Tough Fluids, Steady Flow: The Advantages of Internal Gear Pumps in Industrial Operations

HOW INTERNAL GEAR PUMP DESIGN, ADJUSTABLE CLEARANCES AND VERSATILE MATERIAL OPTIONS ENABLE CONSISTENT TRANSFER OF VISCOUS, CHEMICALLY DEMANDING FLUIDS WHILE SUPPORTING RELIABILITY AND MAINTENANCE EFFICIENCY.

by Ron Crouch



Chemical processors must deal with many fluids that are dangerous and difficult to handle. In order to fashion a handling and transfer operation that optimizes reliability, efficiency and safety in their operations, many are making the decision to install and rely on Blackmer G Series Internal Gear Pumps

Introduction

It is no stretch to say that pumps make the world of industrial manufacturing go round. Every day, thousands of industries around the world rely on various pumping technologies to move raw materials and end products through the production process. Whether handling lube oils, paints and coatings, or working in applications from heat transfer to chemical processing, pumps must reliably, efficiently and safely transfer a dizzying array of fluids, all of which have unique – and oftentimes challenging – handling characteristics. If a pump is the weak link in the production process, then the entire operation will be compromised, with the downtime required for repair or replacement eating away at production quotas and the bottom line.

Industrial manufacturers have a wide range of pump options to choose from when outfitting their facilities. There are also a number of factors that go into their choice of pumping technology. Operational reliability and being able to meet very specific fluid-handling requirements are among the most important. With manufacturing operations governed by operating budgets and expenses, equipment acquisition costs and subsequent maintenance are also primary concerns.

This white paper will illustrate that while all pumping technologies can have their positive points in industrial-manufacturing operations, positive displacement internal gear pumps can offer the precise and consistent transfer of highly demanding fluids – in this case, dangerous chemicals – that is critical in creating a reliable, efficient, cost-effective and safe pumping system.

The Challenge

Chemical processing and manufacture is one of the most complex industrial operations in the world. In fact, the chemical-manufacturing process is so intricate that there are several "unit operations" within the process, from cracking, distillation and evaporation, to gas absorption, scrubbing and solvent extraction, among others.

Within that family of unit operations, one touches every stage of the manufacturing process and stands out above the others in its importance: fluid transfer. Often over-simplified as transporting fluid from one point to another, fluid transfer in chemical manufacturing is so much more.

Fluid transfer is a spectrum of applications, with responsibilities all along the chemical-production chain. For example, thin or viscous raw materials can be transferred to storage tanks or blending and mixing tanks. Final formulations can be transferred to holding tanks, and finished products can be loaded into IBCs for delivery or consumer packaging.

In many cases, chemical-manufacturing processes require the use of dangerous chemicals, such as strong acids, caustics, solvents, resins and polymers. Despite their inherent danger, these substances are necessary for the manufacture of thousands of consumer goods or facilitate other industrial processes. The challenge for users of these dangerous chemicals is to construct, handle and transfer them in a reliable way.

It is only when chemical processors master this juggling act that they will create a manufacturing operation that is both robust and profitable.

The Solution

Fortunately for chemical processors, positive displacement internal gear pumps have continually offered the reliability and cost-effectiveness required when handling raw materials and finished products. One example of this technology is the G Series Internal Gear Pump from Blackmer, a PSG brand.

G Series Internal Gear Pumps feature a simple design with only two moving parts, a pair of coinciding gears called the rotor and idler, making it ideal for precise and consistent transfer of demanding fluids. This design creates a four-step operating process for the G Series:

1. The rotor and idler gears un-mesh at the suction port to create an atmospheric vacuum that draws fluid into the pump. As the rotor turns, the fluid is forced between the rotor teeth and idler teeth.



No acid, polymer, resin or caustic has the same handling characteristics, which makes pump versatility a primary concern for chemical processors. Blackmer G Series Internal Gear Pumps overcome many handling concerns by featuring a method of operation that can successfully and safely transfer fluids of differing viscosities and chemical makeups.

