

Controlled Catalytic Combustion Module (CCM)

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Catacel Corp.



Who is Catacel Corp ?

- Ohio team with 18 years experience in metal substrate catalyst applications.
- Camet, Grace, Engelhard.
- Business relocated, team remained in Ohio.
- Catacel formed to work on challenging applications - combustion, fuel reforming.



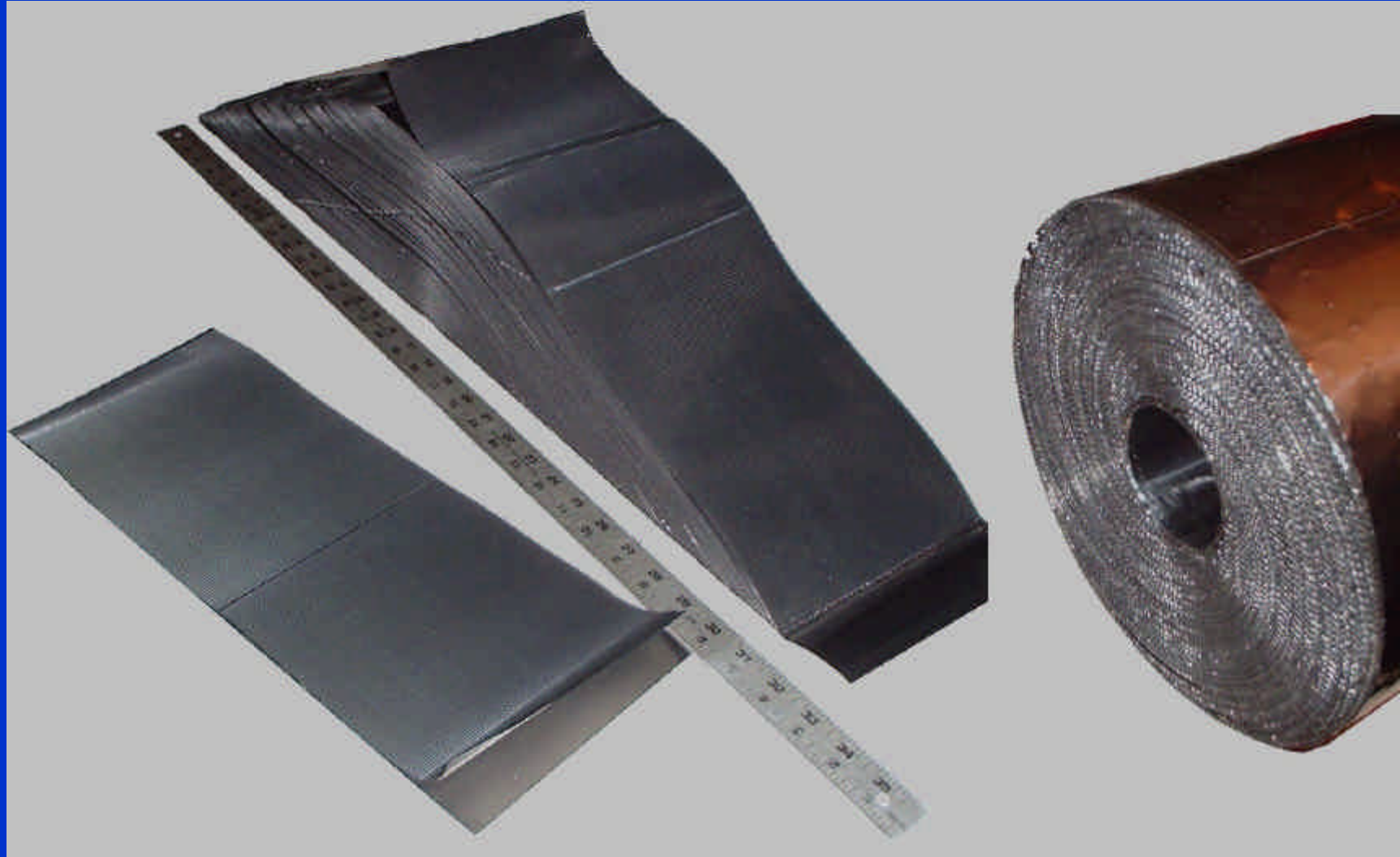
CCM Design Goals

- Use catalytic combustion to reduce or eliminate NO_x formation.
- Manage the temperature - exit at highest possible while maintaining reactor integrity.
- Retrofittable package with no preburner, must drop in place of current burners.
- Small package implies low cost.



