



Thruster Energy Corp.  
Mill's, Bits, Fishing tool Catalogue  
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## Type of Bits. Pros and cons for applications:

Bearclaw (1.1/ 1.2)- Tungsten carbide inserts, ideal for cement drilling. Not recommended for drilling on metal. Able to customize from 5/16" Circulation ports for Thru Tubing applications or open to 1-1/4" circulation ports for reverse circulating with power swivel/ top drive. Straight blade face, vertical water course.

Hurricane (2.1/ 2.2)- Tungsten carbide inserts, ideal for cement drilling. Not recommended for drilling on metal. Able to customize from 5/16" Circulation ports for Thru Tubing applications or open to 1-1/4" circulation ports for reverse circulating with power swivel/ top drive. Swirled face, swirled water course for optimal debris removal.



Fig 1.1

Fig 1.1 Shows Bearclaw Bit that is set up for reverse circulating.



Fig 1.2

Fig 1.2 Shows side view of the Bearclaw bit with it straight/ vertical watercourses for debris removal and ejection from bit face.

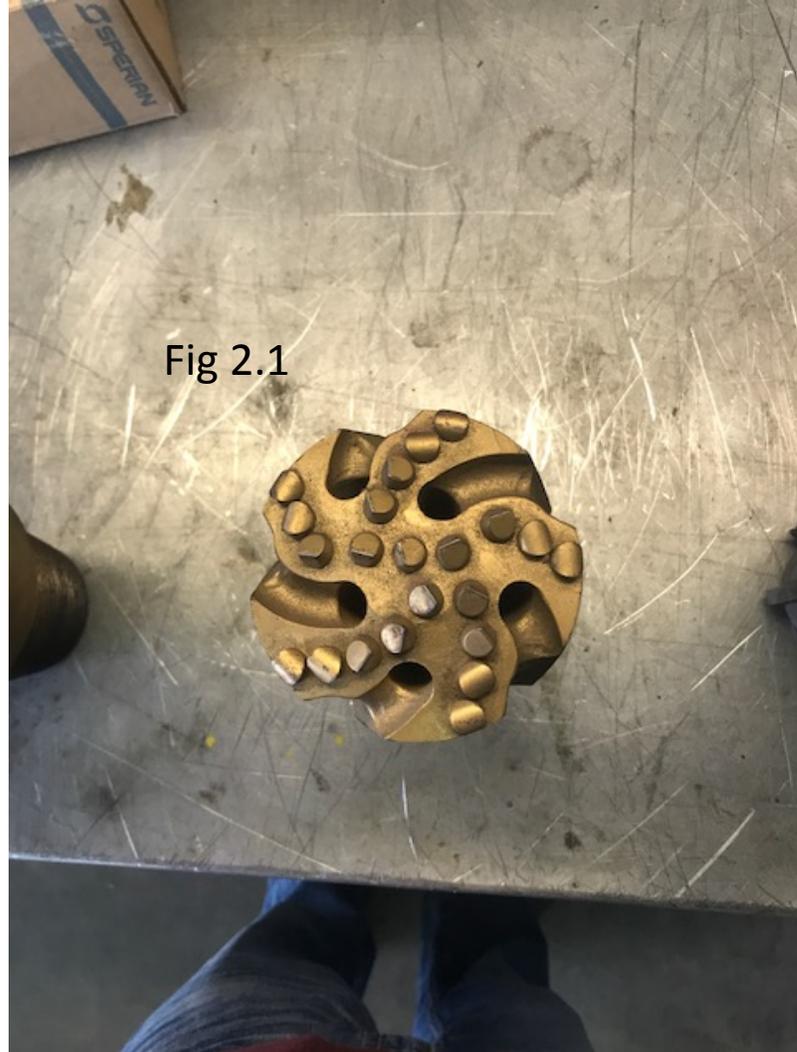


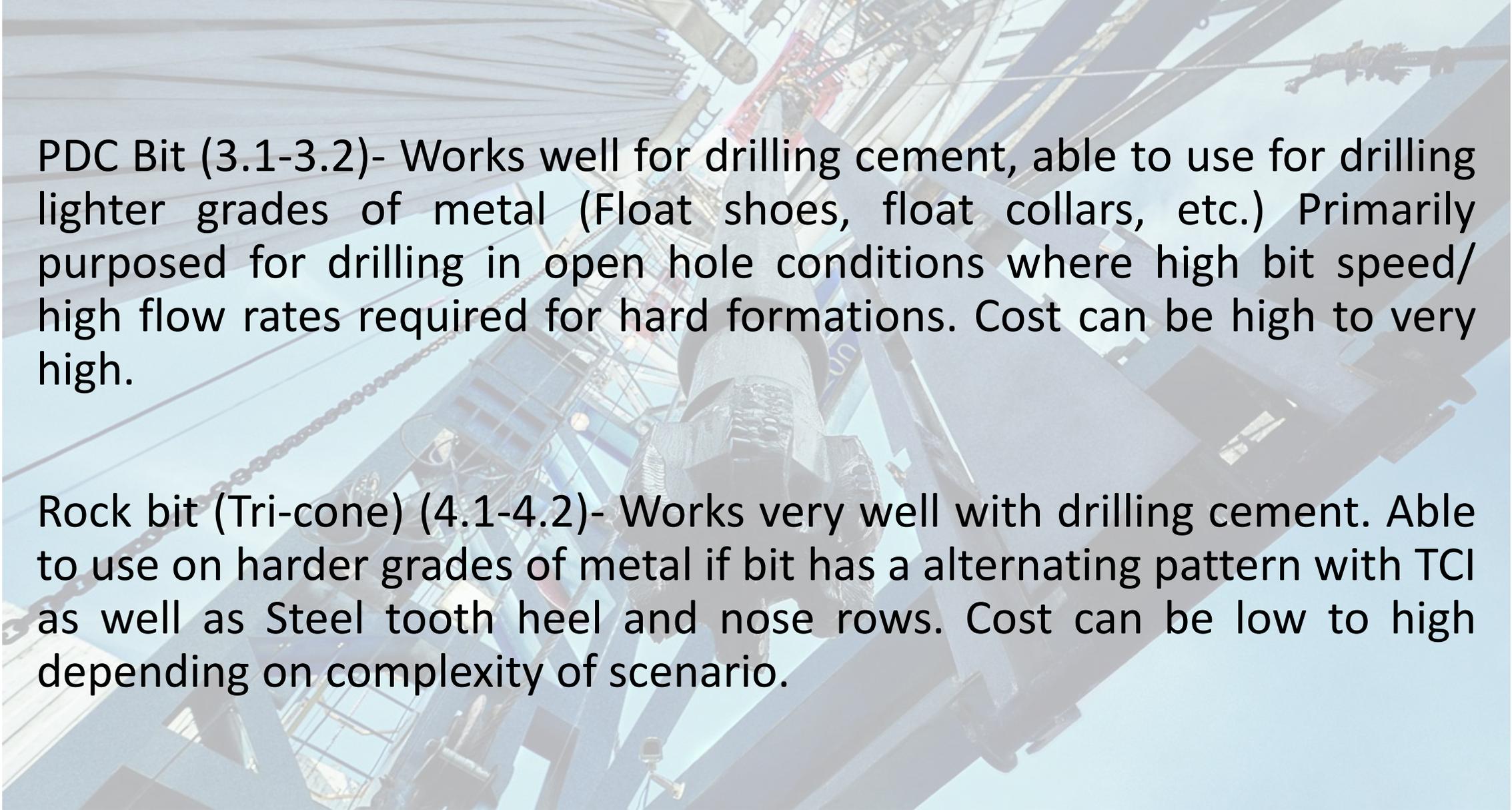
Fig 2.1

Fig 2.1 shows face of the Hurricane bit. Notice the smaller circulation ports, this is set up to run in a thru tubing application where debris ejection from the cutting face is key.



Fig 2.2

Fig 2.2 shows the orientation and of the watercourse on a slight angle to assist larger debris in being removed from face as well as reducing bit hop, making it easier on the drilling motor bearing section components.



PDC Bit (3.1-3.2)- Works well for drilling cement, able to use for drilling lighter grades of metal (Float shoes, float collars, etc.) Primarily purposed for drilling in open hole conditions where high bit speed/high flow rates required for hard formations. Cost can be high to very high.

Rock bit (Tri-cone) (4.1-4.2)- Works very well with drilling cement. Able to use on harder grades of metal if bit has a alternating pattern with TCI as well as Steel tooth heel and nose rows. Cost can be low to high depending on complexity of scenario.

