



FLUOR®

"What we can do for you!"

Fluor's delayed coking experience spans more than 40 years. The coker unit has numerous safety issues and unique processing requirements with which our veteran personnel are intimately familiar. We have the experience to deal with these issues based on innovative designed solutions to safely address these requirements. The following is a list of some of Fluor's innovations for delayed coking.

Fluor Coke Drum Deheading System Patents

- Hinged Head (USP 5,098,524)
- Boltless Closure (USP 5,048,876)
- Drum Cover Handling Apparatus (USP 5,336,375)
- Low Headroom Hinged Head (USP 5,785,843)
- Automated Chute (USP 5,628,603)
- Automated Drill Stem Guide (USP 5,846,043)
- Moveable Platform (USP 6,113,745)
- Low Headroom Coke Drum Deheading Device (USP 6264829)
- Improved Coke Chute Systems & Methods (USP 7189310)
- Improved Vessel Closures & Methods Patent Pending
- Apparatus and Method for Shielding High Pressure Fluid Devices (USP 6926013)
- Safety Lock for Boltless Closures (USP 7108768)
- Low Headroom Coke Drum Deheading Device (USP 7169266)
- Conveyance System Patent Pending

Fluor Delayed Coking Innovations

- First coker ball switch valve (1984)
- First coke drum deheading system (1988)
- First extensive finite element analysis to extend coke drum life (1993)
- First deheading system to throttle cave-in's developed for rail car discharge (1994)
- First automated switching system (1994)
- First promotion of state-of-the-art drum metallurgy (1995)
- Development of automated chute system (1995)
- First "bird cage" removable drum insulation system for inspection of drum seams (1997)
- First totally automated top head deheading system (1998)
- Engineering for first DeltaValve® DeltaGuard™ installation (2001)
- Totally automated bottom head boltless closure (2002)
- Trolley support system for DeltaGuard™ deheading system (2003)

DELAYED COKER EXPERIENCE

Fluor has a long history of involvement in the engineering, construction and innovation of delayed coker facilities. We provide veteran personnel with recent, relevant experience and an established knowledge base to quickly and competently execute such projects. In order to maintain and improve our knowledge base, we continually evaluate the operating data from delayed coking units that we have designed and constructed, reviewing the field for the latest developments that we can bring to future projects.

Our extensive coker experience together with Fluor's renowned world-class engineering talent combine to allow us to deliver integrated delayed coker unit designs with:

- Short cycle times
- Efficient operation throughout all stages of the coke drum cycle
- Reliability and safety in operation

Fluor's experience in the field of delayed coking includes over 80 projects, ranging from feasibility studies to detailed project execution encompassing feasibility, engineering, procurement, construction, commissioning and start-up. Revamp projects have emphasized debottlenecking, instrumentation modernization, and rebuilding of fire-damaged facilities.

Fluor's experience in the design and construction of delayed cokers combined with our continuing program to stay in the forefront of coker technology enables us to bring proven engineering and the latest developments in the field to any project.

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FLUOR DELAYED COKING EXPERIENCE

Client / Location	Year of Completion	Office	Licensor	Fluor Services	Scope			
					New Drums	Revamp	Replace Drums	DeltaValve
KNPC Kuwait	2015	Houston	ABB Lumus	E				
Valero Port Arthur, Texas	2009	Houston	Foster Wheeler	E, P	4			
Valero Port Arthur, Texas	2009	Houston	N/A	E, P, CM		X	6	Exist
Valero St. Charles, Louisiana	2009	Houston	N/A	E, P, C CM		X	4	4 BUD
Valero Wilmington, California	2009	Houston	Fluor	E, P, CM		Revamp 2 Drums	2	4 BUD
Flint Hills Resources Pine Bend, Minnesota	2010	Houston	N/A	E, P		X	2 (A&B)	Exist
Marathon Petroleum Detroit, Michigan	2010	Aliso Viejo	ConocoPhillips	E, P, CM	2			2 BUD 2 TUD
Total Port Arthur, Texas	2010	Aliso Viejo	Foster Wheeler	E, P, CM	4			4 BUD 4 TUD
ConocoPhillips Roxana, Illinois	2010	Houston	ConocoPhillips	FEED, E, P- drums	4			4 BUD (Z&J) 4 TUD (Z&J)
Marathon Petroleum Garyville, Louisiana	2009	Houston	ConocoPhillips	E, P, CM	2			2 BUD 2 TUD
CITGO Coker 1 Lake Charles, La.	2008	Houston	N/A	E, P		X		4 BUD
CITGO Coker 1 Lake Charles, La.	2007	Houston	N/A	FEED		X		4 TUD
Sasol Secunda, S.Africa	2007	Houston	N/A	E, P		X		2 BUD
ENI Gela, Sicily, Italy	2007	Houston	N/A	FEED		X		4 BUD 4 TUD
ConocoPhillips Carson, CA	2006	Aliso Viejo	N/A	FEED		X		4 BUD 4 TUD
CITGO Needle Coker Lemont, Illinois	2006	Houston	N/A	FEED		X		2 BUD
Fort Hills Energy Fort McMurray, Alberta, Canada	2006	Calgary	Foster Wheeler	FEED				
Tesoro Martinez, California, USA	2006	Aliso Viejo	Conoco Phillips	E, P	4			4 BUD 4 TUD



