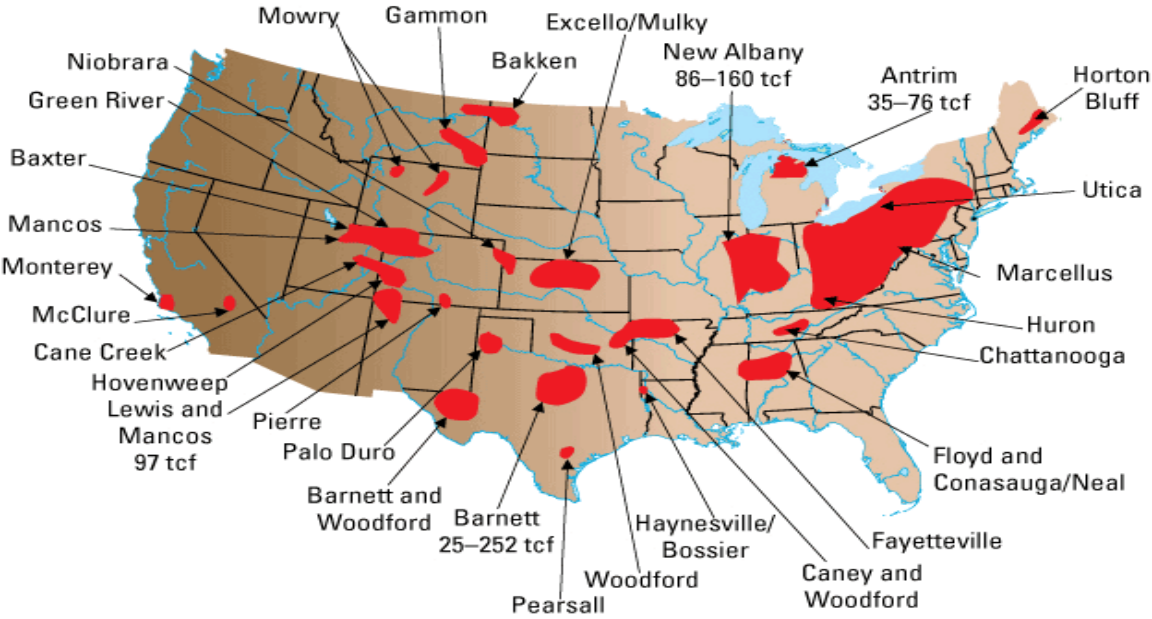
Tulsa/AADE Symposium

Open Hole Sidetracking Technology

January 20,2010

U.S. Shale Plays



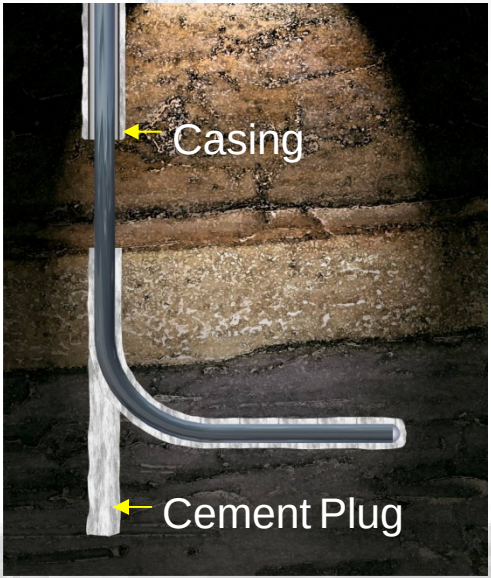
Introduction

- Conventional Cement Plugs
- Sidetracking/Open Hole WhipStock
- Expandable Anchor Technology
- Time Comparisons
- Options
- Case History
- Conclusions

Conventional Sidetracking
Open Hole Sidetrack with Cement Plug

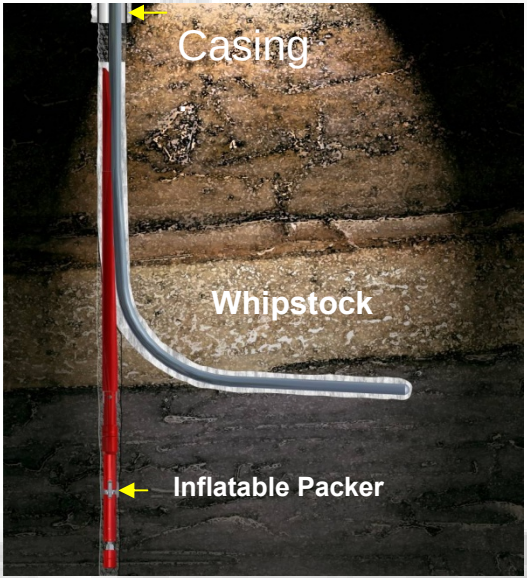
- FISH

- Drill pilot hole TD.
- Run logs (caliper)
- Pump Balanced Kick-off plug
- Wait on Cement
- Time Drill to Sidetrack the well



