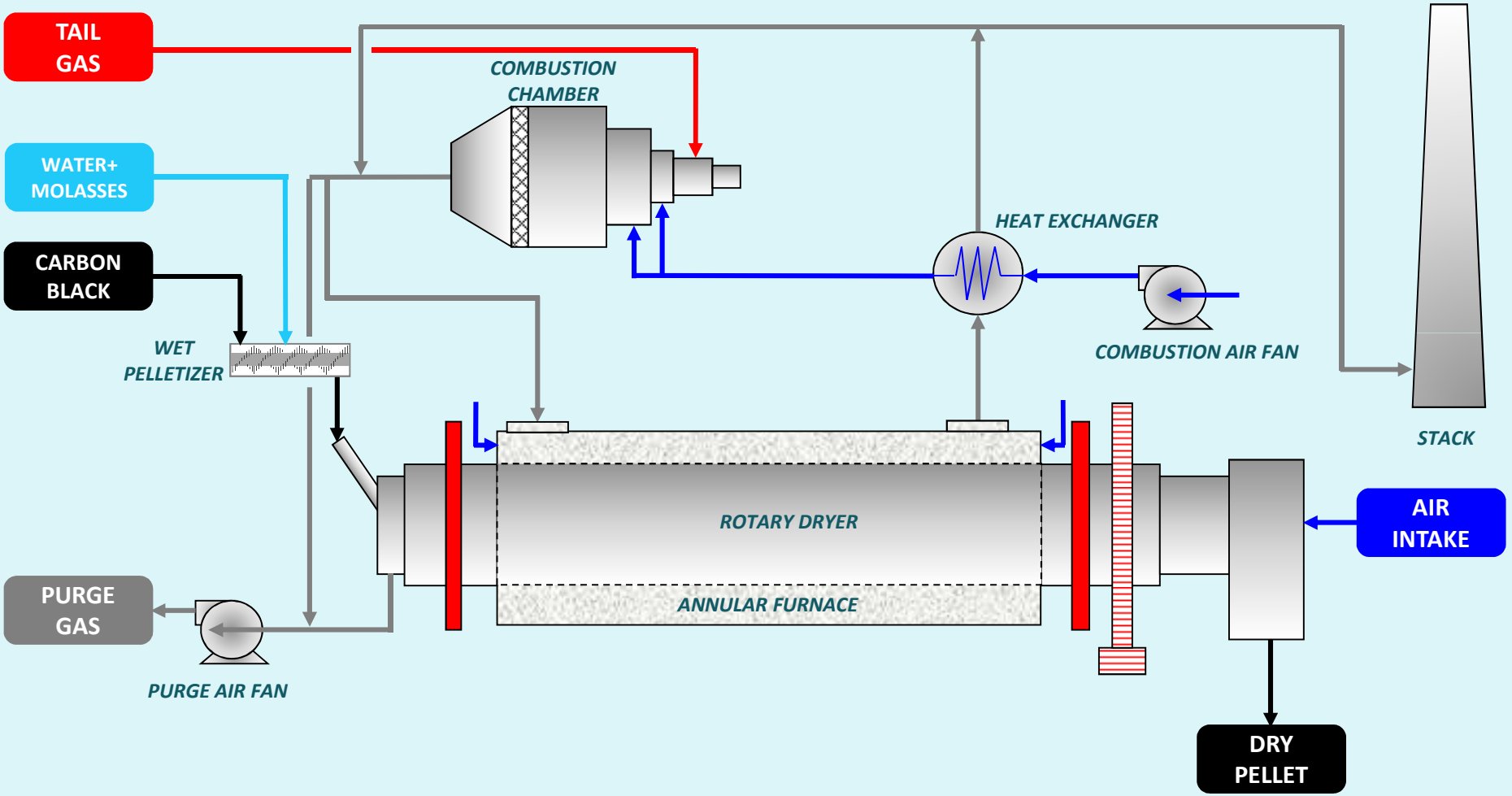
To pelletize the carbon black, water with a small amount of binder is added to the carbon black in a pin mixer. The amount of water/binder is roughly the same mass as the carbon black stream. The wet pellets are dried in a rotary kiln type indirect fired dryer.



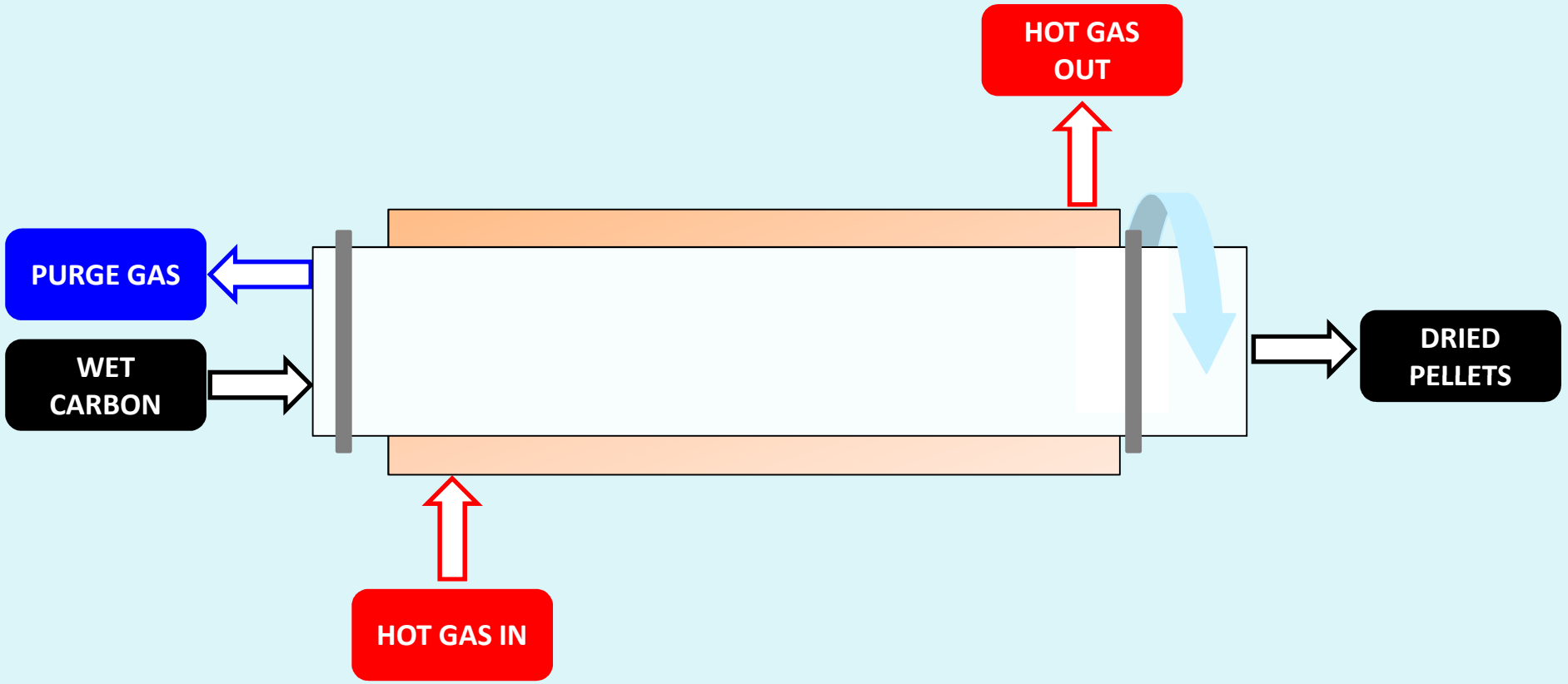
The vapour that is produced contains some carbon black dust so it passes through a "purge filter" before being released to the atmosphere.