Turbine Design Variables

	Microturbine (estimate)	S-W W251AA	GE MS7001EA	GE MS7001FA	Alstom (S-W) GTX100
Turbine					
Pressure ratio	3.5	9.8	11.8	15.7	20.0
Combustion temp, degC	850	925	1370	1480	1550
Compressor discharge, degC	400	325	350	410	440
Flow per module, kg/sec	0.3	14	24	45	3.2
Module diameter, mm	250	300	350	400	150
Module length, mm	250	300	350	400	150
Space velocity, 1/sec	20	541	584	734	990



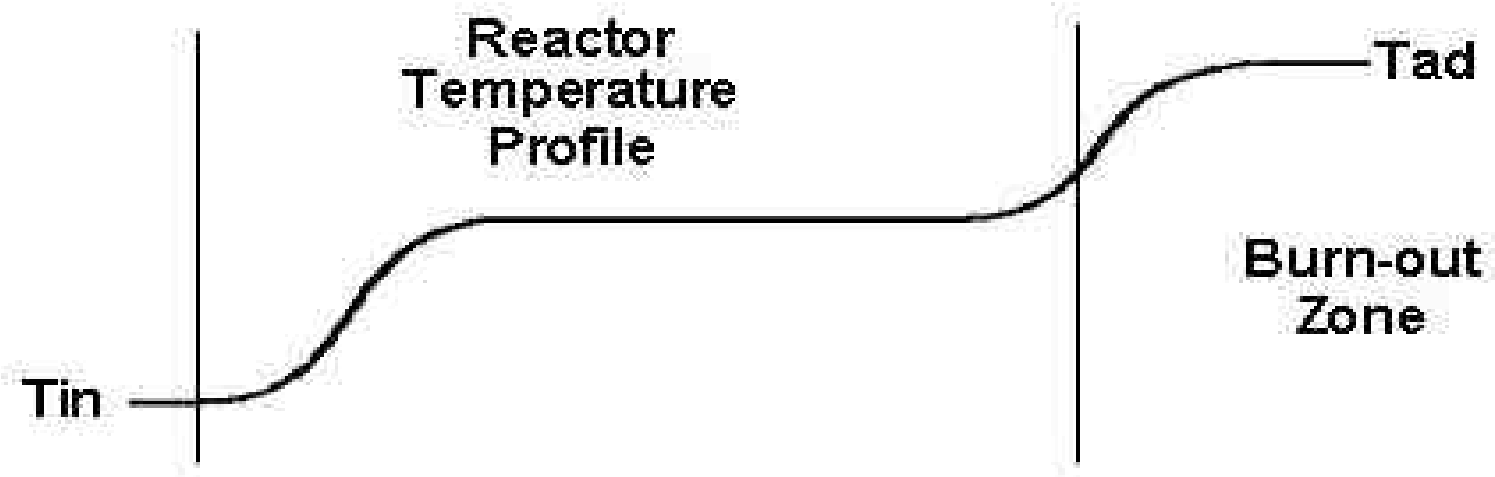
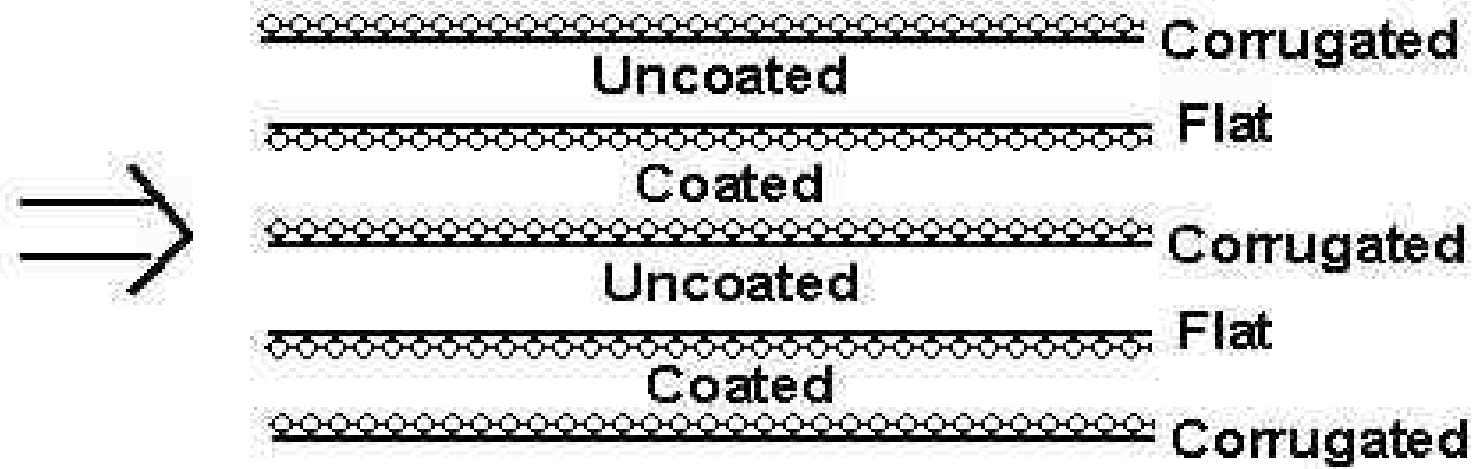
Reactor Assembly

