

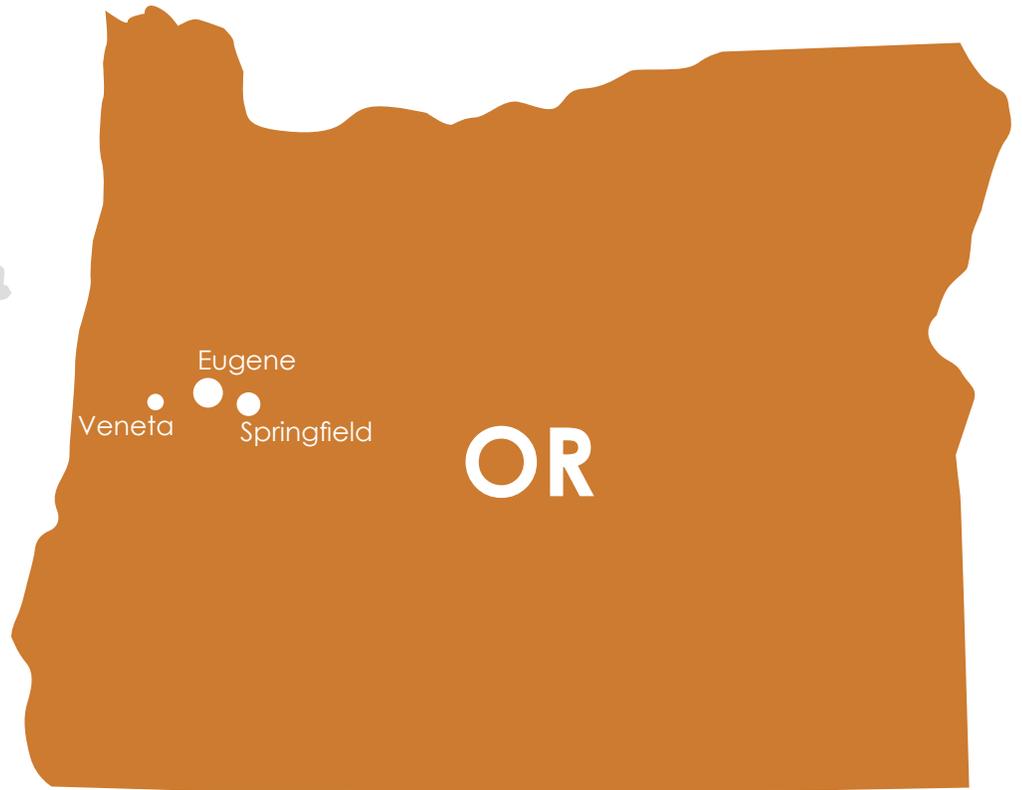
■ REVERSE CIRCULATION

**HOLTE**  
HOLTE MANUFACTURING



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### ■ Eugene, Oregon

Holte's **manufacturing facility** in Eugene, Oregon has long been home to some of the greatest innovations in drilling tools. This is our headquarters housing the design, machining, inventory and shipping centers as well as the office and support staff. Feel free to schedule a visit as we have an open door policy extending to Holte customers for tours and consulting.

This facility houses some of the largest CNC machining centers on the west coast key to making the drilling systems Holte is known for being able to produce. If your project has the need at any time we are set up to manufacture with the shortest turnaround in the industry.

### ■ Springfield, Oregon

Holte's **heat treatment facility** in Springfield, Oregon houses over half a dozen industrial ovens, a pit furnace, an endothermic generator and several styles of quench tanks to ensure that our final products are the ultimate balance between hardness and durability, while allowing careful control throughout the process.

### ■ Veneta, Oregon

Holte's large **fabrication facility** and storage yard in Veneta, Oregon is for custom and retrofit work on drill rigs as well as a product testing grounds for our tooling. We also base our drill rig rentals here.