The carbon black dust rejoins the production stream in the process filter.
The dry pellets from the dryer are conveyed via bucket elevator and screw conveyors to the product storage tanks for final packing.

CARBON BLACK DRYER FLOW DIAGRAM



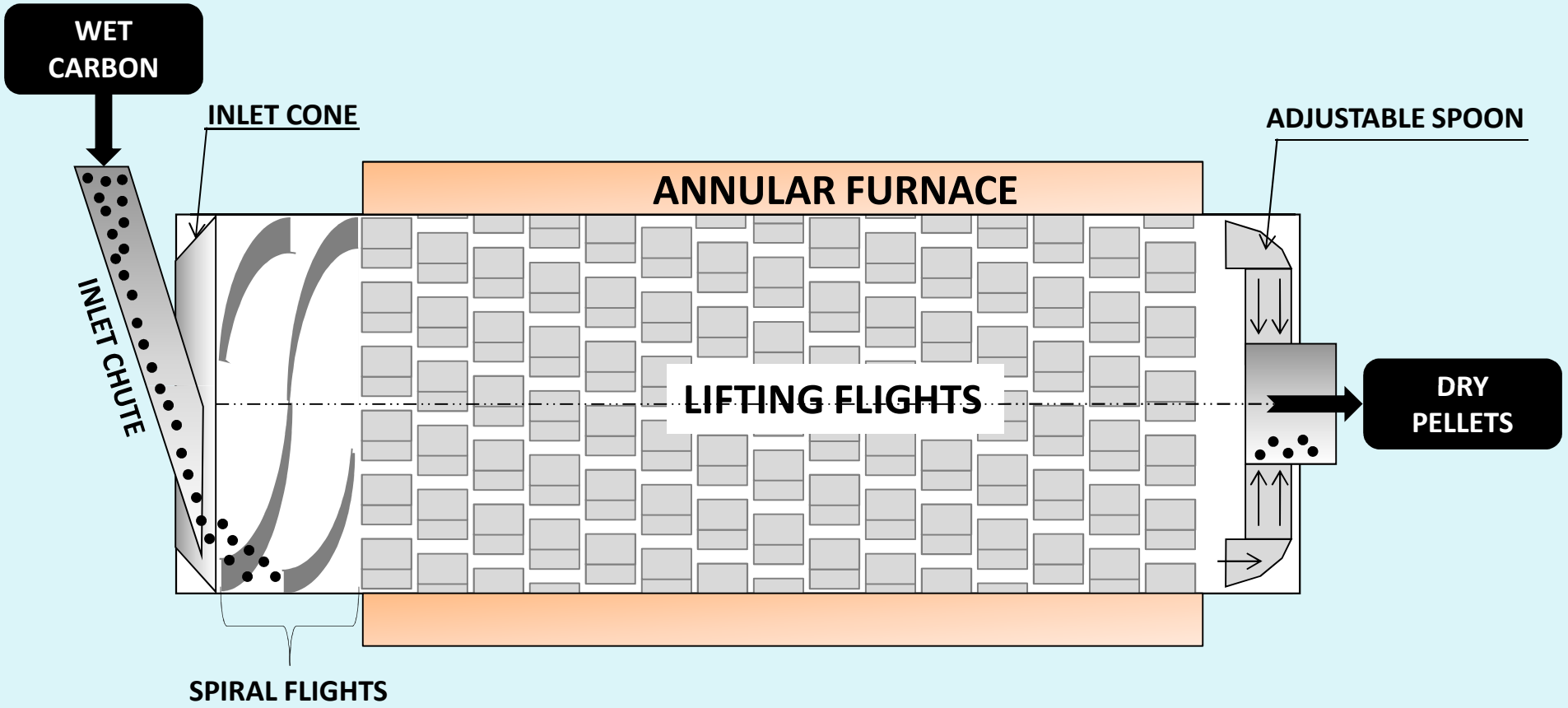
ROTARY DRYER SCHEMATIC

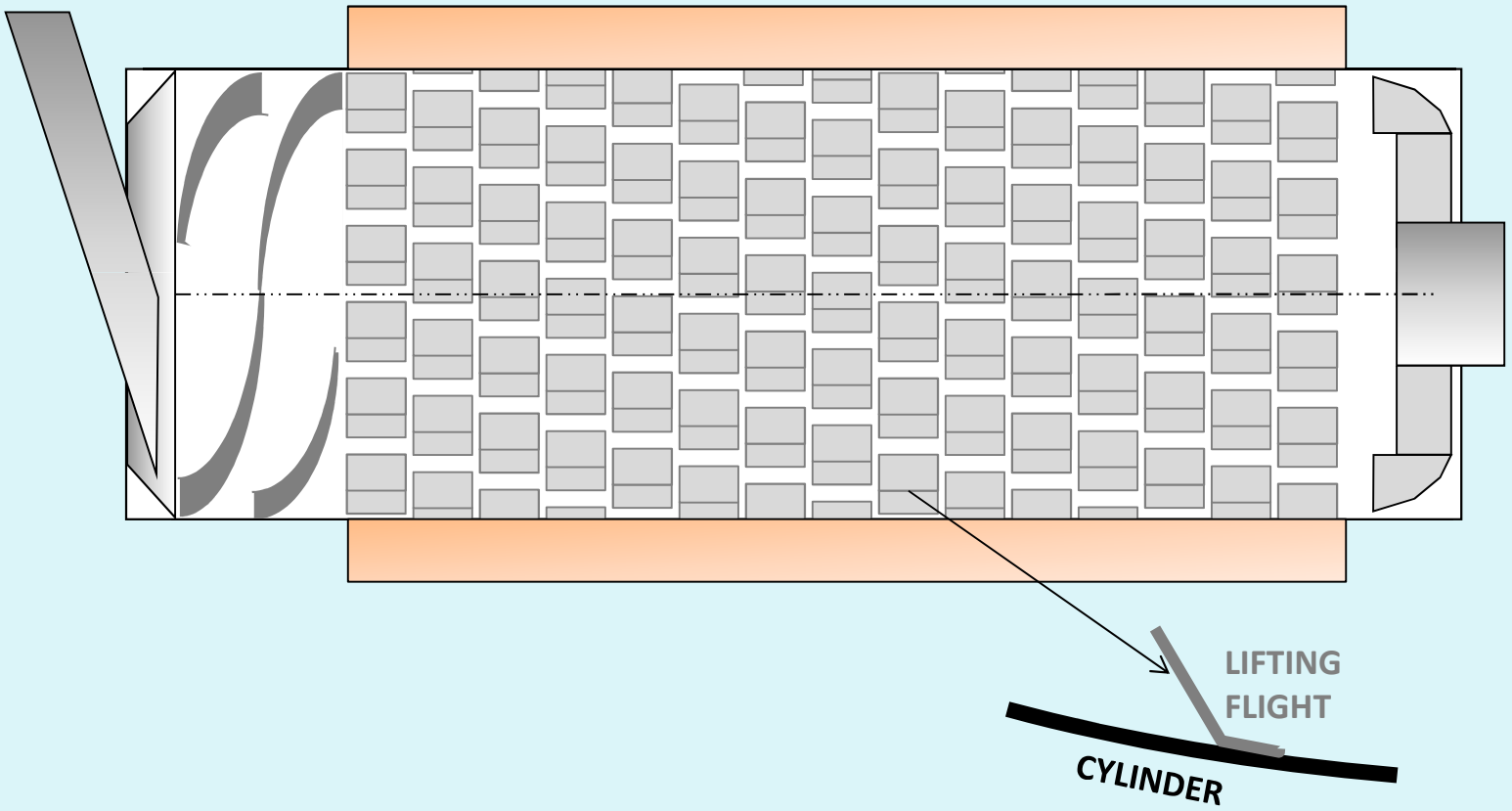


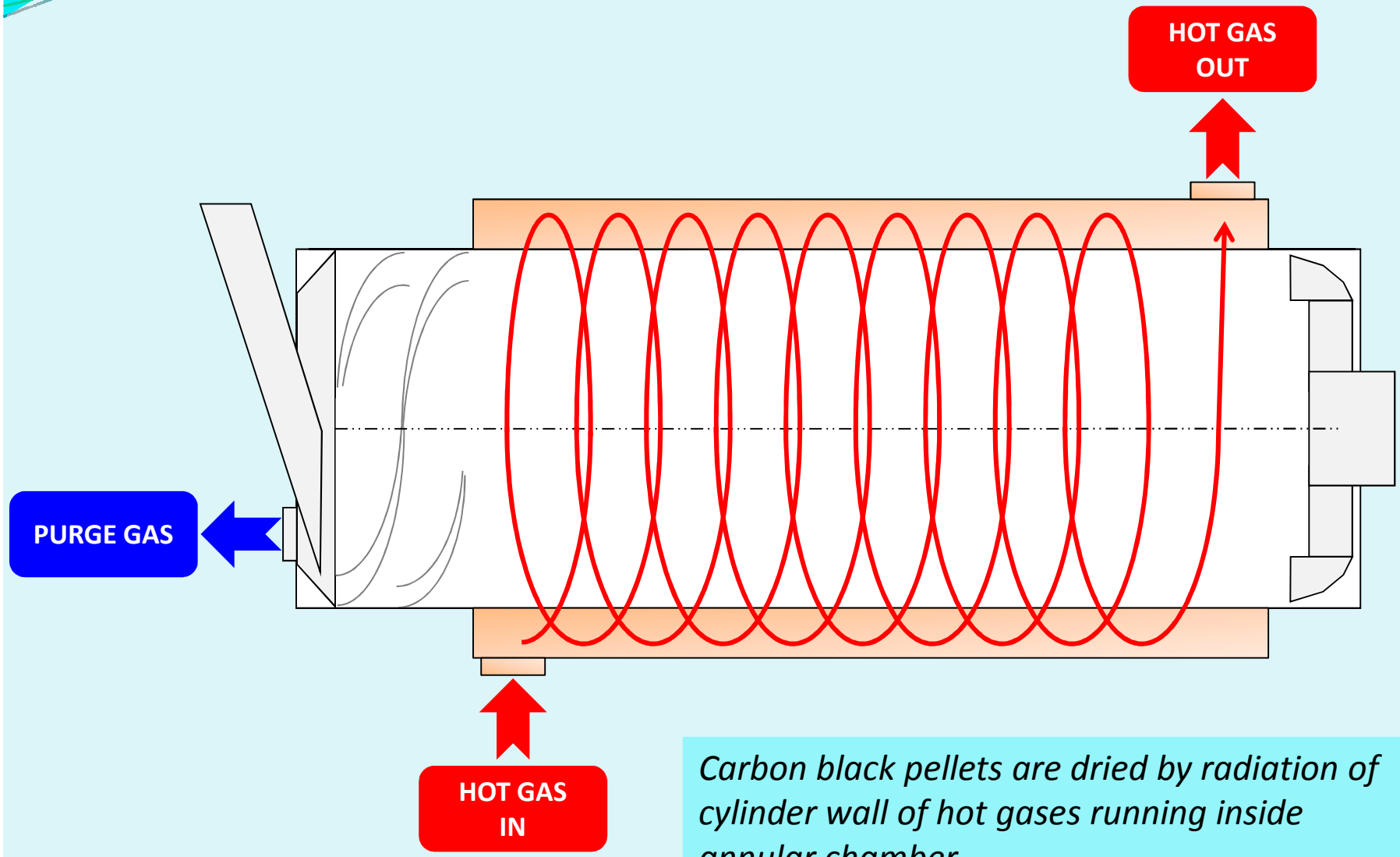
Rotary dryer is indirect type
Hot gases heat up, through radiation, dryer wall and then carbon black pellets

PROCESS DESCRIPTION

The dryer consists principally of a revolving cylinder slightly inclined to the horizontal and supported by two riding rings resting on two trunnion rolls each with integral shaft at the ends of which are journalised in roller bearings with special pillow blocks. The support bearings are assembled on support bases and provided with adjusting screws. The support bases are bolted to Purchaser's foundation.
On each side of the riding ring adjacent to the drive is a thrust roller, that holds the cylinder in the proper longitudinal position.
The zones of contact between riding rings and trunnion rolls are lubricated with graphite blocks.
The cylinder is rotated by means of a girth gear, meshing with a spur pinion mounted on the slow speed shaft of a speed reducer. The reducer high speed shaft is coupled to the motor.
The motor and the speed reducer are mounted on common base.
At the feed end of the cylinder a retaining ring and cone followed by spiral flights for rapid advancing of the material are provided.
The spiral flights are followed by lifting flights to agitate, and to revert material to dry properly.
At the discharge end the cylinder is closed with a retaining ring provided with a series of scoops to lift and discharge the dried material.
The feed end of the dryer is closed by a small diameter breeching provided with screw feeder and positive seal ring. The seal consists of an adjusting spring actuated ring with guide.
This gas flows in countercurrent with the pellets and it is discharged at the feed head side together with the evaporated water vapour. The Purge Gas Blower provides to convey the vapors from dryer to the Purge Gas Filter (out of scope of supply).
