Dr. Ben Egelske
Sr Chemical Engineer

Applied Catalysts

Process Catalysts, Systems & Services Overview

SOCMA 2024
Nashville TN
*** **Booth 310** ***

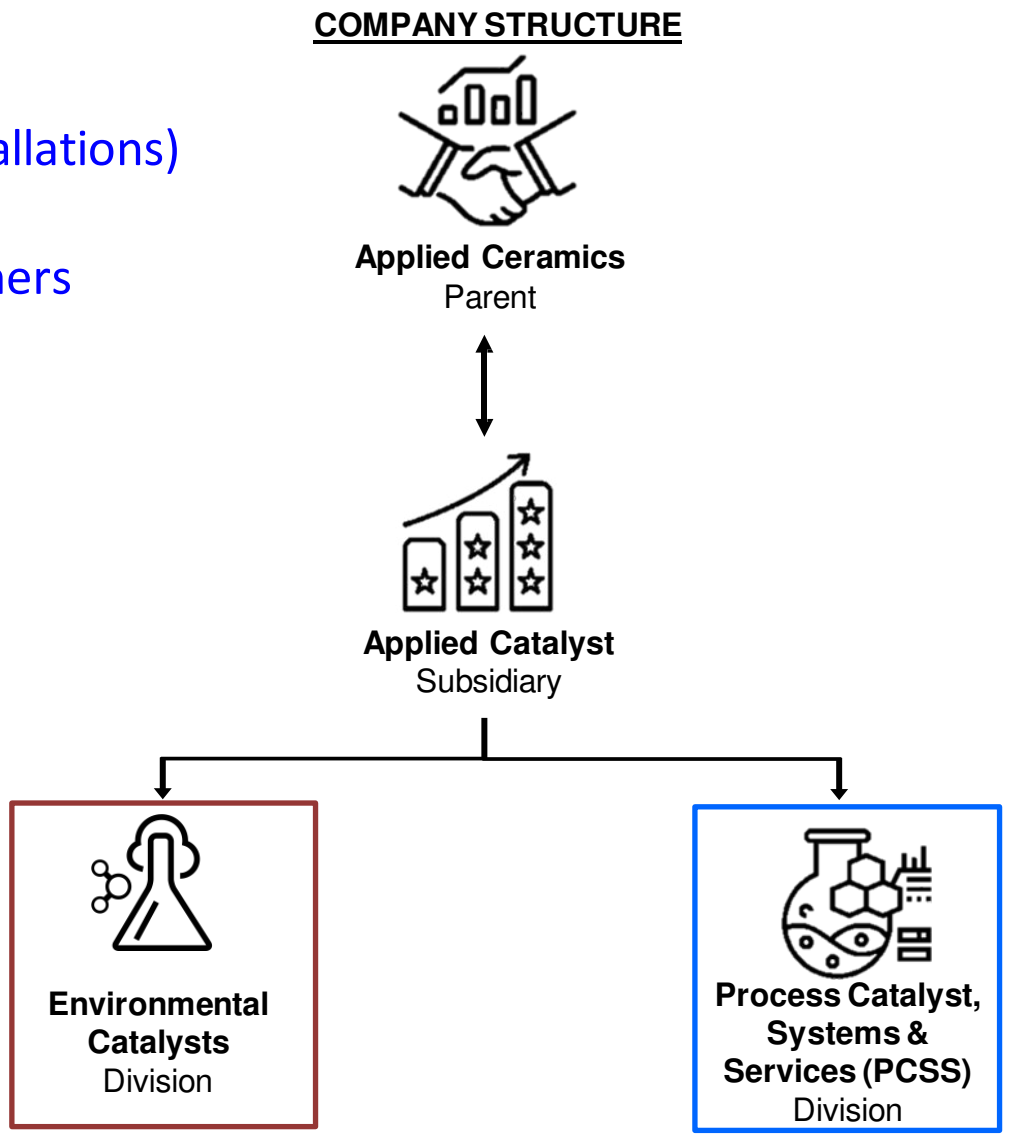
APPLIED CATALYSTS

Applied Catalysts

Parent Company: Applied Ceramics (founded 1967)
Applied Catalysts Established: **1997** (25+ years of proven installations)
Ownership: Family Run & Operated
Manufacturing Sites: United States (SC, GA) + Overseas Partners
Total Employees: 130 (Approx. for whole organization)
Key Values: High Quality, Fast Response, Fair Pricing.

