

Intelligent pump selection in the 21st Century

The future success of pumping companies will depend greatly on their ability to provide timely, cost competitive and accurate product knowledge, design and equipment to their customers. By **Dave Brockway**, Chief Operating Officer, and **Trygve Dahl, Ph.D., P.E.**, Chief Technology Officer, **IntellEquip, Inc.**

The advent of the internet is having a dramatic impact on technology delivery and the methods by which sales persons, application engineers, and ultimately end users will select and configure complex and engineered pumps in the new Millennium. The future success of pump companies will depend on their ability to provide timely and accurate product knowledge, designs and equipment to their customers. Added to the equation will be the ability to deliver an intelligent selection of the 'best' pumping equipment that meets the customer's technical requirements at a competitive price and that satisfies lead-time and quality requirements.

Pump selection and configuration knowledge are the heart of this information. Boastful talk of robust eBusiness initiatives without sound selection and configuration tools in place, are false promises that lead to hollow results. Unfortunately, eBusiness hype has prompted a number of weak Internet initiatives that have left both the pump manufacturer and their customers less than satisfied. Successful internet initiatives in the Pump Industry will not, and cannot occur until manufacturers have first built, tested, validated, and ultimately embraced their own internal selection and configuration tools as part of their core business competencies.

There are currently a number of selection and configuration initiatives in the pump industry that will gradually, but substantially change the way business is conducted. The internet provides the collaborative platform allowing applications and information to be readily accessed by any customer at any time, virtually anywhere in the world. Pump industry domain experts (such as skilled applications and product engineers) provide the knowledge and business/technical rules needed for a truly effective computerised application. Then, next generation software applications are needed to effectively interface the knowledgebase with the human 'user' to assure high-quality selections and quotations consistent with the capabilities of the best and brightest engineering talent in the industry.

An additional advantage of this technology infusion into the pump industry is the impact on the corporate bottom line. The return on investment for investing in such state-of-the-art technology is improved selection quality, faster and more accurate proposal generation, and 'cleaner' orders. internet based architecture is the system infrastructure of choice because of flexibility, ease of deployment, reduced maintenance and reduced client support. Ultimately, it is the internet that allows powerful full functioned 'internal' selection and configuration tools to be seamlessly and painlessly deployed directly to a pump company's customers.

Figure 1. The vertical turbines manufactured by Johnston Pump present complex selection problems that its web-based initiative needed to address. Performance adjustments for fluid friction losses in the pump column discharge head, bearing losses and efficiency adjustments based on materials of construction are but a few of the more than 40 special selection criteria that are considered.

Pumps from environmental to globalisation

The pump industry — which has been in its environmental phase since the post-World War Two re-building era — is now standing on the doorstep of the globalisation phase as the internet has brought it to another level of maturity.

The environmental phase resulted in a convergence of the performance-oriented design and product design technologies of earlier pre-World War Two pump designs with environmental and emission control issues of the period. Sophisticated hydraulic analysis and design software were developed to optimise the basic design embodiments developed earlier. Higher efficiency machines and sealing technology with lower emissions were profiled during this phase. In addition, pump installations were evaluated for their total energy costs and retro-fitted with equipment that was better for the current or changing conditions of service.

Today, the pumping industry is evolving into a Globalisation Phase. This phase is driven by the substantial influence of information technology on the economics of the traditional manufacturing firm.

IT — catalyst for change

Over the past 25 years, change has occurred at a modest pace in the pump industry compared to the electronics and information industries. Information technology has undoubtedly been the catalyst for the globalisation trend that the pump industry is experiencing today. Information technology that is rooted on the internet enables partners located at opposite ends of the globe to collaborate on design projects, to exchange new product designs and to share manufacturing resources based on regional demand. Information technology has also been the catalyst to force companies to re-invent themselves and cause change in their overall corporate business model. The 'dot.com' hype and euphoria, which

has run its course over the last two years, has prompted some pump companies to develop simple web sites, web applications, or internet based selection capabilities when they have not yet implemented corresponding internal process changes to leverage those capabilities. Today's pump customers are too sophisticated to be satisfied with overly simplistic internet solutions for complex problems. Pump companies cannot provide this capability, until they have it themselves. The encouraging news is that technology has been developed that will enable all pump companies to rapidly and economically develop strong selection and configuration capabilities.

Pump selection

Designing the piping network and sizing the components for pumping systems are performed early in the overall pump selection and purchasing process. The piping system design involves numerous components that introduce friction losses in the system. These must be calculated in order to estimate the system resistance curve to properly size the pumps needed in the system.

An important element of this design process is an optimised pump selection. Efficient pump selection programs are being used to aid in this process.