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Temperature Regulation

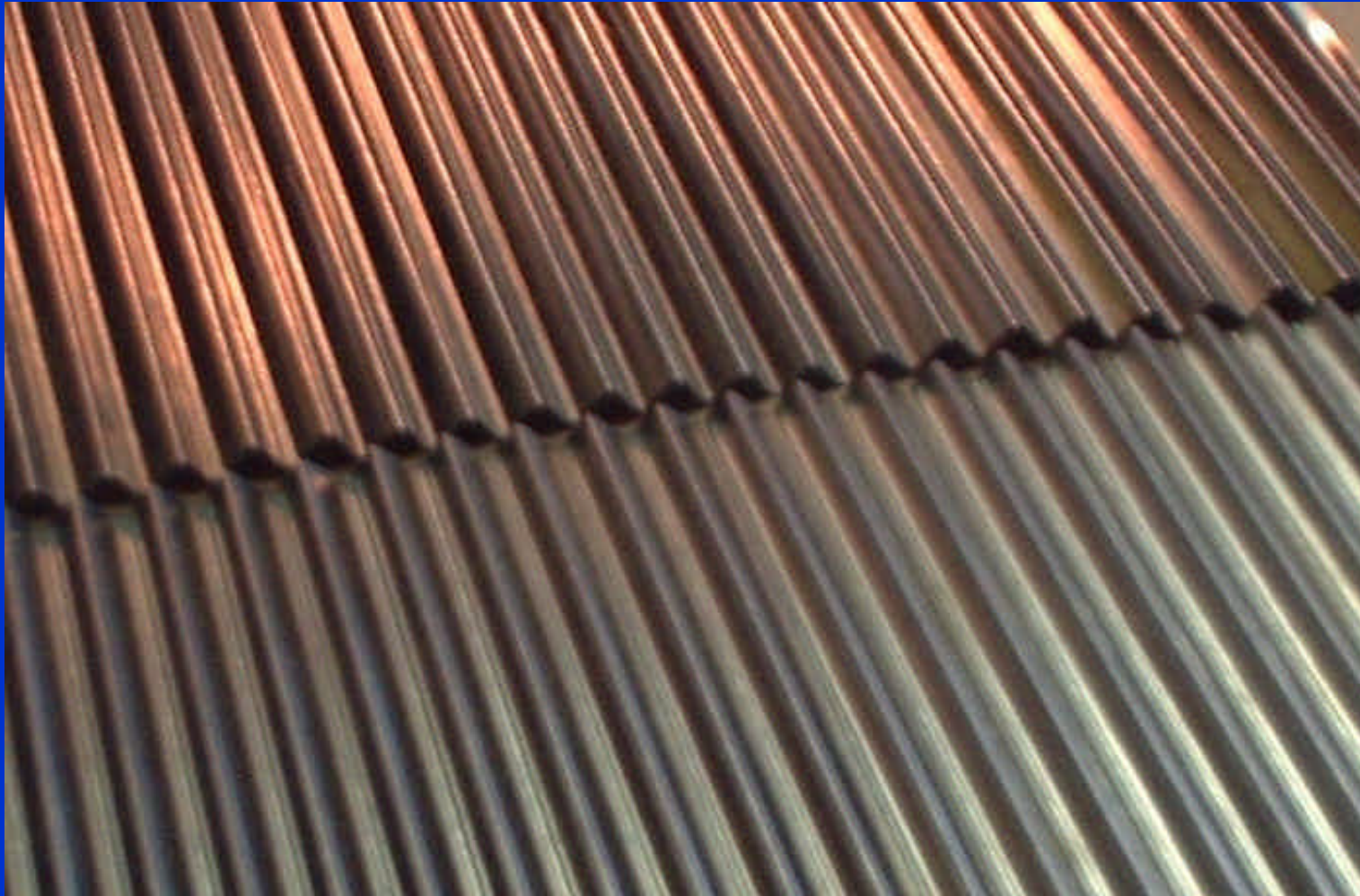
- One-sided coating strategy.
- Internal mixing.
- Novel catalytic materials.