2. Continual rotation of the rotor forces the fluid through a crescent-shaped area within the wetted path. The crescent-shaped area divides the fluid and acts as a barrier between the inlet and discharge ports.
3. As the rotor continues rotation, the fluid is forced past the crescent-shaped area and moves toward the discharge port.
4. As the rotor completes its rotation, the rotor and idler teeth engage to build pressure, forcing the fluid through the discharge port of the pump.

This method of design and operation allows G Series Internal Gear Pumps to operate equally well in either direction, resulting in a positive, non-pulsating flow of the fluid being handled. Other design features of the G Series include a rotatable pump casing that allows for multiple inlet and outlet port positions, single-point end-clearance adjustment, and an enlarged bearing housing at the rear of the pump that allows easy drive-end access to the shaft seal.

G Series pumps are available in cast iron, carbon steel and stainless steel construction. The nine models (G1-2 to G1-222) range in size from 1-1/2" to 6" ANSI port sizes with flow rates from 15 to 500 gpm (57 to 1890 L/min). The cast iron models have maximum discharge pressures of 200 psi (13.8 bar) and can handle fluid with viscosities up to 440,000 cSt. Pumps are available with packing or mechanical seals.

The G Series is interchangeable with up to 95% of mechanically sealed, packed and seal-less internal gear pumps, helping reduce downtime and the need for costly piping modifications.

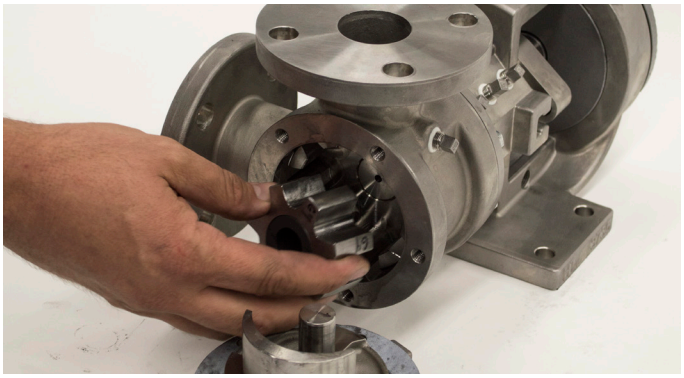
The G Series Internal Gear Pump is also available in a base-mounted configuration. This packaged system includes the pump, coupling, coupling guard, gear reducer and motor all mounted on a standard or heavy duty base, designed to minimize deflection and vibration, maximizing the life of key components, while offering easy and accurate shaft alignment.





G Series pumps are available in cast iron, carbon steel and stainless steel construction and are offered in a variety of connection sizes and flow rates.





G Series Internal Gear Pumps feature a unique design that features only two moving parts, a rotor and idler gear, which allows them to operate equally well in either direction and deliver positive, non-pulsating flow of the liquid being handled.

Conclusion

It's accepted that chemical processors must deal daily with fluids that are difficult to transfer. Their task is to create a handling and transfer regimen that includes pumping equipment that is compatible with many different types of dangerous chemicals, while also offering reliable operation and cost-effectiveness with regard to maintenance, repair and downtime. With its versatile design and consistent flow capabilities, the Blackmer G Series Internal Gear Pump has been proven to be the ideal choice for the handling and transfer of the many different types of chemicals used in many of today's industries worldwide.

About the Author:

Ron Crouch is a Product Management Director for Blackmer and PSG. He can be reached at ron.crouch@psgdover.com. For more information on the full line of Blackmer pumps and compressors, please call +1 (616) 475-9352 or visit blackmer.com. Blackmer is a product brand of PSG, a Dover company, Downers Grove, IL, USA. PSG is comprised of several leading brands, including Abaque, All-Flo, Almatec, Blackmer, Ebsray, em-tec, Griswold, Hydro, ipp, Malema, Mouvex, Neptune, PSG Biotech, Quantex, Quattroflow and Wilden. PSG products are manufactured on three continents – North America, Europe and Asia – in state-of-the-art facilities that practice lean manufacturing and are ISO-certified. PSG is part of the Pumps & Process Solutions segment of Dover Corporation. For additional information on PSG, please visit psgdover.com. PSG: Where Innovation Flows.