These programs can be reasonably sophisticated, using specialized mathematical algorithms to predict pump performance under varying operating conditions of speed, temperature, NPSHA, pressure, and viscosity. Some are capable of adjusting performance based on alternative mechanical seal design, wearing rings design and clearance, bearing design, materials of construction, or other mechanical design features.

There are scores of pump selection programs utilised in the industry today. With few exceptions, these pump selection programs were specifically developed by each pump manufacturer using proprietary selection and searching methods. As such, the initiatives vary in their power, look and feel. Typically, these solutions are DOS or Windows based and are distributed via CD's.

In many cases, they are internal tools only, and not distributed to

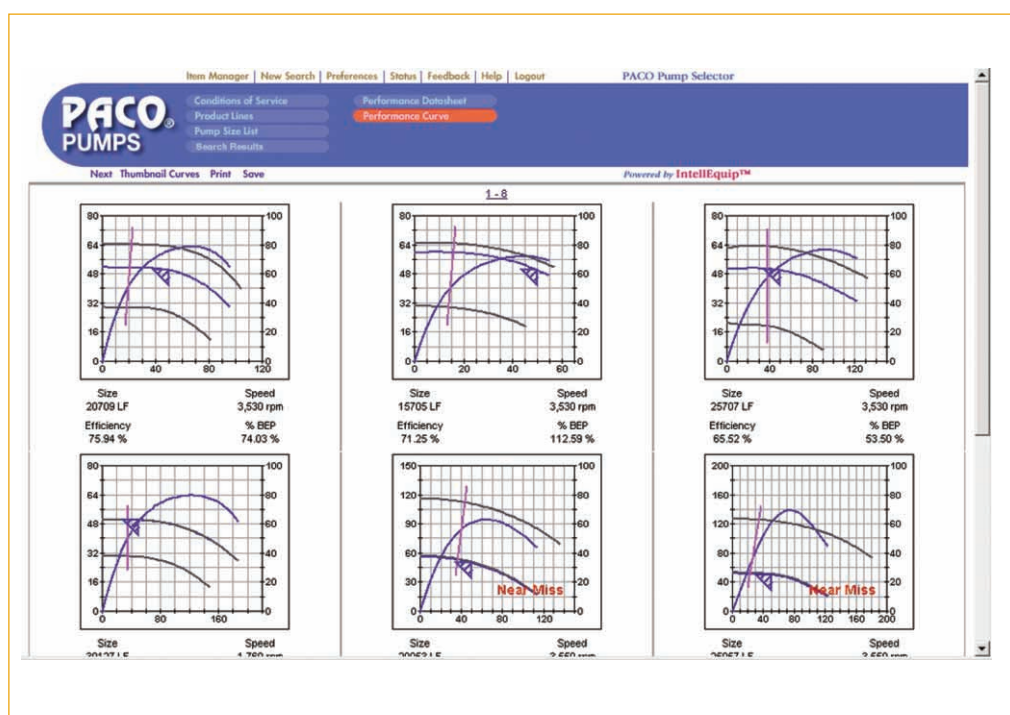


Figure 2. Paco's web enabled selector is accessed by both internal sales people and customers. The subtle power of this solution is illustrated by the 'thumbnail curves' which allow users to quickly compare multiple pump curves like traditional product catalogues.

customers. There is often a link between the size of the pump company, the complexity of their offerings and the power of their internally developed tools. These internal initiatives can be extremely expensive, and financially out of reach for the vast majority of pump companies. As a result, there is a tendency for smaller companies to have lower (or maybe even no) expectations for their digital selection technology.

Many third party and internally developed selection tools are limited in their capabilities. They are not able to perform many of the operations that are required in the proper selection of complex pumps. A properly developed pump selection program gives the user the ability to evaluate a large number of alternative design options in a short period of time, without ever having to refer to paper documents. Building this full-featured capability into a selection program is neither easy, nor inexpensive.

As technology continues to develop, powerful internet-enabled tools will eventually replace paper based and

Windows based initiatives. These internet initiatives will provide greater value to buyers and suppliers alike by providing real-time access to the latest versions of the program and performance data. More importantly, these systems have demonstrated that they can improve selection 'optimisation' by at least 30% (where 'optimisation' is defined as the 'best' pump that meets customer requirements).

Pump configuration

The primary tool used by pump manufacturers during the 'inquiry/quotation' process is commonly known as the 'pricebook'. The pricebook is an engineering design, specification, and pricing manual used by a trained pump applications engineer to convert a customer's inquiry into customised quotation. The diverse array of information, expertise, and resources needed to generate a customised proposal using a pricebook has prompted the need to systematise the selection and configuration process on the internet.