Holte is known for their pride and excellence in workmanship with steel fabrication and welding, hydraulic and pneumatic work as well as assembly and painting in our paint booth capable of housing almost any size drill rig.



## LEADING THE INDUSTRY

### Look No Further Than Holte

For the ultimate control and efficiency when hammer drilling look closely at Holte Drilling Tools. No other company can offer entire systems and solutions for reverse circulation from rig to bit. Our support staff is also readily available, traveling throughout the world to support your needs throughout all phases of the job. In an industry that is becoming ever more challenging to stay ahead, why settle for anything else?

Reverse Circulation is where Holte undoubtedly leads the industry. With 30 + consecutive years of experience designing and manufacturing alongside our customers, Holte has been able to develop some of the most efficient and durable tools available. Whether you need individual components or a complete system designed around specific conditions or a standard design that draws on our past, proven knowledge of drilling you can rely on Holte to work with you and get the job done faster.

Holte's patented Reverse Circulation Grout Through Hammers are the only hammers in the world that have proven successful in drilling down the hole, then grouting through the hammer on the way out by simply switching a valve.



# INTRODUCTION

## Early Pioneer of Reverse Circulation

From the beginning Holte recognized the significant advantages of reverse circulation (RC) drilling while out on the job site. Holte's first true RC hammer, designed in the 80's, eventually led to huge success's with jobs like the Reno Retrack Project drilling 2000+ holes through Reno, Nevada's sensitive downtown infrastructure and more recently on the Whitestone Bridge in New York City drilling 772 mini-piles to support the expansion of the bridge that carries I-678 across the East River connecting the Bronx with Queens.

## Advantages of Reverse Circulation Drilling

- ▶ Mitigates air loss into sensitive formations
- ▶ Requires less air to evacuate cuttings
- ▶ Efficient removal of larger cuttings cause less wear on tooling and faster penetration rates
- ▶ Ultimate control of cuttings when discharged at surface
- ▶ Energy efficient and causes less impact environmentally to the site

## **Innovation and Dedication to Complete Reverse Circulation Systems**

Today, dedication to new technologies and the resources to utilize them is why we continue to lead the industry in development and production of innovate new tooling for reverse circulation, especially oriented toward large diameter and custom systems and solutions.

**Reverse Circulation is where Holte undoubtedly leads the industry. With 30 + years of experience designing and manufacturing reverse circulation systems.**

Holte's patented technologies aid in development of the efficient and durable tooling we are known for today. Being involved with our customers in the field, coupled with powerful computer aided design programs, the latest CNC technologies and our skilled, knowledgeable teams of dedicated employees all combine to make it possible to offer the innovative products creating complete drilling systems from rig to bit.

Holte RC tooling works effectively by itself, but the secret to our customers repeated success is the careful pairing of bit, hammer, sub adapter, drill pipe and top head drive to use air flow efficiently throughout the system. A proper design ensures cuttings are easily removed in large pieces while wear is minimized from the bit face to the discharge system on the surface.

**[ RCDHH ] Features**

- ▶ Bolt together design allows rotation in both directions
- ▶ Quick change bit system allow quick access to bit with hand tools without removing hammer from drill string
- ▶ Oversized center return allows effective large debris removal for faster penetration
- ▶ Carburized center tube spans throughout hammer to minimize wear from cuttings
- ▶ Piston design transmits power to button face breaking rock into large pieces versus grinding them to dust
- ▶ Designed to operate at higher pressure due to simple piston design and advanced porting
- ▶ Patented key drive eliminates bit weight and length offering better piston/bit weight ratio
- ▶ Check valves at the bottom of hammer reduce the possibility of debris from entering the hammer



**REVERSE CIRCULATION DOWN HOLE HAMMERS [ RCDHH ]**

Reverse Circulation Hammer Technology is where Holte shows experience. Designing and manufacturing alongside our customers job specific needs we have been able to develop some of the most efficient, durable tooling available, incorporating innovative solutions no other DHH can match. Our large diameter hammers, in fact, continually set the benchmark for the industry, helping you stay one step ahead.

