Quantex

A novel approach to pumping

Challenge

PDD analysed the medical pumping market and established that there are numerous types of pumps (diaphragm, peristaltic, syringe etc) being used for different pumping applications. There was not one pumping technology that was appropriate for the accuracy and low dispensed volumes at one end of the application scale to the high flow rates required at the other end.

Solution

Following a rationalisation of technology options, PDD decided to approach the challenge from a new angle. Instead of making more complicated and expensive pumps that would have reliability and maintenance issues and would have to be calibrated or restricted to specific IV sets, why not make the pump part of the disposable and keep the drive and control unit simple and cheap?

The result of this approach is an innovative rotary positive displacement pump, designed for high accuracy and very low cost that overcomes many of the deficiencies of peristaltic, syringe and diaphragm pumps. The new mechanism is not sensitive to pressure and temperature effects and by using a rotary motion, continuous flow can be achieved, leading to uses where constancy of flow at low rates is important.

Tested to medical device standards, the patented concept can be customised to suit specific applications, including intravenous infusion, fluid chemistry, immunoassay, HPLC, high accuracy sampling pumps, automated pathology, high throughput screening, micro volume dispensing, bottled home medicines and many others.

Features of the pump include:

- A fully reversible, continuous flow rate of 2µl/min to 30ml/min (1800ml/h)
- Scalable to higher and lower rates
- A fluid viscosity range of up to 100cp
- 22mm x 22mm in size
- ±1% accuracy
- Disposable
- Low cost – only 2 parts

To demonstrate the benefits of the concept, PDD developed a full hospital pump. In collaboration with St Bartholomew's Hospital in London, PDD sought to define both performance and end user needs. Quantex integrated the pump into the giving set and contracted PDD to develop the pump controller. Interaction designers worked closely with all the stakeholders including nurses, doctors and biomeds to understand pressures and challenges of their working days or nights. Through a process of iterative design, testing and refinement, PDD was able to develop a product that is easy to mount on poles or beds, has foolproof loading of the disposable and a simple and intuitive user interface that tells the nurses, doctors or biomeds the information they need to know, when they need to know it.

The pump unit is compact and lightweight and because accuracy is controlled within the disposable element, the drive is a simple stepper motor. This, combined with the development of innovative occlusion sensing keeps part-count and cost low and, through keeping the mechanism simple, maximizes reliability and product life.

Result

This project demonstrates PDD's ability to analyse markets, identify opportunities, and generate valuable IP, as well as PDD expertise in developing technology into commercially viable product solutions.

Building deep relationships that deliver meaningful innovation

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