Manufacturing Plant in Laurens, South Carolina

COMPANY STRUCTURE



PCSS Division
(Process Catalysts, Systems & Services)

PROCESS CATALYSTS

Granular & Extruded Catalysts

Carbon and Ceramic Monoliths

Custom Catalyst Manufacturing

Manufacturing Capacity -> Tons/day

PROCESS DEVELOPMENT SERVICES

PSM Facility

Process Scaleup

Batch/Continuous Chemistry (Lab Scale)

Continuous Chemistry (Semi-pilot)

Hydrogenation & Sister Chemistry

MODULAR PROCESS SYSTEMS

Commercial Turn-Key Solutions

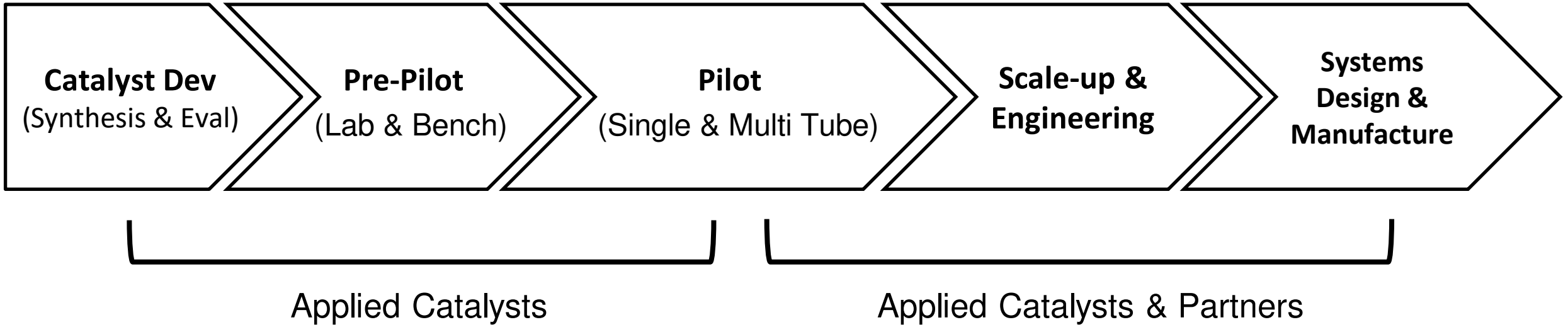
Process Design & EPC Services

Customized Production Systems

Custom Lab Systems

Model for the Commercialization of Hydrogenation and Other Chemistries

Goal -> To provide clients with best-in-class catalysts, process systems, and engineering solutions.

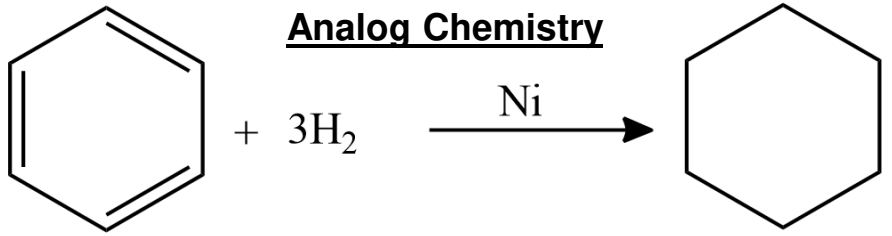


Can assist clients at all parts of the development process

Case Study 1
Fixed Bed Ring Saturation

Lab scale continuous flow reactor with ½-in OD electrically heated reactor (center) and 1.5-in OD hot oil jacketed reactor (right). System rated to 1000 psig.

Analog Chemistry

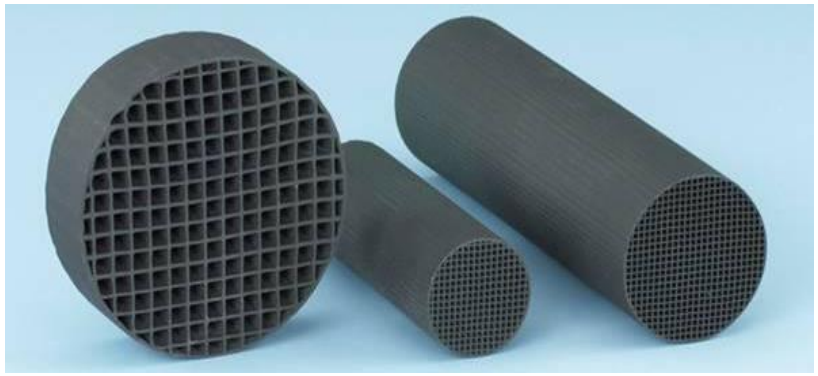


Problem -> Proof of concept complete. Client required optimized catalyst and catalyst manufacturing.

