

# Pump primer

Selecting the right pump for a given duty is not as easy as some believe. Brian Tinha taps into experience and advice from operations engineers and equipment vendors alike

**O**n average, each of us drives past around 1,000 pumps on our daily commute to work. That's all types, including pumps installed in process plants, industrial facilities, construction sites, HVAC equipment – you name it. But wherever and whatever they are, this crude statistic reminds us of the sheer variety of pumping duties, and pump types and sizes. Which should make it all the more surprising that so many of us stick to a type, even down to the manufacturer, we know, and rarely question whether there might be something better.

The clear consequence is that we're almost certainly (albeit inadvertently) failing to deliver the most efficient and/or most effective, quietest, lowest cost and least maintenance pump for every application. A teacher might say, 'could do better'. But how? Those that do look at pump alternatives find themselves confronted by a bewildering array of mechanical arrangements, with apparently little standard nomenclature and contradictory statements about performance benefits. Take metering pumps, for example: the choice includes piston, plunger, mechanical diaphragm and hydraulic diaphragm.

## Back to basics

Glen Siddall, technical support manager for Speedy Hire's pump rental division (who heads up a team boasting some 100 man years of pump experience) recommends going back to plant engineering basics. "From an engineer's point of view, you need to be aware of the application duty first and then match the machine to it. That means considering the pump design, its materials of construction and the likely effects of the pumped medium on the equipment. For example, if you're looking at a centrifugal pump, what will happen if there's a risk of dead-heading? What about the possibility of cavitation? Maybe you need to move away from centrifugal to positive displacement types."

Tony Peters of pumps specialist AxFlow – which



offers brands including Pulsafeeder, Wilden, Waukesha Cherry-Burrell, Unitec, Blackmer, Hermetic, Borger, Mono, Wernert and Typhoon – puts it another way. "Having first established the nature of the medium, it is necessary to consider parameters including delivery volume and pressure, temperature, flow characteristics, vapour pressure, viscosity, specific gravity, solids content, corrosiveness, toxicity and hygiene.

"The correct materials must be selected according to the properties of the pumped medium. In the food, beverage and pharmaceutical industries, for example, the choice of materials is particularly important, as compliance with EHEDG, FDA and 3A regulations is always a basic requirement. Then, when applications involve hazardous environments and liquids, issues such as ATEX certification also have to be addressed."

And then, for process and utility plant, there's the pipework – its size, the number of bends, route taken, materials etc. These are also key for calculating friction loss and static head, and hence a pump size able to deliver the given flow. As Speedy's Siddall says: "If your natural preference is centrifugal pumps, you then need to look at the pump curve and use your calculations to match the duty to the BEP [best efficiency point], so as not to over- or under-engineer the system, including the

**Above:** Speedy pumps on site  
**Left:** Speedy submersible pump  
**Far left:** Blackmer pumps at Samuel Banner chemicals production plant

## Pointers

- Choosing a pump means first working back from the fluid medium and duty
- Pump design, materials of construction and effects on pumped medium then follow
- Consideration must also be given to the pipework and its impact on losses, static head and hence flow
- For centrifugal machines, look at the pump curve and match duty to the BEP
- Many fluid handling problems arise because pumps are neither designed, nor suitable, for the duty



## Innovative engineering in pump choices

Pump types that have been in existence for years, if not decades, are being developed for all sorts of applications – clearing the way for plant engineers to find better solutions to existing problems. Here's a quick roundup to give you some ideas.

Birmingham-based process engineering company Enpure is now using peristaltic pumps from Watson-Marlow at the core of its water treatment technology for continuous turbidity measurement. Enpure's Steve Cole says: "We needed to feed the turbidimeter at a constant flow rate of 1litre/hour and the peristaltic pump does exactly what we need. A centrifugal pump, for example, would be fine for large volumes of water, but it's not fit for purpose here."

