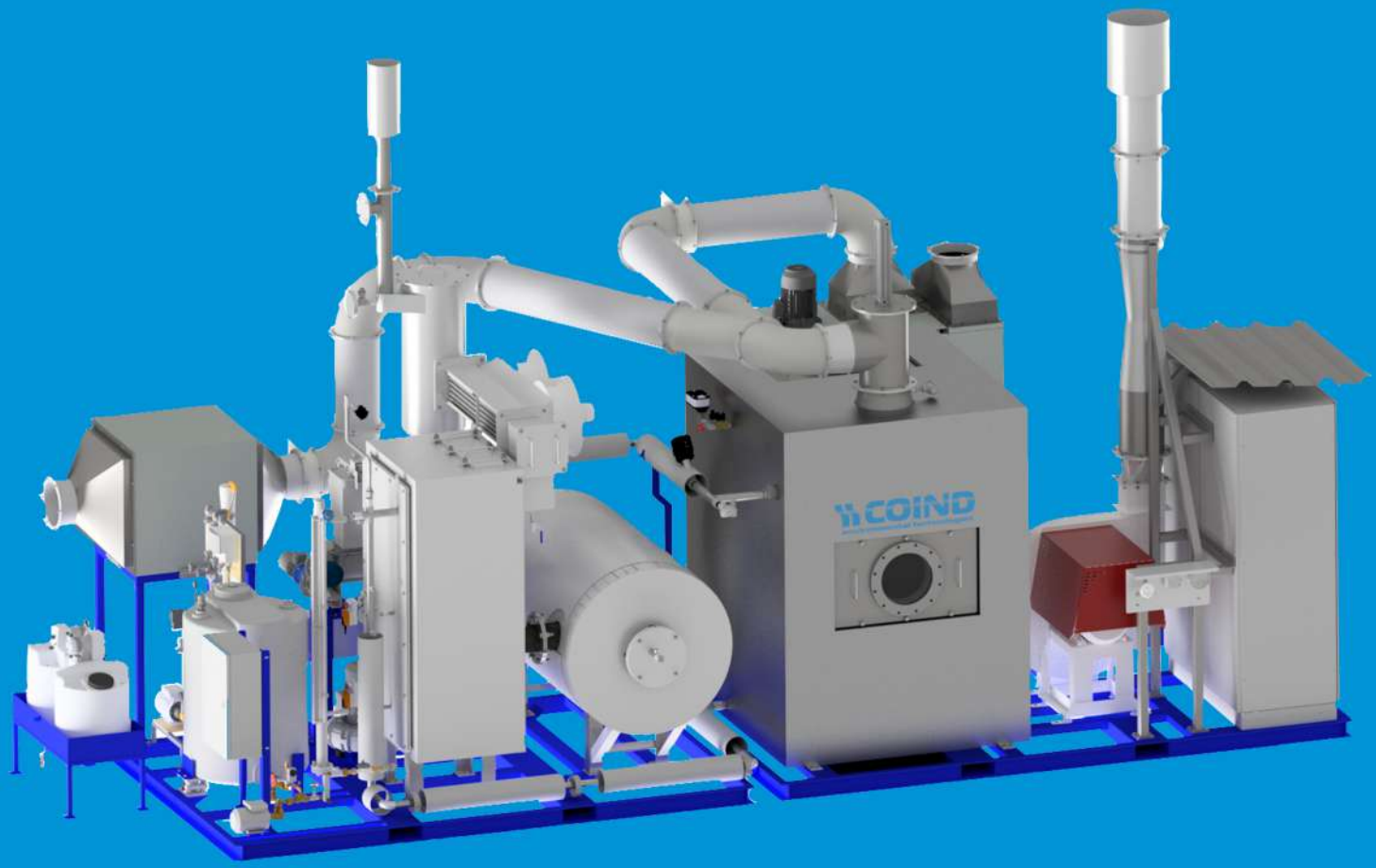
STEAM-REGENERABLE ACTIVATED CARBON FILTER



