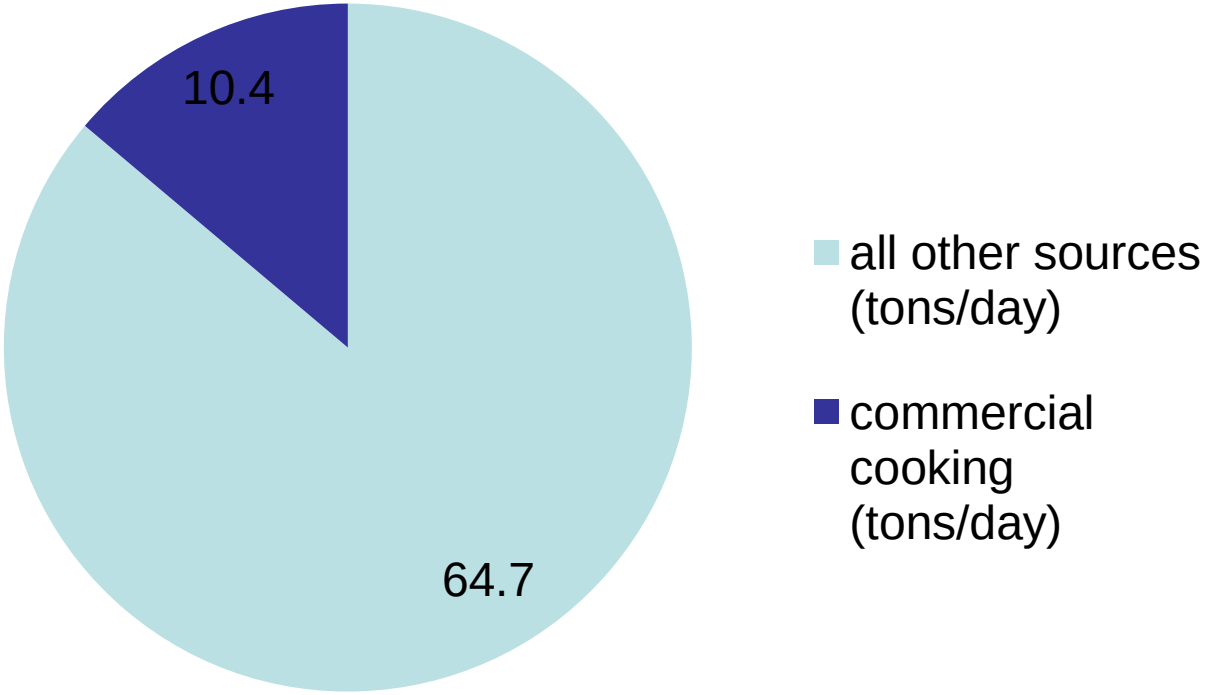
UCR College of Engineering- Center for Environmental Research & Technology

Commercial Cooking Emissions Control
South Coast Air Quality Management District
2016 AQMP Control Strategy Symposium

University of California, Riverside
June 11, 2015

Commercial Cooking Appliances

South Coast Air Basin PM2.5 Emissions (2012)



Emission Factors from Commercial Cooking Operations

Apparatus	Food	PM (lb/1000 lb)	ROG (lb/1000 lb)
Under-fired broiler	25% fat 1/3 lb hamburger	32.65	3.94
Under-fired broiler	whole chicken	10.48	1.82
Under-fired broiler	Atlantic salmon	3.3	0.38
Under-fired broiler	New York steak	17.19	0.86
Chain-driven broiler without control	21% fat 1/4 lb hamburger	7.42	2.27
Chain-driven broiler with catalyst	21% fat 1/4 lb hamburger	1.29	0.32
Griddle (shell down)	24% fat 1/4 lb hamburger	0.85	0.01
Griddle (shell up)	24% fat 1/4 lb hamburger	5.08	0.07
Griddle (shell up)	sk-boneless chicken breast	BDL*	0.4
Griddle (shell up)	cod fillet	BDL*	0.11
Deep fat fryer	1/4" shoestring fries	BDL*	0.21
Deep fat fryer	3 oz. breaded chicken patties	BDL*	0.12
Deep fat fryer	4 oz. breaded cod fillet	BDL*	0.14
*BDL - Below Detectable Level			

