

Perfect Pitch

Gleason's new Pitch Line Fixture design minimizes runout and helps ensure greater accuracy for hard finishing and inspection.

Gear manufacturers are turning to workholding to help reduce cost without compromising quality. Pitch Line Fixtures, for example, can be used to provide a more precise relationship between the pinion/gear member datums and the gear teeth, thus reducing the amount of runout on those datums relative to the pitch diameter (pitch line) of the gear or pinion. Since undesirable runout results from the heat treatment and other manufacturing processes that can cause distortion, Pitch Line Fixtures are particularly well-suited for hard finishing and inspection applications.

A Better Mousetrap

Gleason has developed a Pitch Line Fixture that will average gear member runout to within 0.0005" (0.0127 mm) to the pitch line – and can be as accurate as 0.0002" (0.005 mm). The application determines the required accuracy. If used in a grinding application where normally 0.004" (0.1016 mm) of stock is removed off each gear flank, then the runout to the bearing journals of 0.0005" (0.0127 mm) would be sufficient. However, if used for hard turning with no subsequent finishing applications or lapping applications, then 0.0002" (0.005 mm) would be more appropriate.

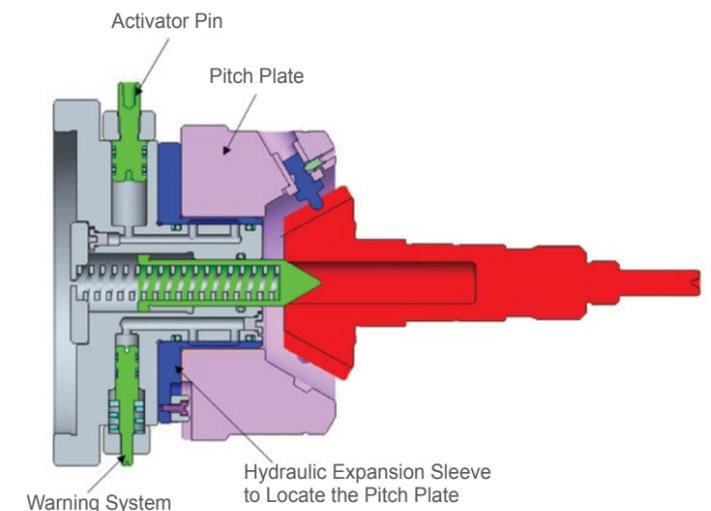
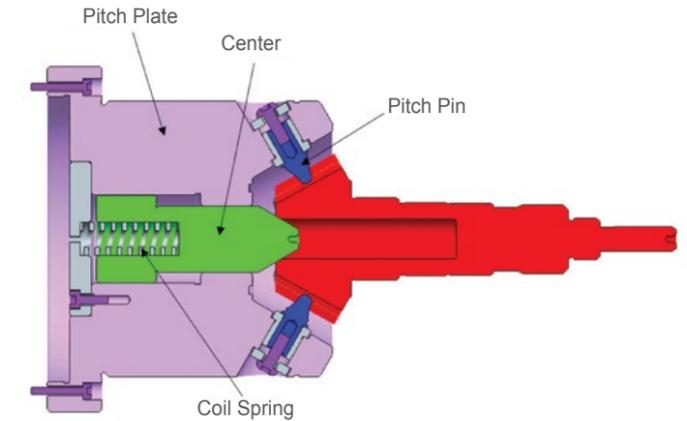
Gleason Pitch Line Fixtures are designed with the pitch pins perpendicular to the gear tooth pitch

diameter for optimized strength, accuracy, and wear. This offers significant advantages over conventional design, where the pins in a pitch line fixture point straight up (parallel to the axis of the part). This can result in a reduction in radial accuracy and stiffness of the centering function. For example, in pinions with a slim pitch angle of, say, 20° the forces on the balls and the pins are not directed in the axial pin direction, thereby reducing the force perpendicular to the pitch angle to only 34% ($\sin 20^\circ$) in the axial pin direction and 94% ($\cos 20^\circ$) perpendicular to the pin. This high perpendicular force will ultimately wear the pin sleeves and also bend the pins. In the case of ring gears this effect is smaller, but the same accuracy and wear issues will occur over time.



(Above) Pitch Line Fixture with spring loaded center in which the part can be positioned off the center and then lowered onto the pins for hard turning, grinding, or inspection.

(Below) Pitch Line Fixture equipped with hydraulic quick change base equipment, for applications where the customer requires fast changeover of multiple part types.



Application Versatility

Pitch Line Fixtures can be designed to meet the needs of a wide range of customer applications: mechanically or hydraulically actuated, tailstock driven, compatible with quick change base equipment, incorporating a spring loaded pre-centering mechanism, and including mechanically activated holding jaws.

The recommended clamping method is determined by the application. For example, a pinion being held in the Pitch Line Fixture by a tailstock would not require clamp blocks on the pinion head for holding the pinion in place.

For a gear member, straps are often used on the back angle if the process requires that the bore be machined as well as the mounting surface. These pitch line features would be incorporated as required into the design of the fixture.

For more information on how Gleason Pitch Line Fixtures can be used to help reduce cost and improve accuracy in your operations, contact your local Gleason representative.



Brian Baldeck
Manager Design
Engineering & Assembly
Tooling Products Group
Gleason Corporation



Ian Schickling
Lead Tool Design
Engineer
Gleason Corporation