The discharge end of the dryer is provided with a breeching with hoppered bottom to discharge the material to the Purchaser conveyor. The breeching is sealed to the revolving cylinder with a positive seal ring in the same manner as the feed end.
Carbon black is fed through a rotary valve which allows the constant feeding of the material to the mixer, where carbon black is mixed with molasses (or other compounds) and then is fed, by means of a screw conveyor, into the dryer.
The active section of the cylinder is enclosed in an Annular Chamber section consisting of a steel casing inside lined with ceramic fibre modules and insulating bricks for the floor. A drilled steel plate will be supplied to cover the external surface of the furnace to allow the installation of external insulation.
The annular chamber is arranged to receive the hot gases at feed end and discharge the same at discharge end.
The first part of the annular chamber is designed to transfer heat by radiation and the remaining part by convection.
The casing is provided with connections for the thermocouples (2) and pyrometers (3).
The casing is made in flanged sections bolted together and includes lifting lugs.
Both ends are closed with mechanical seals consisting of graphite sectors held in place with bolted steel sectors and pressed against the cylinder with springs.
The hot gases for the drying process are produced in a Combustion Furnace equipped with a natural gas / tail gas burner.
The furnace is internally lined with insulating and refractory bricks and castable and is provided with a honeycomb wail to assure complete combustion of the tail gas.
At furnace outlet a connection for thermocouple is provided.
The furnace is connected to the furnace casing with a transition duct internally lined with insulating-refractory castable.
The hot flue gas generated in the Dryer Combustion Furnace enters the shell of the Dryer, where supply the heat for the water evaporation, then preheat the combustion air in the Combustion Furnace Air Preheater and finally are discharged to the atmosphere through existing duct connecting the stack.


