



# PuriSim CATOX Reactor Design

Client: **EXAMPLE CLIENT**

PROJECT:

CATOX Reactor for CO2 Purification

DATE:

2/5/2024

**Design Basis, Criteria, and/or Comments**  
10000 SCFM of CO2 @ 400 psig, utilizing CATOX catalyst to reduce total HC content to below 30 ppmv

Bed Dims: 60" ID x 5'-7"  
with 5150 lbs of Catalyst

### Catalyst:

Type	<b>RCI OxiGone 125</b>		<u>Wt%</u>
Constituents	Pd on Al2O3	Palladium	0.250
Form / size	2 - 4 mm Beads	Platinum	--
Sock-loading Density	46.8 lb/ft3	Rhodium	--
		Ruthenium	--

### Process Conditions:

Primary Feed Gas Rate	10,000 SCFM	Inlet Temp.:	700 °F / 371.1 °C
Secondary Feed Gas	None	Outlet Temp.:	908.5 °F / 486.9 °C
Secondary Gas Rate	--	Effluent Split to Recycle	0.000
Avg Gas MW in Reactor	43.31	Recycle Rate	0 SCFH
Gas Viscosity	0.0340 cp	Total Gas Into Rx	600,000 SCFH
Inlet Pressure	400 psig	Ergun Pressure Drop	2.992 psi

### Bed Dimensions & Catalyst Quantity:

Bed Diameter	60 in	Bed Volume	109.96 ft3
Bed Height	5 ft - 7 in	Bed Mass	5,150 lbs
L/D Ratio	1.12		
Contact Time	6.68 sec		
Space Velocity	5456 hr-1		
Superficial Velocity	0.83 ft/s		

### Fluid Dynamics

\*\*\* FDI = 53.4

See our paper Fluid Dynamics in Packed Beds for more on the FDI - how it's calculated and how it's used in deciding best bed dimensions.

SEE P. 2 FOR STREAM COMPOSITIONS, MATERIAL BALANCE AND ANY SPECIAL NOTES.

Run No. 1478

Run ID: Design Case - 10000 SCFM

\*\*\* The Fluid Dynamics Index or FDI is a metric for the degree of turbulence in the catalyst bed. Designing for FDI > 1 at minimum flow will minimize the possibility of channeling in the bed.

Page 1 of 2



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## Material Balance for EXAMPLE CLIENT

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**STREAM RATES:**

	Main <u>Feed</u>	2nd Feed <u>(None)</u>	Recycle <u>(None)</u>	Combined <u>Feeds</u>	Forward <u>Product</u>
SCFH	600,000	--	--	600,000	600,600
Lbmols/hr	1,578.9	--	--	1,578.9	1,580.5
Lbs/hr	68,422	--	--	68,422	68,422
MW	43.33	--	--	43.33	43.29

**STREAM COMPOSITIONS:**

<u>Comp.</u>	<u>Component Name</u>	<u>(mol%)</u>	<u>(mol%)</u>	<u>(mol%)</u>	Rx In <u>(mol%)</u>	Rx Out <u>(mol%)</u>
1	CARBON DIOXIDE	94.3400	--	--	94.3400	94.9930
2	WATER	0.1100	--	--	0.1100	1.4046
3	OXYGEN	4.0000	--	--	4.0000	2.6014
4	ARGON	1.0000	--	--	1.0000	0.9990
5	METHANE	0.4000	--	--	0.40000	< 30 ppmv
6	ETHANE	0.1000	--	--	0.1000	< 1 ppmv
7	PROPANE	0.0500	--	--	0.0500	< 1 ppmv
8						
9						
10						
11						
12						
13						
14						
15						

Notes:

(1) This design can be used with either OxiGone 125 (0.25% Pd) or OxiGone 230 (0.3% Pt).

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Page 2 of 2