

HALFORD

MILLING TOOLS SERVICES



FOR ALL YOUR MILLING NEEDS

P.O. BOX 2181
PEARLAND, TEXAS 77588
24 HR. 281-489-4272
FAX 281-489-7147
800-605-5048
WWW.MILLKING.COM

WATERMELON

The Watermelon Mill or String Mill is used to mill through collapsed casing and liners. This mill is tapered top and bottom to allow reaming both up and down. A connection on the bottom allows a stinger to be run below the mill to keep it centered which prevents cutting out of the casing or side-tracking. Watermelon Mills are often run piggyback with a long tapered mill as a pilot.

All mills with the exception of the Long tapered Mill and the Watermelon Mill are made with wear pads to protect the casing and maintain stability during milling operations.

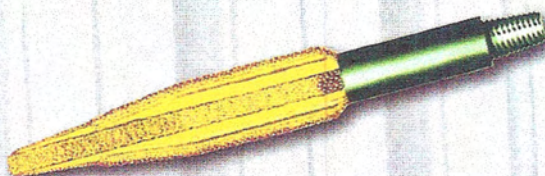


Sizes:
3 1/2" to 6 3/4"

Sizes:
3 1/2" to 22 1/4"

LONG TAPERED MILL

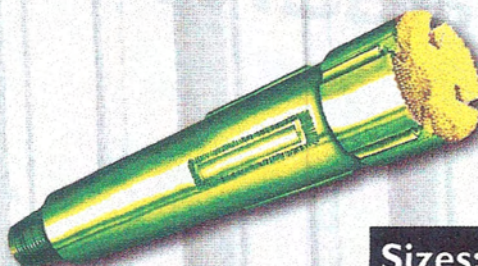
The Long Tapered Mill is used for reaming out casing, liners, whipstock windows, and also milling through various types of restrictions.



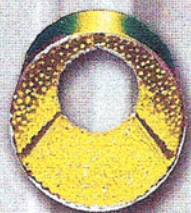
Sizes:
1 1/2" to 22 1/4"

CONCAVE CONE BUSTER

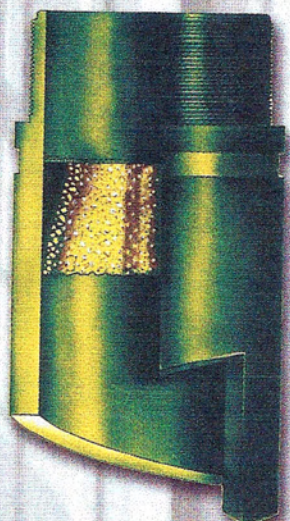
Concave Cone Buster Mill is used for milling bit cones or other objects where it is advantageous to keep the fish centered under the mill for greater effectiveness.



Sizes:
3 1/2" to 12 1/4"



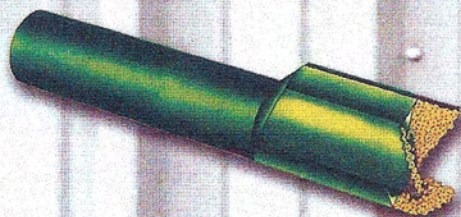
MILL GUIDE



Halford Mill Guide Insert has several distinct advantages over the use of conventional overshot guides as a mill guide.

1. The conventional guide is subject to cracking after repeated dressing or, in some cases, the first dressing depending on whether or not you are having to run a turned-down or slim hole overshot.
2. The Mill Guide Insert is machine made on lathes, therefore when a welder is placing the carbide on a guide he has a true contour to follow. This gives the Mill Guide Insert an accurate internal diameter, which will save the fish from excessive milling on the true outside diameter.
3. The Mill Guide Insert is often used in rotary shoes to center a fish before going over it with an outside cutter.
4. The only heat ever directly on the guide is when the insert is welded in the guide.

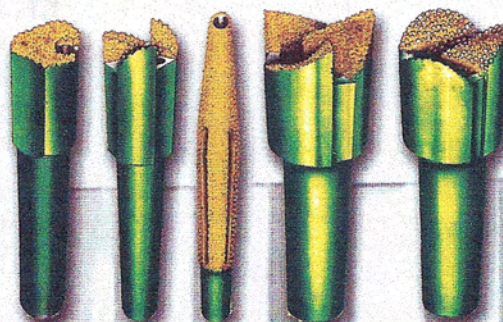
BI-CENTER MILL



The Off-Center Mill is designed so that when rotating it will cut a bigger hole than the OD of the mill and serve as an under reamer. For example, a 1 27/32" OD mill with a 1" C.S. box when rotating off center will cut up to a 2 1/16" hole and a 2 1/4" OD mill when rotating off center will cut up to a 2 7/8" hole. Therefore, when going through a nipple or a restriction you can't rotate until you pass through the restricted area.