WET CARBON
INLET CONE
ADJUSTABLE SPOON
ANNULAR FURNACE
INLET CHUTE
LIFTING FLIGHTS
DRY PELLETS
SPIRAL FLIGHTS

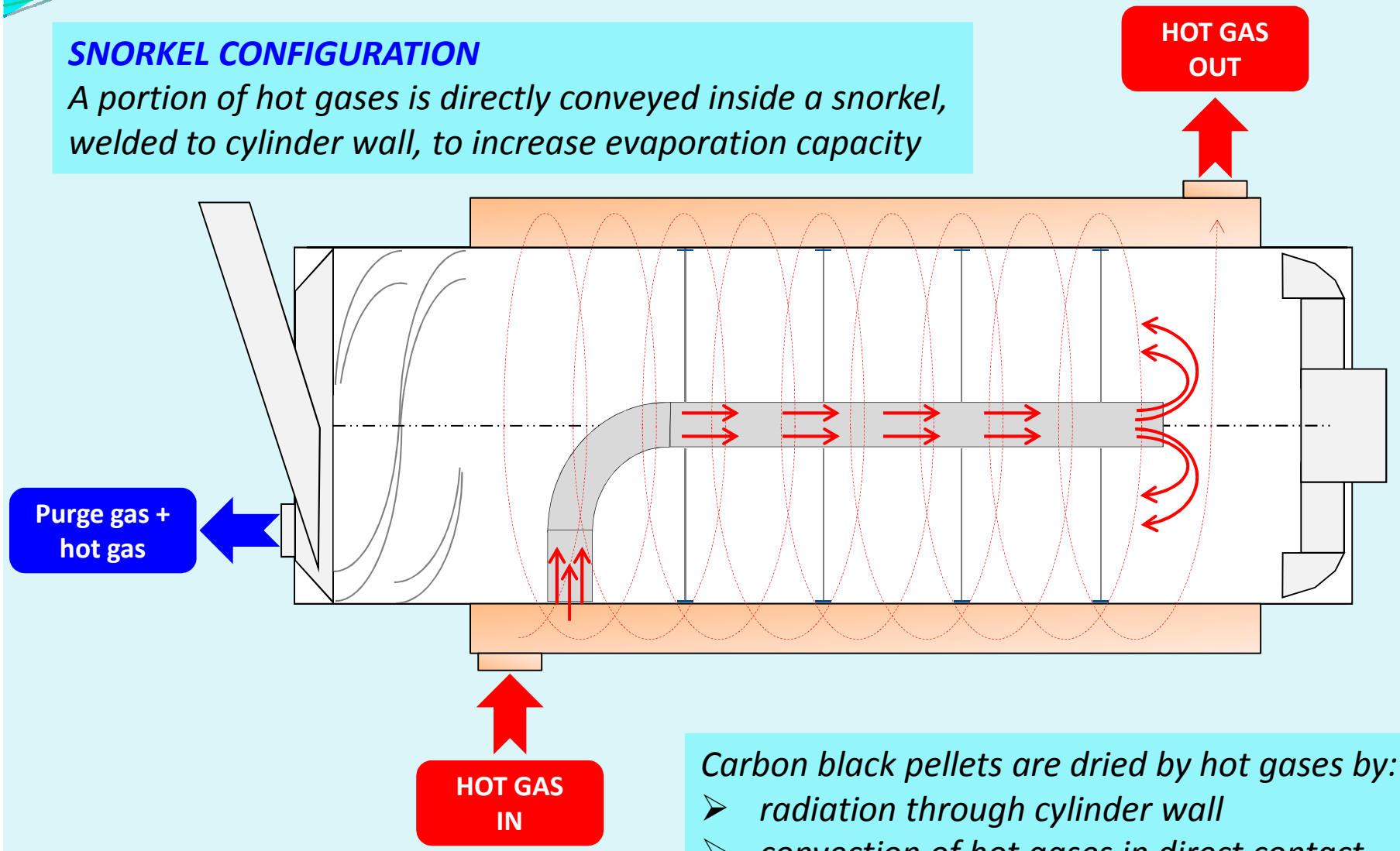

LIFTING
FLIGHT
CYLINDER



Carbon black pellets are dried by radiation of cylinder wall of hot gases running inside annular chamber

SNORKEL CONFIGURATION

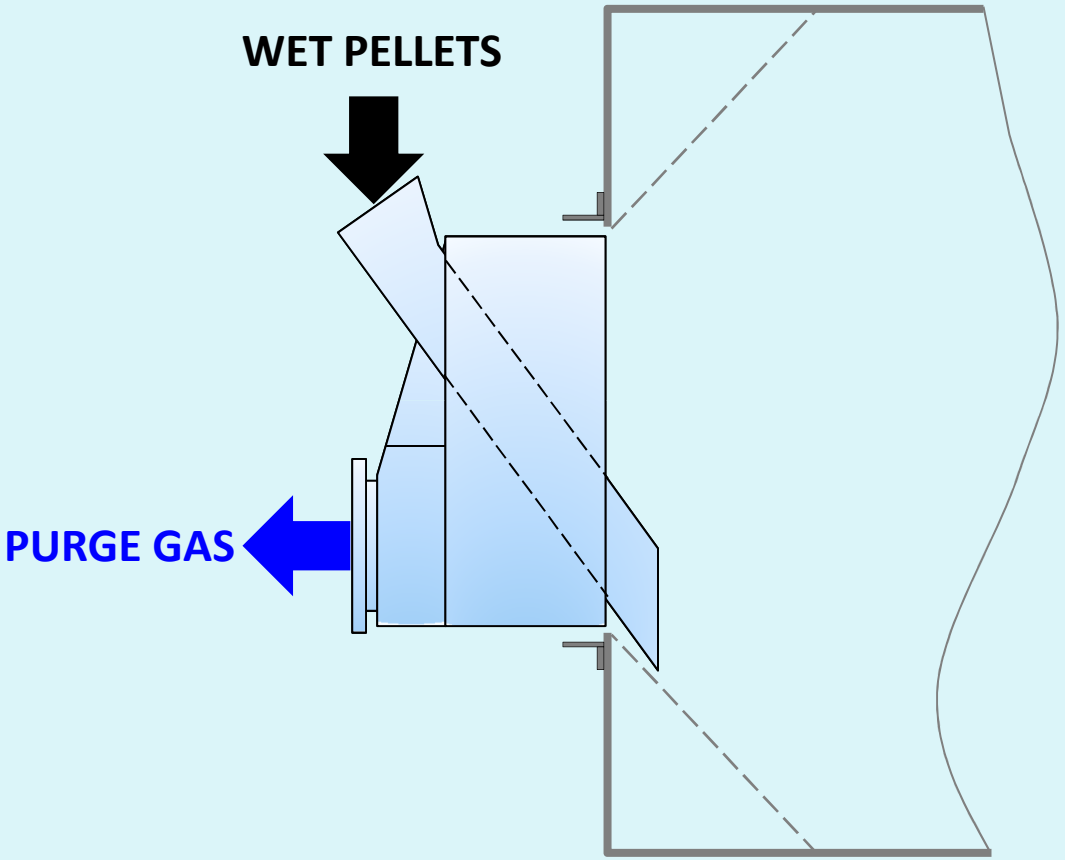
A portion of hot gases is directly conveyed inside a snorkel, welded to cylinder wall, to increase evaporation capacity