CoralGroup

COIND
environmental technologies

The reduction of gaseous emissions containing Volatile Organic Compounds (VOCs) using Activated Carbon (AC) is a well-known and established technology: one mass of AC can adsorb VOCs equivalent to over 20–25% of its weight. After that, the AC becomes saturated and must be regenerated or treated on-site with steam.
Regeneration is expensive, as it requires specialized companies with dedicated furnaces. Besides the cost, only partial recovery of the AC is possible. Classic on-site steam regeneration is safe but economically feasible only in processes involving solvent recovery or non-water-soluble organics.
Many emissions contain low VOC concentrations, and treatment using conventional methods as described above is economically unfeasible due to high energy consumption and significant greenhouse gas emissions.

COIND SRL presents an innovative series of abatement units with on-site AC regeneration, designed for low VOC concentrations (~0.5 grams/Nm³) and suction flow rates ranging from 5,000 to 50,000 Nm³/h and beyond.

Operating principle

The process is based on the following phases, with an automated cycle:

a. The effluent is introduced into the adsorber, where it passes through the activated carbon (AC) bed, which retains VOCs up to about 10% of the AC's weight. The adsorption cycle can range from 40 to 80 hours, depending on the client's requirements.

b. At the end of the adsorption cycle, predetermined according to the VOC load to be captured, the adsorber is hermetically sealed, and the post-combustor—equipped with heat recovery units—is switched on.

c. Steam is injected into the adsorber, passing through the AC bed, and exits as a VOC + steam stream, which enters the post-combustor. The oxidation heat of the VOCs generates superheated water vapor at atmospheric pressure.

d. The regeneration cycle lasts 5–6 hours. At the end of the cycle, the post-combustor is turned off and remains off throughout the next adsorption phase. The adsorber is then restarted.

The system consists of two basic units, adaptable to client needs and compliant with Industry 4.0 standards:
Adsorber(s) with their own fan and stack: one or more units depending on the client's requirements.
Post-combustor and steam generator, with dedicated fan and stack, handling a flow rate equal to 1/10 to 1/15 of the main effluent, heated by a simple and safely ignited air-blown burner.

If values are out of range, please contact our Technical Department.

Criteria for adsorber use

- Dust in the effluent below 5 mg/Nm³
- Effluent temperature ≤ 35°C; if higher, cool using air/air exchangers or other suitable systems
- Relative humidity below 70%, to be assessed in relation to temperature
- Inlet VOCs approximately below 0.5 g/Nm³, to be evaluated case by case

Criteria for post-combustor use

- **Fuel gas:** methane or LPG, 75–80 mbar
- **Demineralized water** for steam production, from our reverse osmosis system unless supplied by the customer

The **emission limits established by Italian Legislative Decree 152/06** are met:

- VOC < 50 mg/Nm³ for the adsorber
- TOC < 20 mg/Nm³ for the post-combustor, with stack temperature between 180 and 250

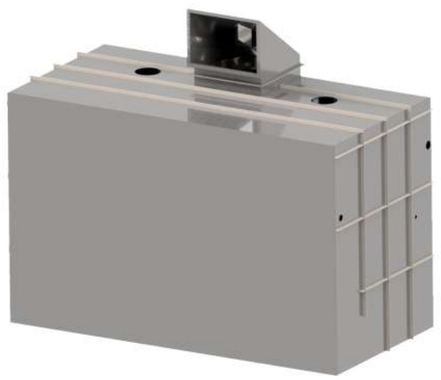
There are **no other waste streams**. Greenhouse gas emissions are only **5–10%** of those generated by competing systems.

