

## Choosing the best pump for lpg autogas applications

*A white paper by Thomas L Stone, director of marketing, PSG.*

**Autogas is now the third most popular motor fuel in the world and as its use continues to grow, regenerative turbine and sliding vane pumps can help optimise its handling.**

For more than a century, gasoline and diesel fuel have dominated the global motor fuels market. Still, many meaningful attempts have been made to add additional fuels to the motor fuel pool, from biofuels to electricity to compressed natural gas, in an attempt to curb the general reliance of motorists on these two fossil fuels.

Today, the most popular of these so called alternative automotive fuels around the globe is autogas, the name given to liquefied petroleum gas (LPG) when it is used as a motor fuel. Autogas has been gaining in popularity because it possesses a number of operational characteristics that are desirable to vehicle manufacturers and operators, namely that it is clean burning, high octane, abundant and environmentally friendly.

According to the World LPG Association's (WLPGA) Statistical Review of Global LP Gas 2014, global autogas consumption in 2013 rose to 25.8 million metric tonnes, up 5.3% over 2012 and 57% higher than the 16.3 million metric tonnes that were consumed as recently as 2003. At the conclusion of 2013, there were nearly 25 million autogas powered vehicles in use with, almost 71,000 fuelling sites located around the world.

Regionally, according to the WLPGA report, the countries of Europe/Eurasia are the top consumers of autogas, with 12.9 million metric tonnes consumed in 2013, or more than half of reported global consumption. Additionally, 16.7 million vehicles were powered by autogas in European and Eurasian countries in 2013. Within



that region, Turkey was the second largest consumer at 2.7 million metric tonnes and became the first country to have more than 10,000 retail sites that offer autogas (10,089).

The WLPGA also reported that other global hot spots for autogas consumption include South Korea at nearly 4 million metric tonnes; Russia, the largest European consumer, at 2.9 million metric tonnes; Thailand at 1.8 million metric tonnes, and Poland at 1.6 million metric tonnes. In North America, autogas consumption has been holding steady in the United States and Canada, with Canadians consuming more in 2013 (518,000 metric tonnes in Canada compared to 409,000 metric tonnes in the USA) but with the USA offering more retail locations (2,956 versus 2,228). Mexico was the largest consumer in Central and South America at 654,000 metric tonnes with consumption in the Dominican Republic and Peru also exceeding 400,000 metric tonnes.

So, while the global consumption of autogas – 3% of the total motor fuels market share according to the WLPGA – pales in comparison to gasoline and diesel, it is becoming a significant part of the motor fuel landscape in a number of countries. In those areas, retailers of autogas must utilise a pumping technology that will optimise the dispensing of the fuel. This white paper will illustrate how regenerative turbine and sliding vane pumping technologies can be the best choice for those autogas dispensing operations.

## **The Challenge**

Autogas, a utilisation of LPG, is a propane/butane mixture. This makes it unique in that it can be transported and stored as a liquid but, when released, it will vaporise and burn as a gas. In other words, autogas is easily changed from a liquid state to a gas state. This is a property that no other commercially available motor fuel possesses. Autogas can also be a safer choice than other motor fuels since it has a narrower window of flammability than most motor fuels. However, there are a few main challenges that autogas retailers must confront and overcome when handling the fuel:

- As a liquefied gas, autogas must be stored in an enclosed container under pressure. When stored in a pressurised container, the autogas takes the form of a liquid with any gas vapours on top, which provides the pressure that keeps the liquid from boiling. Any upset in this state of equilibrium will cause the autogas to boil off or vaporise.
- Autogas has a viscosity of about 0.1 centipoise (cP), which makes it approximately 10 times thinner than water. This low viscosity can make autogas difficult to pump since a fluid with low viscosity is harder to seal, while there is a greater risk that pump slippage will occur during transfer operations.
- During a pumping operation, if the pump's inlet pressure falls below the vapour pressure, vapour bubbles will form in the autogas liquid. As the bubbles travel through the pumping chamber and pressure increases, they will implode and cause cavitation. Cavitation produces pressure spikes and results in noise, vibration and damaged pumping system hardware.