Some manufacturers have responded by developing computerised pump

configurators. Pump configurators aid the application engineer in developing a pump quotation according to a prescribed product configuration model. These configurators use 'design rules' to guide configuration choices. Examples of design rules are maximum pump torque for a given shaft design, or the allowable temperature range for a given material. Using these design rules, a configurator can automatically upgrade a flange rating on a casing based on casing pressure or increase the shaft size to carry the cyclical loading of an engine driver. A simple internet based configurator that many would be familiar with would be those used to configure PC's (Dell and Gateway would be good examples).

The complexity of pump configuration, however, requires a much more robust capability. API 610 process pumps or multistage vertical turbine pumps may have over a thousand options that need to be considered when configuring and pricing. Some considerations would be casing material, flange ratings, impeller material, wearing ring type, bearing design, sleeve material, seal type, seal flush piping, cooling type, coupling type etc the list goes on and on. It is difficult enough for a pump company to 'digitize' these rules for internal use, let alone present them in a fashion that can ultimately be used by their customers.

The adoption of internet-enabled product configurators is an essential step in bringing buyers and suppliers together to optimise the product design and application. Buyer's benefit by understanding design and cost trade offs at a detailed level, while suppliers are assured of a robust implementation of their design rules from configuration through order design.

Fully featured internet enabled configuration tools are available today, however, independent software companies rather than the Pump Companies are developing them. The reason for this is the

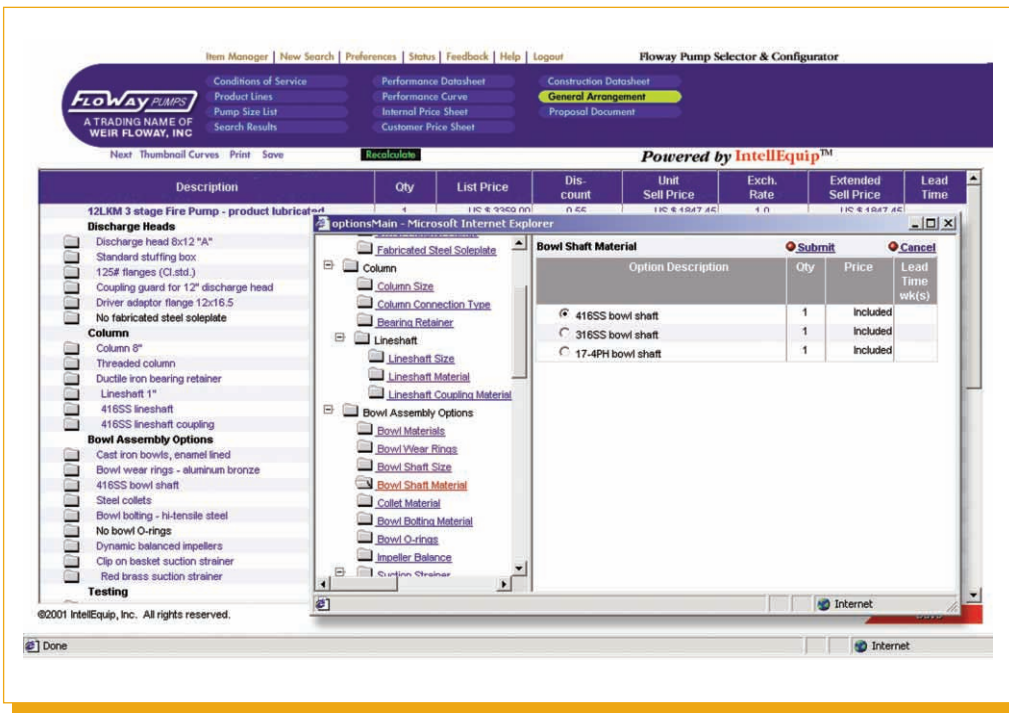


Figure 3. Weir Floway's vertical turbines are integral components of their Firepump packages. The web-based internal price sheet is used by their sales engineers to quickly and accurately configure and price both pumps and complete Firepump packages.