TUBING MILLS

Also In Stock: Tubing Carbide Shoes -
1 3/4" to 2 29/32" (not shown)



Sizes:
1 1/2" to 4 3/4"

PIRANHA MILL

The Piranha Mill is used for milling cemented pipe and in situations where there are large amounts of junk in the hole that requires a mill with a longer life. This mill is specially designed with a deep "V" for maximum circulation of fluid and to hold a large amount of tungsten carbide dressing.

Sizes:

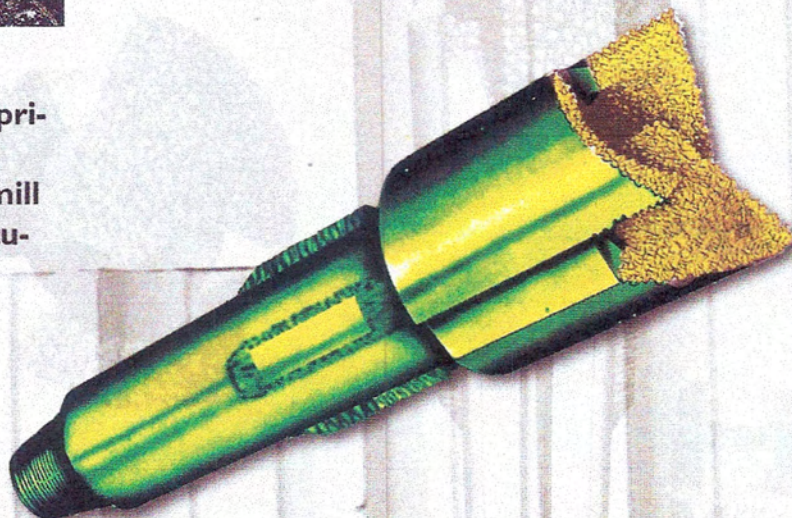
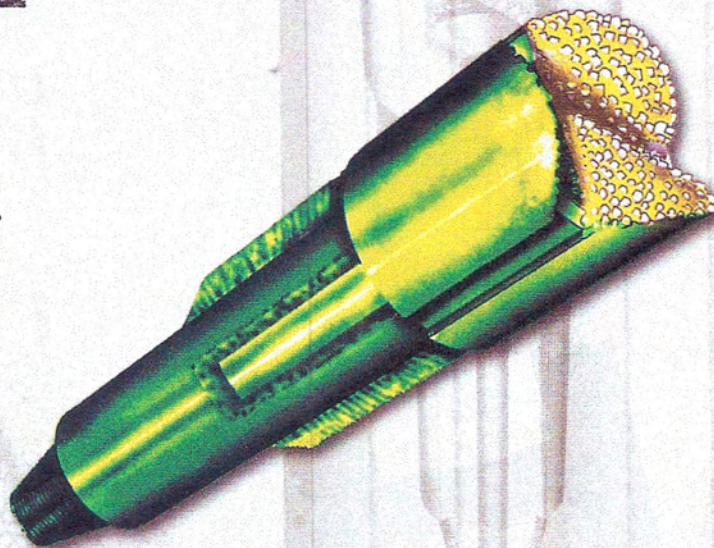
3 1/2" to 8 3/4"

DEEP THROAT CEMENT MILL

The Deep Throat Cement Mill is used primarily to drill cement where small amounts of contamination exist. This mill is specially designed for maximum circulation and cutting speed.

Sizes:

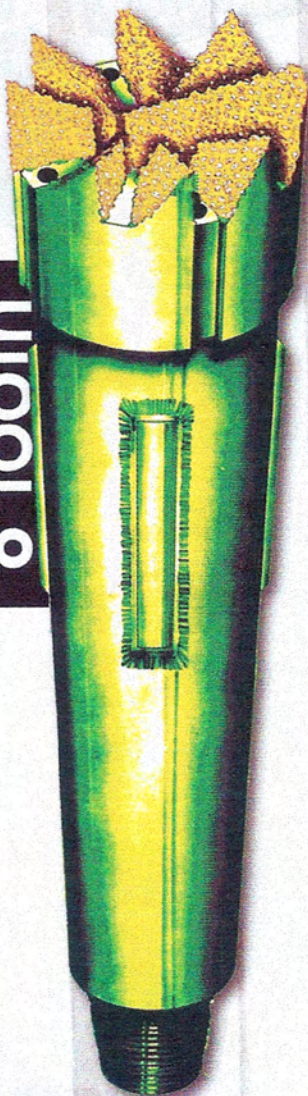
3 1/2" to 8 3/4"



