CHAIR
OF THERMODYNAMICS
AND COMBUSTION

Combustion Processes

The post combustion of CO2 and H2 exhaust gases is carried out in many cases with the radial air injection in cylindri combustion chambers.

Figure 1 shows the principle of a combustor for a single-stage air injection Of particular interest to the co-worker, the question is which n number of nozzles and in which nozzle diameter d for a particular mixing path a substantial temperature uniformity achieved over the cross section. Numerical calculations with the program system FLUENT showed that the temperatu homogeneity of the dimensionless depth h / R of the air jet is dependent (R is the radius of the combustion chamber). T determining physical size for the depth of penetration, the ratio of the dynamic pressures J was (also referred to as pulse curr ratio) determined.

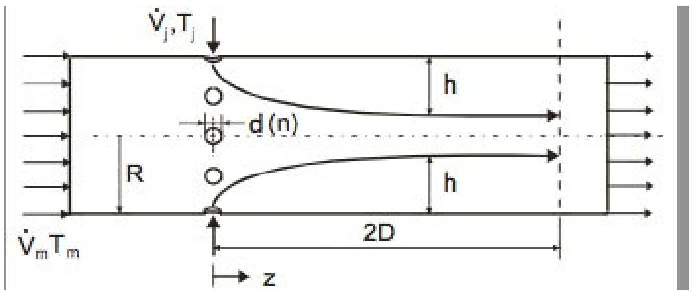

Figure 1: Scheme combustion chamber with radial air injection

Figure 2 shows temperature profiles at different pulse current conditions J / n2. The left edge of images representing the chan wall and the right edge the channel center . The radial deflection of the jet stream is completed after 0.25 diameters and is mark in this area. Through increases in temperature leads, the edges will burn. An increase in the radial supplied gas stream increas the values J / n2 and there is a shift of the flow paths in the direction of center of the channel. The smallest temperatu differences according to a length of 2 diameters arise in J / n2 = 0.3. Figure 3 shows the temperature differences are compared a mixing distance of 2 diameters depending on J / n2. Parameter is the number of nozzles n.

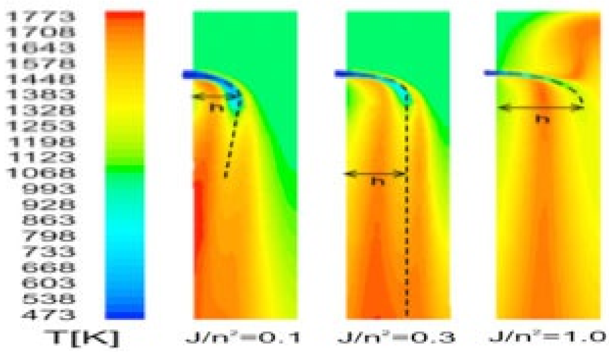

Figure 2: temperature fields in a combustion chamber with single-stage air injection

For all investigated nozzle numbers forms in J / n2 = 0.3 a relative minimum.In nozzle numbers 20 to cause deviations from J /
= 0.3 upwards as well as downwards always an increase of the temperature differences in the combustion chamber cross-sect
. If the nozzles number 24 and higher, is caused by an exceeding = 0.3 J / n2 , a further reduction of the temperature differen
For a given number of nozzles n = 0.3 the optimum nozzle diameter d can be determined by the boundary condition J / n2.

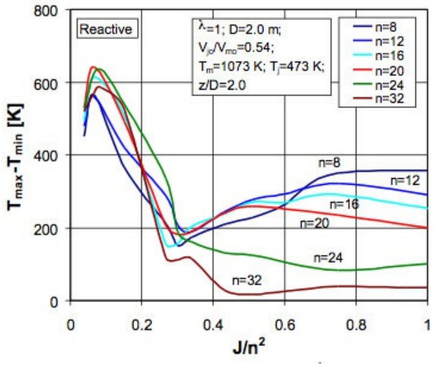

Figure 3: Influence of the number of nozzles and of J / n2 to the temperature differences

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Dynamic Simulation of Heat Treatment Processes

- Rotary Kilns
- Shaft Kilns
- Tunnel Kilns
- Roller Kilns
- Combustion Processes
- Measurement of thermophysical Material Properties
- Intensive Cooling
- Drying Processes