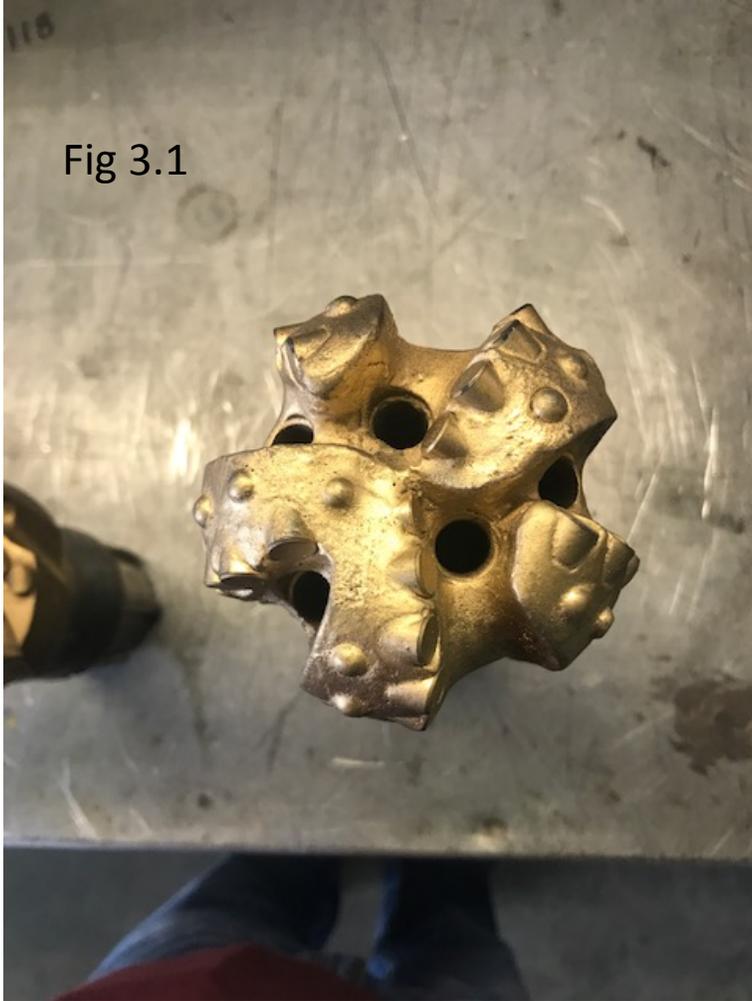


Fig 3.1

Fig 3.1 Shows Face of PDC Type mill. As can tell would produce larger debris in a completion type milling scenario with the large junk slots etc.



Fig 3.2

Fig 3.2 Shows vertical watercourse design as well as gauge protection on half of the blade on this design. This PDC bit's intent is to drill out composite frac plugs and ball seats. It worked well for plugs but creates large debris.

Fig 4.1



Fig 4.1 shows sideview of Tri-cone bit. Disadvantage, no fishneck for recovery, Cones may get left in hole due to wear overtime. Interchangeable jets for optimal cooling and cleaning. B

Fig 4.2



Fig 4.2 Shows face of Tri-cone bit. Notice this particular bit alternates from steel tooth heel row to TCI, and etc. This particular bit works well in 5.5" Casing plug milling scenarios as well as removal of cement retainers, etc.

- Junk Mills (5.1/5.3)- Most junk mills today are comprised of 5 blades with a combination of crushed carbide and carbide buttons of various styles for cutting face. This is the most common type of bit to utilize in Thru tubing applications for removal of bridge plugs, completion system wellbore restrictions, sand and scale removal, dressing of fish tops, etc. Advantage to junk mills, able to handle high RPM, easily customizable for application, controls debris size to fine machining like cuttings. Disadvantages, slow ROP in cement and open hole, circulation ports do not accept interchangeable jets for optimal cooling and jetting.
- Tapered Mills (6.1/6.2) Dressing mills (7.1/ 7.2)- Used to remove casing deformations with a narrow nose that tapers back to usually casing or tubing Drift to slowly open up the deformation. Disadvantages to using tapered mill, they are often very long and at a drilling motors weight and length limitation for the bearing mandrel, failure may occur if too aggressive, long water course means more surface area where debris could potentially wedge beside mill and cause for a bit stuck scenario.

# Tungsten inserts



Bladed Junk mill aggressive –

Dressed with high-quality tungsten chips followed with high-grade inserts on leading edge with chip breaker grooves. This is to ensure optimal performance in every application. These mills are suitable for all types of general milling, as well as the removal of packers, retainers and squeeze tools.

