

Gas control for metal surface treatments

In recent years there has been significant growth in the use and diversity of different techniques for metal surface treatment, thanks to the ability of these processes to alter the surface properties of a material without affecting the bulk characteristics. In order to gain maximum benefit from these techniques it is essential that the process systems employed on the application machines use highly precise and dependable gas control and flow measurement equipment.

Tony Brennan, Field Segment Manager .gas at Bürkert Fluid Control Systems, looks at the some of the techniques and technologies behind precise gas flow control and how it can benefit OEMs and end users alike.

Surface treatment covers a wide variety of processes and techniques from more traditional heat treatment to the latest in plasma coatings and thermal spraying. The common theme is effecting a change in the surface structure of a material in order to improve its qualities, usually with a specific purpose in mind.

Basic heating processes such as normalising, annealing and tempering use specific heating and cooling procedures to change the microstructure of the material, usually steel, to counter the effects of the production and manufacturing processes. Achieving the required specification in these applications requires careful control of the heating process, which is usually governed by the supply of fuel and oxygen to a burner.

Since the heating process in these examples is conducted in normal atmospheric conditions, the best method of controlling the heat is through careful management of the fuel source. In many cases this is a combustible gas such as propane or acetylene which requires certified isolation valves and, depending on the location of the valve, an ATEX rating.

The quality and uniformity of the finished product is heavily dependent on the precise control of temperature which can be best achieved either using a mass flow meter (MFM) or a mass flow controller (MFC) specifically designed and calibrated for the fuel gas. There are a number of additional features which can make certain devices more suitable for some applications, such as fieldbus connectivity, and high IP ratings, but the most important attributes are accuracy across different flow rates and reliability.

The plasma spraying process for example can be used for a variety of applications, such as surface cleaning, increasing temperature tolerance and applying special coatings to withstand corrosion. Coatings can be applied to components as varied as jet engine vanes to pump impellers to achieve a predetermined life period under severe operating conditions.

Creating the correct plasma jet conditions is essential if the finished component is to meet the required standards. This demands precise pressure and flow control of the plasma gas, such as argon, which requires precise flow controllers and control systems. Bürkert has been involved in the design and manufacture of precision gas delivery systems for over 25 years and is actively supporting designers and manufacturers of equipment that requires precision metering.

The MFC can form an integrated, fieldbus- compatible system, comprising a flow sensor, control electronics and control valve. Using this controller, mass flows of gases in the range from 0.005 IN/min to 1,500 IN/min can be kept constant whilst maintaining a turn-down ratio of 1:50, or can follow a predefined set-point profile, regardless of external influences, such as pressure or temperature variations.

Depending on the application, Bürkert can tailor the sensing technology to use one of three types of sensor, each with its own advantages. Inline sensors are positioned in the main channel and provide exceptional response times with minimal contamination susceptibility. MEMS sensors operate in a secondary channel and also provide extremely quick response times, even with the smallest flow rates. Alternatively, capillary sensors are well suited for aggressive gases and can be used with gases that the sensor has not been calibrated for.

For component suppliers, it is essential for the manufacturing processes to have total consistency and this requires feedback systems and control loops to deliver continuous product quality. Achieving this through a reliable process is key to producing a cost effective product that will deliver to the required specification.

Supported by a wide product range of flow controllers and solenoid valves that conform to a variety of European and international standards, Bürkert engineers can help in the design and execution of any surface treatment equipment. By working closely with end users and OEM designers involved with these projects, Bürkert is able to contribute its considerable experience in this field and offer cost effective and reliable solutions.

Photo Captions:

Picture 1: The Bürkert Type 8710 Mass Flow Controller for Gases (MFC) monitors and controls the flow of gases through a sensor element which is not in direct-contact with the gas itself and a built-in high accuracy proportional valve.

Picture 2: Bürkert gas control valves and solutions are used for various gas applications such as: ammonia control, for gas nitriding and nitrocarburising, for controlling protective gas atmospheres at sintering and endogas production sites and for controlling the feed-in to industrial ovens or burners.

Picture 3: The MFC can form an integrated, fieldbus- compatible system, comprising a flow sensor, control electronics and control valve. All items can be panel mounted within a cabinet for convenience and protection.

About BÜRKERT

Bürkert Fluid Control Systems is one of the leading manufacturers of control and measuring systems for fluids and gases. The products have a wide variety of applications and are used by breweries and laboratories as well as in medical engineering and space technology. The company employs over 2,500 people and has a comprehensive network of branches in 36 countries world-wide.

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