

Utilization of Water in a New Clean Technology Applied in the Air Treatment and Energy Production in Buildings

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OBJECTIVES

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- •Development of a clean technology applied in the polluted air treatment, water treatment and energy production.
- •Treatment of the polluted air, using washing and drying processes, instead the traditional filters.
- •Treatment of water with sedimentation process.
- •Application of water in the washing process.
- •Production of energy using three heat exchangers.
- •Separation of the clean air, to the environment, to the polluted water, to the water storage space.

METHODOLOGY

Reactor

Polluted air comes from a factory reactor, crosses the first heat exchanger space, the washing space, the drying space and the second heat exchanger. The polluter water comes from the ring chamber and storage chamber.

This scrubber is constituted by five parts :

- •1) Storage chamber of liquid effluent and lower heat exchanger;
- •2) Entrance hall, formation helical flow and the central heat exchanger;
- •3) Washing chamber to be treated the gaseous effluent;
- •4) Drying hall, superior heat exchanger and extraction chamber;
- •5) Ring chamber of effluent liquid transportation.

In the heat recovery are used three heat exchangers:

•Lower, superior and central heat exchanger.

NUMERICAL MODEL & W062

•9 energy balance integral equations:

$$m_{air_3}C_{p_{air_3}}\frac{dT_3}{dt} = \dot{m}_{23}C_{p_2}T_2 - \dot{m}_{34}C_{p_3}T_3 - \dot{m}_{32}C_{p_3}T_3 + \dot{m}_{43}C_{p_4}T_4 + \frac{T_5 - T_3}{R_{53}} - \dot{m}_{\nu}H \qquad \text{(space 3)}$$

•12 water and particle mass balance integral equations:

$$\frac{dm_{v_1}}{dt} = \dot{m}_{v_{51}} + \dot{m}_{v_{21}} - \dot{m}_{v_{10}}$$

$$\frac{dm_{p_1}}{dt} = \dot{m}_{p_{51}} + \dot{m}_{p_{21}} - \dot{m}_{p_{10}} \qquad \text{(space 1)}$$

•85 Fluids dynamics and mass balance equations:

$$\frac{P_a}{\rho g} + \frac{V_{A^2}}{2g} + Z_a = \frac{P_b}{\rho g} + \frac{V_B}{2g} + Z_b - h_f + h_b$$
$$A_i v_i = A_j v_j$$



A new numerical model, using a coupling of energy, mass and fluids dynamics equations, was developed.



Air and water temperature (°C) and velocity (m/s) inside the clean technology.

145

RESULTS

Water flow rate

14

Particle flow rate

Total flow rate

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Water, particle and total flow rate (m3/h) inside the clean technology.

CONCLUSIONS

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Development of a clean technology, without filters, applied in polluted air treatment, water treatment and energy production.

Development of a virtual prototype with 1.12 m hight,9 cm internal diameter and 13 cm external diameter.

A polluted flow rate of 578 °C guarantees:
1st heat exchangers of 61.9 °C (water storage space),
2nd heat exchangers of 114.5 °C (drying space),
3rd heat exchangers of 193 °C (polluted air space).

FUTURE DEVELOPMENTS AND PROTOTYPING

Use of the prototyping in the clean technology development applied in the polluted air treatment, water treatment and energy production.



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