Approach -> Screen metal / support combinations, manufacture catalyst.

Result -> 5-month execution (NDA -> development -> production).

Catalyst Manufacturing

Granular Catalyst Series	
Activated Carbon Monolith Series	
Ceramic Monolith Catalyst Series	

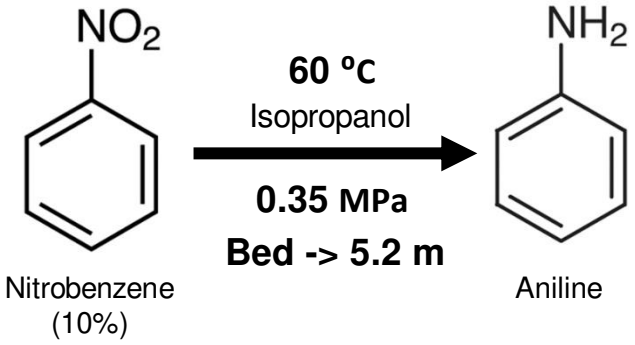
- Manufacturing 3-5 metric ton / day quantities of all catalysts.
- 25 years base & precious metal experience.
- Dedicated team of PhDs and BS scientists.
- Custom heterogenous catalysts.
- Homogenous and powered slurry catalysts through partners.

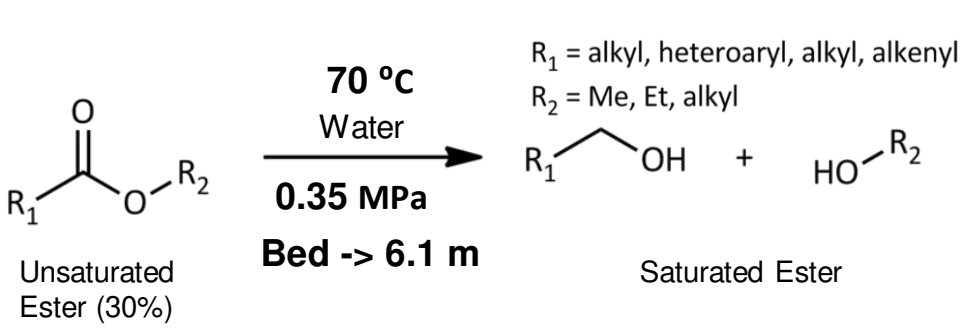
Case Study 2
Batch to Continuous Specially Chemicals

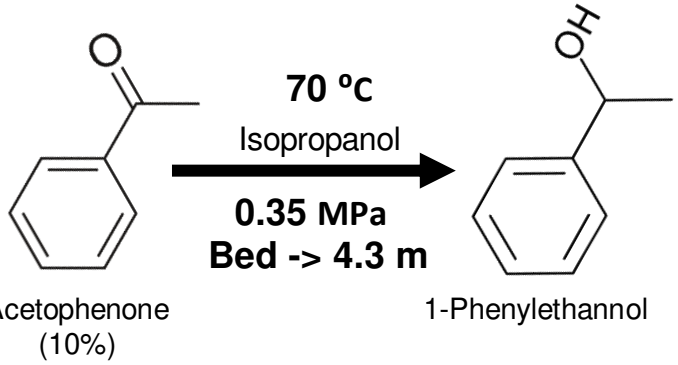
Problem -> Demonstrate four (4) batch chemistry using continuous flow.

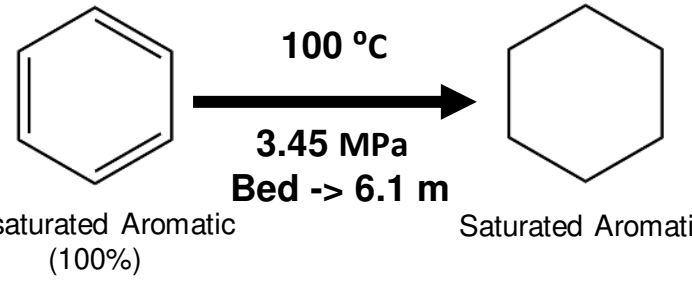
Approach -> Determine parameters for 98% single pass conversion.