One Sided Coating

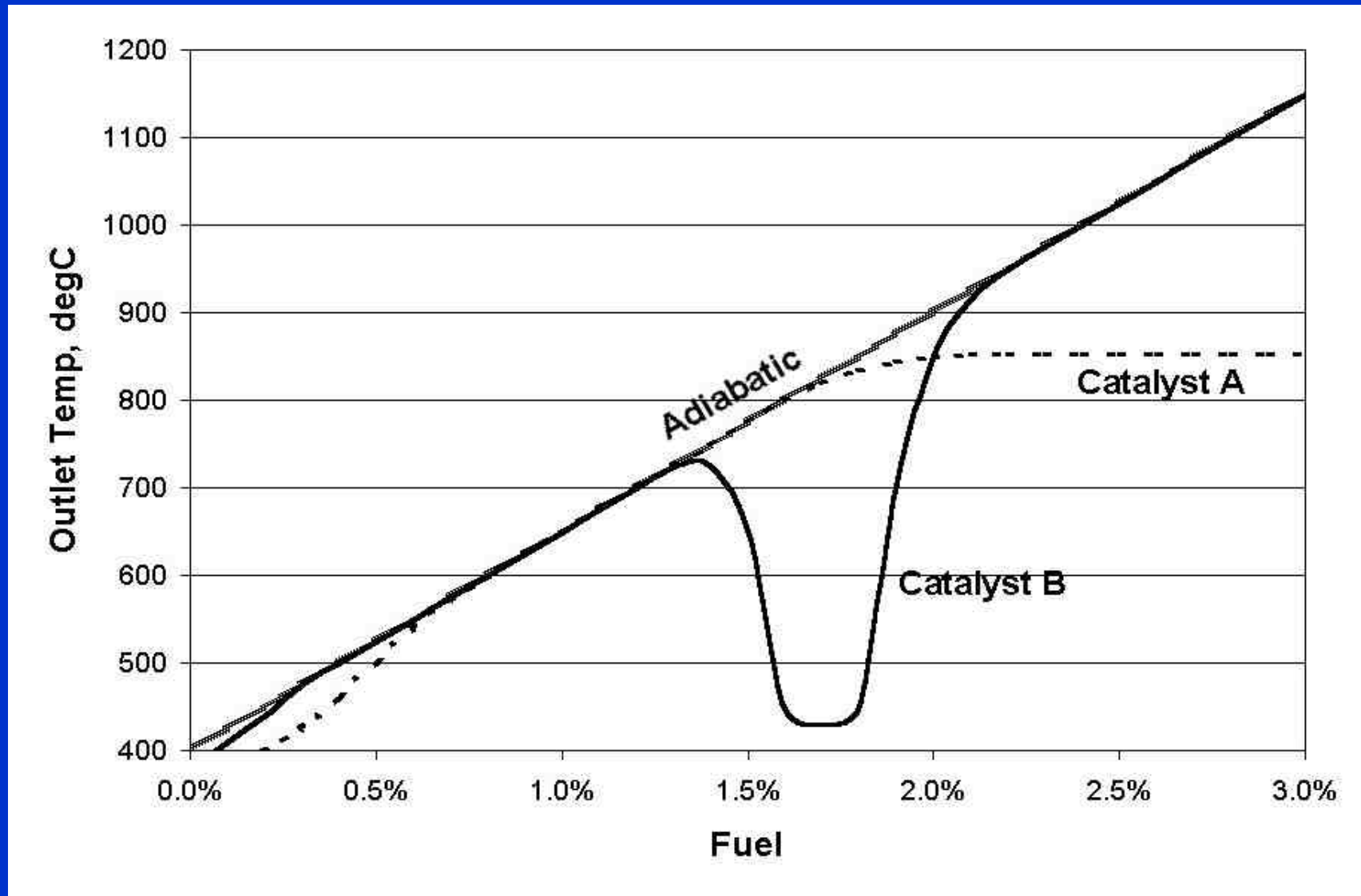
Internal Mixing

- One sided coating entire length means $1/2$ the adiabatic rise.
- Add another similar reactor after the mixed stream, gives another $1/2$, or total of $3/4$ the adiabatic rise.