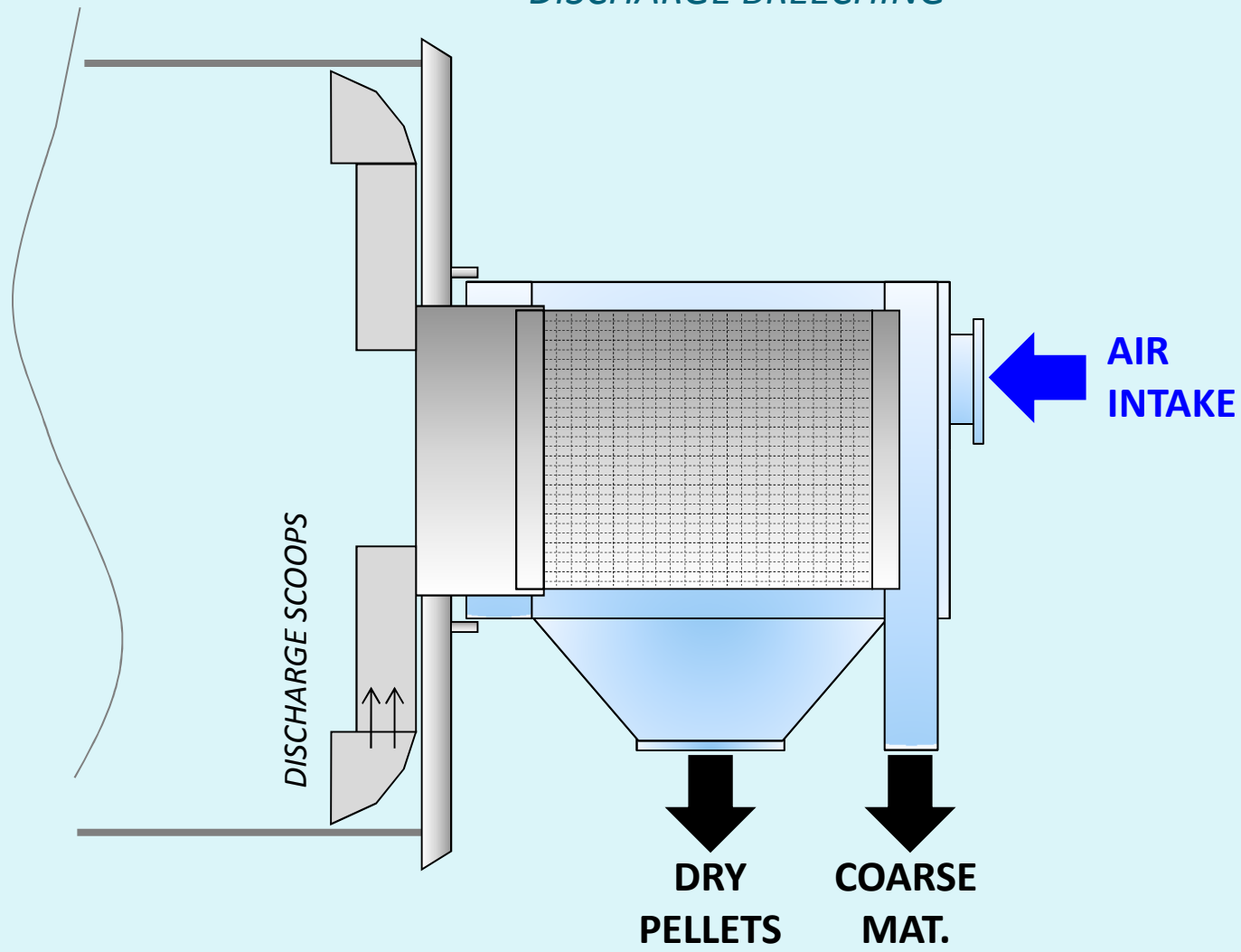
Carbon black pellets are dried by hot gases by:

- *radiation through cylinder wall*
- *convection of hot gases in direct contact with pellets*