Holte's patented Reverse Circulation Grout Through Hammers are the only hammers in the world that have proven successful in drilling down the hole, then grouting through the hammer on the way out by simply switching a valve.

We can manufacture and heat treat in house any single piece hammer up to 43" (1092mm) to ensure the ultimate balance between strength and durability of materials.

We also offer Quad (Cluster) Drills for even larger hole solutions.

| HAMMER SIZES [ RCDHH ] |                         |    |    |    |     |     |     |     |     |     |     |     |     | RC  |     |
|------------------------|-------------------------|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Catalog No.            | Description             | 5" | 6" | 8" | 10" | 12" | 14" | 15" | 16" | 18" | 20" | 24" | 30" | 38" | 42" |
| 010200-0000            | Reverse Circulation DHH |    | ●  | ●  |     | ●   | ●   |     | ●   |     | ●   | ●   | ●   | ●   | ●   |



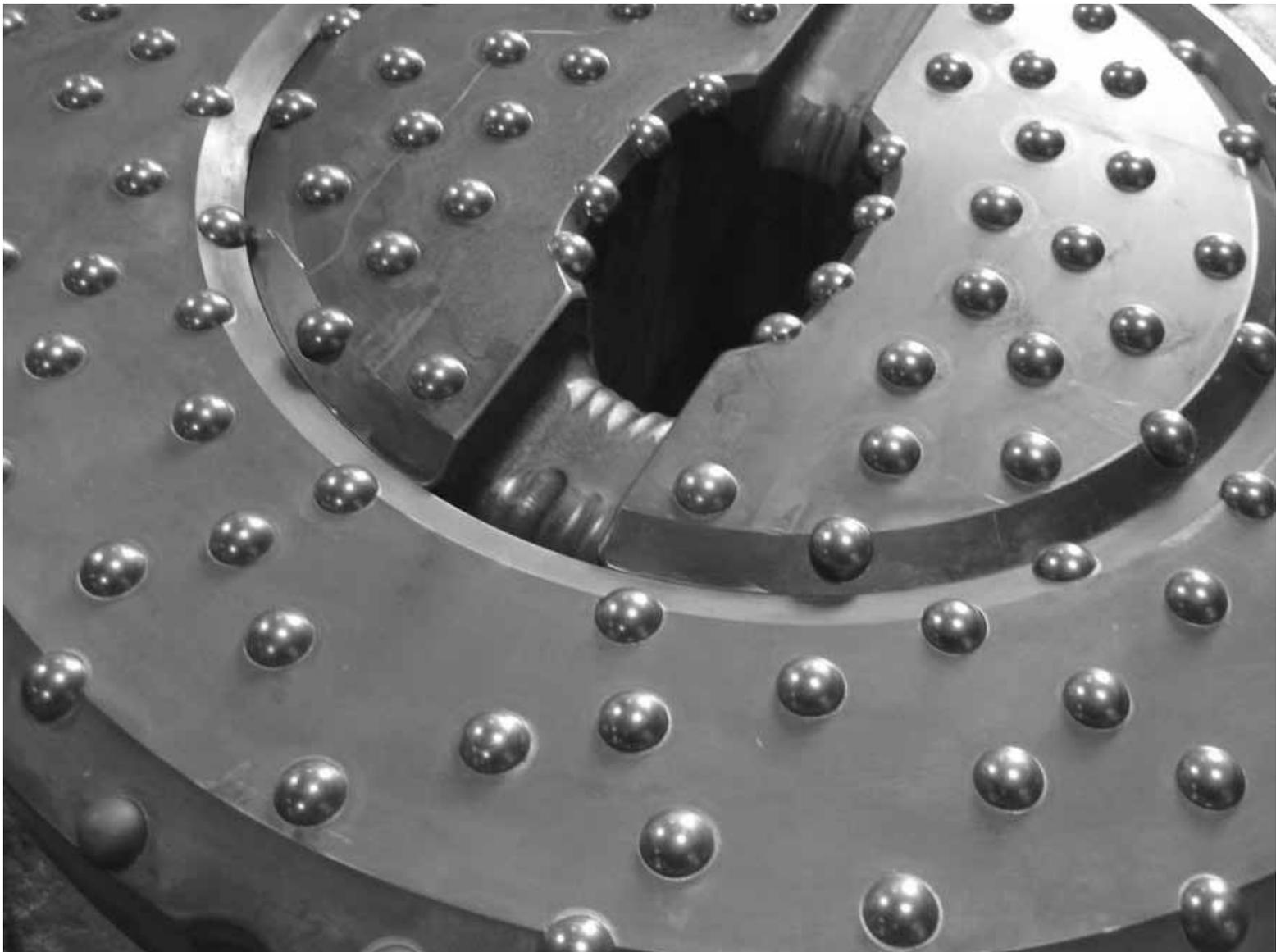
## REVERSE CIRCULATION DOWN HOLE HAMMERS [ RCDHH ] RC