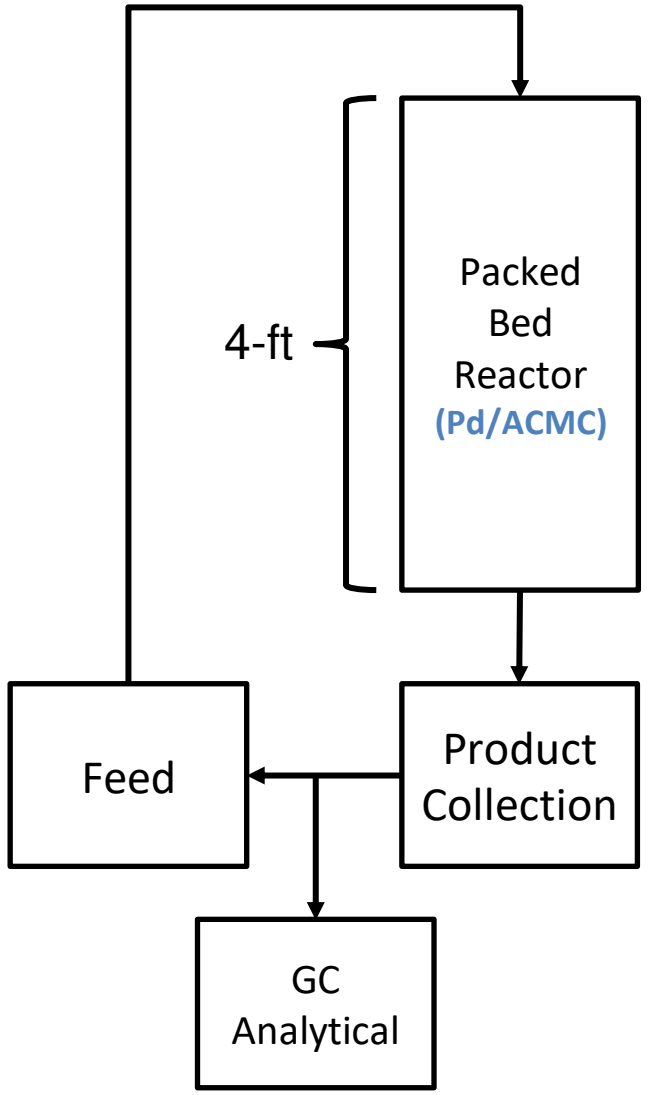
Conclusions -> 97+% conversion with high selectivity. Residence time significantly shorter than batch technology. No catalyst changeout required.











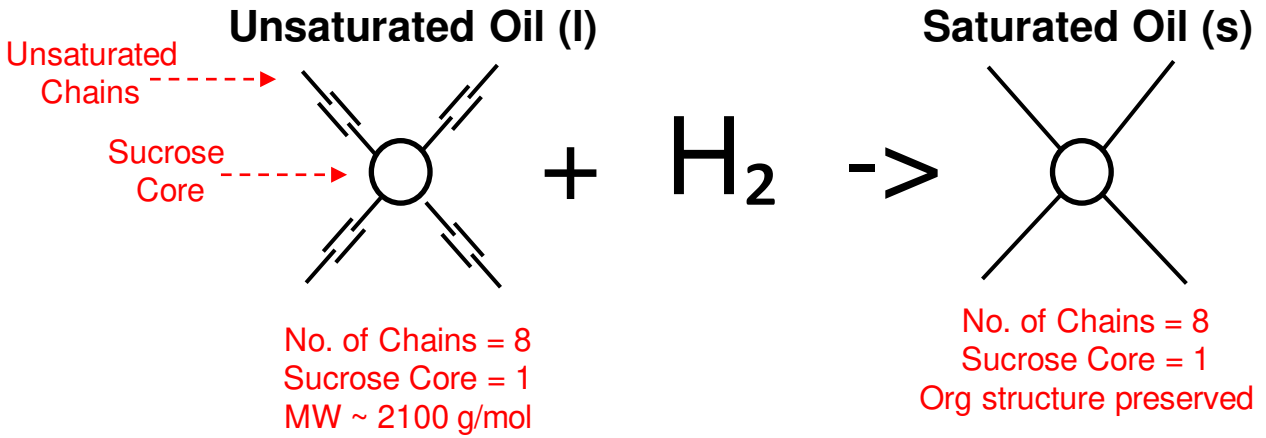
Case Study 3

Batch to Continuous Oleochemical Hydrogenation

Batch Problems

1) 10-15% product loss on filtration.
2) High catalyst attrition rate (fines formation).
3) Slow production method with multiple steps.

