

SMALL AIR:

Exhaust gas treatment system for process gases

ABOUT THE SYSTEM

The SMALL AIR system includes a set of equipment for the elimination and treatment of gaseous organic compounds from industrial and manufacturing processes.

COMPONENTS OF THE SYSTEM

1) MOR Microwave Thermal Reactor

The device's stainless steel housing contains a thermally insulated ceramic bed made of a material that strongly absorbs microwave energy, which makes it reach very high temperatures of 950 - 1150 °C without any fuel. In the presence of a well-defined amount of oxidizer, all organic compounds are eliminated as they are transformed into a basic form in the most efficient thermal process. The reactor bed design properties create a highly turbulent flow of the contaminated gas, which increases the time the contaminants are under oxidizing conditions. This, in turn, guarantees high efficiency of the thermal process. The device is designed to expose harmful volatile compounds to high temperatures for a minimum of 2 seconds.

2) Heat Exchanger

The industrial gases contaminated with aromatic compounds are preheated through the use of a waste-heat recovery system from the treatment process in the MOR reactor. Thanks to this solution, the SMALL AIR system has the highest efficiency in terms of the amount of energy supplied to the process, with a thermal efficiency between 90 and 110%.

3) Activated Carbon Filter

A method to protect the system against, for example, a power failure in the MOR reactor or a sudden uncontrolled drop in process temperature, is to use a conventional absorption filter. This makes the SMALL AIR system safe for handling and the environment.

By using microwave energy, SMALL AIR is a system with zero CO₂/NO_x/SO₂ emissions and other harmful compounds, while maintaining the process temperature between 950 and 1150 °C.

PURIFICATION CHARACTERISTICS

TYPES OF GASEOUS HARMFUL ORGANIC COMPOUNDS REDUCED BY THE SMALL AIR SYSTEM

C7+

ETHANE + ETHENE

PROPANE + PROPENE

I-BUTANE

N-BUTANE

I-PENTANE

N-PENTANE

2,2-DIMETHYLBUTANE

2-METHYLPENTANE

3-METHYLPENTANE

N-HEXANE

CO

METHANE [mole%]

HYDROGEN

HYDROGEN SULFIDE

METHYL MERCAPTAN

ETHYL MERCAPTAN

PROPYLENE MERCAPTAN

C7+

ETHANE + ETHENE

PROPANE + PROPENE

I-BUTANE

N-BUTANE

I-PENTANE

N-PENTANE

**EXAMPLES OF COMPOUNDS SUBJECT TO PURIFICATION
IN SMALL AIR SYSTEM**

Acetone

Aliphatic hydrocarbons (decane, octane, hexane)

Aromatic hydrocarbons (AH) (toluene, xylene, benzene)

Polycyclic aromatic hydrocarbons (PAHs) (benzo[a]pyrene, biphenyl, naphthalene)

Pesticides

Chlorine-containing compounds (dichloromethane, methyl chloride, trichloroethane, chloroform)