|                                 |           | RC6                                         | RC8                    | RC12                  | RC14                  | RC16                |
|---------------------------------|-----------|---------------------------------------------|------------------------|-----------------------|-----------------------|---------------------|
| <b>Standard Diameter</b>        | in (mm)*  | Specs Coming Soon<br>Call HOLTE for Details | 7.4 (188)              | 11 (280)              | 13.5 (343)            | 15 (381)            |
| <b>Length w/o Bit</b>           | in (mm)   |                                             | 44 (1118)              | 59 (1499)             | 59 (1499)             | 59 (1499)           |
| <b>Weight w/o Bit</b>           | lb (kg)   |                                             | 870 (395)              | 1940 (880)            | 2350 (1066)           | 2680 (1216)         |
| <b>Cylinder Bore</b>            | in (mm)   |                                             | 5.6 (142)              | 8.75 (222)            | 10 (254)              | 10.5 (267)          |
| <b>Piston Weight</b>            | lb (kg)   |                                             | 70 (32)                | 260 (118)             | 385 (175)             | 450 (204)           |
| <b>Working Pressure</b>         | psi (bar) |                                             | 100-300 (6.9 - 20.7)   | 100-300 (6.9-20.7)    | 100-300 (6.9-20.7)    | 100-300 (6.9-20.7)  |
| <b>Maximum Working Pressure</b> | psi (bar) |                                             | 350 (24.1)             | 350 (24.1)            | 350 (24.1)            | 350 (24.1)          |
| <b>CFM Required @ 200 psi</b>   | cfm       |                                             | 600                    | 900                   | 1000                  | 1200                |
| <b>Standard Top Sub</b>         | **        |                                             | 7" Holte Threaded      | 9" Holte Threaded     | 9" Holte Threaded     | Holte Hex           |
| <b>Flat On Top Sub</b>          | in (mm)   |                                             | Specify                | Specify               | Specify               | Specify             |
| <b>Min/Max Bit</b>              | in (mm)   |                                             | 7.5 - 10 (190.5 - 254) | 11.8 - 16 (300 - 406) | 13.5 - 20 (343 - 508) | 15 - 22 (381 - 559) |