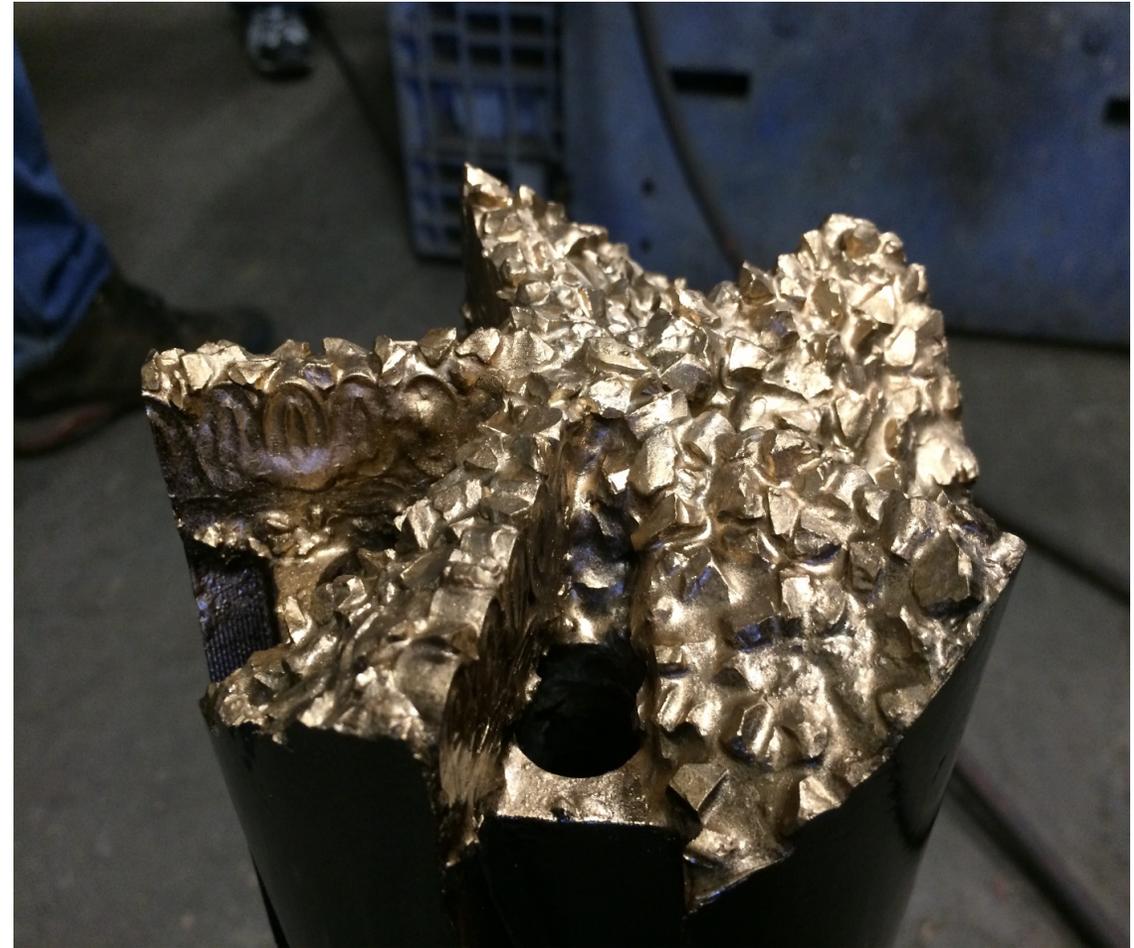






Fig 5.1 This is a Convex type junk mill for drilling stage tool and debris subs. The convex portion is to engage the core of the wiper plug first then work its way through stage tool.

Fig 5.3 this is a Port mill. The reason for using a longer gauge zone is in order to match or slightly exceed the frac port recess length once shifted, this is so there is no damage to the sleeve profile as the mill could engage into the body of the frac port if incorrect shank to recess length selected.



Fig 5.2 this is a composite plug mill. The short shank is what makes it a plug mill as there is enough stability to drill through plug but small enough surface area slip debris will clear quickly.



Taper mill – Specifically for milling through tight spots in tubulars. Heavy crushed tungsten dressing increases on-bottom time, while ground OD length eliminate the risks of cutting through casing. They are recommended for cleaning out liners, tubing and other collapsed or deformed tubulars. They can also be run ahead of other milling tools to clean out “bird nests”.