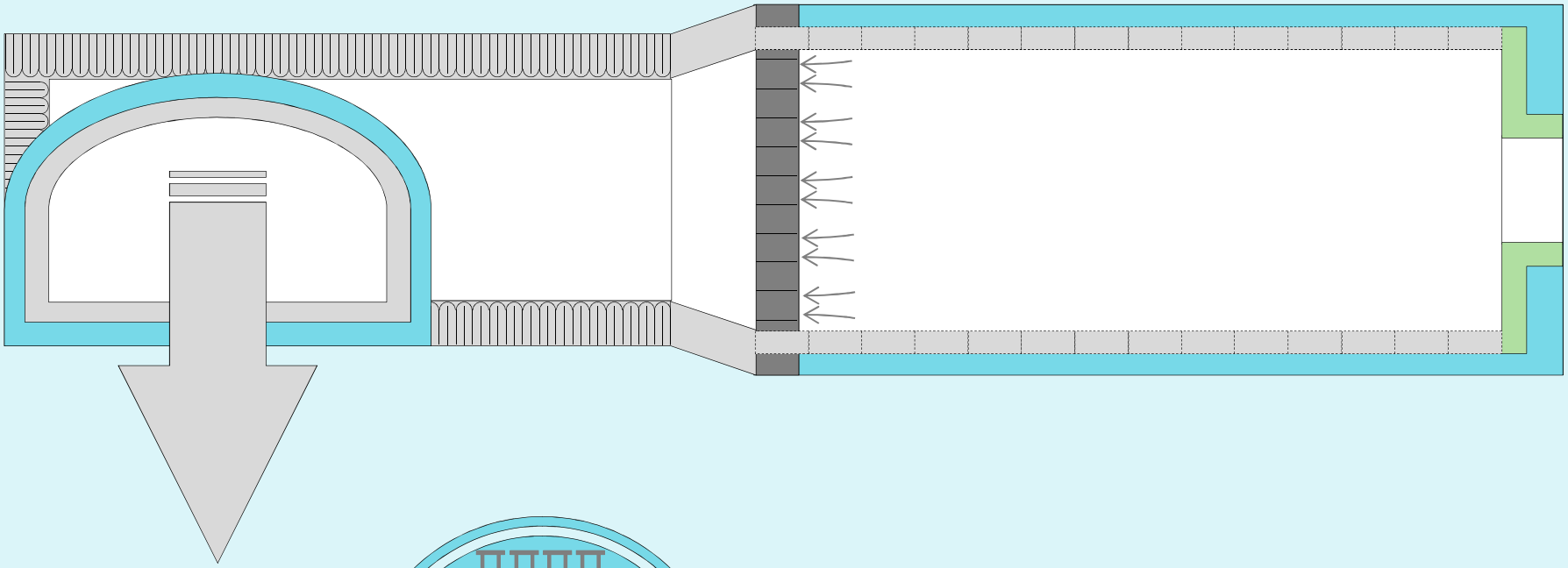
INLET BREECHING

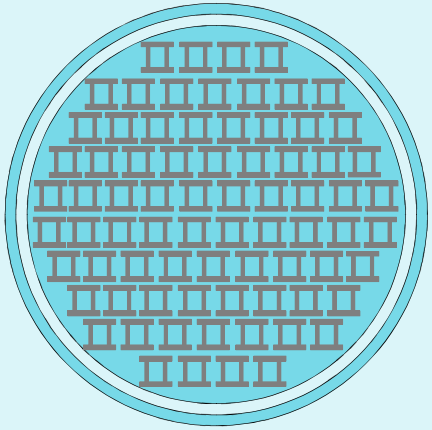


DISCHARGE BREECHING



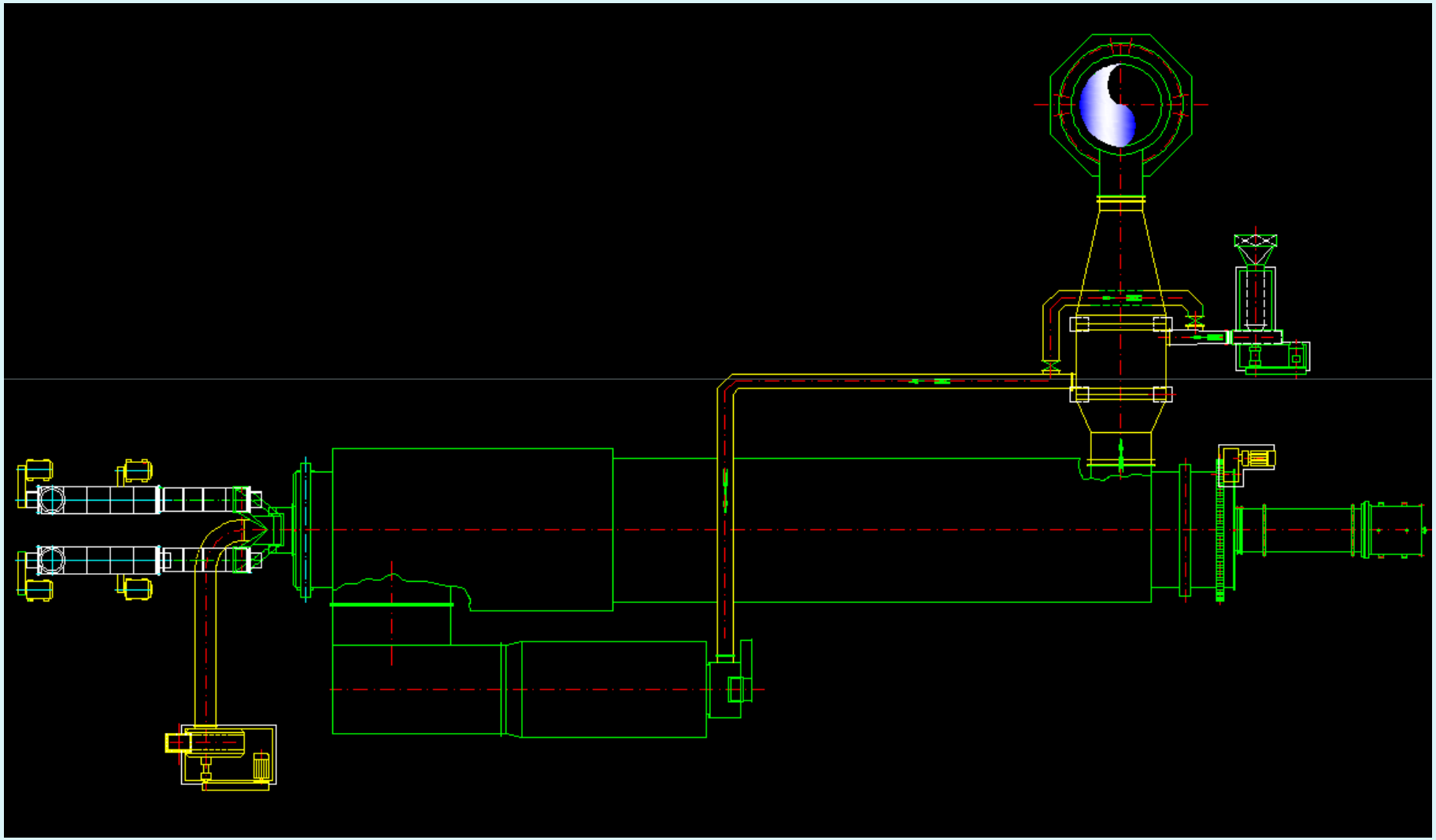
COMBUSTION CHAMBER WITH TRANSITION DUCT