Offset Corrugations



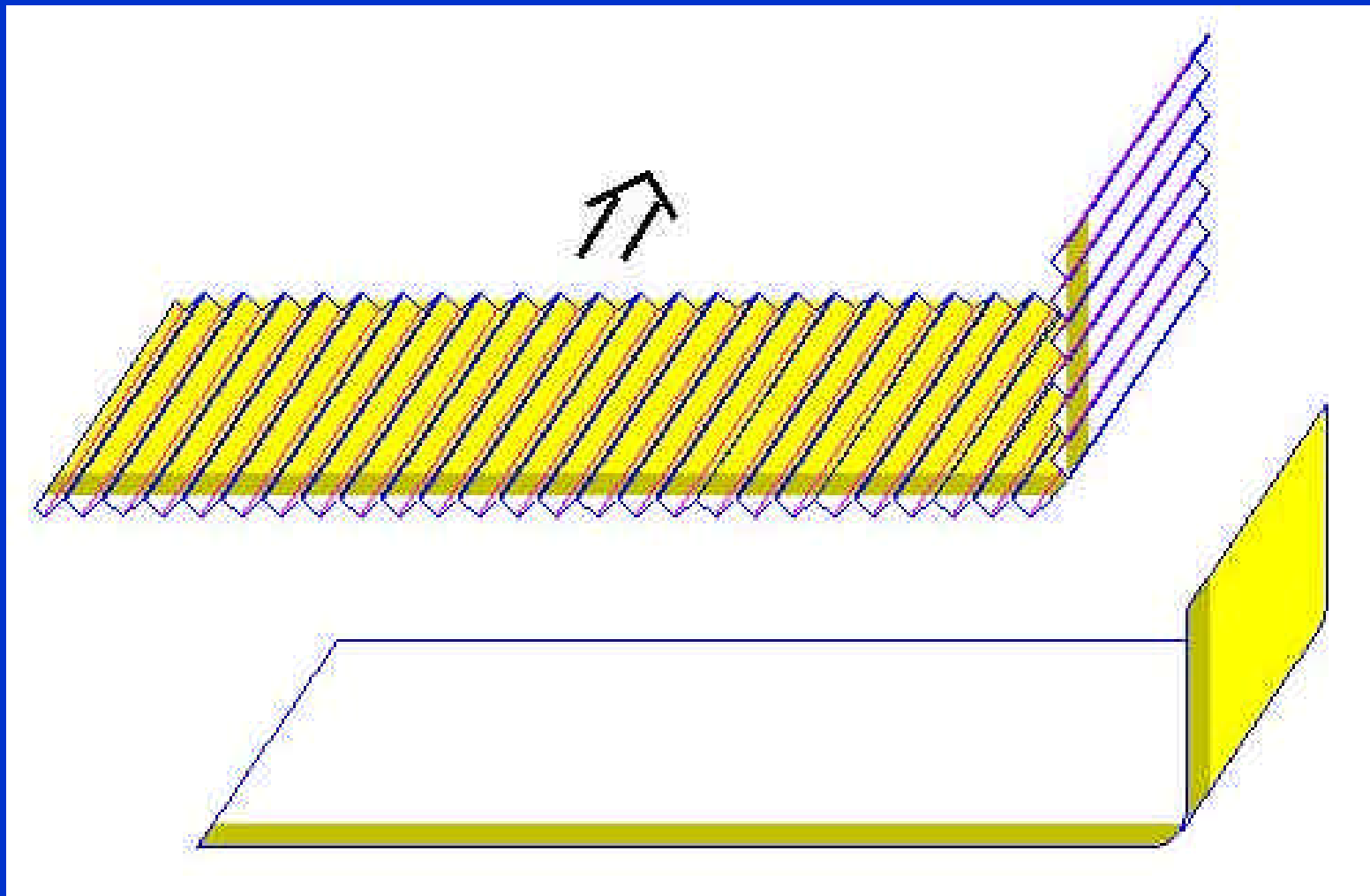


Catalyst Performance



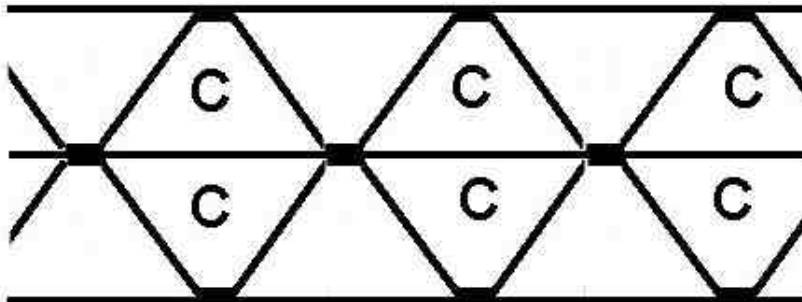
Light-Off

- Novel chemistry of catalytic materials.
- More catalyst near the leading edge.
- More surface area near the leading edge.