Approach -> Screen catalysts using pilot tube.

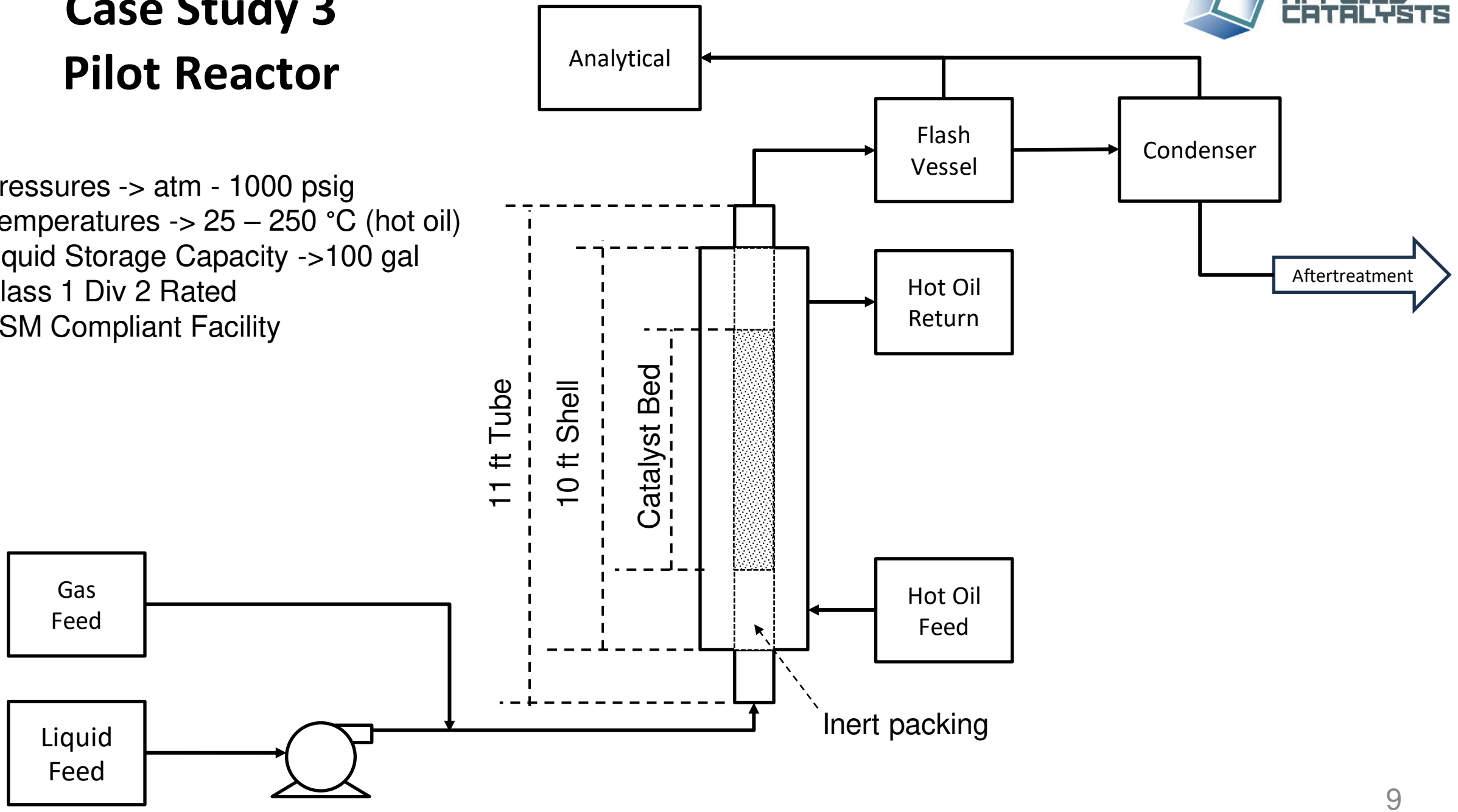


Catalyst	Active Metal
230 CPSI ACMC	Pd
400 CPSI ACMC	Pd
Granular Industry-Pd	Pd
Granular Industry-Ni	Ni
Palladium (Pd) Loadings -> 0.25 – 1.0 wt% metal Nickel (Ni) Loadings -> 10 – 15 wt% metal	