REVERSE OSMOSIS FOR
LOW-CONDUCTIVITY WATER
PRODUCTION

ELECTRICAL PANEL
TOUCH SCREEN
INDUSTRY 4.0 TECHNOLOGY

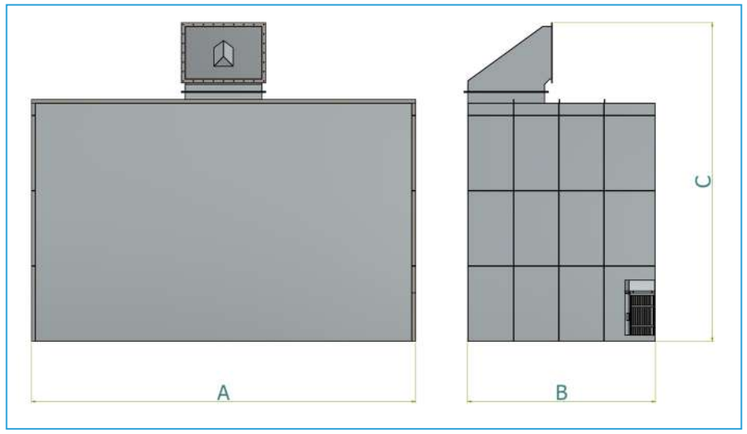
SHELL AND TUBE
HEAT EXCHANGER

DIRECT-FIRED
POST-COMBUSTOR

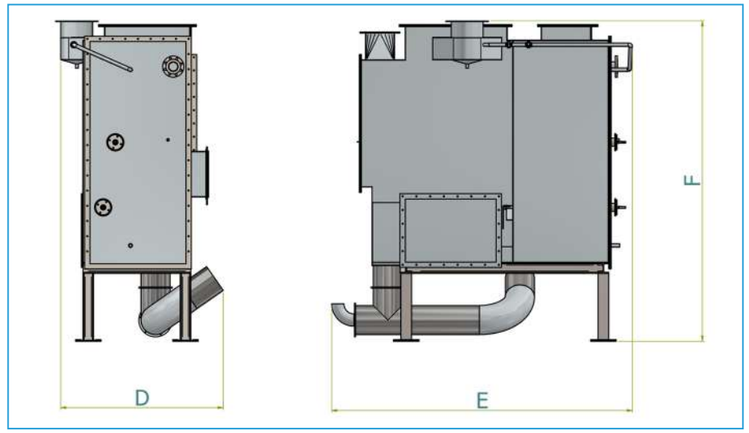


ACTIVATED CARBON ADSORBER
WITH HORIZONTAL BEDS

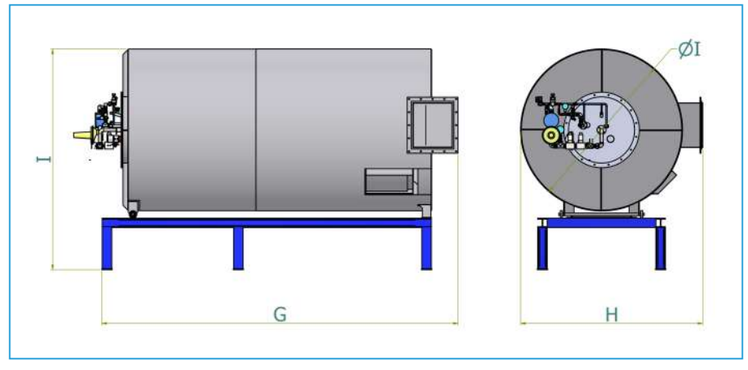
ADSORBER



HEAT EXCHANGER



POST-COMBUSTOR



Model	Flow rate	Adsorber dimensions (mm)			Steam generator dimensions (mm)			Post-combustor dimensions (mm)				Min Plant Area (mm)			kW
		A	B	C	D	E	F	G	H	I	Ø	L	H	P	
ADS-PCD 05	5000	1700	1950	1850	600	700	2000	2050	1250	1500	1050	6000	2000	2300	11
ADS-PCD 12	1200	2700	2000	2500	950	1100	2100	2600	1500	1800	1300	9000	3000	3100	22
ADS-PCD 25	25000	4800	2750	3200	1150	1900	2350	3280	1700	1800	1520	14000	4000	4100	37
ADS-PCD 50	50000	5300	2700	3400	1350	2500	2700	3700	2700	2100	1800	14000	4000	4600	70