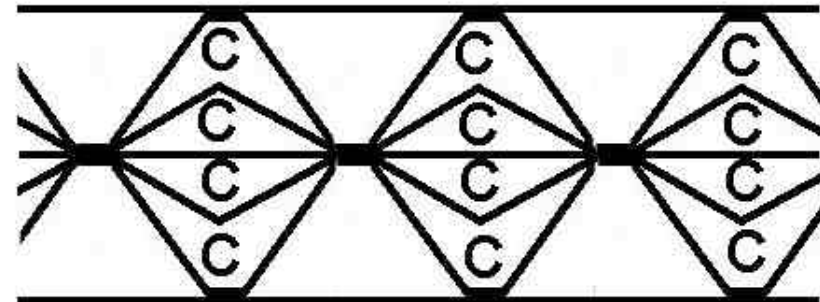


Lightoff Band

C = Coated Channel



Section Through Reactor

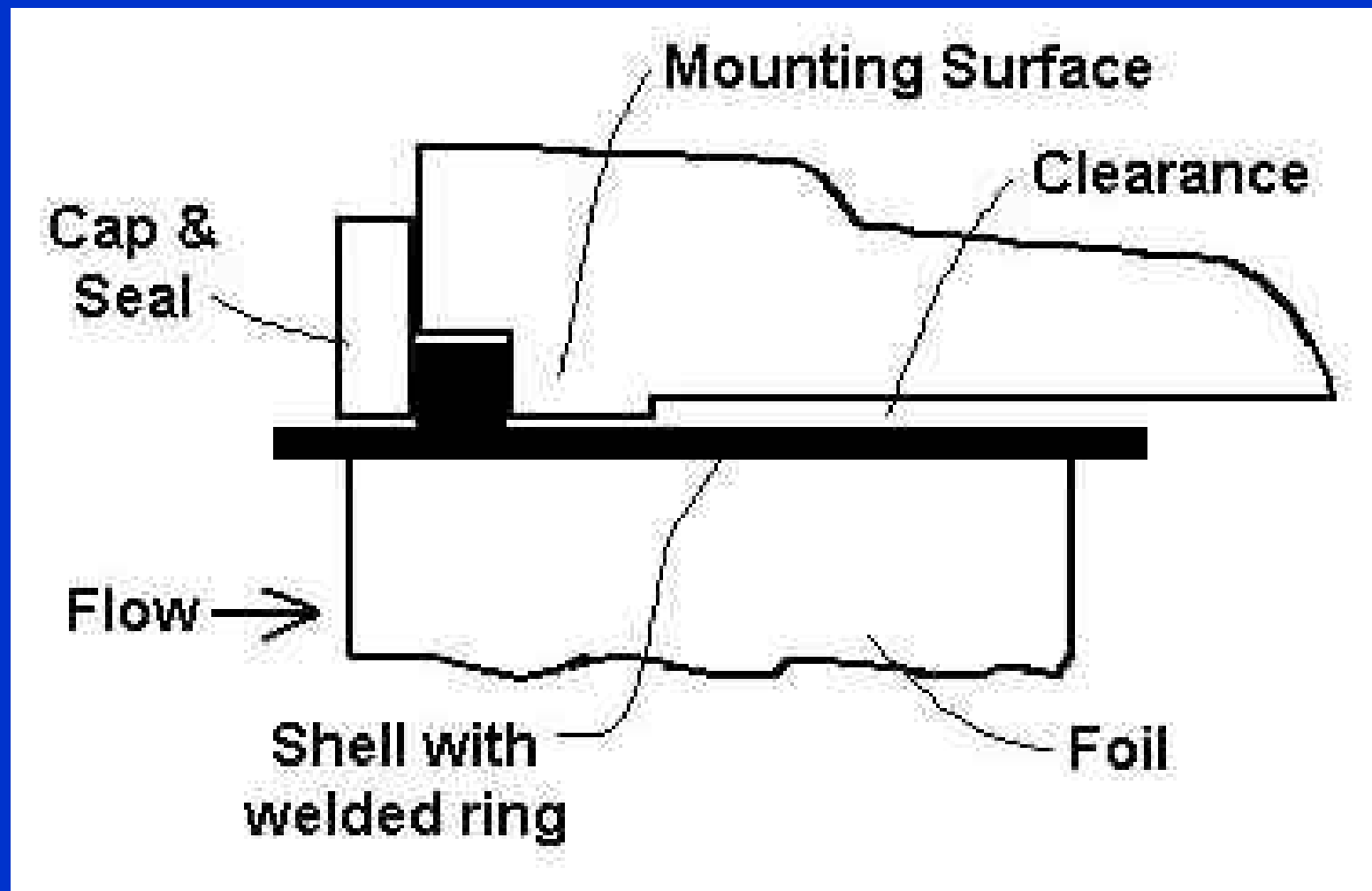


Section Through Lightoff Zone
Showing Embedded Strips

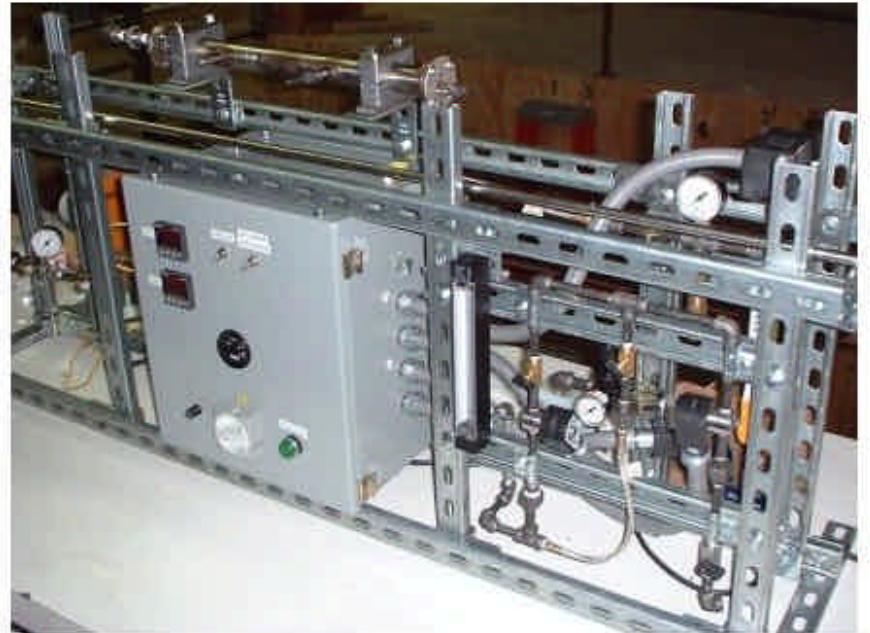
Embedded Strips

Mounting Issues

- Allow for thermal expansion.