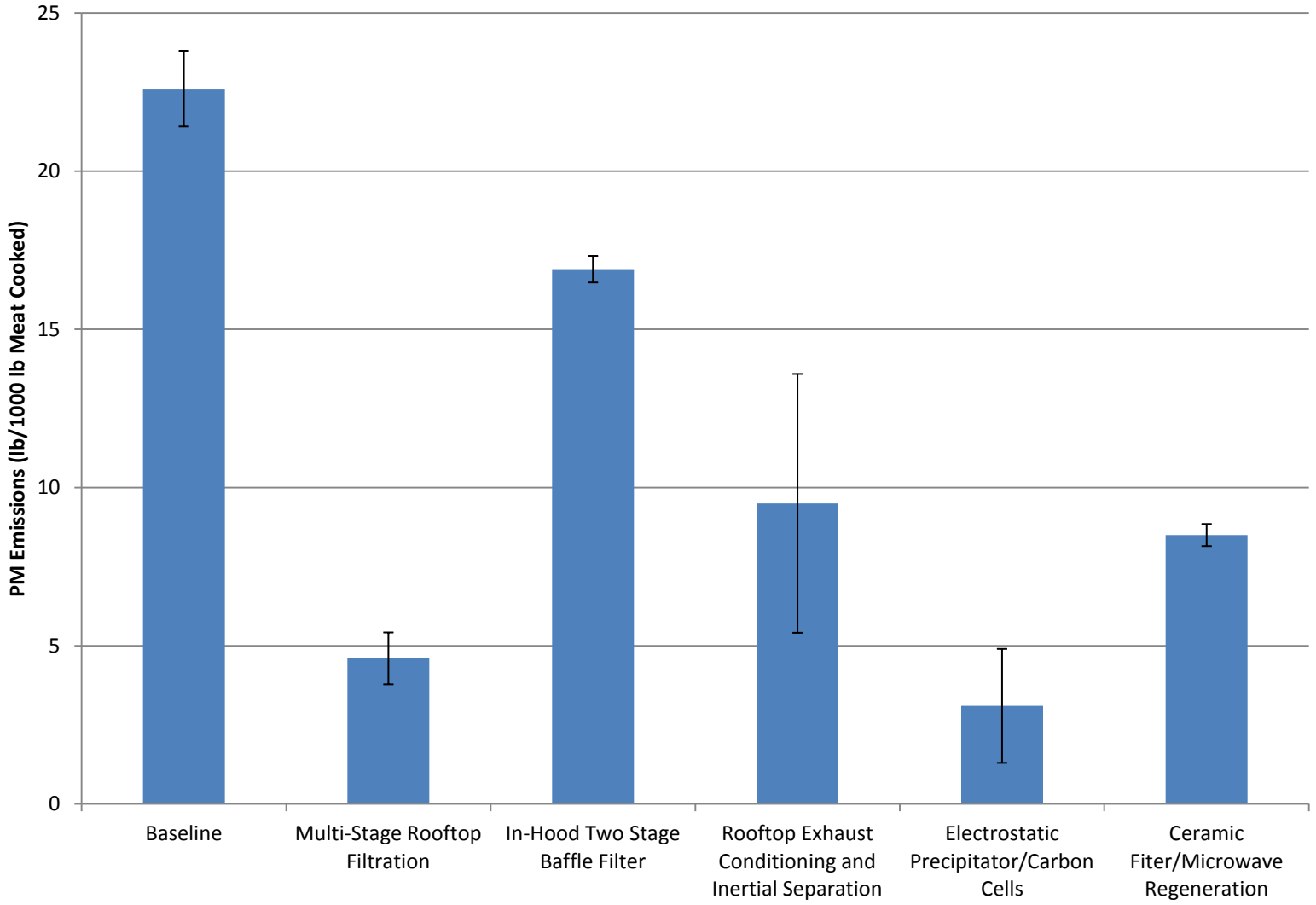
Objective

Evaluate potential control technologies for reducing Particulate matter emissions from commercial Underfired charbroiler operations

Technologies

- In-hood reticulated ceramic filter
- Multiple stage rooftop filtration
- In-hood two stage baffle filters
- Rooftop exhaust conditioning and inertial separation
- Electrostatic precipitator/activated carbon cells
- Ceramic filtration with microwave regeneration
- Retrofit charbroiler grate

Testing Results to Date


PM Emissions (lb/1000 lb Meat Cooked)
25
20
15
10
5
0
Baseline
Multi-Stage Rooftop Filtration
In-Hood Two Stage Baffle Filter
Rooftop Exhaust Conditioning and Inertial Separation
Electrostatic Precipitator/Carbon Cells
Ceramic Fiter/Microwave Regeneration

Companion Studies

- Bay Area Air Quality Management District
- SCAQMD Comprehensive Characterization