## REVERSE CIRCULATION DOWN HOLE HAMMERS [ RCDHH ] RC

|                                 |           | RC20                 | RC24                  | RC30                   | RC38                                        | RC42                                        |
|---------------------------------|-----------|----------------------|-----------------------|------------------------|---------------------------------------------|---------------------------------------------|
| <b>Standard Diameter</b>        | in (mm)*  | 19 (483)             | 22.8 (579)            | 28.5 (724)             | Specs Coming Soon<br>Call HOLTE for Details | Specs Coming Soon<br>Call HOLTE for Details |
| <b>Length w/o Bit</b>           | in (mm)   | 80 (2032)            | 80 (2032)             | 99 (2515)              |                                             |                                             |
| <b>Weight w/o Bit</b>           | lb (kg)   | 4300 (1950)          | 6300 (2858)           | 10000 (4536)           |                                             |                                             |
| <b>Cylinder Bore</b>            | in (mm)   | 13 (330)             | 14.6 (371)            | 20.6 (524)             |                                             |                                             |
| <b>Piston Weight</b>            | lb (kg)   | 615 (279)            | 845 (383)             | 1890 (857)             |                                             |                                             |
| <b>Working Pressure</b>         | psi (bar) | 100-300 (6.9 - 20.7) | 100-300 (6.9 - 20.7)  | 100-300 (6.9-20.7)     |                                             |                                             |
| <b>Maximum Working Pressure</b> | psi (bar) | 350 (24.1)           | 350 (24.1)            | 350 (24.1)             |                                             |                                             |
| <b>CFM Required @ 200 psi</b>   | cfm       | 1800                 | 2200                  | 3500                   |                                             |                                             |
| <b>Standard Top Sub</b>         | **        | Holte Bolted Hex     | Holte Bolted Hex      | Holte Bolted Hex       |                                             |                                             |
| <b>Flat On Top Sub In</b>       | in (mm)   | Specify              | Specify               | Specify                |                                             |                                             |
| <b>Min/Max Bit</b>              | in (mm)   | 19 - 28 (483 - 711)  | 22.8 - 36 (579 - 914) | 28.5 - 48 (724 - 1219) | 36.5 - 48 (927 - 1219)                      | 40 - 52 (1067-1321)                         |

\* Minimum outer barrel size available. Larger sizes can be easily accommodated to meet most specifications.  
 \*\* Additional top sub connections available.



## REVERSE CIRCULATION DOWN HOLE BITS [ RCDHB ]

### Holte Reverse Circulation Bits Offer Control

As the most experienced reverse circulation manufacturer in the industry we understand bits and the importance of having a durable, effective design leading your tooling down the hole. Our complete line of reverse circulation bits are designed with that in mind.

Patented precision, hardened keys are the core of our key drive system, taking place of traditional splines. They allow shorter shank length and lighter weight bits by eliminating bit bushings and utilizing inexpensive, replaceable delron wear plates. The compact bit shank design equates to the highest piston to bit weight ratio in the industry, in turn, delivering maximum energy to the button face so you are bringing rock chips to the surface, not wasting time making dust. Redesigned airflow channels reduce the chance of bit face plugging and ensure the hammer continues running in all types of ground conditions. Careful control of airflow also better directs air traveling over the face of the bit to the center helping to eliminate the unwanted pressurization of surrounding formations and making drilling in sensitive sites less risk.

Holte Reverse Circulation Bits are available in a variety of shank style, bit face and button configuration to include an innovative two piece design utilizing diamond buttons for the ultimate in durability. Sizes range up to 43" (1092mm), but our flexible design, manufacturing and heat treatment process is capable of adapting to meet your needs if another size better suits the job.



## REVERSE CIRCULATION SOLUTION COMBINATIONS

**RC**

| HOLTE [ RCDHH ] | HOLTE [ RCDHB ] | HOLTE [ RCPIPE ]                  |
|-----------------|-----------------|-----------------------------------|
| RC6             | 6" - 8"         | 4.50" x 2.25"                     |
| RC8             | 7.5" - 10"      | 7" x 3.85"                        |
| RC12            | 11.8" - 16"     | 7" x 3.85" or 8.625" x 4.90"      |
| RC14            | 13.5" - 20"     | 7" x 3.85" or 8.625" x 4.90"      |
| RC16            | 15" - 22"       | 8.625" x 4.90"                    |
| RC20            | 19" - 28"       | 8.625" x 4.90" or 10.75" x 6.25"  |
| RC24            | 22.8" - 36"     | 10.75" x 6.25" or 13.625" x 7.80" |
| RC30            | 28.5" - 48"     | 13.625" x 7.80" or 16" x 7.80"    |
| RC38            | 36.5" - 42"     | 16" x 7.80"                       |
| RC42            | 42" - 52"       | 16" x 7.80"                       |

\* Combinations are only suggestions based on past project design and application. Numerous variations and additional sizes not stated are readily available.



