

Background and Product Overview

Tuthill has over 75 years of experience manufacturing a wide range of positive displacement pumps that address many of the challenging applications in the asphalt industry. Tuthill offers positive displacement pumps in the circumferential piston, internal gear and external gear designs, ranging in capacity from .5 GPH to 550 GPM and available in iron, stainless steel, and other materials. Tuthill Pump products have established a reputation for reliability and durability in the equipment machinery and process industries.

The Tuthill HD Series is a circumferential piston pump capable of running dry without damage, handling a wide range of viscosities and slurries, and is a low-shear design. The design incorporates the use of externally-mounted, synchronized timing gears operating close clearance impellers with external shaft-bearing support. It is available in ductile iron and stainless steel construction as standard, with other materials available on special order. Because of its no metal to metal contact design, and availability in hardened iron wetted parts, the HD pump has been successfully used in high concentration limestone filled asphalt applications.

GlobalGear® is a heavy-duty internal gear pump that features an external thrust bearing and heavy-duty bracket for supporting bearings and mechanical seals. The GlobalGear® internal gear design pump offers a heavy-duty modular design capable of back pullout access to the fluid chamber without disturbing the pipe. The modular design features also minimize maintenance costs and inventory requirements compared to other internal gear pumps. GlobalGear pumps are available in cast iron, stainless steel, and other materials upon request.

Lower flows such are encountered with equipment forced oil lubrication services are addressed with the L & C series of products that include a wide range of integral close-coupled pumps and motors, and CC Series of flanged-mounted pumps for use with NEMA C faced motors.

The Tuthill Technaflo Products include precise, low-flow pumps suitable for pumping additives and product modifiers. They are available in a variety of pump head materials of construction and are capable of adjustable flow rate with variable-frequency drives. The pumps can be combined with accessories and fabricated systems to meet a variety of chemical and process-feed requirements,

Tuthill is a leading manufacturer of positive displacement pumps that serve a variety of applications in the asphalt and related building materials industries.

Asphalt Industry Applications

Since its discovery more than 5000 years ago, Asphalt/ has proved to be one of nature's most useful and abundant materials. There are various other names used for this material; bitumen earth pitch, mineral pitch and petroleum asphalt. This petroleum by-product is used for various different applications, of which the largest segments are:

- Road Asphalt
- Roofing/Shingles (See notes on "filled asphalt")
- Waterproofing
- Softener in Rubber blends

Tuthill GlobalGear® and HD pumps have been successfully applied to numerous applications throughout the Asphalt industry, including:

- Bulk Transfer
- Loading/Unloading of Tankers, (highway and rail types)
- Transferring from main storage-tank to production tanks
- Feeding of production installation, e.g. production of roof shingles.
- Mobile road repair equipment

Asphalt is normally a solid or semi-solid material at room temperature.

In most applications asphalt is pumped at elevated temperatures of 270 °F to 400 °F to reduce the viscosity (100 to 7500cPs) and ease processing.

To maximize operational efficiency of pumps in asphalt service, Tuthill has incorporated a range of options that make products ideally suited on various asphalt applications.

Construction and Available Options for Asphalt Service

Tuthill provides the option of a jacketed bracket and jacketed cover on select GlobalGear® models. A complete two-piece pump jacket is available for the HD pump. These jacket options are suitable to be used in combination with a thermal fluid (hot oil) or steam.

Tuthill recommends using heating jackets to keep the asphalt product at design temperature during transfer. Before start-up, the pump should be pre-heated so it is at operating temperature. Insulation on pumps and piping, as shown in figure 1, is important to avoid cold spots and the potential of product solidifying.

GlobalGear® features modular build on flanges as standard for the range. Oversized flanges can be installed on the pump housing to reduce the pressure losses on the suction line. This reduces the possibility of cavitation and increases operational efficiency.

Tuthill also offer a standard choice of 90° or 180° port positions, on GlobalGear®, to reduce length of suction pipework; or, suit the customer's preferred installation. Tuthill uses adequately sized shaft diameters and high strength materials, as standard, on internal components, for trouble-free operations in the full range of conditions encountered including cold starts. By comparison, major competitors charge a substantial premium for their version of "steel fitted" high strength construction that may be necessary to avoid breakage of components during cold start situations.

For HD pumps, high torque shaft materials are offered as options for handling viscosities up to 4,000,000 Cps.

High Temperature Options

Asphalt is normally pumped at elevated temperatures. The GlobalGear® range of iron pumps can be used, with the correct material configurations, up to a maximum temperature of 600°F. HD Pumps can be utilized for applications up to 530°F.

Generally, the maximum temperature for asphalt applications is about 425°F. Depending on the maximum temperature, the following GlobalGear construction options are recommended:

Temperatures less than 300°F

- Standard Iron construction pump can be used with bronze bushings
- Above 150°F, internal clearances are increased, in line with Tuthill Engineering recommendations

Temperatures 300°F to 400°F

- High temperature package required, consisting of HT-ball bearing, HT gaskets and HT paint
- Standard bronze bushing and standard packed gland can be used
- High temperature clearance required, in line with Tuthill Engineering recommendations

Temperatures 400°F to 450°F

- High temperature package
- High temperature clearance
- Bronze or HT carbon bushings
- High temperature packing

Filled Asphalt Applications

In certain applications, the pump is required to handle mineral additives in the asphalt fluid. This results in a compound, which is heavily abrasive. Limestone is common additive filler.

In these applications, it's very important to reduce normal operational pump speed and include other abrasive resistant features, Tuthill has available:

- Tungsten Carbide Bushings
- Chrome Oxide coated Idler Pin
- Hardened Shaft
- Tutrided (Low temperature Nitrogen hardening of Iron) Gears, Housing and Cover

Generally, for asphalt with high concentrations of solids or mineral fillers, we recommend utilising HD heavy-duty rotary circumferential piston pump, which has the following main features.

- Externally timed Gears: Timing gears, used to synchronize the action of pump rotors to avoid metal-to-metal contact. Timing gears are separated from the fluid chamber, and run in an oil-filled casing
- External Bearing Chamber: Both shafts are supported by roller bearings, which are mounted outside of the fluid chamber; so hard particles in the fluid are not able to attack the bearings
- Run Dry Capability
- High Pressure Capability, up to 450 psi



Figure 1: Tuthill Gear Pump Asphalt Installation

Sealing of Asphalt Pumps

Currently, packed gland shaft sealing is the popular choice on asphalt pumps. The main disadvantage of packed gland pumps is they inherently “weep” base fluid. Recent environmental regulations require a reduction of the “leaking” from process equipment. Depending on the application, other sealing types are used such as component mechanical seals, cartridge mechanical seals or lip seals. GlobalGear® pumps utilize a standard seal housing, designed to accommodate a variety of seal types. Some things can be done to improve leakage performance with packing. Use offilled PTFE throttle bushing wedges and engineered packings show promise as tactics to minimize shaft leakage.

There are challenges in applying mechanical seals due to coking. If the asphalt contacts air at elevated pumping temperatures, coking occurs, which forms hard abrasive particles. Most often quench glands are used where mechanical seals are applied, supplying steam or hot water on the atmospheric side of the seal. Hard face seals may be applied as a precautionary measure in addition to the quench gland. If temperatures greater than 375°F continuous 400°F intermittent are encountered, perfluoroelastomers are recommended for secondary seals.

Overall, mechanical seal solutions on asphalt are very expensive, and usage is relatively limited to refineries and terminals owned or operated by the major oil companies.