AIMCO

PULSE TOOLS

Pulse Tools

HISTORY OF A PULSE TOOL

1965
NEW TECHNOLOGY

The first prototype designed to provide torque control with out high maintenance cost of impact wrenches

1980
U SERIES

The U-Series is invented. The first pulse tools to be commercially available for assembly evolving into full-shut off tools.

1988
EC SERIES

Combining advantages of pulse tools with controlled tool technology, the EC Series is developed. It incorporates a transducer into the design perfect for critical safety applications.

1995
ALPHA SERIES

In order to achieve the best power-to-weight ratio, the alpha 9-blade, twin chamber air motor is developed providing significant power and reducing cycle times.

2001
ULT / UL SERIES

The new O-ring design improves durability. The roller bearings in the pulse unit increases hydraulic fluid life and the redesigned porting maintains fluid temperature and torque repeatability. The UL tools, are ideal for applications where the lightest, fastest tools are necessary.

2006
UEP-MC SERIES

The first and only electric power pulse tool is developed. Combining programmable tool speed with the MC-style transducer making it extremely accurate. Repeatable torque is achieved on a variety of applications.

2012
UDP-MC CONTROLLED SERIES

Smaller, lighter electric pulse tools that have an integrated fan unit are developed.

2013
UA-AMC CONTROLLED PULSE SERIES

Featuring the angle measurement for improved process control, it detects cross threading, double hits on the same fastener, stripped and damaged fastener threads and incorrect fasteners.

2013
UAT SERIES

The patented Auto Relief Technology is developed enabling efficient delivery of torque energy to the application. It responds to ever changing pressures in the pulse unit by applying its energy in a smooth manner to the joint as the torque is developed. The Auto Relief valve is fully open during free run and automatically closes when torque resistance is sensed. No adjustment required.

How Pulse Tools Work

TERMINOLOGY

Pulse

- Each torque producing event
- Once per revolution
- 2 Milliseconds in duration

Pulse Unit

- Entire chamber and parts that house the hydraulic fluid
- Also called liner casing assembly

Pulse Fluid

- Specialized hydraulic fluid within the pulse unit

Anvil

- Part of pulse unit which transfers power to the bit/socket
- Standard square drive or ¼” hex quick change drive

Driving Blade

- Internal part of pulse unit
- Pressure in fluid builds against blade generating torque application at anvil

Relief Valve

- Pressure operated mechanism which controls adjustment of torque output of tool
- Adjusted through Allen screw on top of pulse unit