## REVERSE CIRCULATION DRILL PIPE

### Holte Reverse Circulation Drill Pipe

As an early proponent of reverse circulation (RC) drilling Holte has remained dedicated to developing new ways to continually improve RC pipe design and manufacturing techniques.

Holte's standard reverse circulation dual wall pipe allows for air to move through the annulus between the center tube and outer pipe, while the cuttings flow up freely through the center. Additional jetting pipes can also be added to our dual wall design within the annulus to give added control of air distribution and cutting retrieval for underwater drilling or deep holes.

### Simplicity and Durability

Our expertise in understanding materials and the strains placed on them during drilling derives from our years of manufacturing and working in the field alongside the customer. Today, Holte's design centers on simplicity and durability. Precision machined and heat treated tool joints are assembled under careful supervision using a unique, proven technique that uses heavy wall, durable drill steel formulated and tempered for maximum wear resistance and strength. Our design does not use center tube connectors or complicated inner barrel suspension systems so you never need to worry about costly repairs and downtime in the field. In fact, Holte's design allows the center tube to be a single, continuous piece of drill steel that is threaded on both ends. Prior to welding the outer pipe to the joints we carefully torque the inner pipe into the machined joint, creating additional strength unmatched by any other drill pipe on the market.



### Hex Pipe Offers Advantages

Holte's Patented Dual Wall Pipe with Quick Release Hex Head was created by Holte Manufacturing as a solution to the problem of thread binding. This is particularly a problem with large diameter systems using our traditional threaded joints due to the higher amount of torque applied to the drill string. Holte Hex Joint Pipe eliminates this, while adding several other advantages over traditional threaded joints.

When disconnecting hex pipe no counter rotation is needed as the joints simply plug together due to their unique design. When connected the joints are held together by two machined pins that require no more than a standard wrench to remove. This greatly reduces time spent assembling and disassembling pipe. Another big advantage of hex connections is the ability to rotate in both directions. When difficult conditions persist this is an option that will keep you drilling, while your competition is stuck in the hole.

### Complete Drilling Systems

Reverse circulation drilling requires all the components to be carefully matched in order to fully realize the benefits of this style of drilling and drill pipe sizing is critical to success. For this reason Holte is proud to offer everything from rig to bit, including custom top head drives specifically designed and outfitted for reverse circulation drilling.

| REVERSE CIRCULATION DRILL PIPE |                     |                       | RC                   |
|--------------------------------|---------------------|-----------------------|----------------------|
|                                | Diameter (OD x ID)* | Max Torque (ft/lbs)** | Weight (20'-0" L)*** |
| <b>Thread</b>                  | 4 1/2" x 2.25"      | 15,000                | 600                  |
|                                | 7 "x 3.85"          | 40,000                | 940                  |
|                                | 8 5/8" x 4.90"      | 50,000                | 1120                 |
|                                | 10 3/4" x 6.25"     | 75,000                | 1800                 |
|                                | 12 3/4" x 7.80"     | 85,500                | 1980                 |
|                                | 13 5/8" x 7.80"     | 100,000               | 2250                 |
| <b>Hex</b>                     | 8 5/8" x 4.90"      | 50,000                | 1250                 |
|                                | 10 3/4" x 6.25"     | 75,000                | 1930                 |
|                                | 13 5/8" x 7.80"     | 100,000               | 2370                 |
|                                | 16" x 7.80"         | 120,000               | 2610                 |

\* Custom sizes available. Inner pipe shown is standard size. Most variations possible.