TOOTH TYPE

Tooth Type Combination Junk and Cement Mill is used for bridge plugs, reamer blades, slip inserts, and other smaller objects that are dropped or lost in the well.
(Actual mills may not appear as shown)

8 tooth



6 tooth



4 tooth



3 tooth



1 1/2" to 22 1/4"

Whipstocks and Whipstock Mills

Whipstock Types

The *Whipstock* tool is a retrievable or non-retrievable, mechanically-set non-hinged whipstock for use in cased holes. It can be oriented and is ideally suited for drilling multiple laterals from a single hole. The most unique feature of the *Whipstock* tool is that in a deviated hole it can be set traditionally to mill up and to the right or it can be set on the low side so that it will mill downward. The top of the tool is concave and locks against the casing bore regardless of orientation.

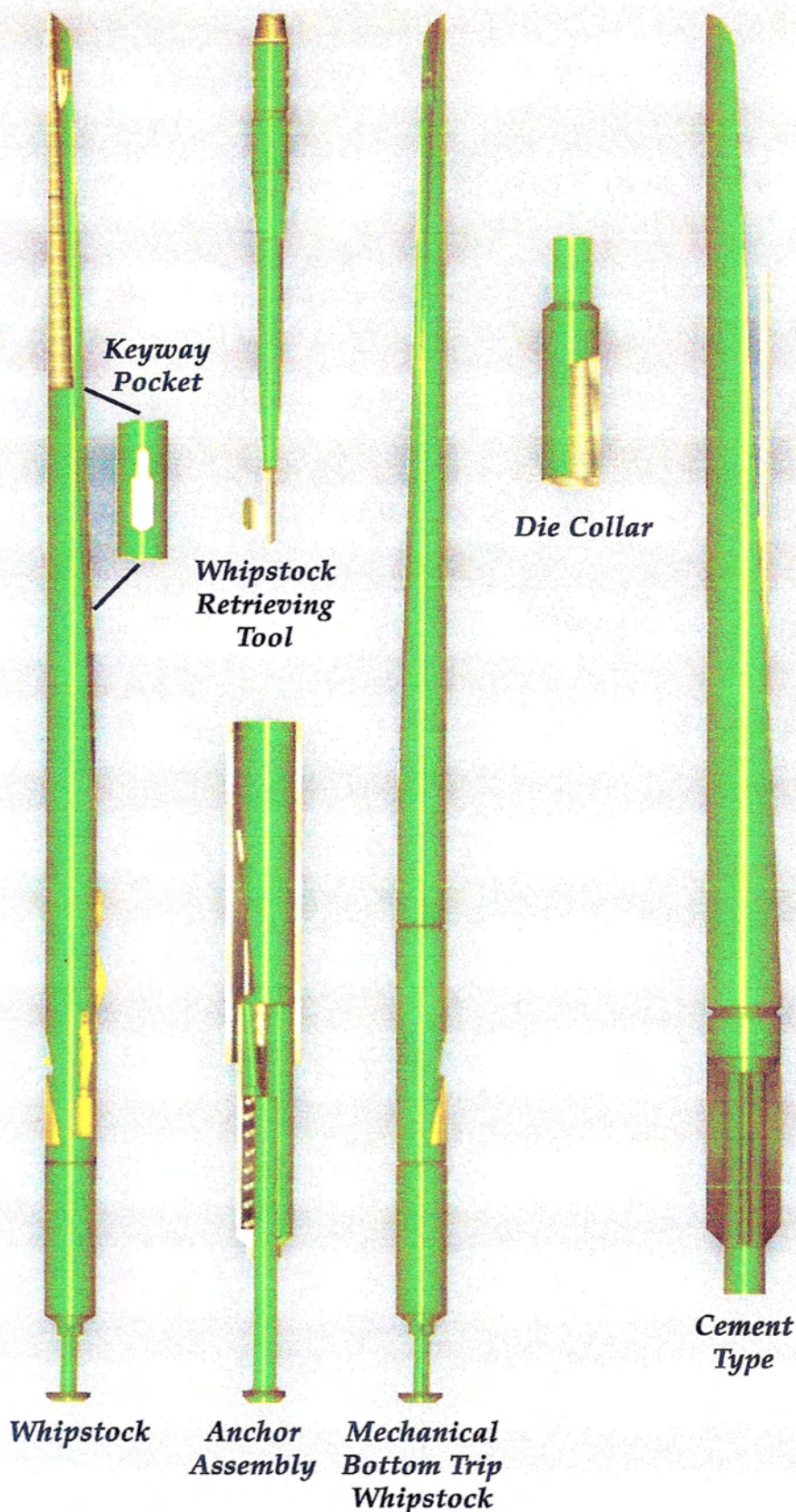
The *Whipstock* tool has been designed with a bypass area allowing sidetrack, while producing. It has circulation slots around and ports through the whipstock for more by-pass area.