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					New Drums	Revamp	Replace Drums	Delta Valve
Tesoro Anacortes, Washington, USA	2006	Aliso Viejo	ConocoPhillips	E	2			
Flint Hills Resources Pine Bend, Minnesota	2005	Houston	N/A	S		X (E&F)		2 BUD
Flint Hills Resources Pine Bend, Minnesota	2005	Houston	N/A	E		X (A, B, C, D)		4 BUD
Petrozuata Jose, Venezuela	2005	Houston	N/A	E		X		4 BUD
CITGO Sponge Coker Lemont Illinois	2005	Houston	N/A	E, P, CM		X		6 BUD
Hovensa St. Croix, Virgin Islands	2004	Houston	N/A	FEED		X		4 BUD 4 TUD
Conoco Humber North Lincolnshire, England	2004	Haarlem	ConocoPhillips	E				
Conoco Immingham, England	2004	Haarlem	ConocoPhillips	E, P, CM		X	4	
CITGO Coker 2 Lake Charles, Louisiana	2004	Houston	N/A	E, P		X		4 BUD
Chevron Pascagoula, Mississippi	2003	Houston	N/A	E, P, C		X	6	6 BUD 6 TUD
BP Oil Company Toledo, Ohio	2003	Houston	N/A	S				
Frontier El Dorado, Kansas	2002	Aliso Viejo	N/A	E, P		X		
Chevron Salt Lake, Utah	2001	Houston	N/A	E, P		X		2 BUD
Petrozuata Jose, Venezuela	2001	Houston	Conoco	FEL				
CITGO Coker 1 Lake Charles, Louisiana	2001	Houston	N/A	E, P		X		1 ABC
Flint Hills Resources Pine Bend, Minnesota	2000	Houston	N/A	S			X (E&F)	
Phillips Sweeny, Texas	2000	Houston	N/A	FEED, CM				
SASOL Secunda, South Africa	2000	Johannes- burg	N/A	E, P, C		X		
Petrolera Ameriven Jose, Venezuela	1999	Aliso Viejo	Foster Wheeler	E, P, C	4			4 FDHD
BP Oil Company Toledo, Ohio	1999	Houston	BP / Fluor	E, P, C	2			2 FDHD
Cenco Santa Fe Springs, CA	1998	Aliso Viejo	N/A	S				





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Equilon Wilmington, California	1998	Aliso Viejo	N/A	S				
CITGO Coker 2 Lake Charles, Louisiana	1998	Houston	N/A	E, P		X		4 FDHD
Koch Refining Pine Bend, Minnesota	1998	Houston	N/A	E, P		X	2	4 HCDHD
CITGO Coker 1 Lake Charles, Louisiana	1996	Houston	N/A	E, P		X	4	4 FDHD
ExxonMobil Baton Rouge, Louisiana	1995	Houston	N/A	E, P, CM		X	4	4 FDHD

Fluor Services: S = Study, FEED = Front-End Engineering & Design, FEL = Front-End Loading, E = Engineering, P = Procurement, C = Construction, CM = Construction Management, BUD = Bottom Unheading Device, TUD = Top Unheading Device, FDHD = Fluor Deheading Device, ABC = Fluor Automated Boltless Closure, HCDHD = Hahn & Clay Deheading Device, Z&J = Zimmerman & Jansen Deheading Device



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FLUOR DEHEADING VALVE EXPERINECE

Client	Location	BUD	TUD	Remark
Marathon	Detroit, MI	2	2	Engineering in Progress
Total	Port Arthur, TX	4	4	Engineering in Progress
Valero	St. Charles, LA	4		Engineering In Progress
Valero	Wilmington, CA	4		Engineering Complete
Marathon	Garyville, LA	2	2	Installation In Progress
COP	Woodriver, IL	4	4	FEED Package
CITGO (Coker Unit #1)	Lake Charles, LA	4		Operating
COP	Carson, CA	4	4	FEED Package
ENI	Gela, Sicily, Italy	4	4	FEED Package
CITGO (Coker Unit #1)	Lake Charles, LA		4	FEED Package
Tesoro	Martinez, CA	4	4	Operating
Sasol	Secunda, S. Africa	2		Operating
Hovensa	St. Croix	4	4	FEED Package
CITGO (Needle Unit)	Lemont, IL	2		FEED Package
FHR	Pine Bend, MN	4		Operating
CITGO (Sponge Unit)	Lemont, IL	6		Operating
Petrozuata	Jose, Venezuela	4		Operating
CITGO (Coker Unit #2)	Lake Charles, LA	4		Operating
Chevron	Pascagoula, MS	6	6	Operating
Chevron	Salt Lake City, UT	2		Operating
Totals		70	38	70 BUD + 38 TUD = 108 Total

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