



Alvacat

Joint Catalyst Development Proposal

Catalytic Combustion

07-17-20

www.alvacat.com



Catalytic Combustion

- **Catalytic flameless combustion for energy-efficient heat generation**
 - Controlled low-temperature combustion without necessity to add excess of air to moderate flu gases temperature
 - Environmentally clean combustion (zero CO or NO_x emissions) which does not require post treatment to clean up flu gases
 - Drop-in solution to replace traditional burners/flame combustion
 - Capital cost savings: materials of construction less problematic
- **Integrated process : catalytic combustion with endothermic reaction**
 - 2 sections in reactor : heat producing (combustion chamber) and heat consuming (reaction chamber)
 - Better temperature control
 - Enhanced radiant and convective heat transfer to reaction chamber
- **Emerging technology making its way in the last 10 -20 years**
 - Major challenge – combustion catalyst stability at high temperature
 - Alvacat has 1-st hand experience with developing stable catalyst for catalytic combustion and coating the catalyst powder onto metal substrate
- **Potential applications: boiler, reformer, gas turbines, consumer stoves**



Catalytic Combustion, cont'd

➤ **Boiler applications: energy saving [1,2]**

- ❖ Detailed experimental and theoretical analysis of fuel efficiency and waste heat losses resulted in the following conclusions:
 - Fuel efficiency of catalytic burner is about 0.5 -1 % higher than flame combustion due to more complete fuel burning.
 - Thermal efficiency for catalytic combustion is about 0.6% higher due to lower waste heat losses.

➤ **Steam reformer**

- ❖ Catalytic combustor provides enhanced radiant and convective heat transfer to the reformer catalyst bed [3].

➤ **References**

- [1] U. Viani et al., Boilers with catalytic combustion. US 4886017. 1989.
- [2] Q. Dong et al., Energy analysis of the Catalytic combustion burner. Heating technology for energy efficiency. Vol. III-1-3. 2006.
- [3] G. Voecks. Steam reformer with catalytic combustor. US 4909808. 1990.