Bottom Trip

The Bottom Trip for cased holes is a mechanically set, non-retrievable whipstock that, when set, is highly resistant to rotation. It is specially designed to be set on any plug, cement retainer, liner hanger, junk or on top of a fish. It is run the same way as the *Whipstock* but is not retrievable.

Cement Type

The Cement Type is usually set in an open hole. It is the simplest type designed to accommodate setting and cementing operations. It has a standard thread connection on the bottom to allow the addition of a tail pipe. Once the Cement type is set in the open hole, a drill bit can be used to continue down the concave face of the whipstock.



Whipstocks and Whipstock Mills

Introduction

Halford whipstocks are specialized tools used to establish new drilling courses for directional and lateral drilling in cased or open hole wells. Whipstocks provide a cost effective and efficient means of sidetracking, for re-entry in existing wells, to drill multiple laterals. The method can also be used to straighten a crooked hole or to avoid obstacles in the hole. Whipstock operations can be even more efficient when using a complete line of **Halford** sidetracking tools. **Halford** whipstock products and operators have reduced sidetrack costs and saved valuable time on hundreds of wells.

Advantages

The use of **Halford** whipstocks and related tools offers its users the following advantages:

- Only one directional survey is required
- Whipstock mills can penetrate multiple strings
- Eliminates section milling
- Strong shear bolt assures positive setting
- Anchor prevents whipstock movement
- Reduced hole cleaning resulting in less debris than with section milling

Construction

Halford whipstocks, depending upon type, consist of one or more main parts:

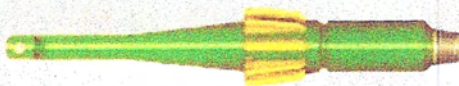
- Anchor or packer section
- Hinged or rigid assembly
- Tapered concave assembly
- Starting Mill and setting assembly

All components are manufactured from special alloy steels and are hard faced in specific areas for excellent performance. The tapered concave assembly is designed so that its face directs the mills and bits away from the whipstock, creating a window and a new drilling course.

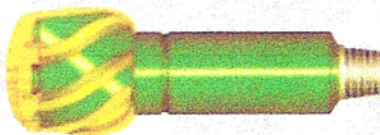
Recommended Bottom Hole Assemblies

Using the whipstock for window cutting in a cased hole generally utilizes the following basic bottom hole assemblies once the whipstock is anchored in position:

- Run 1 - Orientation Sub, high strength steel pipe, Crossover Sub, Starting Mill, Whipstock
- Run 2 - High strength drill pipe, Crossover Sub, Window Mill (option Watermelon Mill directly above the Window Mill)
- Run 3 - Drill Collar, Crossover Sub, String Mill, Watermelon Mill, Window Mill



Starting Mill



Window Mill



Whipstock Mills

All **Halford** whipstock mills used in side-tracking of cased holes use API regular connections and are run pin up. The mills are dressed with tungsten carbide particles for fast cutting of all steel grades of casing. Insert starting and window mills are also available. The principle mills are:

Starting Mills

This mill is used to lower the whipstock into position and to cut the initial window once the whipstock has been set and the starting stud has been sheared. The Starting Mill's taper rides down and against the pilot lug on the whipstock's concave side forcing the mill to cut through the casing and into the formation.

Window Mills

The Window Mill is used for cutting the window as a follow-up to the Starting Mill in whipstock operations. It can be used alone or in conjunction with a Watermelon Mill on a joint of drill pipe. The mill may cut as much as ten feet into the formation.