How Pulse Tools Work

Reduced Size
Optimum Power
to Weight Ratio

New O-Ring Design
Better durability

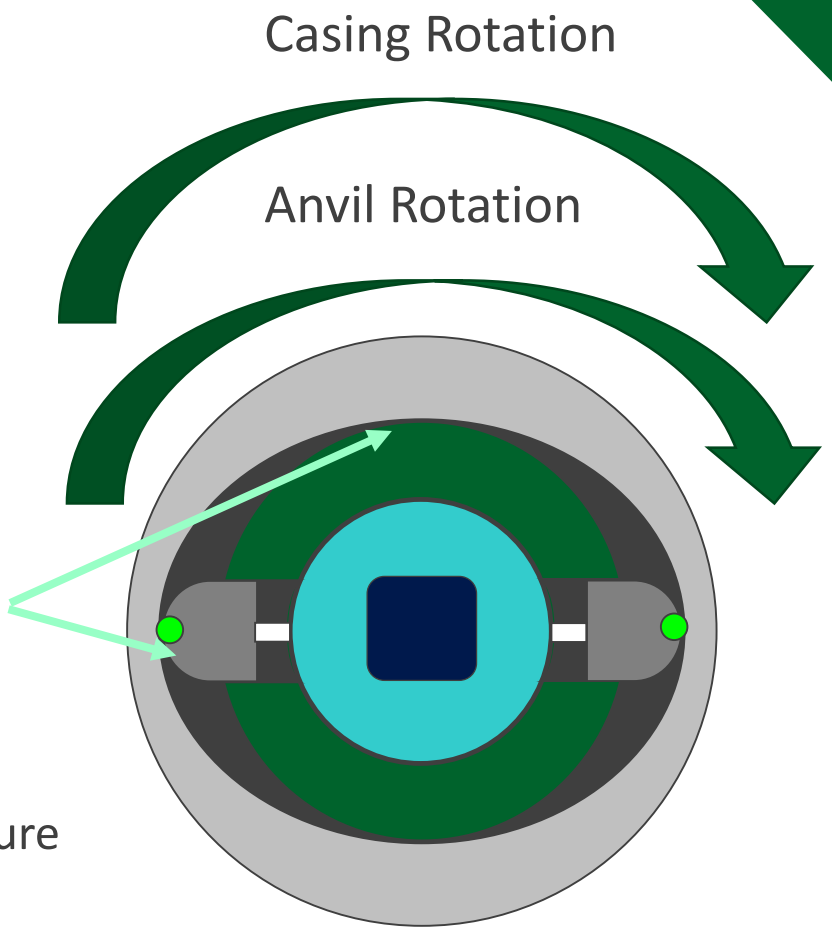
Accumulator
Manages fluid volume

Roller Bearings
Reduced Friction

How Pulse Tools Work

DURING RUNDOWN

During free-speed rundown, the outer casing and anvil spin at the same speed



At this point, the edges of the anvil do not touch the inner wall of the casing and there is no compression of the springs or driving blades

There is no free rotation and no pressure builds in fluid

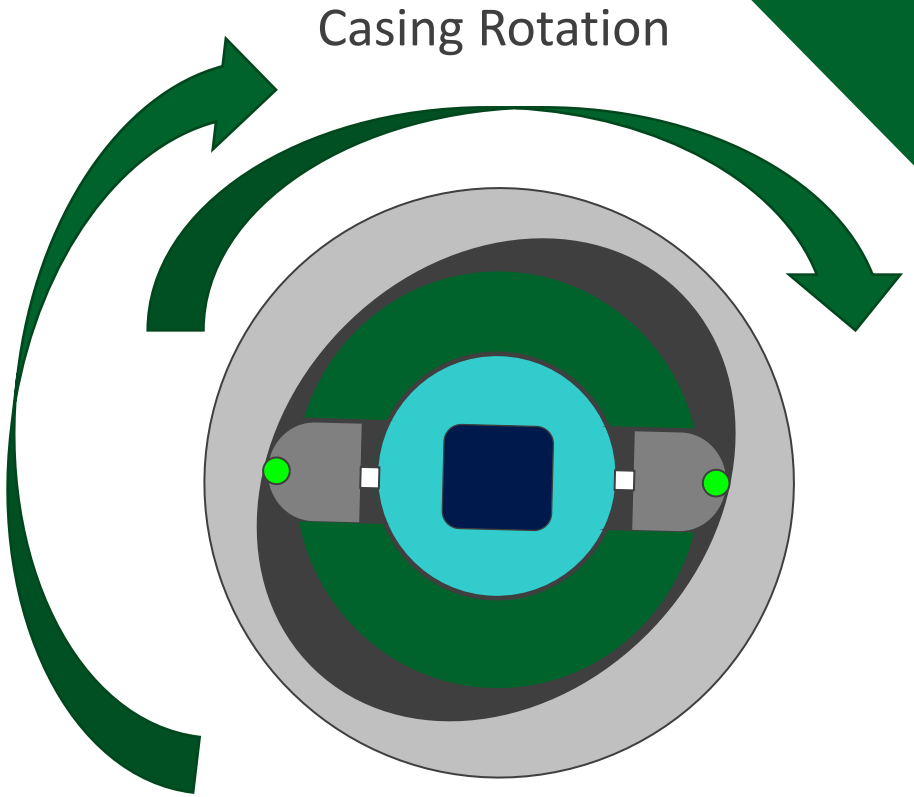
How Pulse Tools Work

DURING RUNDOWN

As the fastener provides resistance to rotation, the anvil and casing begin to rotate at different speeds

The anvil slows as the casing continues to rotate

The springs of the driving blade begin to compress and the driving blade is pushed inwards towards the anvil