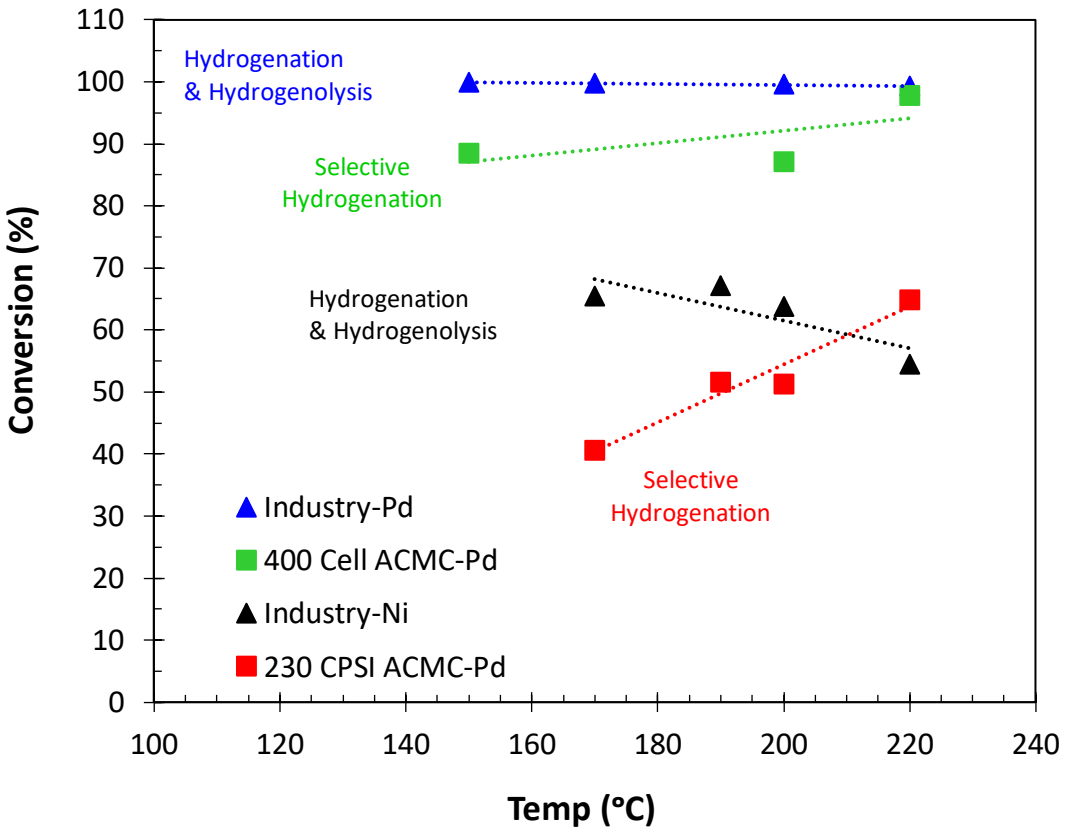
Liquid reactant (left) and solid product (right) @ 25 °C