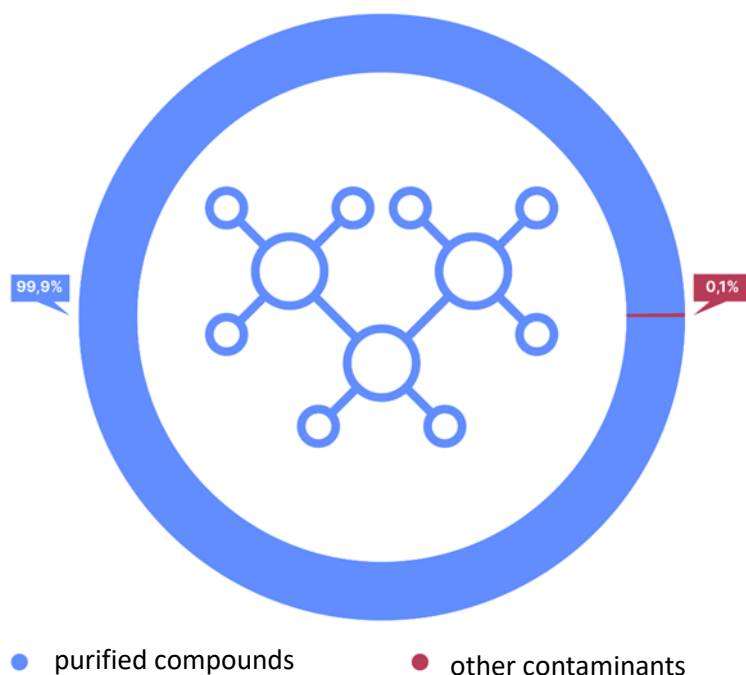
N-butyl acetate

Dichlorobenzene

4-phenyl cyclohexene (4-PC)

Terpenes

VOC



MOR REACTOR MODELS USED IN SMALL AIR SYSTEM

MOR S - 01M/10G	value	unit
Minimum efficiency [gas calorific value 0 kJ/m ³ n]	167	[m ³ n/h]
Maximum efficiency [gas calorific value 1,000 kJ/m ³ n]	5,082	[m ³ n/h]
Number of microwave generators	10	[units]
Microwave/heat power	30	[kWc]
Waste heat (hot water/air)	27	[kWc]
Thermal efficiency of the device	95	[%]
Minimum electrical power consumption from the grid	10	[kWe]
Maximum electrical power consumption from the grid	60	[kWe]
Process temperature	950-1150	[stC]
Organic compound purification efficiency	99.9	[%]
Enclosure	ISO 20'DV	
Length	6,058	[mm]
Width	2,438	[mm]
Height	2,591	[mm]
Device weight	5,500	[kg]
BASE PRICE	230,000	[euro]

MOR M - 02M/20G	value	unit
Minimum efficiency [gas calorific value 0 kJ/m ³ n]	334	[m ³ n/h]
Maximum efficiency [gas calorific value 1,000 kJ/m ³ n]	10,165	[m ³ n/h]

SMALLTHINGS

Number of microwave generators	20	[units]
Microwave/heat power	60	[kWc]
Waste heat (hot water/air)	45	[kWc]
Thermal efficiency of the device	95	[%]
Minimum electrical power consumption from the grid	10	[kWe]
Maximum electrical power consumption from the grid	110	[kWe]
Process temperature	950-1150	[stC]
Organic compound purification efficiency	99.9	[%]
Enclosure	ISO 30'DV	
Length	9,125	[mm]
Width	2,438	[mm]
Height	2,591	[mm]
Device weight	7,200	[kg]
BASE PRICE	310,000	[euro]

MOR L - 04M/40G	value	unit
Minimum efficiency [gas calorific value 0 kJ/m3n]	668	[m3n/h]
Maximum efficiency [gas calorific value 1,000 kJ/m3n]	20,329	[m3n/h]
Number of microwave generators	40	[units]
Microwave/heat power	120	[kWc]
Waste heat (hot water/air)	90	[kWc]
Thermal efficiency of the device	95	[%]
Minimum electrical power consumption from the grid	20	[kWe]
Maximum electrical power consumption from the grid	220	[kWe]
Process temperature	950-1150	[stC]

Organic compound purification efficiency	99.9	[%]
Enclosure	ISO 40'DV	
Length	12,192	[mm]
Width	2,438	[mm]
Height	2,591	[mm]
Device weight	9,000	[kg]
BASE PRICE	450,000	[euro]

MOR REACTOR PURIFICATION EFFICIENCY

	value	unit
CO	99.5	%
H ₂ S	99.9	%
SO ₂	91.3	%
butyl alcohol	99.7	%
toluene	99.9	%
xylene	99.9	%
benzene	99.9	%
aromatic hydrocarbons	99.9	%
acetone	79.3	%
butyl acetate	99.9	%
aliphatic hydrocarbons	99.9	%
ethylbenzene	99.9	%

MOR REACTOR EFFICIENCY