Over the years, various types of pumping technologies have been used for the handling and dispensing of autogas. Two that have been utilised but were found to have significant downsides in these applications are centrifugal and side-channel pumps.

The main shortcoming of centrifugal pumps when handling autogas is that they are prone to experiencing vapour lock. Centrifugal pumps used in autogas handling applications are also not self-priming, unless they are submersible. But there are additional disadvantages with submersible centrifugal pumps, a noteworthy one being that they must be degassed before maintenance can be performed on them, which is an elaborate and time consuming process.

While side channel pumps are self-priming, they do introduce a number of negatives that affect their ability to handle autogas. One is that they are very poor for handling any fluids that contain solids, which can be found in lower grades of autogas. Secondly, they have a high purchase price and are expensive to maintain.

## **The Solution**

PSG, a Dover company, offers two product brands that feature standard setting pump technologies for use in autogas handling applications – Ebsray regenerative turbine pumps and Blackmer sliding vane pumps. For more than 75 years, Ebsray, acquired by PSG in 2013, has built a reputation as the leading developer and supplier of industry standard regenerative turbine pumps for use in the LPG markets of Europe, Asia and Australia. Upon its acquisition by PSG, the distribution of portions of the Ebsray regenerative turbine product portfolio in North America was incorporated into Blackmer's US based operations. Like Ebsray in Europe, Asia and Australia, Blackmer is the strongest brand in the North American LPG market.

Ebsray regenerative turbine pumps stand out in autogas dispensing applications because they have been designed and precision built for high-pressure transfer applications. They feature an innovative impeller design that optimises hydraulic performance, resulting in high differential pressures even at low flow rates, which is a critical consideration for autogas applications.

The design of the Ebsray regenerative turbine pump's impeller is a rotating, non-contacting disc that has up to 60 small buckets or cells on its periphery. When the liquid enters the suction port of the pump it is picked up by the impeller and accelerated around the narrow hydraulic channel that surrounds the cells. Kinetic energy is imparted to the liquid while circulating radially around the channel. The resultant spiralling of the liquid many times within one revolution builds energy and pressure.

Ebsray regenerative turbine pumps are offered outside of the USA in various models and configurations designed for underground, aboveground and submersible LPG installations and applications. In the USA, Ebsray specifically offers its RC series regenerative turbine pumps in two models for autogas applications – the RC20 and RC25. The RC20 pumps offer flow rates up to 15 gpm (58 L/min) and flow rates up to 25 gpm (94 L/min) for the RC25 models. Both pumps can operate at differential pressures up to 175 psi (12 bar).

Blackmer offers the LGL series sliding vane pump for use in autogas handling applications. The secret to the success of sliding vane pumps in LPG installations can be found in their unique design and method of operation. Sliding vane pumps have a number of vanes that are free to slide into or out of slots in the pump rotor. When the pump driver turns the rotor, a combination of forces (centrifugal, mechanical push rods and liquid) causes the vanes to move outward in their slots and around the inner bore of the pump casing. This forms internal pumping

chambers and, as the rotor revolves, the fluid flows through the suction port and into the pumping chambers that are created by the vanes. The fluid is then transported around the pump casing until the discharge port is reached, at which point the fluid is moved into the discharge piping.

Blackmer LGL pumps are available in 1" to 4" sizes, with flow rates from 8 to 32 gpm (30.3 to 121 L/min), and all models are UL-listed for LPG service. The LGL pumps feature a cavitation suppression liner that reduces the noise, vibration and wear that can be caused by entrained vapours. Blackmer LGL150 series sliding vane pumps were specifically designed for use in autogas dispensing applications.

## **Conclusion**

Currently, the search for viable alternatives to gasoline and diesel fuel sees autogas gaining ground and becoming an even larger player in many regions of the world. When determining which type of pumping technology to use at autogas dispensing facilities, there are two standout alternatives – regenerative turbine and sliding vane pump technologies, especially those offered by Ebsray and Blackmer. These technologies have been proven to offer the operational characteristics and reliability required to successfully optimise autogas handling operations.

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