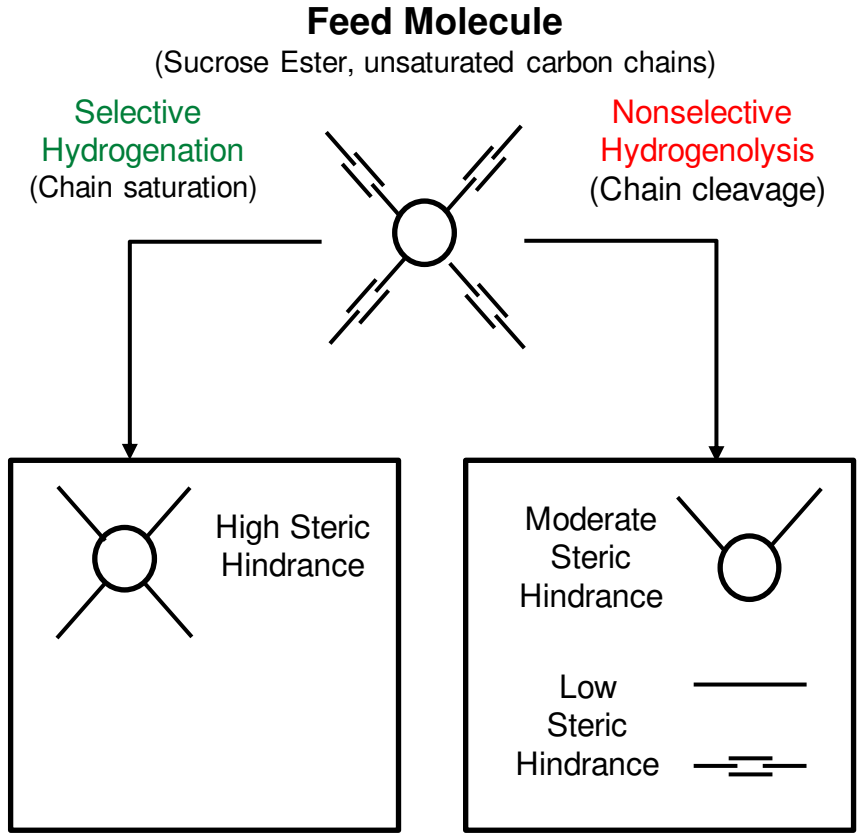
Case Study 3
Pilot Reactor

Pressures -> atm - 1000 psig
Temperatures -> 25 – 250 °C (hot oil)
Liquid Storage Capacity ->100 gal
Class 1 Div 2 Rated
PSM Compliant Facility