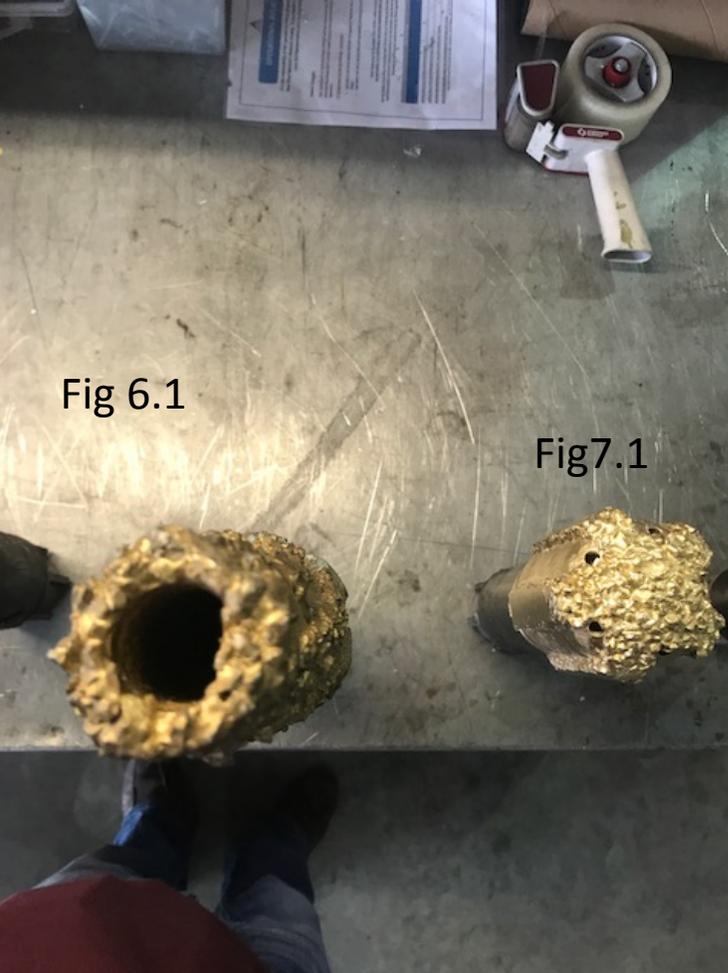


Fig 6.1

Fig7.1

Fig 7.1 Shows Face of Dressing mill that was manufactured to clean up the ID of a Polished Bore Receptacle (PBR). All crushed carbide face, no blades, non aggressive.

Fig 6.1 Tapered mill face. The crushed on the face allows the mill to essentially walk itself from a ledge into where it needs to begin cleaning up the ID of casing or tubing.



Fig 6.2

Fig 7.2

Fig 7.2 Shows the side view of the dressing mill for the PBR clean up. Very non aggressive and short.

Fig 6.2 Shows how the tapered mill transitions from a greatly smaller OD at the face to the max allowable OD. This direction of watercourse does not allow the tapered mill to “screw” itself into the obstruction due to its reverse design.

Watermelon/String mill - Ideal for cleaning out damaged casing, liners, or tubing, string taper mills taper from the top and bottom of the mill, allowing reaming operations from both directions. String taper mills can also remove keyseats in open hole. Pin-down and box-up connections permit the mill to be run in a drill collar string or combined with a smaller pilot assembly to avoid sidetracking when removing obstructions.



Pilot mill – Suitable for milling sections of tubular junk and can be used as a dress mill for installing casing patches or milling liner hangers and other down hole tool throughbore.



Washover Shoes



Saw toothed Shoe



Dressing Shoe



Dressed Cut-lip Shoe

# Frees stuck pipe in the wellbore

## Applications

- Releasing stuck pipe lodged in the wellbore as a result of debris or obstructions

## Benefits

- Reliably frees stuck pipe

## Features

- Rugged N-80 grade or greater casing or tubing construction; higher specification

## Materials available by special order

- Integral joints for job design flexibility
- Available in sizes 2-1/4 in to 24 in
- Other designs fabricated by special order.

Washing over frees stuck pipe in the wellbore by cutting away and circulating out the obstructions blocking the pipe's movement.

Washover shoes and associated equipment can also be specially fabricated for any job.

Conebuster mills are ideal for heavy milling:  
Tri-cone bit cones, slips, and pieces of downhole tools. A concave cutting face with a thick cutting structure ensures long service life and efficient milling. This mill type is not recommended for cement cleanout.







SNP1

L07

TOOLS READY FOR USE