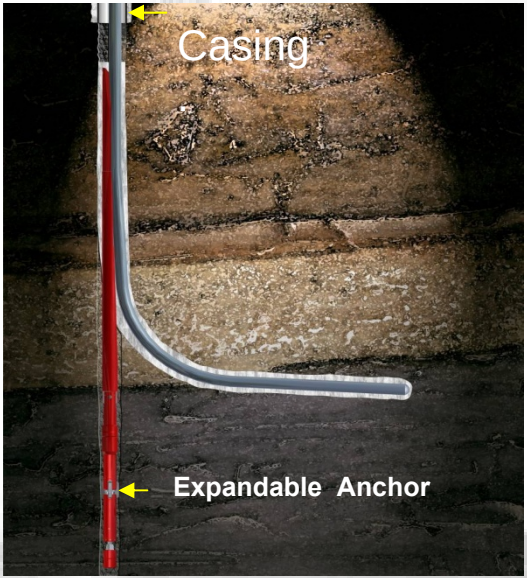
Open Hole Sidetrack with Whipstock & Packer

- Drill pilot hole to TD
- Run logs (caliper)
- Run whipstock with Inflatable Packer
- Orient whip
- Hydraulic Actuation
- Sidetrack the well with minimal rat-hole



Open Hole Sidetrack with Expandable Anchor

- Drill pilot hole to TD
- Run logs (caliper)
- Run whipstock with Expandable Anchor
- Orientation
- Hydraulic Activation
- Sidetrack the well with minimal rat - hole



Expandable Anchor

Features & Benefits

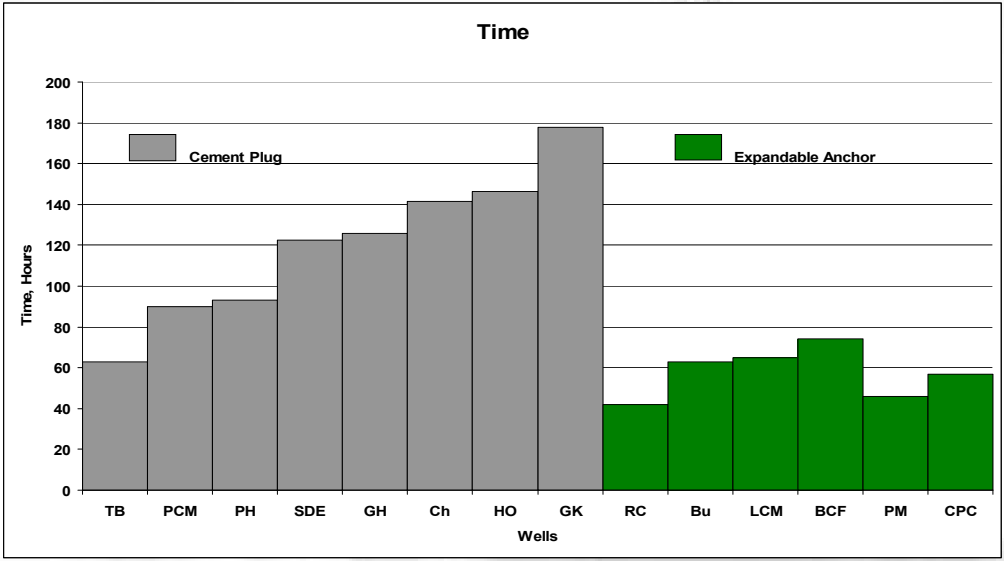
1. Hydraulically actuated/mechanically locked blocks, designed to engage open hole formations, with no string manipulation required
2. Ideal for medium to hard formations
3. Variable expansion capability allows anchor to span multiple hole sizes
4. Axial and torsional load capacities greater than typical hydraulic or mechanical anchors
5. Retrievable

Expandable Anchor Specifications			
Size (in.)	OD (in.)	Torque (lb-ft)	Push/Pull Capacities (lbf)
4 ½ x 7	3.69	6,000	50,000
7 x 9 ⅝	5.62	30,000	100,000
9 ⅝ x 13 ⅜	8.00	50,000	150,000
13 ⅜ x 20	11.75	80,000	150,000

