

Case study: preeflow volumetric adhesive dispensing helps ensure integrity of life-saving medical device

Our customer **BPR Medical**, based in Mansfield, Nottingham, is a perfect example of a small British company which combines expertise, creativity and entrepreneurialism to design, develop and manufacture world-beating products for export worldwide and use in the United Kingdom, for which it was rewarded in 2012 with a Queen's Award for Enterprise: Innovation. As with any manufacturing company, the success of its products depends to a considerable degree on assembly methods.

Watch how BPR Medical found their dispensing solution

The company's latest success story is the Bidirectional Firesafe™ Cannula Valve, used for in-home medical oxygen supplies to extinguish fires which can occur in the line between the concentrator and the user's mask or nasal cannula. Such fires can occur if the line comes into contact with ambient flame – such as a candle – or more commonly if the patient is a smoker.

The UK's Home Oxygen Service supports some 90,000 patients. In the US, accident & emergency units attend to in excess of 1,000 thermal burns a year caused by ignitions associated with home medical oxygen, of which smoking was by far the leading cause*.

**National Fire Protection Association estimate*

Life and death integrity

BPR's unique inline Bidirectional Firesafe Cannula Valve extinguishes the fire by cutting off the oxygen supply. It is a development of an existing, unidirectional design and acts as a thermal fuse whereby the oxygen supply is cut off when a fusible component softens as a result of the heat from an approaching fire in the oxygen delivery tube. Integrity of operation is vital and could literally represent the difference between life and death.

When BPR had chosen a two-part epoxy to bond both halves of the valve's body, the next task was to

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find a dispensing solution that would assure deposition of a precise, repeatable volume of the adhesive, metered and mixed in the correct ratio, on to a cylindrical assembly. The resulting bond integrity would help ensure conformance for CE marking under European Medical Device Directive, as well as BPR's unerring commitment to quality.

Technical Director Ben Johnson's team evaluated a number of possibilities, including premixing and dispensing via a pinch tube valve. This yielded inconsistent results due to changes in viscosity which begin to occur naturally as soon as epoxy is mixed, exacerbated by temperature fluctuations. It also took an unacceptable amount of set-up and clean-up time.

The accuracy of volumetric dispensing

Having determined that volumetric technology would provide a better solution, BPR contacted us and two other vendors to arrange equipment demonstrations. Trials using the selected epoxy were conducted in a wide ambient temperature range, and rigorous pull, flexural and other testing of the assembled valve, revealed that the [preeflow eco-DUO](#) precision metering, mixing and dispensing system suggested by our product specialists was the correct solution. It offers $\pm 1\%$ dosing accuracy, >99% repeatability and can dispense volume flows of 0.2 to 32ml per minute, with a minimum volume of 0.01ml. The **preeflow** positive displacement technology means that the volume dispensed is not affected by viscosity changes in the material.

Key Customer Benefits were recognised as:

- Confidence of consistently high quality
- Increased productivity
- Decreased operating costs
- Time savings pre, during & post-operation
- Reduced material usage
- Reduced reject rates

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- De-skilled assembly process
- Aesthetically superior products

The two alternative potential vendors and their systems were also evaluated, but we were selected – not only on the basis of the **preeflow eco-DUO** meeting BPR's needs, but because of the lower total cost of ownership and promise of superior initial and ongoing support from our team.

Ben Johnson and Product Development Programme Manager Mike Brudenell worked with our product specialists to configure the dispenser into its bespoke manufacturing jig, into which the two populated halves of the Firesafe valve body are manually loaded prior to being rotated whilst the epoxy is applied. Each of the 20,000 units per month produced at the time of writing is non-destructively tested, whilst regular samples are subject to a three-point flexural test.

The system operates an automatic purge at the end of the shift, eliminating the need for cleaning down. Control is via a **preeflow plug 'n' mix** interface and stored settings ensure consistency and repeatability, and eliminate daily set-up time. Thanks to preeflow's accuracy, the volume of epoxy applied has been reduced to 0.05g from the pinch tube valve's 0.06g.