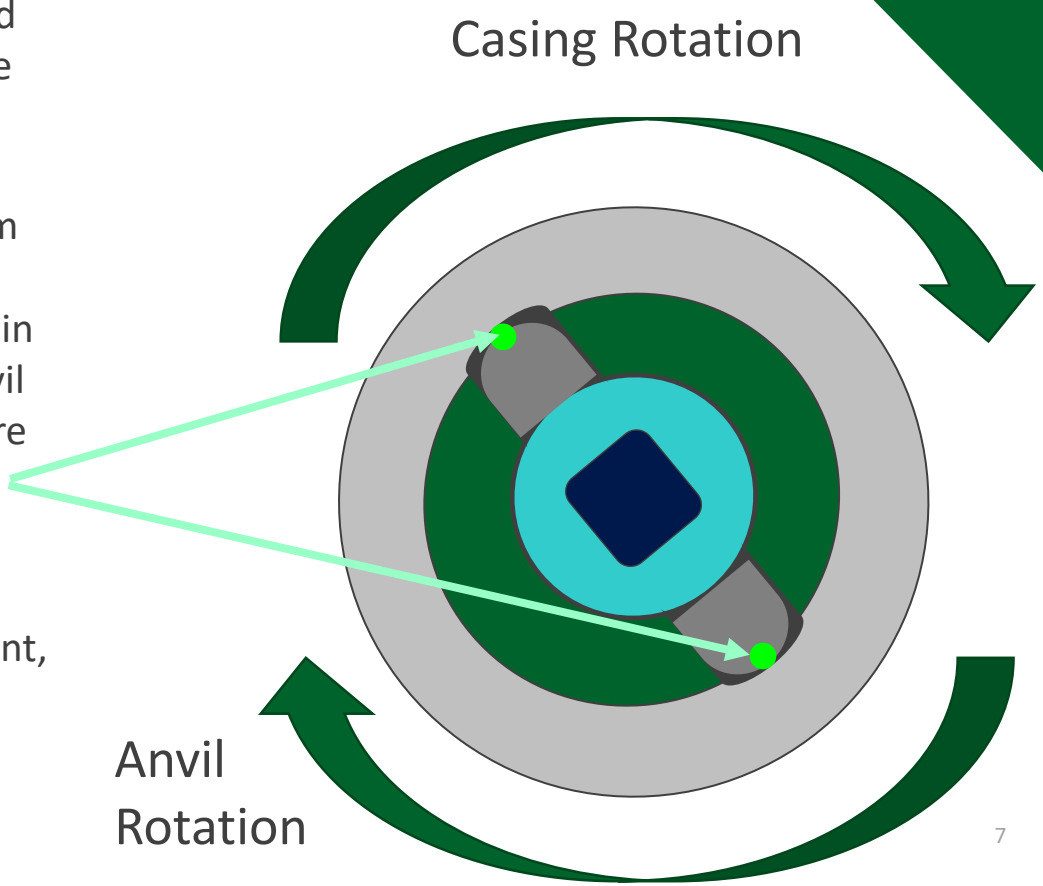
How Pulse Tools Work

DURING RUNDOWN

As the casing continues to rotate, fluid pressure builds further and the anvil begins to hesitate slightly. As the pressure in the fluid builds to a maximum, force is applied to the driving blade forcing its rotation

When the anvil is displaced 90 degrees from the casing, the driving blades are fully compressed at the seal point, the pressure in the fluid approaches maximum and the anvil comes to a near stop. At this point, pressure on the anvil is also at a maximum

As the anvil resumes moving forward, the driving blade moves away from the seal point, pressure in the fluid drops, and the anvil begins to accelerate



How Pulse Tools Work

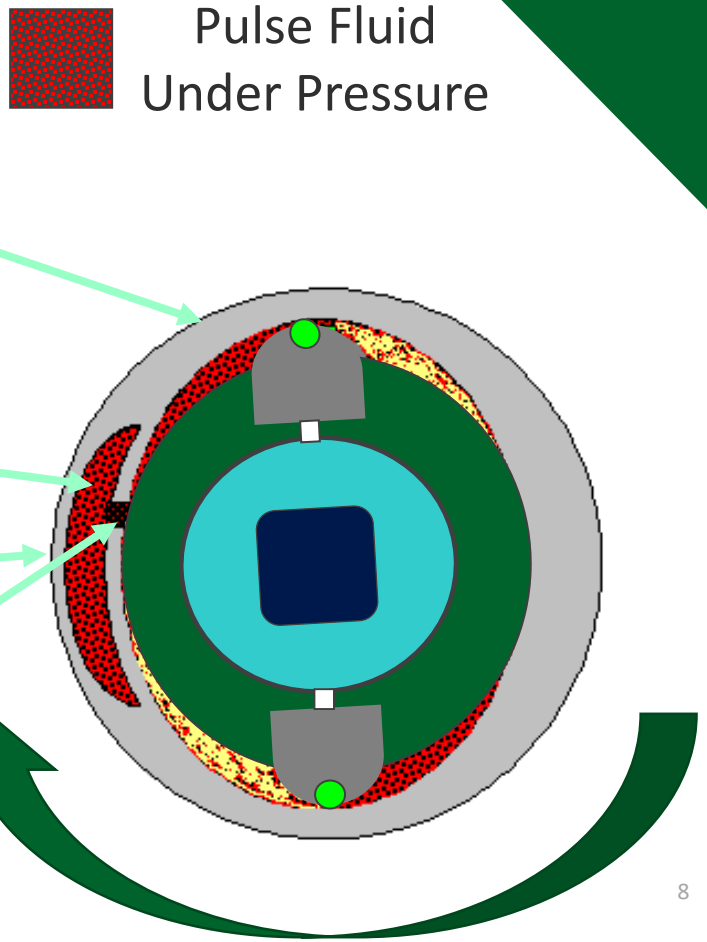
AT TARGET TORQUE

When driving blades are at the seal point, pressure in the pulse fluid reaches maximum