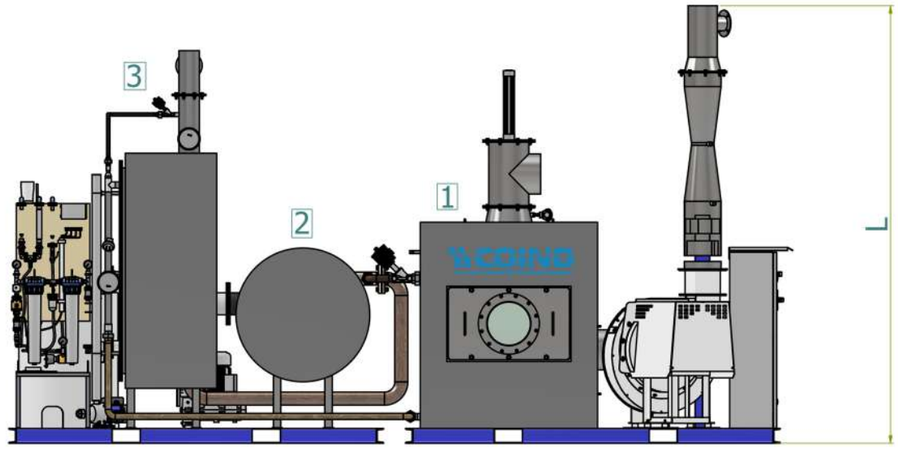
PILOT PLANT FOR ACTIVATED CARBON EFFICIENCY TESTING

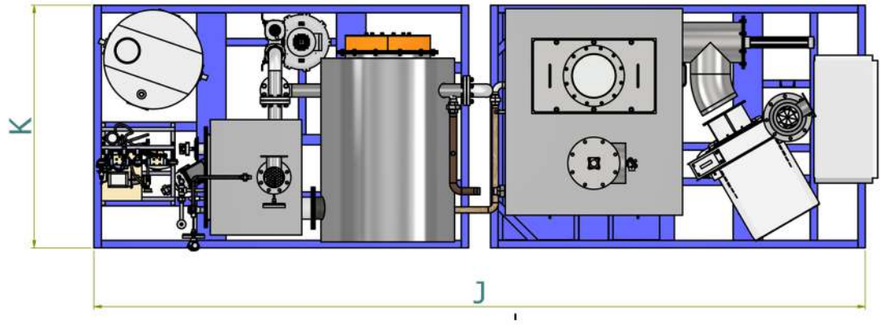
Coind's presence in multiple sectors (food, aerospace, energy, chemical, waste management, painting, etc.) has highlighted the need to consistently guarantee the functionality of treatment systems for its clients.
For this reason, a pilot plant has been developed for the adsorption of organic vapors, which can be regenerated using **self-produced low-pressure steam.** This unit can be r**ented based on customer needs**, allowing them to assess its purification efficiency and long-term performance reliability.

The pilot unit, with a suction flow rate of 2,000 Nm³/h, is equipped with:
1. **an adsorber** with activated carbon
2. **a post-combustor** for oxidizing VOCs desorbed from the activated carbon, using steam at atmospheric pressure
3. **a superheated steam generator** at atmospheric pressure, powered by the heat from the oxidation of the desorbed

The pilot unit is a complete system that allows for the verification of:
A. All VOC abatement parameters on activated carbon, in order to optimize efficiency
B. On-site regeneration of the activated carbon, with the ability to fine-tune the parameters of the VOC stripping cycle
C. Post-combustion, where oxidation of the stripped VOCs generates the heat used to produce the stripping steam

PROCESS DATA AND PILOT PLANT DIMENSIONS					
1	2	3	J (mm)	K (mm)	L (mm)
30 kg COV/ ciclo	Post-combustor heated with electric power – 35kW	H2O/rigen 150lt	5900	1850	3000





COIND
environmental technologies

WE DEVELOP SOLUTIONS AND TECHNOLOGIES FOR ENVIRONMENTAL PROTECTION SINCE 1976

COIND S.R.L.
ENVIRONMENTAL TECHNOLOGIES

CORSO EUROPA, 609
10088 VOLPIANO (TO) ITALY
TEL +39 011 9980305 - 011 9978230
FAX +39 011 9973400

info@coindengineering.it
coind@pec-mail.it

www.coindengineering.it