- Seal against gas bypass.
- Structurally sound.
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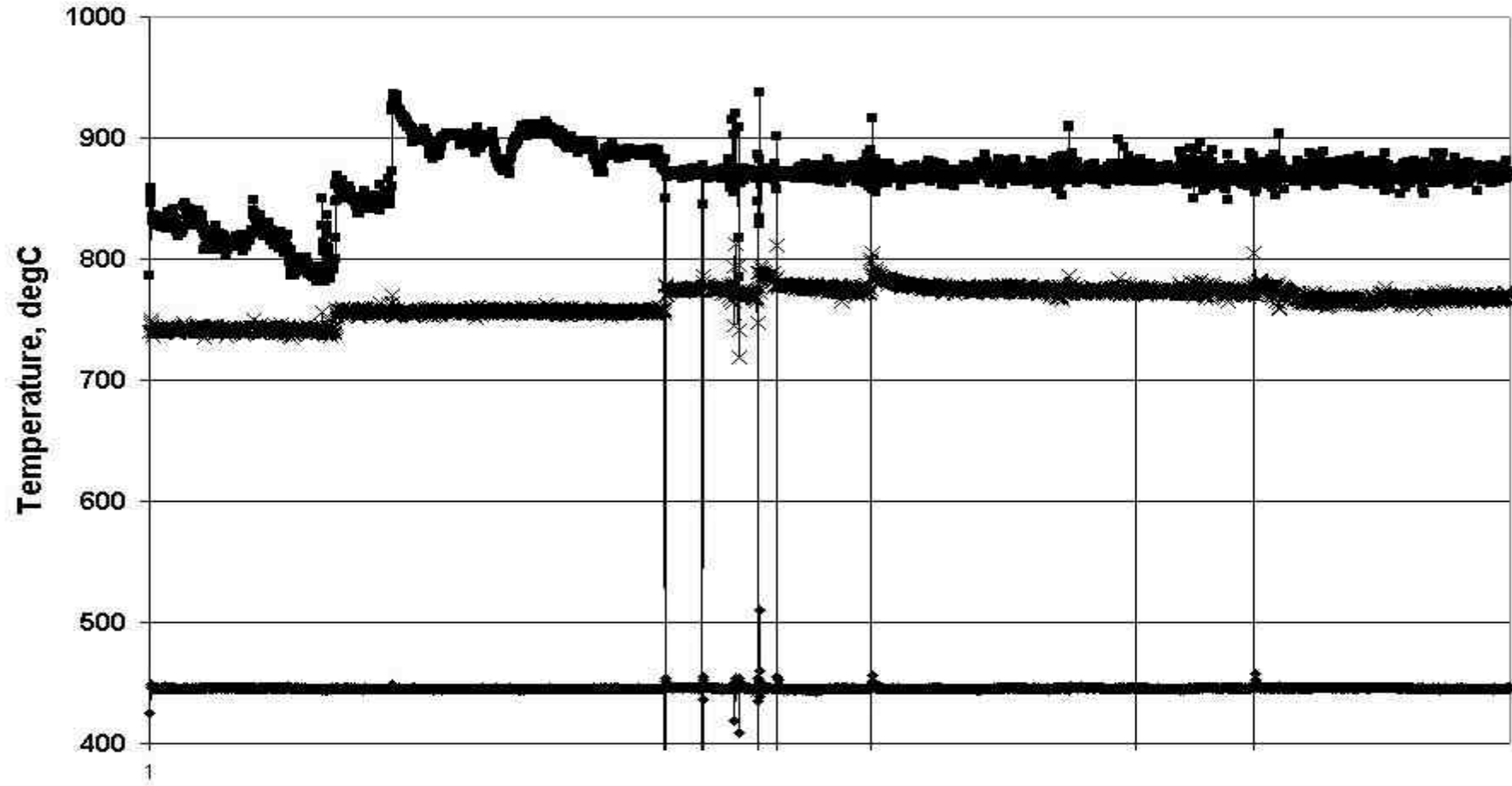


Mounting Arrangement



Durability Rigs

41-77 Performance



Performance Over Time



Summary

- Design options available for temperature management and low temperature light-off.
- Mounting strategy available to insure mechanical durability.
- Catalyst shows good durability at velocities of interest.
- CCM has low-cost retrofit potential.
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Thank You !



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