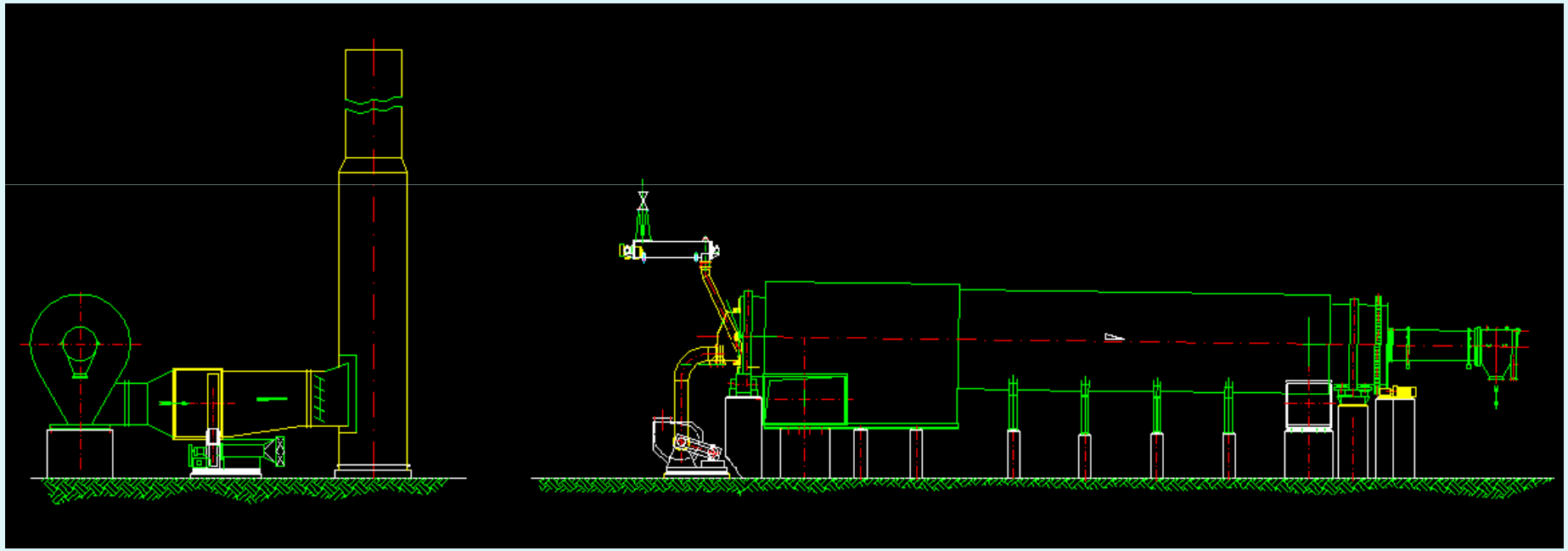


HONEYCOMB CONFIGURATION

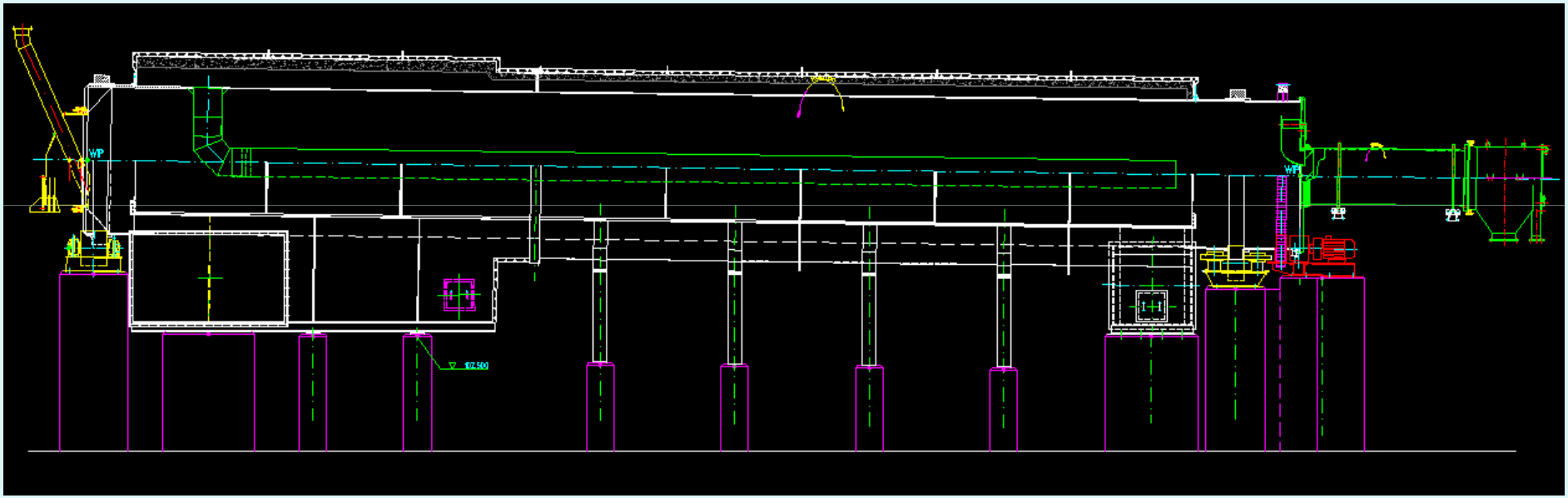
ROTARY DRYER PLAN LAYOUT



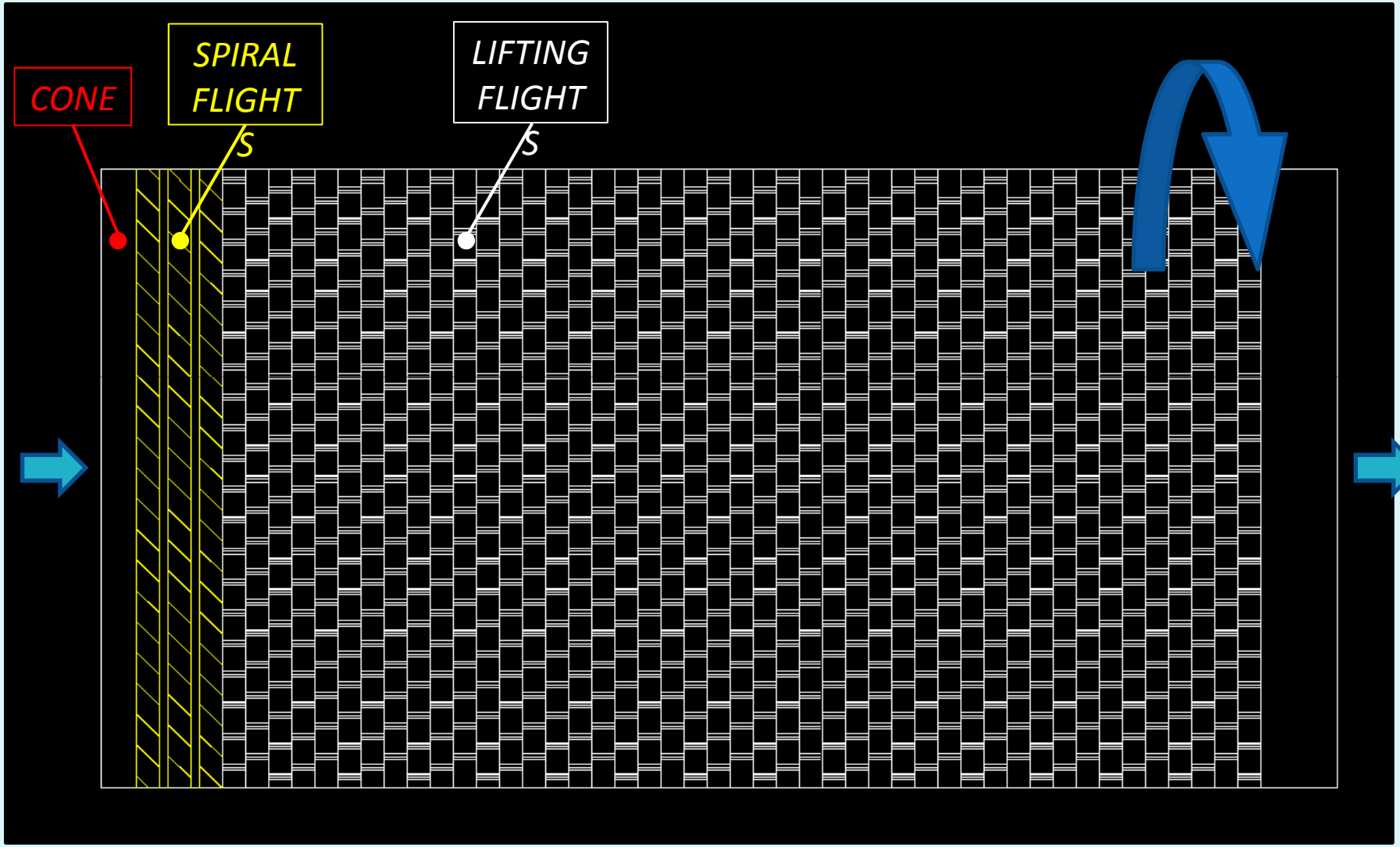
ROTARY DRYER PLAN SECTIONS