Anchor vs. Hole Size

Tool Body Diameter (in.)	Max. Expanded Diameter (in.)	Typical Open Hole Size (in.)
3.69	6.061	4-3/4
5.62	9.217	6-1/8 & 7-7/8
8.00	13.165	8-1/2 & 8-3/4
11.75	19.085	12-1/4

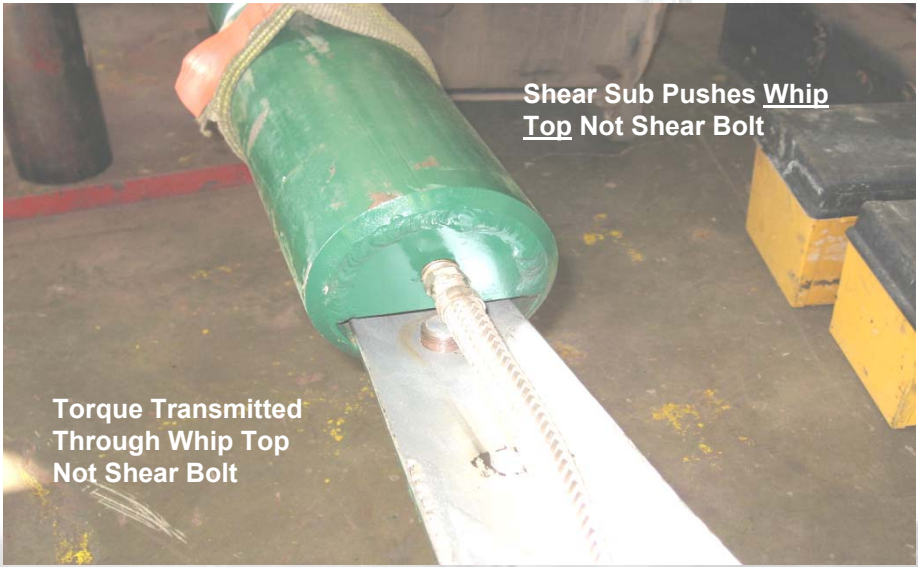
Time Comparison Cement Plugs vs. Whipstock & Expandable Anchors



Open Hole Whipstock System Deployment Options

- SHEAR SUB – No rat hole
- CEMENTING MANDRELS
- VARIOUS MILL – 3’-15’ rat hole
- PDC BIT SYSTEM – PDM Directional BHA Drill ahead

Shear Sub


Shear Sub Pushes Whip Top Not Shear Bolt
Torque Transmitted Through Whip Top Not Shear Bolt

Drill Ahead System

- PDC Drill Ahead Mill Run on Directional Drilling Assembly
- Whip stock System Hanging below
- RIH, Orient, Set, Sidetrack, Drill Extended Rathole
- Proven System

Open Hole Job Summary

Hole Size	Mill to Whip	Shear Off Sub
6.000”	1	0
6.125”	61	0
6.500”	4	0
6.750”	10	0
7.875”	4	0
8.500”	5	0
8.750”	300	46

YOUR KEY TO SAVINGS

On average, Open Hole Whipstock Technology saved companies 2 ½ days and approximately $86,250/well in the Shale Plays compared to traditional cement plugs

SMITH SERVICES

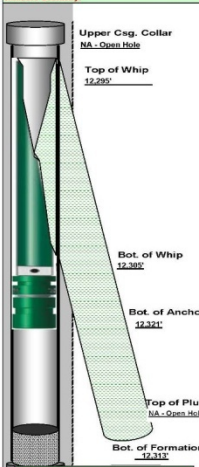
SideTrack Run Summary Report

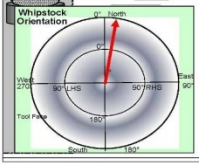
DRS Drilling Record System

OPERATOR	:	COUNTRY	: United States	LAT/LONG	:
WELL NAME/NO.	:	STATE/PROV	: Oklahoma	BLOCK	:
SMITH OPERATOR	: Robert Gonzales	COUNTY/PARISH	: Washita	FIELD	:
CONTRACTOR	:	RIG NAME	:	WELL TYPE	: Horizontal

Sidetrack Type	Type of Whipstock	Mill Type	Anchor Type	Hole Size	Jet Nozzle Config.
Open Hole	Trackmaster Plus	Trackmaster Plus Fastrack Bi-Mill - w/ Diamond	Trackmaster Plus Expandable	6-1/8"	14 - 20

Wellbore Geometry:





LAST CASING DATA:

O.D.	Wt.	I.D.	Drift I.D	Grade	Top @	Shoe @
7.000	26.00	6.276	6.151	P-110		12,198

MUD DATA:

	Mud Type	WT	PV	YP	Lost Circ?
IN	Oil Base	11.6	23	16	
OUT					

WHIPSTOCK ORIENTATION:

	Inclin	Azim	Deg	LHS/RHS
IN	1.5	6	-	-
Survey Company		Ryan		

MILL RUN DATA:		In	Out
Depth (Mill 1)	u/m ft	12,295.0	12,313.0
Depth (Mill 2)	u/m ft	-	-
Depth (Mill 3)	u/m ft	-	-
		Milling	Drilling
Hours		-	9.00
ROP	u/m ft/hr	-	2.00

PARAM. DATA:		Min	Median	Max
WOB	klb	4.0	8.0	10.0
RPM at Mill		40	50	60
Flow (Total)	gpm	-	223	-
S.P.Press	psi	-	1850	-
Surf.Torq		-	-	-

TIME DATA:	Interval	Hours	ROP	%
Casing Exit	-	-	-	0.0%
Drilling	18	9	2.0	39.1%
Whip Orientation	1.5	1.5	-	6.5%
Tripping	12995	11.5	-	50.0%
Circulating	-	1	-	4.3%
Other	-	-	-	0.0%
Hrs. Summary		23.00		100.0%

BHA DESCRIPTION:	Length (ft)
7" Trackmaster Plus Whip	26.17
6 1/8 " Bi-mill	6.16
Running Tool	5.01
NAMCV	4.52
Float Sub	2.67
Total Length	44.52

GEOLOGICAL DATA:

Formation Type	Properties	Top (MD/TVD)

Mill DULL GRADE:

I - O - D - L - G	FD - FG	DD - DG	OD - R
1 - 2- WT - T - 2	WG - IN	X - X	HC - TD

Mill DULL GRADE:

I - O - D - L - G	FD - FG	DD - DG	OD - R

COMMENTS:

Sidetracking assembly was TIH on 6/8/2009 to 12,300' and the whip face was then oriented to 6° azimuth by MWD. The anchor was then set and the mill was sheared from the whip with 48k-lbs over string weight. Ten foot of hole was drilled down the whip face along with eight foot of rathole in a total of 9.0 hours and the assembly was then tripped out of the hole. Directional equipment was tripped in hole, oriented, and kicked off the slide with no issues. Job successfully completed on 6/10/2009.

Total Time to Complete: 23.0 Hours

SMITH SERVICES

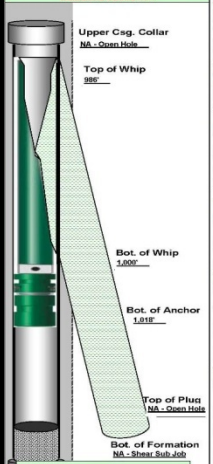
SideTrack Run Summary Report

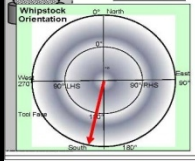
DRS Drilling Record System

OPERATOR	:	COUNTRY	: United States	LAT/LONG	:
WELL NAME/No.	:	STATE/PROV	: Arkansas	BLOCK	:
SMITH OPERATOR	:	COUNTY/PARISH	: Jackson	FIELD	: Fayetteville
CONTRACTOR	:	RIG NAME	:	WELL TYPE	: Directional

Sidetrack Type	Type of Whipstock	Mill Type	Anchor Type	Hole Size	Jet Nozzle Config.
Open Hole	Trackmaster Plus	Trackmaster Plus Open Hole Shear Off Sub	Trackmaster Plus Expandable	8-3/4"	NA

WELLBORE GEOMETRY:





LAST CASING DATA:

O.D.	Wt.	I.D.	Drift I.D.	Grade	Top @	Shoe @
9-5/8"	36.00	8.921	8.765	-	-	-

MUD DATA:

	Mud Type	WT	PV	YP	Lost Circ?
IN	Oil Base	8.9	-	-	N
OUT					

WHIPSTOCK ORIENTATION:

	Inclin	Azim	Deg	LHS/RHS
IN	0	196	-	-
Survey Company		VES		

MILL RUN DATA:		In	Out
Depth (Mill 1)	u/m ft	-	-
Depth (Mill 2)	u/m ft	-	-
Depth (Mill 3)	u/m ft	-	-
		Milling	Drilling
Hours		-	-
ROP	u/m ft/hr	-	-

PARAM. DATA:		Min	Median	Max
WOB	klb	-	-	-
RPM at Mill		-	-	-
Flow (Total)	gpm	-	-	-
S.P.Press	psi	-	-	-
Surf.Torq		-	-	-