Pressure overcomes spring tension of relief valve and fluid is able to begin moving out of pulse unit

Fluid moves into bypass

As fluid is able to move into bypass, pressure drops, anvil is able to continue rotating and pulse event ends



How Pulse Tools Work

THE EASY METHOD

- Air Motor drives a cylinder filled with hydraulic fluid
- Under load, each revolution of the cylinder produces pressure in the fluid
- Applies force to the anvil and produces torque
- Relief valve prevents over-torqueing of the fastener
- Fluid absorbs vibration and the design of the tool removes any torque reaction

Benefits of AIMCO Pulse Tools

With AcraDyne's Gen IV ACE Controller Platform you now have the flexibility and freedom to control any AIMCO transducerized pulse tool including Air, Battery, and Electric!

PRODUCTIVITY

Combining high operating speeds (up to 6700 RPM) with one-handed operation, AIMCO pulse tools help manufacturers produce at the highest possible rates.

ERGONOMICS

Light weight, low vibration and noise, and no torque reaction make AIMCO pulse tools the safest assembly tools available.

RELIABILITY

Revolutionary engineered O-Ring design provides long lasting leak free performance between maintenance intervals.

QUALITY

The most repeatable torque and clamp load results of any assembly tool, AIMCO pulse tools guarantee high product quality.

Qualifiers

Joint Rate Sensitivity

- Anvil slows when resistance to rotation develops
- Soft joint will cause the speed of the anvil to slow dramatically and will extend rundown time
- This can be countered by use of a larger tool model

Prevailing Torque

- Anvil will to slow when prevailing torque provides resistance to rotation
- If prevailing torque values are close to final torque requirement, tool may shut-off or stall prematurely
- This can be countered by use of a larger non-shut-off tool

Maintenance

- Pulse fluid requires regular periodic changing to maintain torque accuracy and to prevent wear of hard parts
- Every fourth fluid change should include a PRK change of soft parts in pulse unit

Sockets

- Multiple of worn sockets and extensions can lead to poor performance of shut-off mechanism

Pulse Tool Maintenance

Air Motor

- Lubricated daily
- Manually or through a filter/regulator/lubricator
- Should be inspected for damaged air motor blades and wear of hard parts annually

Pulse Unit

- Regularly scheduled changing of the pulse fluid
- Schedule determined by tool model, duty cycle and application type
- PRK (pulse unit repair kit) should be installed with every fourth fluid change
- Involves changing low cost springs, O-rings and gaskets
- Inspect all hard parts for wear (rare)

Pulse Fluid Change Cycle

DETERMINED BY NUMBER OF PULSE SECONDS

Pulse Second

- One second worth of time during the which the tool is actually producing toque (pulsing)
- Does not include free-speed rundown time

To Determine Pulse Seconds for an application & Tool

- Observe operator using tool on application
- Record period of time with tool under load completely tightening fastener
- Subtract amount of free-speed time (time before snug-point is reached)
- Amount of time left is Pulse Seconds for tool and application

Pulse Fluid Change Cycle

U, UX-,UXR- and Alpha

- Models require fluid changes on average after 150,000 pulse seconds

UL- and ULT- models

- Models require fluid changes on average after 200,000 pulse seconds

Example 1

- An automaker uses an **ULT-150** to rundown a frame bolt to 125 Ft Lb.
  - This is a medium joint with approximately 100 degrees of rotation of the fastener from snug to tight
  - Total rundown time is 2 seconds, with 1 second of this being free speed
- **150,000 Pulse Second Maintenance Schedule / 1 Pulse second per rundown = 150,000 fasteners between fluid changes**

Example 2

- The same automaker uses a **UL-40** to tighten a fastener holding carpeting and a trim piece in place
  - The specified torque is 12 Ft Lb. Due to the trim, carpeting, pad and gasket material this is a very soft joint
  - Total rundown time is 5 seconds, of which only 1 second is free speed.
- **200,000 Pulse Second Maintenance Schedule / 4 Pulse second per rundown = 50,000 fasteners between fluid changes**