\*\* Torque is estimated and subject to change at HOLTE'S discretion. If higher torque is required call Holte for special application pipe.

\*\*\* HOLTE pipe is sold in any random length required.



# GROUT THROUGH SYSTEM

## **Patented Grout through System**

Holte's grout through technology comes standard in all our reverse circulation down hole hammers. By eliminating the traditional check valve in the top and distributing them around the bottom of the inner barrel, Holte Hammers virtually prevent water and debris from entering the operating parts concealed within the hammer. This patented innovation allows grout to be pumped into the system from above ground flowing through the center tube of a dual wall pipe, which can also be designed to be the casing in overburden conditions, and on through the hammer and bit. It also contributes to extending the life of working parts within the hammer since they remain protected from contamination during all phases of drilling.

## **Increased Production**

Using a Holte Reverse Circulation System with a custom top head or conversion allows holes to be drilled and grouted using any of our RC hammers. When drilling and the desired depth is achieved a specially designed valve is opened in the top head allowing grout to be pumped in through the system while the tooling is retracted to the surface. Once the hole is complete simply tram the fully rigged mast to the next hole and repeat the process while rebar and pile reinforcement is added as the rig continues drilling.

Advanced monitoring systems are available to ensure integrity of the finished hole while using such things as portable grout plants or cutting containment systems can further simplify the process.



# CLOSED LOOP

## Reduce Energy Loss in Large Diameter Drilling or Deep Underwater

Closed loop drilling is a combination of Holte tools that allow a Down Hole Hammer (DHH) to exhaust to surface through specially designed air passages within our dual wall reverse circulation drill pipe. This helps to minimize back pressure created within the hammer as a result of not providing exhaust air a place to expand and escape. This is a problem under certain drilling conditions and causes a serious degradation in DHH performance by reducing the effective air pressure that makes the hammer piston cycle. Drilling deep underwater, for example, it becomes critical at a certain depth to exhaust against atmospheric pressure to keep the DHH running efficiently.



## QUICK CHANGE BIT SYSTEM

A recent innovation, developed on a job where changing bits quickly was critical, allows our RC bit to be changed with hand tools while the hammer is still attached to the drill string, hanging from the rig. Once free the outer barrel simply slides up, over the backhead to expose our patented key drive system. Pull each key by hand and the bit is free to change.



# CONVERSIONS

Since we normally find that most rigs are not capable of using reverse circulation systems effectively we have found it necessary to modify them. By applying our experience and knowledge of design we are able to fabricate the proper tooling to work most efficiently with the rig.

Today our rig modifications range from complete top head drive units capable of massive amounts of torque to cutting edge mast modifications and accessory upgrades that ensure you are getting the most from your rig.



## FIELD SUPPORT

As the drilling industry continues to demand more from its people, equipment and tooling Holte strides to remain the leading innovator of tooling and solutions geared towards reverse circulation.

We have brought so many successful new tools to the market that we know what it takes to get approval from you local, state and/or federal jurisdiction when it comes to using new drilling methods.

Our experience also allows us to work directly with drilling and construction contractors as well as engineers to communicate the means and methods needed to get the job started. Holte's unique approach to doing business enables us to work with you early on, designing and outfitting your drilling equipment and tooling needs entirely through the experience and resources available at our three facilities. Because of our company's passion for innovation and the way we designed our manufacturing process in Oregon we are able to take that a step further and design, fabricate and manufacture with the shortest turnaround of anyone in the industry.

Our knowledge of drilling and our relationship within the industry allow us to supply everything you need to ensure success from the moment you unload at the job site.

Since we sell directly to our customer's it is imperative that we sell only the tooling and solutions essential to your needs. The work that we put into your job does not come to an end when we send your tooling out the door. Our dedicated people travel to your job site and ensure that everything is installed and operating effectively, in fact, we frequently spend several weeks on the job site working alongside to ensure no detail is overlooked. We judge our success based on yours.

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