Case Study 3 Results



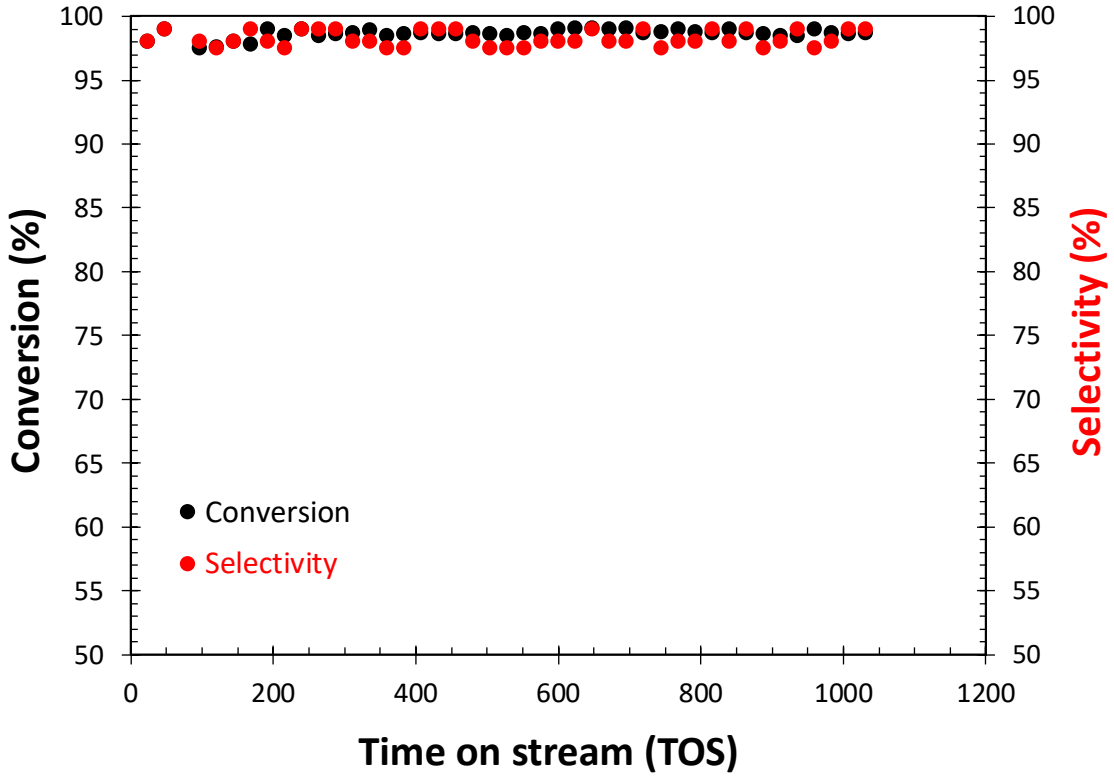


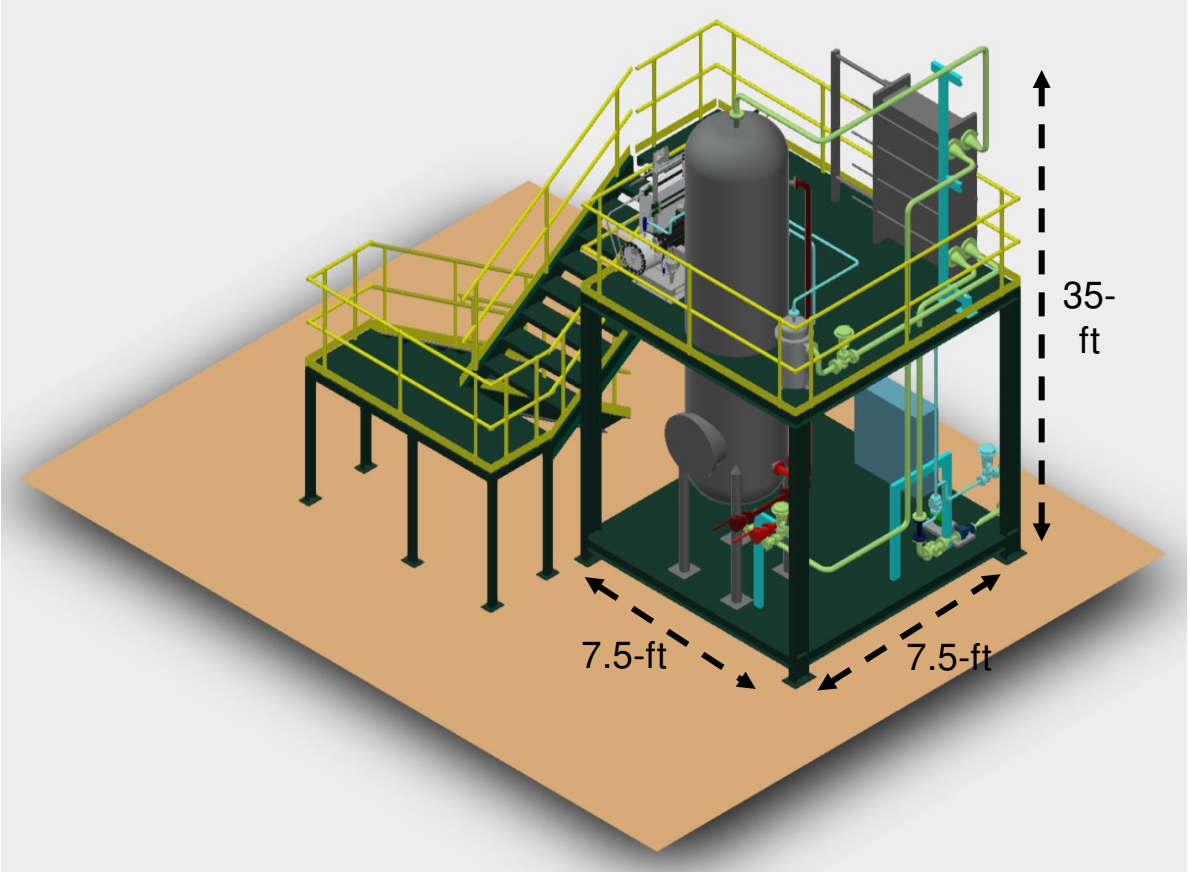
Mass Transport Effects

Granular Media -> Higher contact time -> Chain Cleavage (Hydrogenolysis).

Activated Carbon Monolith -> Hydrogenation w/o holdup -> Selective Saturation.

Case Study 3 Next Steps
Modular Process Skid with ACMC





Conclusions

- 1000 hrs -> 2400 lbs of product @10 kg/day
- No Pd leaching (PIXE analysis of product)
- Domestic and international fabrication options

Conclusions

Applied Catalysts PCSS Group
- 25 years of catalysis manufacturing experience.
- Diverse range of experience commercializing chemical technology.
- Dedicated team of engineers and scientists (3 PhD, 3 BS, 2 Technicians).
- Specialized in hydrogenation and sister chemistry (amination, reductive alkylation, etc)

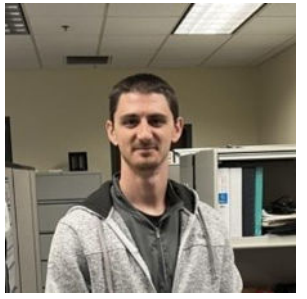
Catalyst Manufacturing
- 3-5 metric ton / day manufacturing capacity.
- Custom development of fixed bed catalysts.
- Homogeneous and slurry catalysts with partners.

Services
- PSM compliant facility.
- Class 1 Division 2 pilot operations.
- Process parameter and scaleup studies (Lab to Pilot)

Systems
- Domestic & international fabrication partners
- Engineering design

Applied Catalysts
Booth 310

Ford Jolly
Chemist I



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