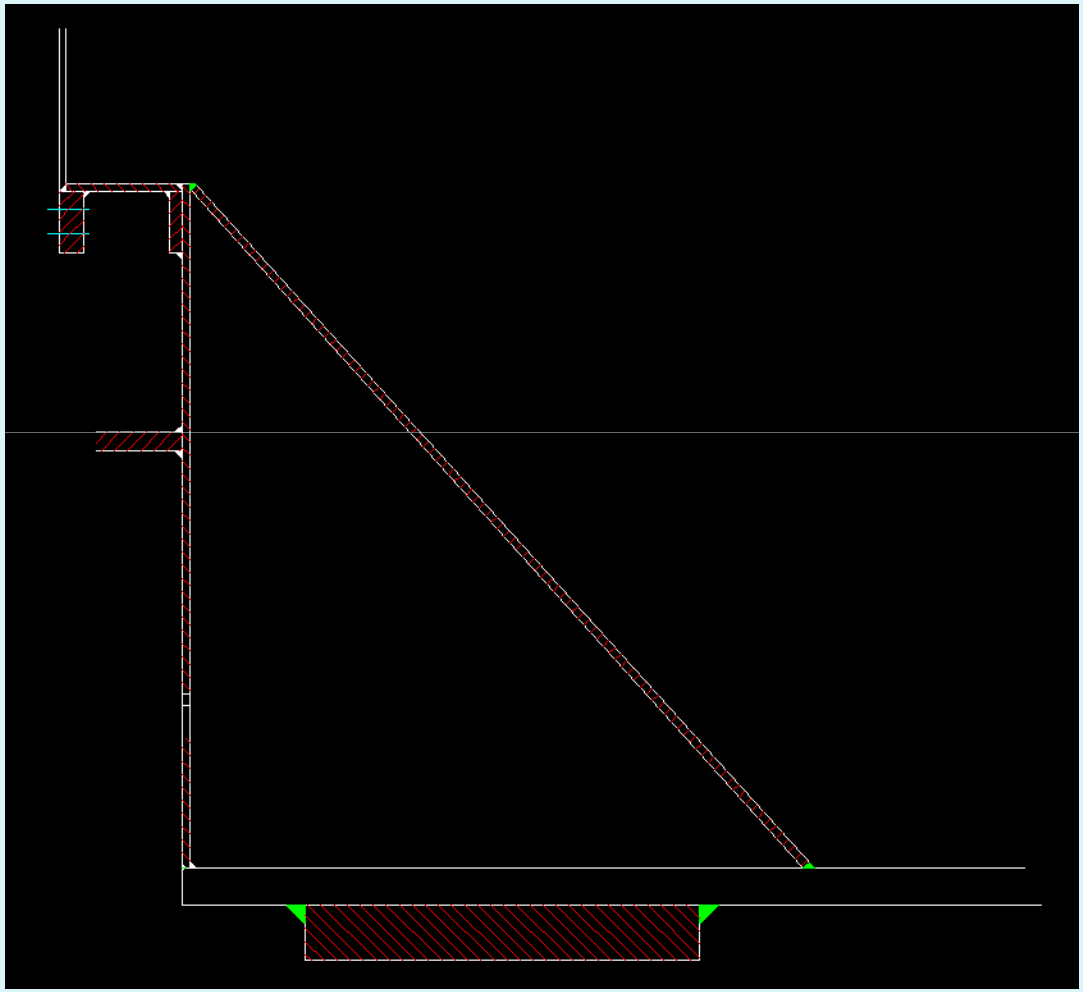
ROTARY DRYER ASSEMBLY



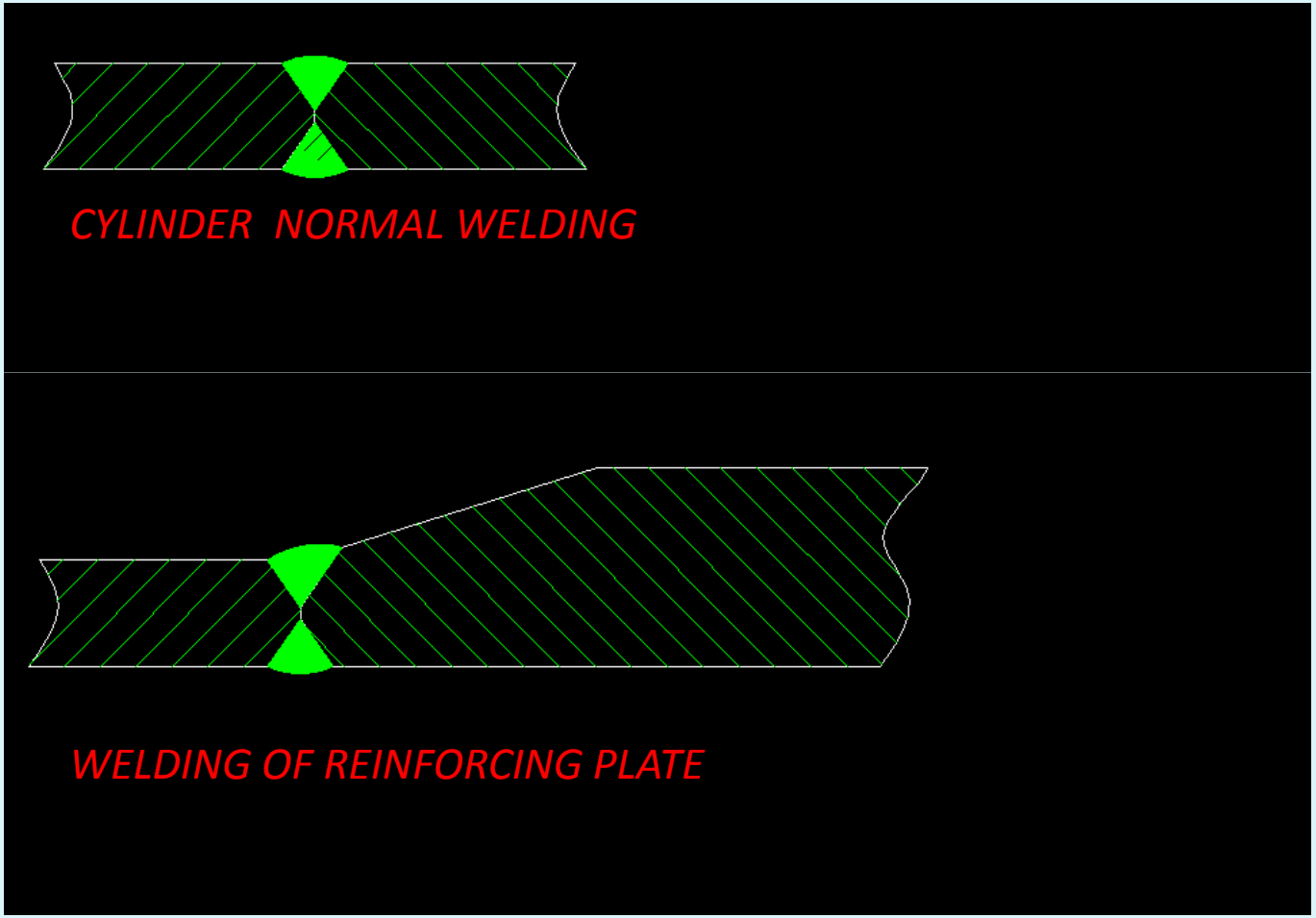
CYLINDER ENVELOPE



CYLINDER INLET CONE



CYLINDER WELDING



CYLINDER NORMAL WELDING

WELDING OF REINFORCING PLATE