TIME DATA:	Interval	Hours	ROP	%
Casing Exit	-	0	-	0.0%
Drilling	-	0	-	0.0%
Whip Orientation	-	1	-	33.3%
Tripping	1,000	2	-	66.7%
Circulating	-	0	-	0.0%
Other	-	0	-	0.0%
Hrs. Summary		3.00		100.0%

BHA DESCRIPTION:	Length
Whipstock	32.20
Shear Sub	2.40
Running Tool	6.30
XO	2.50
UBHO Sub	2.85
Total Length	46.25

GEOLOGICAL DATA

Formation Type	Properties	Top (MD/TVD)
Shale	Dense	

SMITH SERVICES

No Mill - Shear Sub Job

Mill DULL GRADE:

I - O - D - L - G	FD - FG	DD - DG	OD - R

SMITH SERVICES

No Mill - Shear Sub Job

Mill DULL GRADE:

I - O - D - L - G	FD - FG	DD - DG	OD - R

COMMENTS:

Sidetracking assembly was TIH to 1,018' and whip face was oriented to 196° azimuth by gyro. Anchor was set with 3,000 psi and the shear sub was sheared from the whip with 40k-lbs over string weight. The assembly was tripped out of the hole and directional equipment was made-up, tripped in hole, oriented, and kicked off slide with no issues. Job successfully completed on 6/16/2009.

Total Time to Complete: 3.00 Hours

SMITH DELIVERS A SUPERIOR SOLUTION FOR PETROHAWK IN THE HAYNESVILLE BOSSIER SHALE

Trackmaster® Plus Open Hole Whipstock System Saves Rig Time While Improving Well Geometry

PetroHawk Energy Corporation faced a major challenge in getting off a cement plug in the hard Bossier Shale. After struggling for days without success and before utilizing a double-bend assembly, Smith was asked to provide a solution, and a Trackmaster Plus Open Hole Whipstock System was deployed. The hydraulic anchor was set at 11,617 feet, and a Fastrack Bi-mill with diamond enhanced inserts was used to mill out. In just four hours of milling, the well bore exit was completed and two feet of pilot hole rathole were drilled.

Objectives:

- Save rig time by kicking off from vertical and maintaining superior hole geometry with a One Trip Whipstock System
- Reduce risk in future well operations caused by high dogleg at KOP

Customer: Petrohawk Energy
Well Name: Sample 9-1H
Location: Red River Parish, LA
Drilling Engineer: Charles Montgomery
Company Man: Danny Bonnette

Formation: Bossier Shale
Depth: 11,617 feet

Results:

- Wellbore exit was made in 4-hours
- Full Gauge Pilot Hole completed in one trip
- Initial DLS was limited to 4.36°/100 ft
- Rig time reduced by 14 days
- Casing was run to bottom and completion executed to plan
- More than 10 comparable jobs successfully deployed to date

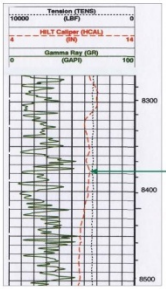
THE POSSIBILITIES ARE ENDLESS

SMITH

SMITH DELIVERS A SUPERIOR SOLUTION FOR MARSHALL & WINSTON, INC. IN LEA COUNTY, NEW MEXICO

Trackmaster® Plus Open Hole Whipstock System Saves Rig Time

Marshall & Winston, Inc. needed a reliable solution for a planned open hole wellbore sidetrack after drilling an 8 ¾" vertical pilot hole. An 8 ¾" Smith Trackmaster Plus Open Hole Whipstock System was deployed at a depth of 8,377 ft. The sidetrack was successfully completed in one run, and the directional drilling assembly was tripped in the hole without incident.



The caliper log shows the hole at 8,377 ft to be approximately 10 ¼". The Smith 9 ⅝" x 13 ⅜" Expandable Anchor performed flawlessly, anchoring the whipstock in the oversized hole. An 8 ¾" Fastrack Bi-Mill was used to deploy the system and drill the sidetrack departure.

Customer: Marshall & Winston, Inc.
Well Name: Medin Federal Com 8-2H
Anchor Depth: 8,377 ft

Results:

- Wellbore sidetrack was accomplished in one trip
- Zero cement related non-productive time
- No cement required
- Lateral drilled without problem

THE POSSIBILITIES ARE ENDLESS

SMITH

Conclusion

- Open Hole Sidetracks with Expandable Anchor Technology is a cost effective alternative to setting a cement plug.

- Using Expandable Anchor Technology has proven to be reliable for Sidetracking Operations.

AADE
AMERICAN ASSOCIATION of DRILLING ENGINEERS

Thank you.