

# PERFECTING PUMP DESIGN



**ANDY FORMAN, AMARINTH, UK, DISCUSSES THE CHALLENGE OF ACQUIRING HIGH-SPECIFICATION BESPOKE PUMPS ON SHORT LEAD-TIMES, COST-EFFECTIVELY.**

**T**he offshore oil and gas industry is going through unprecedented change, finding and extracting oil and gas from ever-more challenging fields with constantly increasing pressure on reducing equipment costs. To access these reserves often requires a small number of very high specification pumps designed and built to a bespoke requirement, and on short lead-times and to a keen budget.

Presented with such a complex and often juxtaposing set of needs it is little surprise that many pump manufacturers quickly say 'no' to tendering and move onto more standard stock pump requirements. Of those that consider proposing a solution, it often entails a lengthy and difficult enquiry stage that leaves offshore customers frustrated and which impacts on deadlines. It is no surprise then to find that one of the

offshore industry's challenges is finding the pumps it needs, to the specification it needs, when it needs them, and within the project budget.

So, how can pump manufacturers help the offshore industry when the pumps are often, by necessity, ordered late in the contract but must still meet all of the expected requirements economically? In this article, Amarith explores how re-thinking the approach to enquiries, design, the supply chain and the company processes can enable low volume, bespoke pumps to be delivered economically and on short lead-times that meets the industry's needs.

### The diversity of pump DNA

The challenge faced by pump manufacturers when they receive a specification from the offshore oil and gas industry is that each set of requirements can be very unique. Each pump may have a different 'DNA'. For example, pumps for new platforms or floating production storage and offloading (FPSO) vessels may have very specific duties, perhaps a low shear capability or low net positive suction head (NPSH), or the requirement may be to fit in a defined space necessitating a bespoke length of vertical pump or the packaging of a pump and its seal support system to fit a small footprint or limited headroom.

For retrofit pumps on existing facilities it may be that the pumps have to align with existing pipework and structures to minimise downtime during installation but ensure no additional forces are introduced, or a particularly fast turnaround is required to replace a failing system.

De-mothballing of facilities to bring them back into production to extract oil and gas from previously uneconomical reserves presents its own challenge too, as the existing pumps may have to be replaced with updated designs but which still fit within the existing layout and footprint on the platform or FPSO and may also need bespoke casings and impellers manufactured from exotic materials to accommodate, for example, higher maximum working pressures or more corrosive pumped fluids.



Figure 1. Compact skid packaging of a bespoke gas driven pump.

Is it realistic for the oil and gas industry to expect a pump manufacturer supplying a largely standard range of API pumps to have the agility or engineering expertise to deliver against these requirements within a timescale that is frequently shorter than for a more 'standard' pump? The answer is a qualified 'Yes', when the customer is willing to work hand-in-hand with a pump manufacturer that understands the need for a more consultative approach right from the initial enquiry and which has invested in the tools and processes to design and deliver bespoke solutions with little difference in timescales to that of a standard design.

### Enquiry

At the outset of a new project it is crucial that the pump manufacturer and the customer work closely in reviewing the specifications and needs. It is common for the customer to have their own ideas on the type of pump they think will meet the duty, but this may be dictating longer lead-times than required or a higher than desirable cost.

However, if a more open minded and consultative approach is adopted at this early stage and the duties carefully analysed, a skilled and experienced pump manufacturer may be able to propose a solution that the customer had not previously considered. This could be using a different specification or type of pump that will enable the duty to be met but on a shorter lead-time, with less disruption to the process, or at a reduced cost. Also the pump manufacturer may be able to draw on its experience to suggest packaging and skid options that could alleviate other time and cost issues.

Although the questions a skilled pump manufacturer may be asking at this point can seem frustrating to a customer trying to expedite a project, especially when timescales are short, perseverance at this stage when working with a manufacturer that has streamlined design and manufacturing processes can produce a much more beneficial outcome for the project.

A pump manufacturer that is used to dealing with bespoke requirements on short lead-times should know what many of the common requirements are. If that company has an appetite to invest in engineering forethought and technology it will be able to anticipate many customer needs, which when combined with the latest computer aided tools and computerised tracking of processes can produce a system that, for example, delivers general assembly and isometric drawings, including nozzle loads, weights and other data essential to the customer in a matter of minutes with the full design package following in just two or three weeks. This can significantly reduce the overall time spent at this enquiry stage, even accounting for the more consultative approach.

### Design

The traditional method of designing bespoke pumps often takes the project beyond the lead-times demanded by offshore oil and gas customers, but by embracing technologies such as parametric design, pump manufacturers can significantly shorten the design phase producing robust designs based on a number of proven modules.

For example, API 610 VS4 pumps are a staple of the offshore industry, but can be specified any length and with a range of options. Undertaking a bespoke design for each project is a lengthy process, but by developing a system that can construct a bespoke design based on a set of parameters, the design time can be significantly reduced. At Amarith for example, the