Pulse Fluid Change Cycle

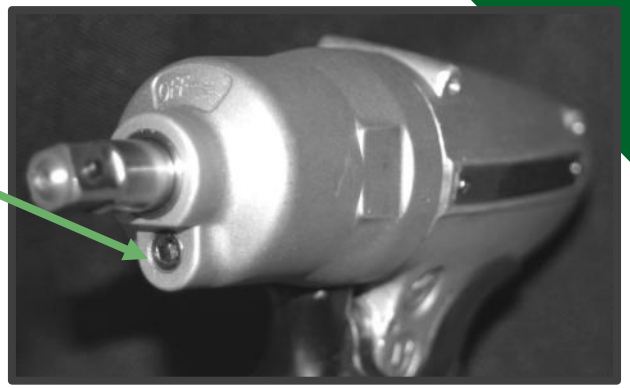
Besides following the maintenance schedule, how do I know when to change pulse fluid?

- Tool begins to take longer to achieve final torque
- One shut-off tools, shut-off feature fails to work
- Excess fluid leaking from around front casing or anvil
- More than 6 months have passed since last fluid change

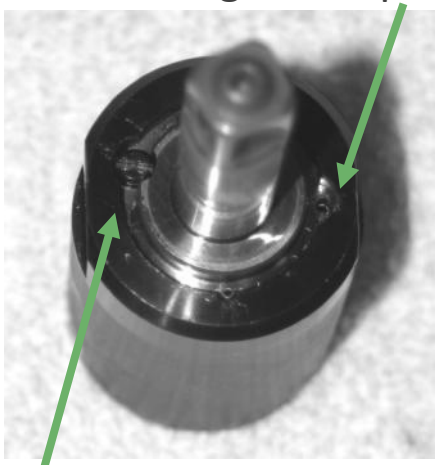
Torque Setting & Adjustment

Torque adjustments typically made through access point on the front of the tool

The Allen Head Plug is removed



The anvil is turned manually until the **Relief Valve Adjustment Allen Screw** can be viewed through the opening



Do not confuse this with the **Filler Plug** which is a slotted head

Notes

- Clockwise rotation of the Relief Valve Adjustment increase torque
- Counter Clockwise rotation of the adjustment screw decreases torque
- Tools for adjustments are included with new tools
- Small number of models use slightly different procedures

Pulse Tools

Type	Pneumatic, Electric, Cordless
Primary Industries	MVI, Agriculture, Compressors / Pumps, White goods, Electronics
Current Customers	Toyota, Honda, Nissan, Mercedes, Daimler, Chrysler, GM, Ford, Caterpillar, Polaris, John Deere, Mercury Marine, Mack, Freightliner, Peterbilt, Thomas Built, Kenworth, Volvo, Bendix, Harley Davidson, York, Sullair, Trane, Carrier, Copeland, Tecumseh, Steelcase, Hon Company, Herman Miller, Square D, MGE Power, Maytag, Nordyne
Typical Applications	Precise metal parts assembly, trim screws, engine assembly, Large wiring
Number of Models	240
Configuration	Shut-off, Non-Shutoff (Stall), Controlled, Electric, Cordless, Cycle verification (TM Type)
Grip Styles	Pistol, Inline, Angle head
Torque Ranges	2 – 850 Nm
Speed Ranges	2000 – 6000 RPM
Joint Types	Hard to medium joints with light prevailing torque
Main Advantages	Lightweight, No torque reaction, long life, repeatability

Complete Portfolio

CONTROLLED TOOLS


Controller


DC Pistol


DC Angle


DC Inline


High Torque

Transducerized


Continuous Battery


Electric Pulse


Pneumatic Pulse

POWER TOOLS PNEUMATIC


Pistol Screwdriver


Inline Screwdriver

Open-End Tubenut


Angle Nutrunner


Pulse


High Torque


High-Speed Series

CUSTOM ENGINEERED SYSTEMS

POWER TOOLS ELECTRIC


Pulse


Electric Screwdrivers

POWER TOOLS BATTERY


Continuous


High Torque Continuous


Discontinuous

TORQUE MEASUREMENT


Testers


Data Analyzers


Test Stands


Torque Wrenches


Transducers


Joint Simulators


Torque Carts

TOOL SUPPORT


Air Line & Accessories


Spring Balancer

FRL


ERGO Arms


Torque Tubes


Torque Arms

FASTENER TOOLS


Bits


Sockets


Extensions

Mag-O-Nets®

PERQ

- **PRODUCTIVITY:** the speed and efficiency of assembly
- **ERGONOMICS:** the physical relationship between personnel and mechanisms they use in the assembly process
- **RELIABLILTY:** expected service life for its intended job
- **QUALITY:** the adherence to engineering specifications during the assembly process

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