Ben Johnson commented:

We had to go through a number of stringent processes to ensure the integrity of the bonding of the two body halves. An essential part of this was how the two-part epoxy adhesive was applied: to ensure a highly accurate, repeatable dose on a rotating jig, but also to maintain the correct dispense volume regardless of viscosity changes caused by temperature. After evaluating a number of options, we chose the **preeflow eco-DUO** from Intertronics as it provided the best results for both of these criteria.

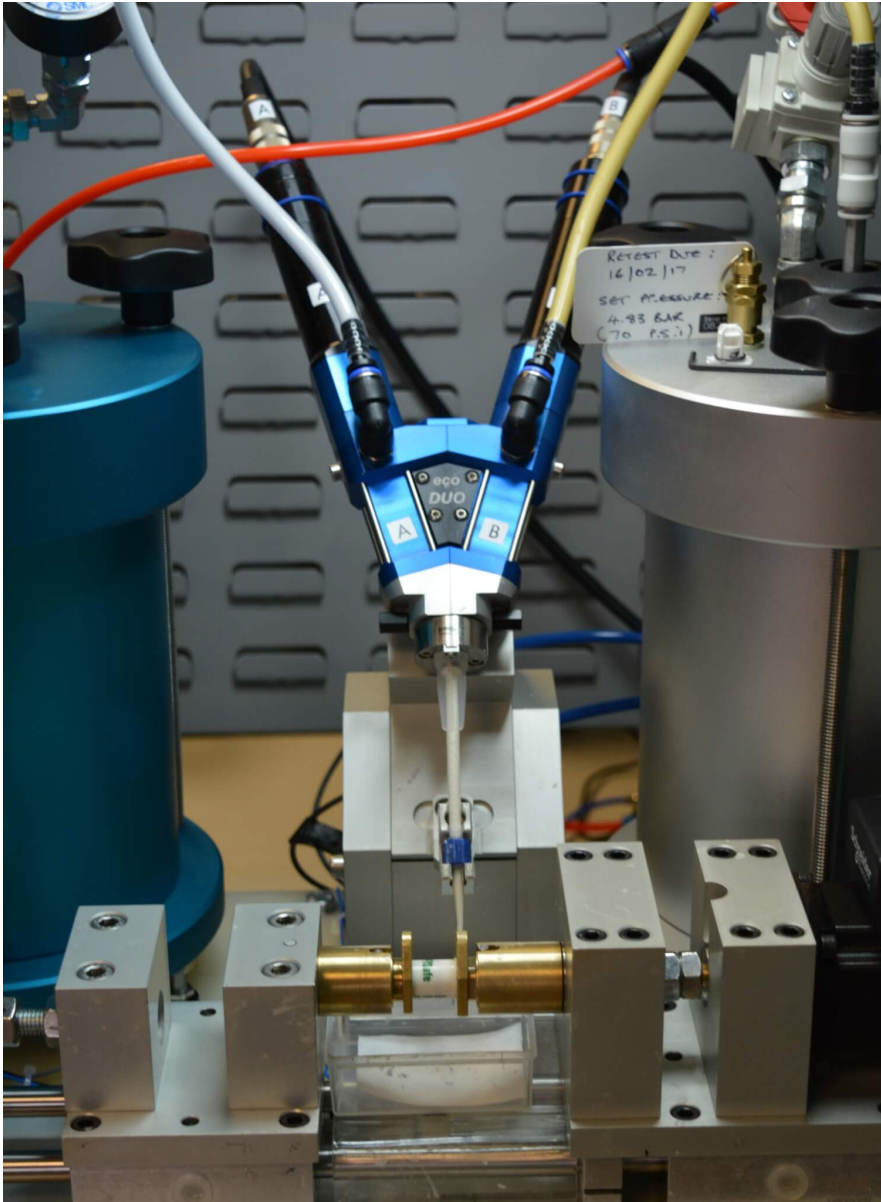
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Intertronics helped us choose a volumetric dispensing solution that was the best one for our needs. We've been very impressed with their expertise, they're responsive and always on hand to support us with any queries or technical support we might need. The way they've helped us to integrate and set up the system means that we always achieve a consistently high level of process capability.

Not only that, but we estimate our return on investment to be in the region of £2,000 a month.

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