It's a similar story at Reliable Electrical Services in South Africa, which needed a pump for automatic and precise dosing of ink and sealant, 24/7, for an automotive windscreen sealing process. It chose the British-made Verderflex peristaltic pump. Eddie Horn, one of RES' founders, says that its remote stop/start and speed control made it easy to integrate into the automated system, but also that the pump met the brief of precise ink/sealant application.

But centrifugal pumps are also not standing still. Alfa Laval's new SolidC UltraPure centrifugal pump, for example, takes concepts used in its no-frills Solid C Range and marries those to its high-performance UltraPure sanitary pumps. According to the company, the result is four sizes and 72 variants of centrifugal pumps that are ideal for hygienic pumping duties, such as CIP (clean in place) and short-run batch processing. Features include: a smooth, crevice-free surface design, which prevents an accumulation of contaminants and bacterial growth; and an external single-shaft seal or flushed-shaft seal construction, with the spring mounted on the atmospheric side and a defined-compression O-ring fitted on the back plate. The latter allows maintenance to be carried out quickly (it takes only around 5 minutes to replace the shaft seal) and inexpensively.

Finally, for the wastewater industry, Severn Trent Water is using Vaughan chopper pumps, supplied by solids handling specialist P&M Pumps, initially to deal with unscreened sewage at a submersible foul pumping station near the Sinfin Golf Course in Derby. Previously, the station's

solids handling pumps could not cope with the volume of rag following storm conditions. Now, four months after commissioning and following 700 hours of operation, the Vaughan pumps have not blocked, meaning no call-out charges and no maintenance costs. Also, when the pumps were inspected as part of routine maintenance, Derbyshire pumping station manager David Stone reported no wear, despite normal amounts of grit. Severn Trent has since installed Chopper pumps on two more similar sites.



**Above:** AxFlow pumps at EDF  
**Centre:** AxFlow King Cobra heavy duty peristaltic unit  
**Right:** Speedy's Bentonite pump

motor size and hp, to achieve the duty."

Incidentally, Siddall also advises going to site to assess an application for yourself. "Keep an open mind, whatever the industry. Nine times out of 10, people think they know what they want, but it's worth making some notes and drawings and giving it some thought." All well and good. But, if your experience is limited, that's not going to help a lot. So it's hard to escape the conclusion that talking to the experts might make sense – especially given the fact that there are so many pump types, many of which have now been re-engineered for greater versatility.

If you don't, as Peters warns: "Many fluid handling problems arise because the pumps are neither designed, nor suitable, for the applications and/or conditions for which they have been selected. The consequences can go beyond frequent downtime, high maintenance costs and spares demand: there can also be penalties due to unnecessarily expensive and complex plant installations, occasioned by a need for control, monitoring and safety devices which, in turn, mean additional maintenance costs.

Worst of all, there is a risk of producing substandard product."

The bottom line: if in doubt, find a supplier with an expert you can trust and don't automatically select the cheapest option. Pumps designed for specific duties may be more

expensive, but can often repay the extra in terms of simple, lower cost and more efficient installations.

Siddall gives the example of a pump his team specified for a Bentonite (clay-based) pumping application. "The customer had traditionally used standard over-pumping equipment, but engineers were spending half the shift cleaning it out, because the material was setting hard inside the pumps. So we came up with a pump made from hard iron that was resistant to the product abrasiveness, and that could be dismantled easily and rinsed down in 10 minutes."

He also cites a pumping solution for wellpoint dewatering, traditionally achieved using centrifugal pumps with over-sized three- or four-cylinder diesel engines. "We came up with a design using a reciprocating piston pump, driven by a small single-cylinder 10hp diesel engine. We also worked on the reliability of the engine – extending the sump and improving oil filtration – and now we have a machine that runs continuously for 1,000 hours between services, with a 300 hour fuel tank capacity to match. They can set it up on site, turn the key and just leave it for three weeks at a time." 