Watermelon Mills

This mill is typically run above the Window Mill on drill pipe to assist in further opening the window. The Watermelon Mill is dressed with a slight taper on each end to elongate the top of the window. This mill is also used on the final run with a drill collar.

Whipstocks and Whipstock Mills

Whipstock and Mill Diameters

Casing		Whipstock Diameter (in.)	Use Mill Diameter
Diameter (in.)	Weight (lbs)		
4 1/2	13.5	3.50	3.75
	11.6	3.50	3.88
	9.5	3.50	3.88
5	18.0	4.00	4.12
	15.0	4.00	4.25
	13.0	4.00	4.38
	11.5	4.00	4.38
5 1/2	23.0	4.25	4.50
	20.0	4.25	4.63
	17.0	4.50	4.75
	15.5	4.50	4.75
	14.0	4.50	4.88
	13.0	4.50	4.88
6	23.0	4.50	5.00
	20.0	4.50	5.12
	18.0	4.50	5.25
	15.0	4.50	5.38
6 5/8	32.0	5.25	5.50
	28.0	5.25	5.63
	24.0	5.25	5.75
	20.0	5.50	5.88
7	17.0	5.50	6.00
	38.0	5.25	5.75
	35.0	5.50	5.88
	32.0	5.50	5.88
	29.0	5.50	6.00
	26.0	5.50	6.12
	23.0	5.50	6.12
	20.0	6.00	6.25
7 5/8	17.0	6.00	6.38
	39.0	6.00	6.50
	33.7	6.00	6.63
	29.7	6.25	6.75
	26.4	6.25	6.75
	24.0	6.25	6.88

Casing		Whipstock Diameter (in.)	Use Mill Diameter
Diameter (in.)	Weight (lbs)		
8 5/8	49.00	7.0	7.38
	44.00		7.50
	40.00		7.50
	36.00		7.63
	32.00		7.75
	28.00		7.88
	224.00		7.88
9 5/8	53.50	8.0	8.38
	47.00		8.50
	43.50		8.50
	40.00		8.63
	36.00		8.75
	32.30		8.88
	29.30		8.88
10 3/4	55.50	9.0	9.50
	51.00		9.63
	45.50		9.75
	40.50		9.75
	32.75		9.88
11 3/4	60.00	10.0	10.50
	54.00		10.63
	47.00		10.75
	42.00		10.75
	38.00		10.88
13 3/8	72.00	11.5	12.12
	68.00		12.12
	61.00		12.25
	54.50		12.25
	48.00		12.38

Setting Stud Shear Values

Whipstock OD (in.)	Weight	
	(lbs)	(kg)
3.50 and 4.00	6,150	2790
4.25 and 4.50	9,380	4255
5.25, 6.00, 6.25 and 7.00	18,000	8165
8.00	19,520	8855
9.00 and 10.00	23,000	10435
11.50	37,000	16780

Other Setting Stud shear values available upon request.

HALFORD
MILLING TOOLS SERVICES

P.O. Box 2181
Pearland, Texas 77588
24 HR. 281-489-4272
Fax 281-489-7147
800-605-5048
www.millking.com
HEHMills@aol.com

Halford products and services are subject to the Company's standard terms and conditions, available on request or at www.millking.com. For more information contact an authorized Halford representative. Unless noted otherwise, trademarks and service marks herein are the property of Halford. Specifications are subject to change without notice.

©2009 Halford. All rights reserved.

MESSAGE FROM THE OWNER

Halford Milling Tools is dedicated to giving you the best quality milling tools for all your milling needs. The founder of the company, Sonny Halford, started learning to build mills, rotary shoes and other milling tools from Bob Savel at age 13 in 1976 at Edwards Rental and Fishing Tools in Venice, LA. They opened a store in Alvin, TX in 1978. My dad opened the store where I worked for him in fishing tools and learned all about downhole fishing tools. Then, I worked for Smith International, Houston Fishing Tools, Petco, Oilfield Rental and Homco, until I decided to start building tools on my own. When fishing tool operator; such as, Preacher Kirkland, Leroy Wallace, "Niger" Fritz, Jimmy Davis and Barney Paine, told me I should start my own business with my own tools, I listened and God showed me the way to be honest and trustworthy to do the right thing. All my customers, big or small, can be sure that all knowledge I have came from my father, Gene Halford, and my father in heaven. May all your business dealing with my company be good ones. Looking forward to doing business with any new customers as well as the old ones.

God Bless You All!