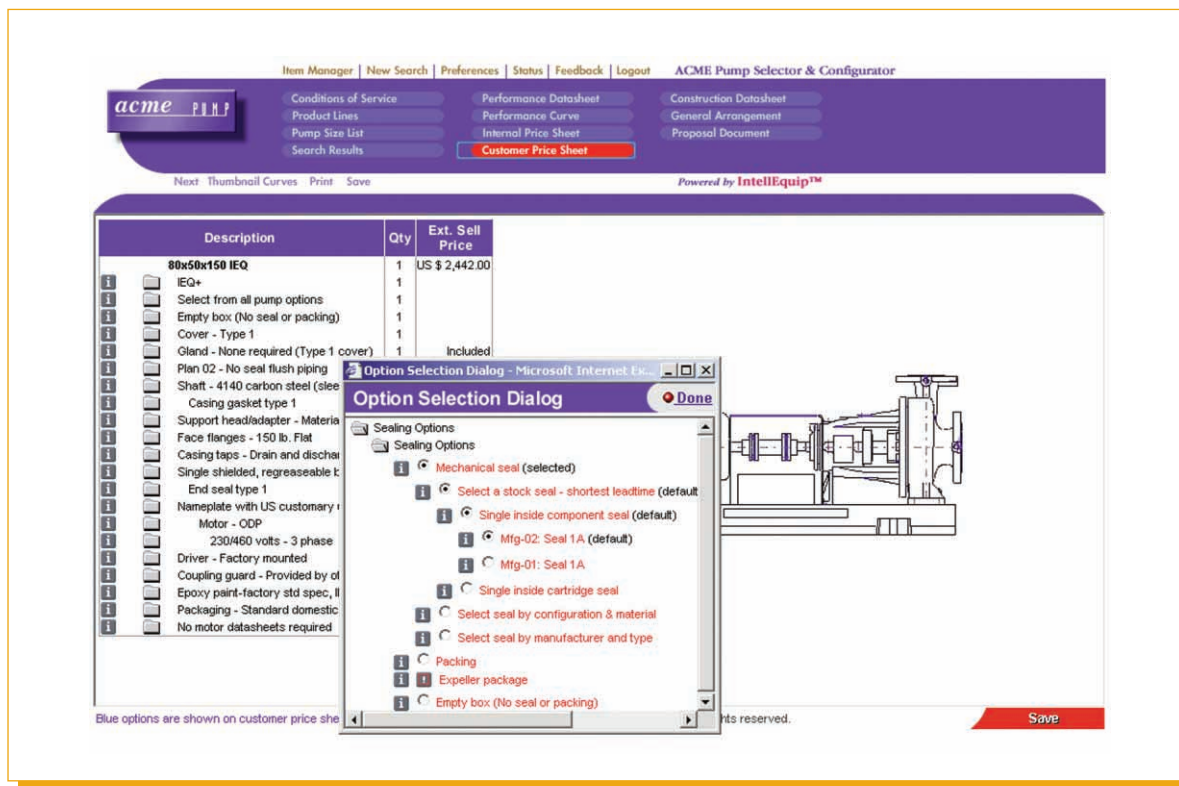


Figure 4. A global (European-based) pump company has recently integrated both selection and configuration capabilities into a web-based internet initiative. After making a pump selection, a customer can use the online price sheet to choose applicable features and options by simply clicking on the appropriate graphical image on the drawing.

extremely high cost of internal development. A third party software developer is able to build the core technology and then license it to multiple pump companies at a fraction of the cost of an in-house initiative. New releases with more power and functionality are being released regularly. A developer with deep pump domain experience is the key ingredient for developing tools that solve the difficult problems that exist in the successful development effort.

So, by leaving the industry specific software development to third party experts, pump companies can focus their unique product experience in the development of proprietary selection and configuration rules that 'digitize' their intellectual competencies. Then, their competitive advantage comes from a rapid implementation and unique deployment of this software allowing them to re-frame their internal and customer-facing business processes. Internal adoption of this technology by the pump manufacturer is necessary for testing and validation before ultimately

being made available to their customers.

Summary

The basic activities — design, selection and purchase — of pumps are substantially the same today as in the past. However, the process and technologies employed in performing these activities will dramatically change as a consequence of the internet and new information technologies. The motivations are the desire for shorter cycle times, higher quality, and lower costs in the selection, configuration and purchasing process. These motivations are driven by the availability of new and emerging information technologies that offer a more seamless and structured flow of information between the purchaser's and the supplier's sales, applications, engineering, and manufacturing functions.

The emergence of the internet as a worldwide, ubiquitous information pipeline guarantees that a stable infrastructure is in place on which pump companies can build their

selection and configuration capabilities. The cost of this technology will be directly born by the pump companies, but they will also be the direct beneficiaries of the cost savings that are realized. The full internal adoption of these tools by manufacturers has to precede their availability to their customers.

As with all new technologies, the adoption rate is unknown. Forward-looking pump companies have already started these initiatives, while the majority of companies are taking a 'wait-and-see' attitude. Customers can have a strong influence on the adoption rate by asking their vendors to provide them access to internet-based selection and configuration tools that are capable of dealing with the complexities of the pump industry. ■

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